3.0 *Alternatives To The Proposed Project/Action*

3.1 *Introduction*

This chapter contains a description of the alternatives evaluated in this Draft EIR/EIS, a summary matrix (Table 3-1) of the environmental effects, a discussion of differences in hydrodynamics and a brief comparative evaluation. More detailed discussions of the impacts to each alternative are found in the individual impact chapters. The proposed project, ISDP, is described in Chapter 2.0. NEPA CEQ Regulations, 40 CFR 1502.14, describe this section as follows. *"This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (Section 1502.15) and the Environmental Consequences (Section 1502.16), it should present the environmental impacts of the proposal and the alternative in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public."*

The alternatives selected for detailed evaluation in this DEIR/EIS were developed in good faith, and in consultation with the Corps, USFWS, EPA, NFMS, and DFG, in compliance with the letter and spirit of both CEQA and NEPA. We believe this DEIR/EIS follows the requirements of CEQA and NEPA in considering a full range of alternatives that would meet the purposes of the proposed ISDP. We also believe the range of the selected alternatives is consistent with the analytical requirements of 404(b)(1) of the Clean Water Act. The 404(b)(1) Guidelines (40 CFR 230) are the substantive criteria used in evaluating permit applications to the Corps to discharge dredged or fill material into waters of the United States. The Guidelines require a permit applicant to clearly demonstrate that the proposed discharge is unavoidable and the least environmentally-damaging practicable alternative. The proposed ISDP 404(b)(1) Alternatives Analysis and the discussion concerning the identification of the least environmentally damaging practicable alternative is contained within the Public Draft EIR/EIS (Appendix 1).

Each alternative to the proposed ISDP is described in the following, beginning with the original South Delta Water Management Project. It should be noted that the proposed ISDP was designed as a scaled-down version of this project in an attempt to achieve some key project objectives in a more environmentally conservative manner.

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TABLE 3-1: OVERVIEW OF THE SIGNIFICANT ADVERSE IMPACTS FOR THE ALTERNATIVES

Topic	Enlargement of Clifton Court Forebay, construction of two intake structures, increased export, and construction of permanent barriers.	Reduction of SWP/CVP Exports and Management or Reduction of Demand for SWP Water	Modification of CVP/SWP exports consolidation of agricultural diversions, extensions of existing agricultural diversions, and increased pumping at Harvey O. Banks up to 10,300 cfs.	ISDP with Additional CCF Intake at Italian Slough	ISDP without Northern Intake, but with Expanded Southern Intake
Aesthetics, Light and Glare	Impacts of ISDP except those related to northern intake. Impacts of expanded forebay, including restriction of views of two National Historical Landmarks.	Elimination of impacts of ISDP.	Impacts of regulating reservoirs and related facilities; dredging-related light and glare.	Impacts same as ISDP.	Impacts same as ISDP.
Air Quality	Elements of this alternative involve larger areas of construction resulting in greater emissions of ozone, particulate matter, and CO than the proposed project.	Elimination of impacts of ISDP.	Impacts associated with ISDP barriers would be eliminated. Greater impacts associated with the consolidation and extension of the agricultural diversions, and related reservoir construction and additional dredging.	Impacts associated with ISDP plus additional air pollutants resulting from construction of the Italian Slough intake structure.	Emissions levels are expected to be comparable to ISDP emissions.
Aquatic Resources	Impacts related to ISDP, plus increased predation in the forebay and increased loss of shoreline habitat.	Elimination of impacts of ISDP.	Increased dredging-related impacts upon aquatic resources, including smothering of habitat and habitat loss for the delta smelt, splittail and striped bass. Significant impacts to spring-run and late-fall run chinook salmon. Would alleviate several ISDP impacts to aquatic resources.	Impacts same as ISDP.	Impacts same as ISDP.
Cultural Resources	Possibility of vertebrate fossils in the vicinity of the proposed facilities. Portions of ISDP project area have not been surveyed. Potential effects on four archaeological sites, potential effect on three ethnographic sites, and potential effect on two historic bridges.	Potential impacts unquantified.	Potential impacts to significant vertebrate fossils. Certain project element sites were not surveyed.	Same as ISDP, plus those associated with the construction of the Italian Slough Intake. Five sites are located in the vicinity of Italian Slough. Certain project element sites have not been surveyed.	Same as ISDP, except those associated with the construction of a new intake at the northwestern corner of Clifton Court Forebay. Some project element sites not surveyed.

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Hazards	Same safety-related conflicts at some barriers as ISDP. Greater THMFP than ISDP due to flooding of Victoria Island.	Elimination of impacts of ISDP.	Elimination of safety-related conflicts related to barrier passage.	Impacts same as ISDP.	Impacts same as ISDP.
Land-Use Planning	The irretrievable commitment of important agricultural lands in conflict with the 1992 Delta Protection Act. Over 40 residential, agricultural, and commercial structures to be eliminated. Conflict with Highway 4 and Discovery Bay development.	Elimination of impacts of ISDP; potential impacts in service areas.	The development of ten regulating reservoirs, totaling 400 acres, represents conflict with existing land use patterns. Impacts to 1,480 acres of agricultural lands.	Impacts same as ISDP.	Enlargement of West Canal conflicts with the 1992 Delta Protection Act. Loss of agricultural lands due to construction of the setback levee.
Public Services/ Utilities	Potential conflicts with existing power lines. Relocation of electrical power lines.	Elimination of impacts of ISDP.	Impacts same as ISDP.	Impacts same as ISDP.	Relocation of two existing transmission lines along the southern boundary of Clifton Court Forebay.
Recreation	Impacts same as ISDP, except effects from construction and operation of the northern intake facility. Expansion Forebay to cause loss of access to existing recreational facilities, elimination of a least one marina, and the restriction of access to a popular fishing area.	Elimination of impacts of ISDP.	Elimination of impacts of barriers.	Impacts same as ISDP, plus the impacts of Italian Slough intake, including the blocking access to Clifton Court Levee and access to a fishing area.	Impacts same as ISDP, with some minor effects shifted to West Canal instead of northern intake site.
Navigation and Transport-ation	Impacts of ISDP, plus additional impacts as a result of construction of Clifton Court Forebay.	Elimination of impacts of ISDP.	Same as ISDP, with greater effects related to construction and dredging for the consolidation and extension of agricultural diversions.	Impacts same as ISDP.	Impacts same as ISDP.

TABLE 3-1: OVERVIEW OF THE SIGNIFICANT ADVERSE IMPACTS FOR THE ALTERNATIVES

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Noise	Same as ISDP, plus noise due to construction of the Clifton Court Forebay.	Elimination of impacts of ISDP.	The construction of consolidated diversions could have construction-related effects on noise levels as great or greater than ISDP.	Same as ISDP, plus noise associated with construction of the intake at Italian Slough.	Impacts same as ISDP.
Geologic Conditions	Same as ISDP, plus loss of 2,900 acres of class III, and IV agricultural lands. Potential for ncreased levee scour.	Elimination of impacts of ISDP.	Permanent loss of about 400 acres of agricultural lands. Temporary loss of about 1,000 acres of agricultural land greater than ISDP. Greater potential for grading- and excavation-related impacts.	Same as ISDP, with additional potential of scour.	Same as ISDP, with additional potential of scour.
Socio-economics	Significant disruption to businesses due to road construction and obstructions that discourage recreational boaters from using local restaurants. Impacts to agricultural lands, and other impacts outlined in the proposed alternative.	Long-term impacts to agricultural, municipal, industrial, and residential water-users.	Similar impacts as ISDP, plus additional impacts to agriculture. The cost of operation maintenance of the reservoirs, consolidated pumps, and related distribution systems would be higher.	Same as ISDP, plus noise and aesthetic impacts on local businesses. Potential for impacts on water skiing and boat use.	Impacts same as ISDP.

TABLE 3-1: OVERVIEW OF THE SIGNIFICANT ADVERSE IMPACTS FOR THE ALTERNATIVES

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Terrestrial Biological Resources	Same as ISDP, plus disturbance of 2,900 acres of plant and wildlife habitat associated with forebay expansion. Impacts on Vernal pools, Valley sink scrub, riparian scrub, alkali grasslands, wildlife habitats, nesting raptors, electrocution of raptors, loss of Delta tule pea, Mason's lilaeopsis, rose-mallow, brittle scale, delta mudwort, cuisun marsh aster, Swainson's hawks, nesting herons, California Black Rail, Giant Garter snake, Valley elderberry longhorn beetle, and San Joaquin Kit fox.	Service area impacts to Mason's lilaeopsis, hydrophytic vegetation, wetlands habitat, urban wildlife habitat, and riparian habitat. Impacts to wildlife resulting from fallowing. Impacts to numerous special status plants.	Same as ISDP except for barrier-related impacts. Additional construction-related impacts. Potential habitat loss due to dredging, impacts to raptor nests, rose-mallow and Delta tule pea, Swainson's hawk, western pond turtle, Valley Elderberry longhorn beetle, loss of instream islands and waterside vegetation, Cumulative impacts to Mason's lilaeopsis.	Same as ISDP, plus impacts to Mason's lilaeopsis, rose-mallow, brittlescale, and nesting herons due to the construction of Italian Slough intake facility.	Same as ISDP, plus impacts on vegetation and wildlife, impacts to willow scrub habitat, and potential loss of island habitats.
Water Quality	THM formation may increase as a result of flooding on agricultural land on Victoria Island to enlarge the forebay. The impacts from construction activities (dredging, filling, providing flow diversion), are the same as those analyzed for ISDP.	Elimination of impacts from ISDP.	Elimination of impacts from ISDP.	Impacts same as ISDP.	Impacts same as ISDP.

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3.2 Enlargement Of Clifton Court Forebay, Construction Of Two Intake Structures, Increased Export Capability, And Construction Of Permanent Barriers

This alternative, the original South Delta Water Management Program preferred alternative, would include five project components. Three of the components are exactly as described for the proposed ISDP: 1) increase export capabilities at Clifton Court Forebay; 2) construct and operate a seasonal barrier; and 3) construct and operate three tidal flow control barriers. Table 3-2 details the physical features and costs of this alternative and Figure 3-1 shows the location of the alternative components. Two of the components are different from the proposed ISDP, and these are described in the following.

3.2.1 Enlarged Clifton Court Forebay

Clifton Court Forebay would be enlarged from 2,100 surface acres to more than 5,000 surface acres. The northwest portion of Victoria Island and the remaining area of Clifton Court Tract would be used to enlarge the forebay. The Southeast portion of Byron Tract would be used to hydraulically connect the existing forebay to the new area. The enlarged forebay would require an estimated 150,000 cubic yards of excavation, six million cubic yards of embankment and 2,788,000 (sf) of riprap material.

Twelve miles of levee would be required for the dam embankment. It is assumed that the new embankment can be safely built on the existing foundation material, since adjacent existing levees have been constructed on the same foundation with steeper side slopes. It is planned that the material dredged from the channels be placed in the embankment area.

In addition to the dredged material, about six million cubic yards of borrow materials would be imported for the construction. The estimated quantity of borrow for the embankment has been increased by 15 percent to account for the expected settlement. Embankments would be provided with a toe drain to tie into the existing drainage system on the islands. Wells would also be installed to monitor potential seepage.

The enlargement of the forebay would also require the realignment of Highway 4. This includes construction a roadway parallel to the existing roadway alignment. The relocation would consist of about 1,500 linear feet of embankment and a 628 foot, multi-span, reinforced-concrete bridge near the eastern portion of Byron Tract. The bridge would be a slab bridge with pile supports spaced at a 26 foot minimum. It is estimated that 80-foot-long, precast, and prestressed concrete piles would be needed for the pile supports. The roadway section would be 14 feet above mean sea level (MSL) and would consist of two 12-foot-wide traffic lanes with eight foot shoulders for emergency parking. During modifications and restoration, Highway 4 would be detoured. For a period of 24 to 38 months, motorists can expect delays of about 5 minutes.

Siphons between Byron Tract and Victoria Island would be used to hydraulically connect the expanded forebay areas. Each siphon structure would be made up of cast-in-place reinforced concrete conduits about 700 feet long. Each conduit would be about 25 feet wide by 25 feet high. Four siphons would be capable of conveying flows of 15,300 cfs at a velocity of about six feet per second.

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Table 3-2 Physical Features of Alternative 3.2
Enlarged Clifton Court Forebay, Intake Structures, Permanent Barriers

	Enlarged Clifton Court Forebay	Northwest Intake Structure	Northeast Intake Structure	Channel Enlarge-ment	Siphon Structure	Perma-nent Barriers[2]	Totals
Type of Gates	None	Radial	Radial	None	None	Varied	N/A
Number and Dimensions of Gates	None	5@20x30	6@30x29	None	None	Varied	N/A
Capacity (cfs)	N/A	15,000	30,000	21,000	15,300	N/A	45,000max
Structure Footprint (ft x ft)	N/A	120x60	200x60	N/A	700x100	Varied	N/A
Storage Pad (ft x ft)	None	200x200	200x200	None	None	Varied	N/A
Boat Passage Facility	None	None	None	None	None	Varied	N/A
Excavation (cy)	150,000	60,000	100,000	-0-	341,000	121,200	772,200
Embankment/Backfill (cy)	6,000,000	6,000	9,000	400,000[1]	205,000	98,300	6,718,300
Structural Concrete (cy)	-0-	3,000	5,000	-0-	29,000	8,300	45,300
Levees Constructed (lf)	100,000	-0-	-0-	5,500[1]	-0-	1,000	1,000
Levees Removed (lf)	-0-	-0-	-0-	-0-	-0-	1,000	6,500
Riprap (sf)	2,788,000	62,000	62,000	370,000	104,000	98,000	3,484,000
Channel Dredging Length (mi)	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Channel Dredging Amount (mil cy)	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Forebay Enlargement Increase in Size (ac)	2,900	-0-	-0-	-0-	-0-	-0-	2,900
Construction Period (mos)	60	36	36	12	12	18-36	6-36
Construction Crew	30	100	100	15	25	Varied	15-100
1/96 Estimated Cost ($ million)	254.2	12.2	17.1	17.0	79.7	32.9	413.1

[1] Levee setback
[2] See Table 2-1

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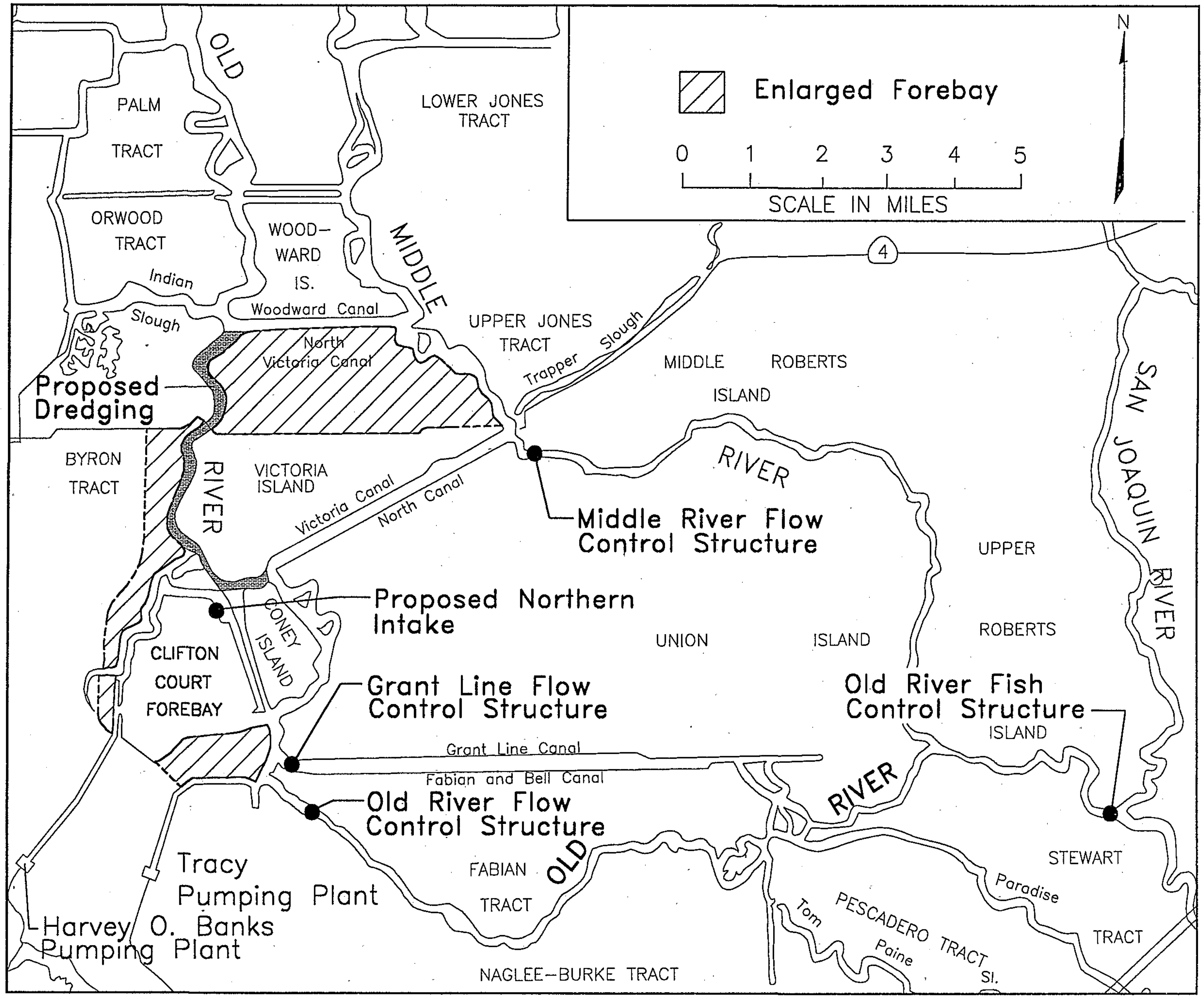

Figure 3-1. Enlarged Forebay Alternative.

3.2.2 *New Intake Structures*

Two new intake structures would be constructed on the north end of the expanded forebay. The northwest intake structure would be located at the confluence of North Victoria Canal and Middle River. The second intake northwest structure would be located at the confluence of North Victoria Canal and Old River.

The northwest intake would have five radial gates 20 feet wide and 30 feet high, with a peak diversion capacity of 15,000 cfs. The northeast intake would have six radial gates 30 feet wide and 29 feet high, with a peak diversion capacity of 30,000 cfs.

The typical construction method for concrete control structures with one or more gates is to build the structure on dry land near the site and float the structures into the project area. Construction of the two forebay intakes would require a total of 8,000 cubic yards of concrete and 124,000 (sf) of riprap materials.

The two new intake structures would be similar in operation to the existing intake structure. The structures would be operated either in conjunction with or independent of the existing intake, depending on the amount of water to be diverted, water quality, specific tidal conditions, or other factors. The gates would be closed when the water level outside the forebay recedes, to retain water in the forebay.

3.2.3 *Hydrodynamics*

This alternative differs from the proposed ISDP by increasing the size of Clifton Court Forebay, providing two new intake structures at the northern edge of the new forebay, and by widening a portion of Middle River to increase hydraulic capacity, rather than dredging a portion of Old River. The alternative would not change the amount of increased export capability, and it assumes that demand is the same as for the proposed ISDP.

Since export capability is not changed in this alternative, it is likely that the pumping schedule modeled by DWRSIM for proposed ISDP would not change for this alternative. If this is the case, then this alternative would not change any of the impacts that were modeled for the proposed ISDP with respect to Delta Inflow, Delta Outflow, Delta Exports, or operation of SWP Reservoirs. There would be some minor differences in flow velocities, local circulation patterns, and water level elevations, depending upon whether the barriers are operating.

3.2.4 *Comparative Impact Evaluation*

The implementation of this alternative would cause all of the same impacts as the proposed project, ISDP, but would involve substantially greater construction- and land-disturbance-related impacts within the Delta, as detailed in the Table 3-1.

3.3 *Reduction Of CVP/SWP Exports And Management Or Reduction Of Demand For SWP Water*

3.3.1 *Introduction*

This alternative was developed through discussions with staff from the Department of Fish and Game, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the U.S. Environmental Protection Agency. The alternative consists of two components: 1) management of combined Central Valley Project and State Water Project Delta exports to improve water levels and circulation in the south Delta during the agricultural season, and 2) management/reduction of pumping demand.

3.3.2 *Component 1: Management Of CVP/SWP Delta Exports*

The irrigation season in the south Delta typically extends from April through September, with peak demands occurring in July. Pumping at the Banks Pumping Plant (SWP) averages 3,800 cfs in April, 5,000 cfs in August, and 3,600 cfs by September. Tracy Pumping Plant (CVP) averages 3,200 cfs in April, and 4,000 cfs during July through September. This component of the alternative examines whether a reduction in pumping at the Tracy and Banks pumping plants would significantly improve water levels and circulation in the south Delta.

To assess the effect of reducing CVP and SWP pumping, computer simulation analysis was done comparing a base scenario with a scenario that assumed pumping at the Tracy and Banks pumping plants was restricted during the irrigation season, April through September, to a total of 1,500 cfs; 1,000 cfs at the Tracy Pumping Plant, and 500 cfs at the Banks Pumping Plant. A critically dry condition was also assumed in order to show the maximum amount of improvement pumping restrictions could provide. The changes in water levels and salinities were evaluated at locations throughout the south Delta.

Plots of the changes in water levels resulting from the pumping reduction show, water levels increase 0.10 foot in April, 0.25-0.35 feet in July, and 0.10-0.20 feet in September For all locations except Old River at Highway 4, salinity remains the same or increases when pumping is reduced. The increases vary throughout the irrigation period. A maximum increase of 200 TDS is projected for the San Joaquin River at Lathrop in July. Salinity in Old River at Highway 4 (#90) is worse during April and May with reduced pumping however, it improves up to 200 TDS during June through September.

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If the effects of carryover storage are ignored, the impact of pumping restrictions upon water supply can be estimated. Analysis of the projected operation of the CVP and SWP, given a demand of 4.1 maf for the SWP, concludes that the pumping restrictions would decrease water supply by 1.1 maf in critical years to between 1.9 to 2.2 maf in dry and below-normal years. Table 3-2 contains the data used for this analysis. The reductions in above-normal and wet years are not incorporated into this analysis because it is possible that water demands would be less under these conditions.

3.3.3 Component 2: Management/Reduction Of Pumping Demand

This component assumes that appropriate water supply management or demand reduction options are implemented in combination with the reduction in Delta pumping (combined SWP/CVP pumping in April through September limited to 1,500 cubic feet per second) described above.

Bulletin 160-93, the update of the California Water Plan, was released in October 1994 by the Department of Water Resources. This document identifies a number of supply and demand management options for meeting the State's future needs which fall into two major categories.

Level 1 options are programs which have undergone extensive investigation and are judged to have a high likelihood of being implemented by the year 2020. Level 2 options are additional programs that could be implemented in the future, but require more extensive investigation and analyses before they can be further evaluated for feasibility. Both Level 1 and Level 2 options contain short-term and long-term measures.

Included among the Level 1 options are: 1) urban and agricultural water conservation; 2) agricultural land retirement; 3) urban water rationing; and, 4) land fallowing/short-term water transfer programs. Level 2 options, comprises both additional supply and demand management options needing further feasibility studies, as well as additional storage and conveyance facilities. However, Level 2 options assume the implementation of all Level 1 options, which includes the proposed ISDP.

Utilizing Level 2 options for demand reduction and management without implementation of Level 1 options would consider demand reduction and management programs with the following measures.

Agricultural Water Conservation. Increased agricultural water use efficiency.

Urban Water Conservation. Increased urban water use efficiency.

Land Retirement. Retirement of land with poor drainage disposal in west side San Joaquin Valley.

Water Transfer. Reallocation of supply for short- or long-term transfers.

Reclamation. Use of gray water, water recycling and desalting, reuse of agricultural brackish water.

San Diego County Water Authority Water Resources Plan. Plan includes water recycling, ground water development, and desalination of brackish water.

Santa Clara Valley Water Management. Increased water conservation programs, water reclamation, permanent water transfers, and additional long-term storage.

3.3.4 Hydrodynamics

This alternative is intended to improve water levels and circulation in the south Delta during the irrigation season. As such, it seeks to meet the objectives of the permanent barriers of proposed ISDP, and consists of two components: 1) reduction of CVP/SWP exports during the irrigation season (April through September); and 2) reduction of demand to compensate for export reductions.

Methods. A computer simulation was performed to assess the hydrodynamic impacts of a reduction in both the CVP and the SWP exports during the irrigation season. The irrigation season in the south Delta typically extends from April through September, with peak demands in July. Exports form Bank Pumping Plan average 3,082 in April; 2,871 in May; 3,660 in June; 5,184 in July; 3,795 in August; and 3,537 in cfs in September. Exports form Tracy Pumping Plant average 2,936 in April; 2,879 in May; 3,523 in June; 4,387 in July; 4,006 in August; and 4.078 cfs in September. This existing average export schedule was compared to the reduced export schedule for this alternative totaling 1,500 cfs during the period from April through September. The reduced exports were shared between the CVP and SWP as follows: 1,000 cfs is pumped at Tracey, and 500 cfs is pumped from Banks. For the screening-level analysis, a critically dry condition was used of the model boundary conditions. By inference from the modeling performed for the proposed ISDP, the consequences observed during the critical year would be similar in timing during the other year types, but may differ in magnitude. The critical year sometimes produces the "worst-case" conditions, but not always.

The 4.1 maf demand case modeled for the proposed ISDP with DWRSIM was used as a baseline for evaluating the environmental consequences of this alternative. The Delta model (DWRDSM) was used to simulate changes in water levels and salinities, evaluated at several south Delta locations. The Delta model run for the critical year without the proposed ISDP was used to stimulate the existing environment. The consequences of the alternative were simulated by reducing CVP and SWP exports during April through September. No other changes were made to the simulations performed for the proposed ISDP. For example, the operation of Lake Oroville was kept the same, although the pumping restriction could leas to a change in Oroville operations.

<u>Hydrodynamic Effects</u>. Water levels were predicted to increase throughout the south Delta with this alternative, but the increases are generally as much as one foot less than those modeled for the installation of barriers by the proposed ISDP. With this demand reduction alternative, water levels in the south Delta increase an average of 0.09 feet in April; 0.05 feet in May; 0.16 feet in June; 0.21 feet in July; 0.04 feet in August, and 0.13 feet in September in the representative critical year.

We assume that there would be sufficient reduction in demand to compensate for the reduction in exports during the irrigation season, as described for component two of this alternative. Under this assumption, exports would not increase during the period from October through March to compensate for the reduction in export during the irrigation season. If the demand reduction is successfully implemented, then the pumping schedule modeled by DWRSIM of the proposed ISDP in the non-irrigation season (October through March) would not change for this alternative, and this alternative would not change any of the impacts that were modeled for the proposed ISDP with respect to Delta Inflow, Delta Outflow, Delta Exports, or operation of SWP reservoirs.

If there is an insufficient reduction in demand to compensate for the export limitations, then SWP and CVP operation may be altered in order to provide greater exports during the period from October to March. These potential changes were not modeled, but qualitatively they would likely be as follows. The export limitations during the irrigation season would likely lead to less releases from Lake Oroville (SWP) and Lake Shasta (CVP). Releases from both reservoirs would likely increase between October and March in order to allow greater exports during these months. Theses changes would probably be small during above normal and wet years since there would be limited additional export capability in the SWP system. During below normal, dry, and critical years, however, the changes in operation could be greater. This alternative does not adequately improve water levels or circulation, or improve hydraulic conditions to increased diversions into CCF.

3.3.5 Comparative Impact Evaluation

The implementation of this alternative would avoid significant impacts in the south Delta with regard to transportation, aquatic resources, public services and utilities, land use and planning, noise, water quality, aesthetics, recreation, and hazards. On the other hand, implementation of this alternative would potentially cause the conversion of agricultural lands to more intensive uses, leading to extensive adverse effects on terrestrial biological resources in the SWP Service Area, and substantial socioeconomic impacts in farming and rural regions of the San Joaquin Valley, as outlined in Table 3-1.

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3.4 Modification Of CVP/SWP Exports, Consolidation Of Agricultural Diversions, Extension Of Agricultural Diversion, And Increased Pumping At Harvey O. Banks Up To 10,300 cfs

3.4.1 Introduction

The components of this alternative were developed through discussions with staff from the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, California Department of Fish and Game, and the National Marine Fisheries Service. The alternative consists of six components: 1) modification of CVP and SWP exports; 2) consolidation and screening of agricultural diversions in the south Delta islands; 3) screening and extending other agricultural diversions deeper into south Delta channels; 4) construct and operate a new intake structure at Clifton Court Forebay; 5) channel dredging along a reach of Old River north of Clifton Court Forebay; and, 6) increase diversions into Clifton Court Forebay and the pumping capability at Banks Pumping Plant to 10,300 cfs. Table 3-3 provides information on the physical and cost features of this alternative.

3.4.2 Component 1: Management Of CVP/SWP Delta Exports

The December 15, 1994 Delta Accord and the subsequent May 1995 State Water Resources Control Board Water Quality Control Plan (SWRCB WQCP) restrict Delta exports between April 15 and May 15 to 1,500 cfs or 100 percent of a three day running average of San Joaquin River flow at Vernalis, whichever is greater. This export restriction does not supersede the overall export restriction of 35 percent of Delta inflow. The more restrictive of these two objectives applies (Footnote 22, SWRCB WQCP, May 1995).

Component 1 of this alternative requires further export restrictions during the April 15 to May 15 time period of 1,100 cfs or 50 percent of Vernalis flow, whichever is greater. Further reductions of exports during this period were recommended to help improve water levels and circulation in south Delta channels, and to protect resident fish in the south Delta channels from the influences of the SWP and CVP pumps.

To assess the affect of implementing this component, DWRSIM and DWRDSM analyses were conducted. The results of the analyses are described in detail in Appendix 3. In general, the additional April 15 to May 15 reductions in exports cause the SWP and CVP to alter releases of water from upstream reservoirs. As a result, reservoir releases and Delta exports are increased after May 15 in order to fill San Luis Reservoir.

There are no construction costs associated with this component, however, operational changes for both SWP and CVP will be required. A DWRSIM model run of a future demand case of this alternative compared with the preferred alternative estimated SWP Delta exports will be reduced from 3,335 to 3,323 taf on a 71 year average, and from 2,016 to 2,005 taf in a May 1928 to October 1934 critical period. CVP Delta exports are reduced from 3,008 to 2,988 taf over the 71 year average, and 2,384 to 2,380 taf in the May 1928 to October 1934 critical period.

Table 3-3 Physical Features of Alternative 3.4
Modification of CVP/SWP Exports, Consolidation of Agricultural Diversions, Extensions for Existing Agricultural Diversions, and Increased Pumping at Banks Pumping Plant up to 10,300 cfs

Components	**Calculations**	**Estimated Cost ($ Million)**
Consolidation	40 pumps consolidated to 10 sites	33.5
Extensions	Extensions: 44 sites @ $36,852 = $1,621,500 Fish screens: 44 sites @ $37,955 = $1,670,000	3.3
Dredging for consolidations and extensions	1,814,000 cy	12.2
New Intake Structure	See Proposed Project	17.5
Old River Dredging	See Proposed Project	3.4
Total		69.9

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3.4.3 Component 2: Consolidation Of Agricultural Diversions

This component reduces the number of potential fish entrainment sites in south Delta channels by consolidating the operation of 40 individual pumps into 10 larger pumps. The purpose of this measure is to protect fisheries in the south Delta and provide a reliable supply of water to south Delta farmers. Each location (Figures 3-2 to 3-10) consolidates two to seven pumps into one larger pump. Consolidation sites were selected in areas of the south Delta where poor water circulation and water levels are observed.

The consolidated pumps are equipped with fish screens and the inverts of each pump will extend deeper into the channel. This is intended to increase pump impeller submergence, protect the pumps from damage due to low water levels and provide clearances for installing fish screens. Under severe conditions, minimum water levels in south Delta channels can fall below two feet in depth.

Dredging is required to extend the pumps deeper and provide a reliable flow of water through the shallow south Delta channels. Where the preferred alternative solves the water level problem by raising water levels through the installation of barriers, this alternative provides adequate water levels by lowering the channel bottom. In the south Delta channels, the average depth of dredging is estimated to be 2-1/2 feet and will extend over the center two-thirds width of Middle River, Old River and Paradise Cut. The total amount of dredged material resulting from Components 2 and 3 (described below) is estimated to be 1,814,000 cubic yards.

If all of the dredged material from Components 2 and 3 were disposed of using a hydraulic dredger, 1,080 acres of land would be required for settling (dewatering) ponds. By adding this to the dredging component required to increase the diversions to Clifton Court Forebay to 10,300 cfs (Component 5 below), a total of 1,680 acres of farmland would be required for settling ponds with this alternative.

The operation of the consolidated pumps would involve removing water from the channels and storing it in small regulated reservoirs on the islands adjacent to the pumps. The reservoirs are required to provide farmers with the same independent distribution system as currently exists with separate pumps. The regulated reservoirs are designed to provide a one day supply of irrigation water. This requires a minimum depth of eight feet of dead storage space for water drawdown purposes, with an additional two feet of active storage space to store the one day supply of irrigation water.

Depending on the size of the reservoirs, it is expected they will fall within the regulatory jurisdiction of the California Division of Safety of Dams (DSOD). Additional design provisions necessary to comply with DSOD criteria include: 1) four feet of freeboard at each reservoir for wave protection; and, 2) the ability to drain the reservoir completely in 30 days. Reservoir embankments will be constructed of imported fill and dredge disposal material will be used in the reservoir construction.

Because the construction of reservoirs on Delta Islands raises other concerns, another option was studied. This option would require grouping individually screened agricultural pumps onto a single pump platform. Water would be distributed using pipes and/or ditches leading back to the original agricultural canal distribution systems. Under this design, each of the separate pumps could still be operated independently from the single pump platform.

C-086519

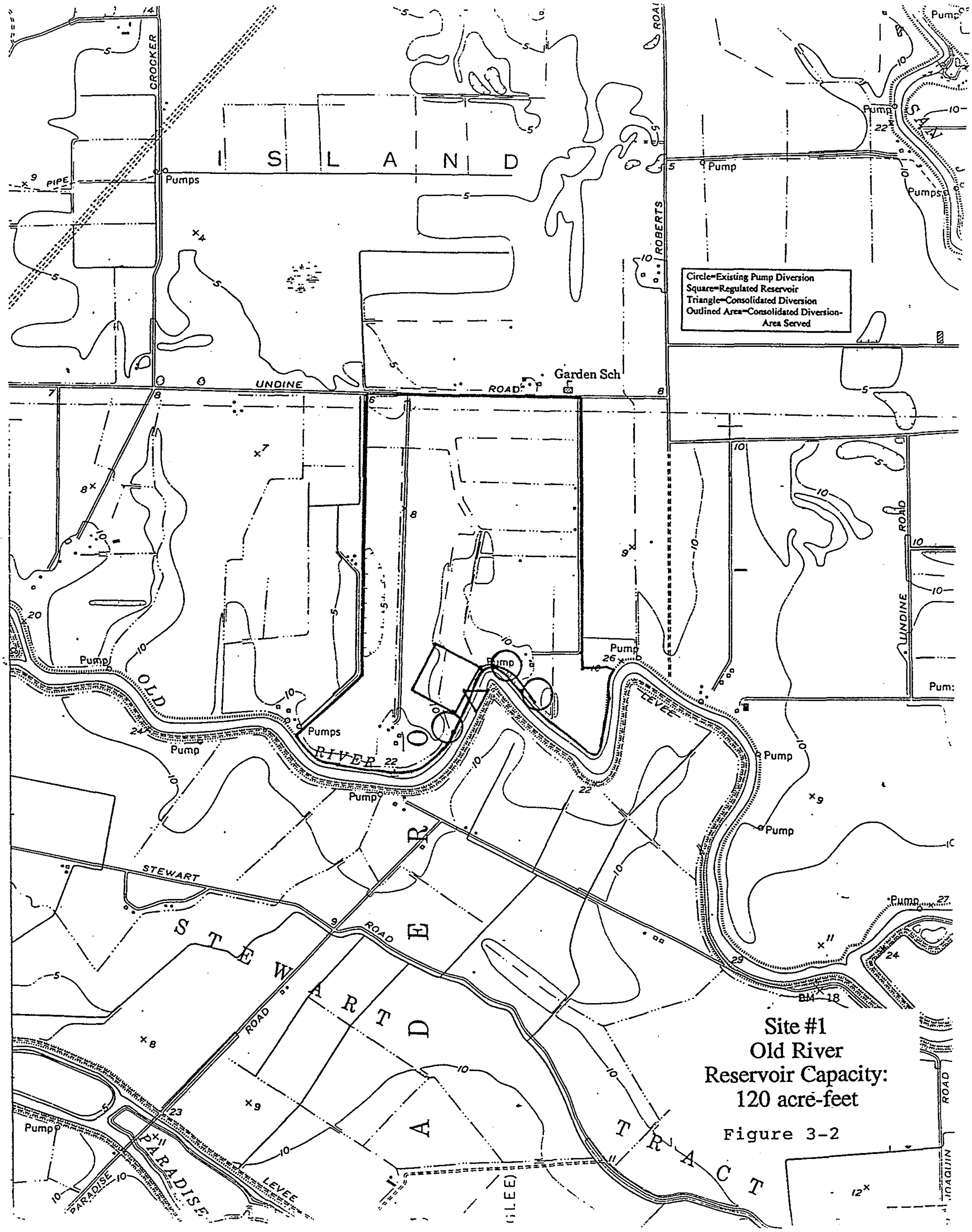

Figure 3-2. Site #1 Old River Reservoir Capacity: 120 acre-feet.

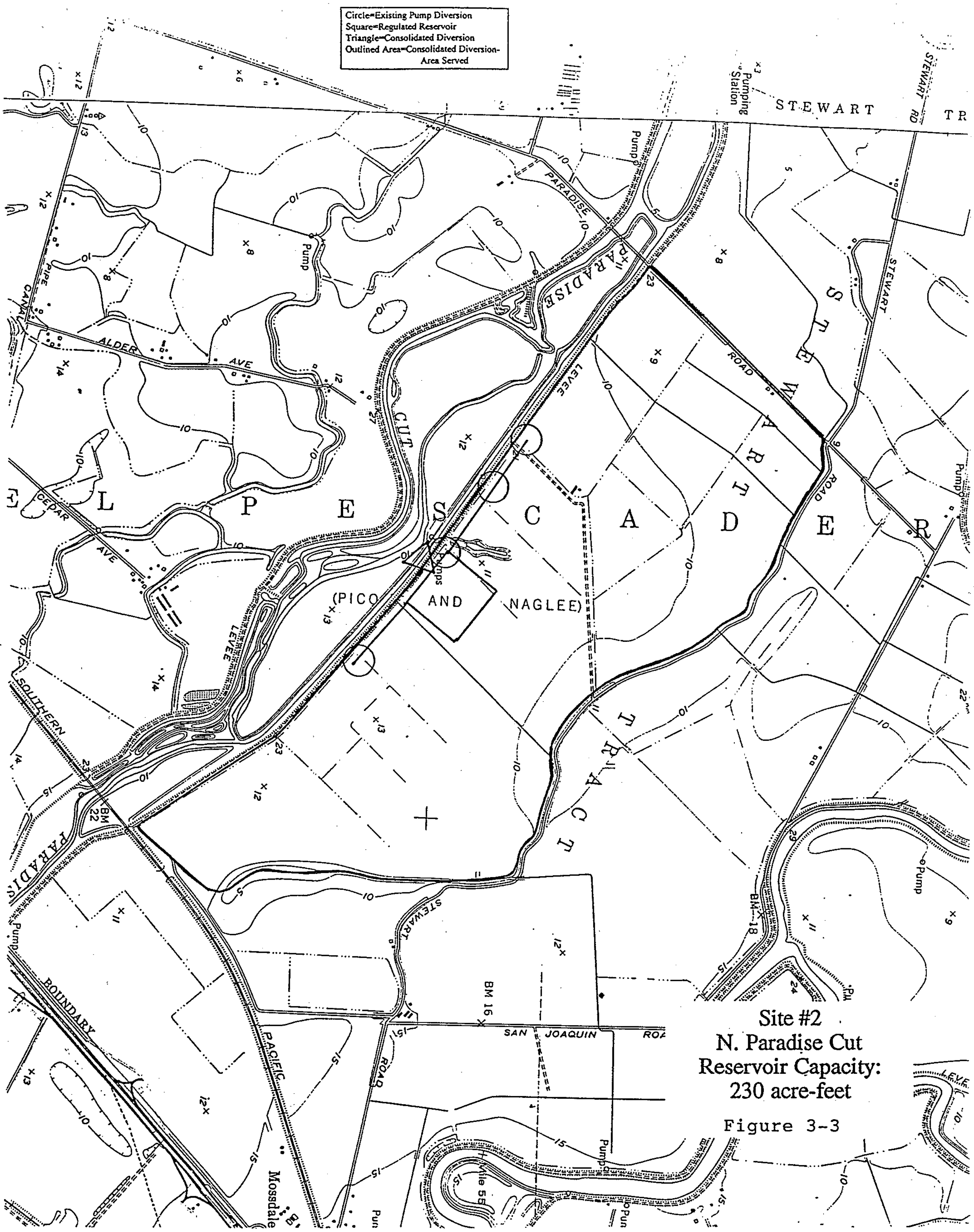

Figure 3-3. **Site #2 N. Paradise Cut Reservoir Capacity: 230 acre-feet.**

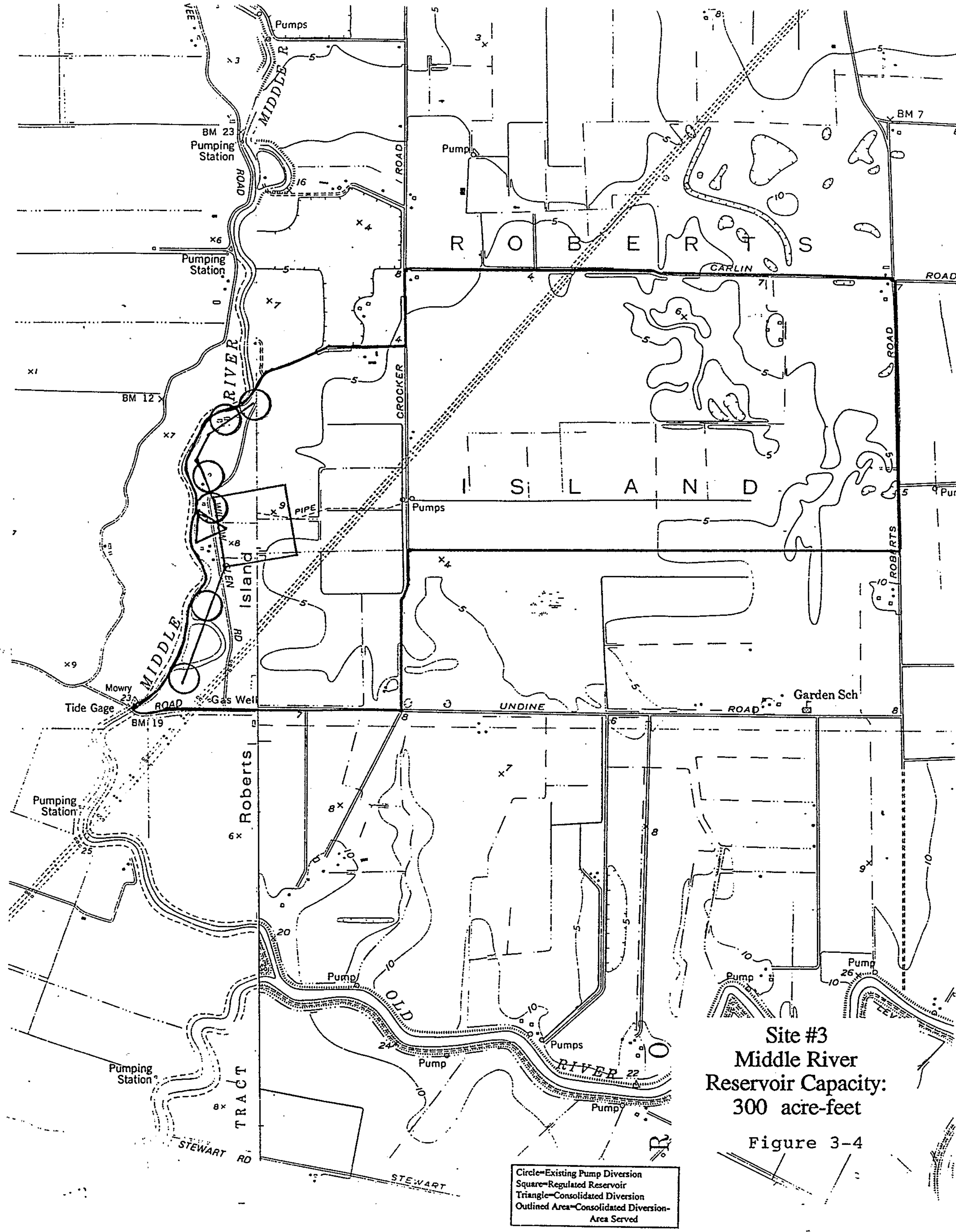

Figure 3-4. **Site #3 Middle River Reservoir Capacity: 300 acre-feet.**

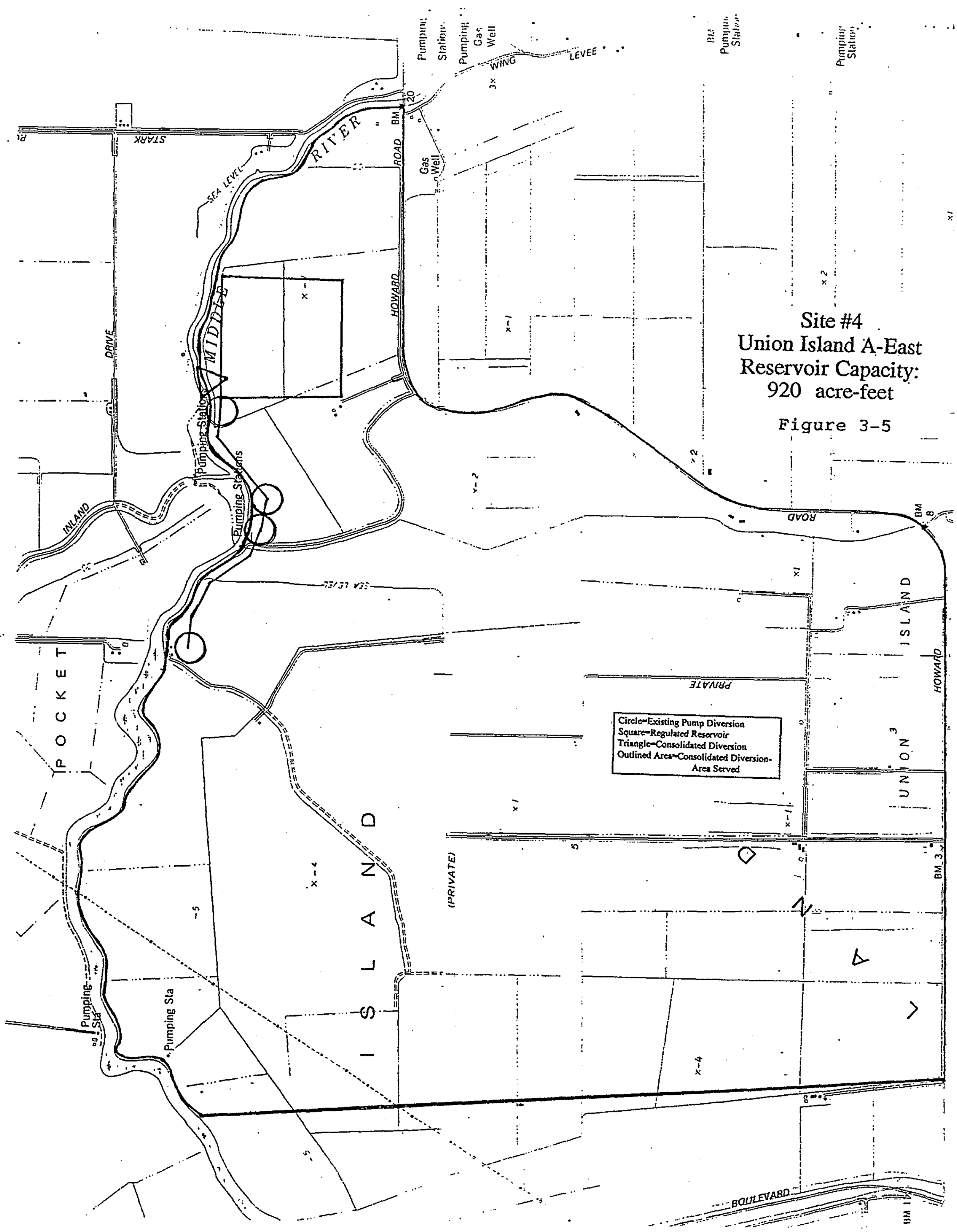

Figure 3-5. **Site #4 Union Island A-East Reservoir Capacity: 920 acre-feet.**

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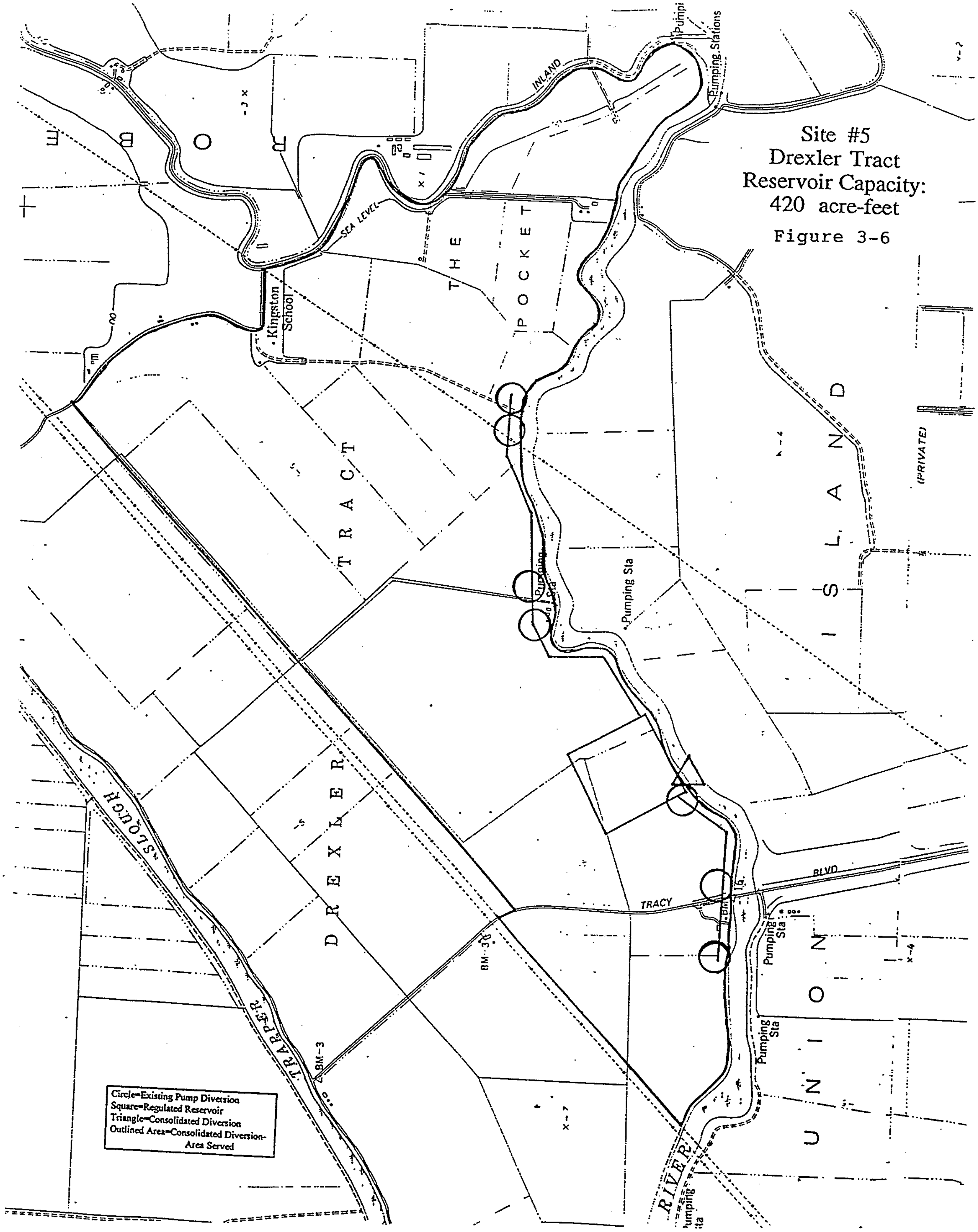

Figure 3-6. **Site #5 Drexler Tract Reservoir Capacity: 420 acre-feet.**

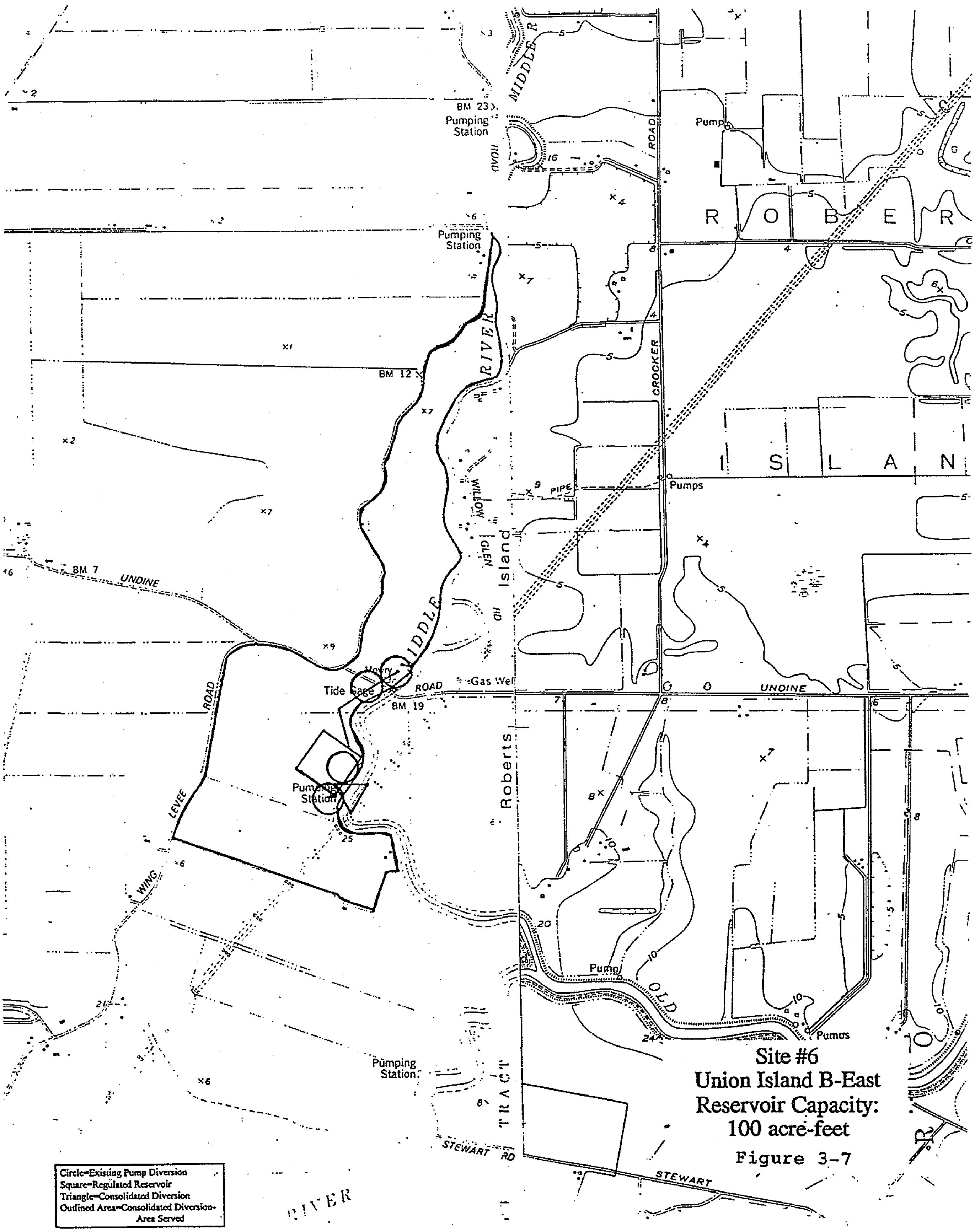

Figure 3-7. **Site #6 Union Island B-East Reservoir Capacity: 100 acre-feet.**

C-086525

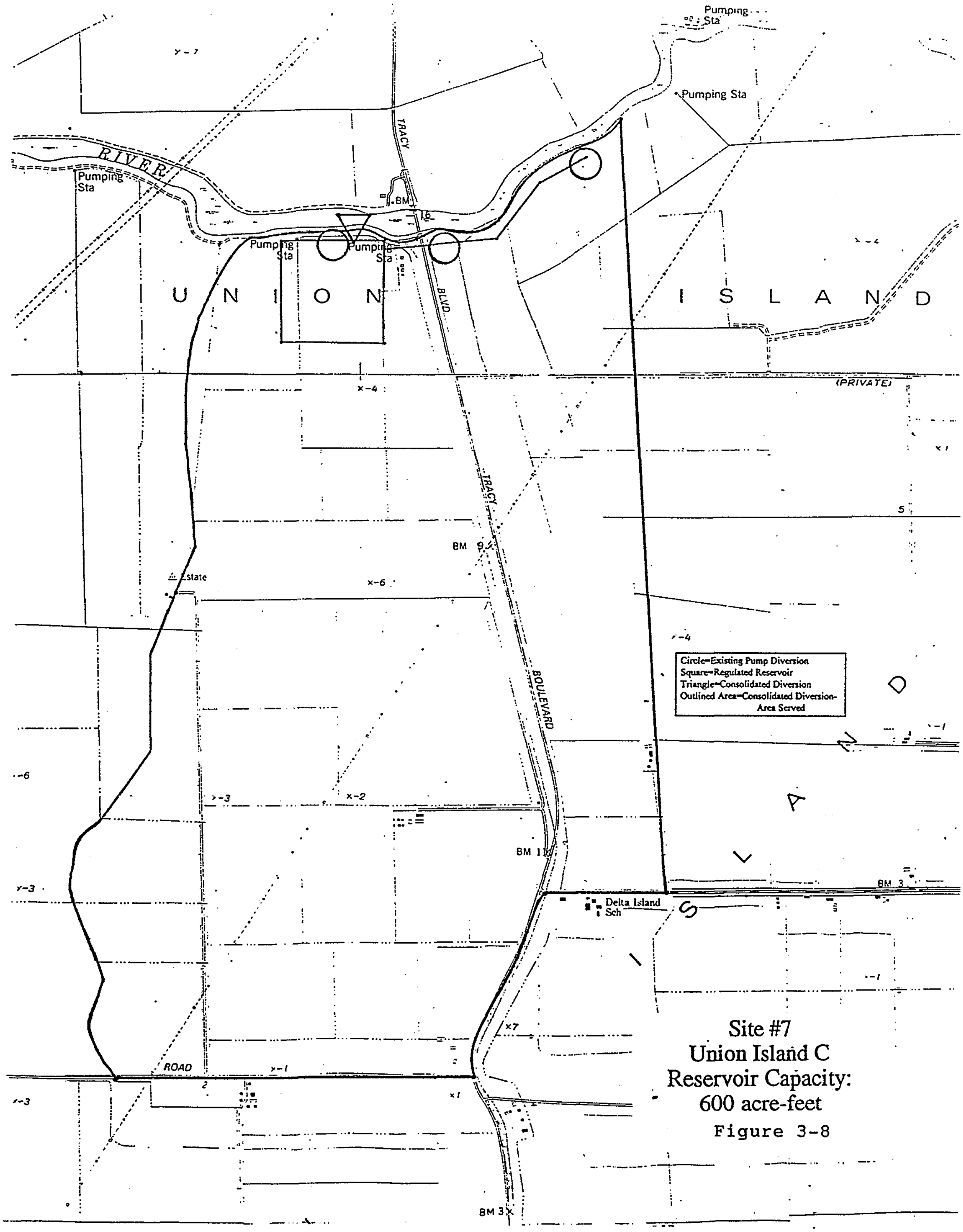

Figure 3-8. **Site #7 Union Island C Reservoir Capacity: 600 acre-feet.**

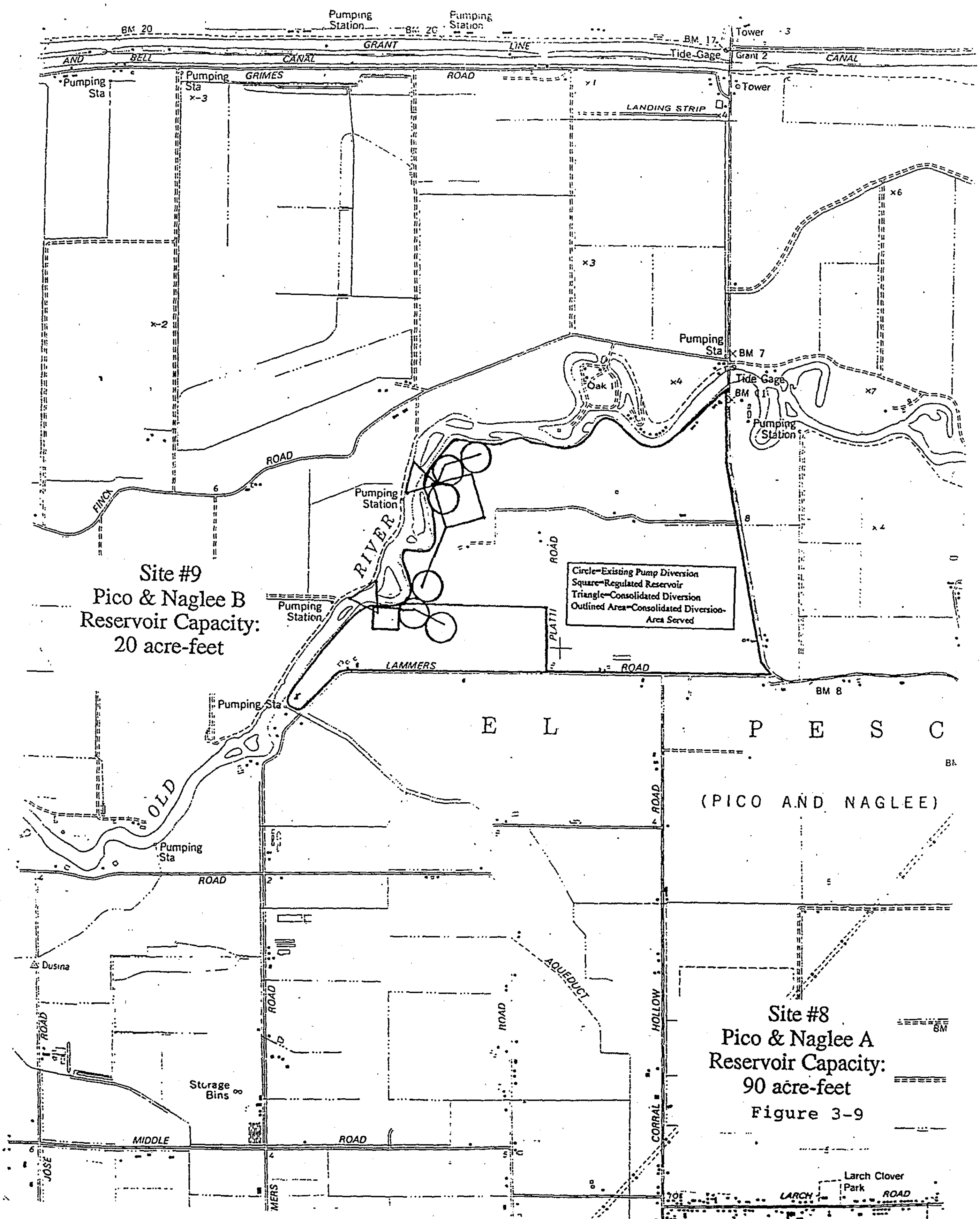

Figure 3-9. **Site #8 Pico and Naglee A Reservoir Capacity: 90 acre-feet.**

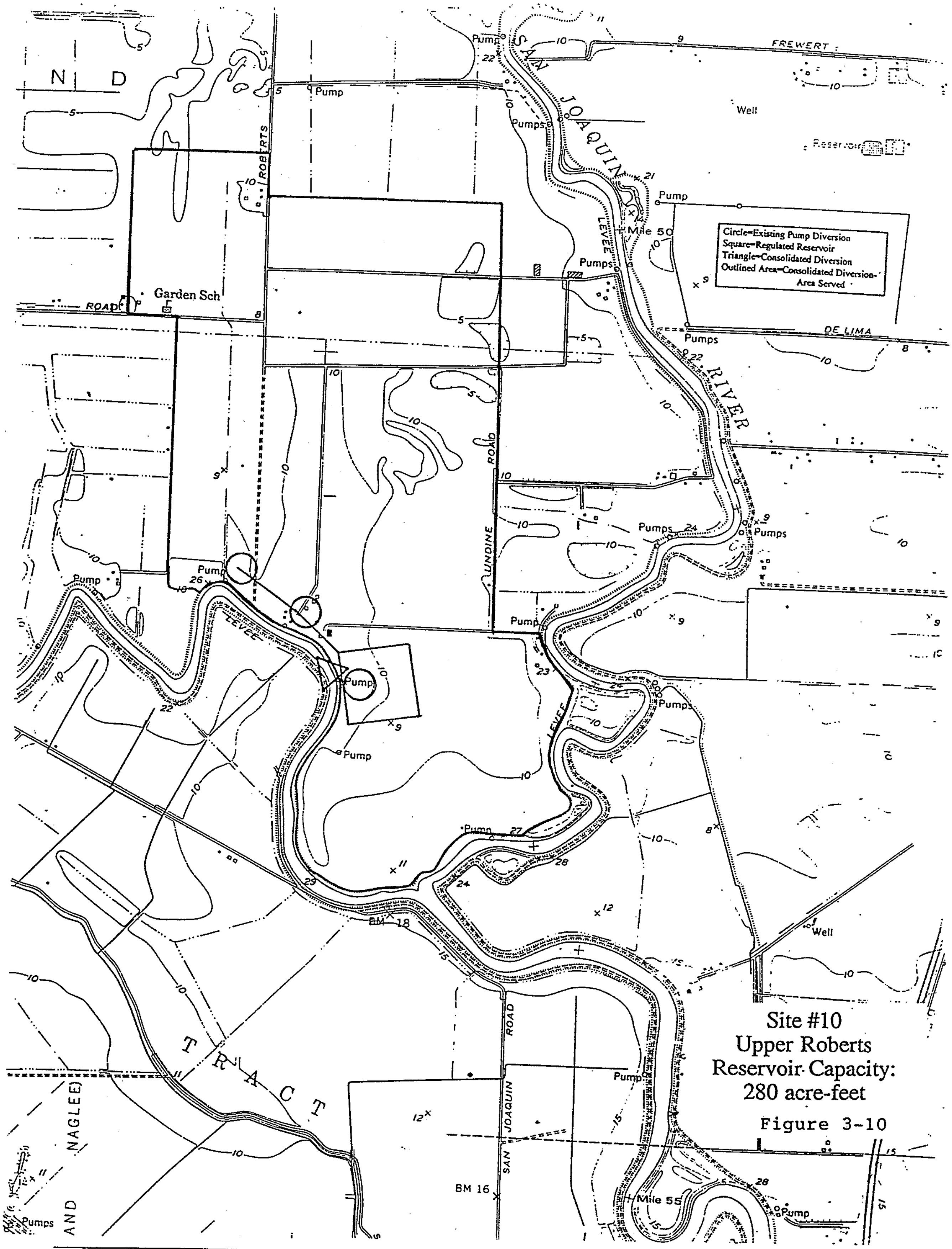

Figure 3-10. **Site #10 Upper Roberts Reservoir Capacity: 280 acre-feet.**

As in the original design, the pumps at the consolidation sites were designed with cylindrical fish screens. Fish screens require very large surface areas to maintain low approach velocities (0.3 fps for delta smelt). When factoring in approach velocities and operational requirements for the screens, it was apparent that operating multiple screened pumps in close proximity to each other would adversely affect the operation of the pumps through increased drawdown. If the screened diversions are spread out to avoid affecting pump operations, there would no longer be any benefits from the consolidation. As a result, the regulated reservoirs were retained in the design of this component of the fisheries alternative.

Siphons and pipes are used to transport water from the reservoirs to irrigate crops on the islands. The reservoirs are designed with the same number of siphons to distribute water on the island as the number of pumps which have been consolidated. Pipes are used to distribute the water from the siphon to the existing distribution system. Approximately eight miles of piping is required for the ten sites (Table 3-4).

The estimated cost to conduct this component, not including dredging costs, is $33.5 million. Dredging costs for both Components 2 and 3 total $12.2 million, assuming hydraulic dredging. If mechanical dredging is required, the cost of dredging would be more than double.

3.4.4 Component 3: Extensions For Existing Agricultural Diversions

Modifications will be made at 44 other south Delta agricultural pumps by extending the invert of each two to three feet deeper into the channel. The locations are shown in Figure 3-11 This is intended to protect the pumps from damage due to low water levels. Like the consolidated diversions, each intake will also be equipped with a fish screen.

Extensive dredging is required in order to extend the pumps deeper into the channels. In the south Delta channels, the average depth of dredging is estimated to be 2-1/2 feet in the center two-thirds of each channel. Under severe conditions, minimum water levels in south Delta channels can fall below two feet in depth. Dredging is required on Old River, Middle River and Paradise Cut. As discussed above, the total amount of material dredged from Components 2 and 3 is estimated to be 1,814,000 cubic yards.

The cost for dredging is discussed above in Component 2. The cost for extending the existing pumps, and rebuilding pump platforms for the 44 sites is estimated to be $1.62 million. The cost to add fish screens to the 44 sites is estimated to be $1.67 million.

3.4.5 Component 4: Construct And Operate A New Intake Structure At The Northeast Corner Of Clifton Court Forebay

This component is the same as Component 1 of the preferred alternative as described in Section 2.2.1. The cost of the new intake facility is $17.5 million.

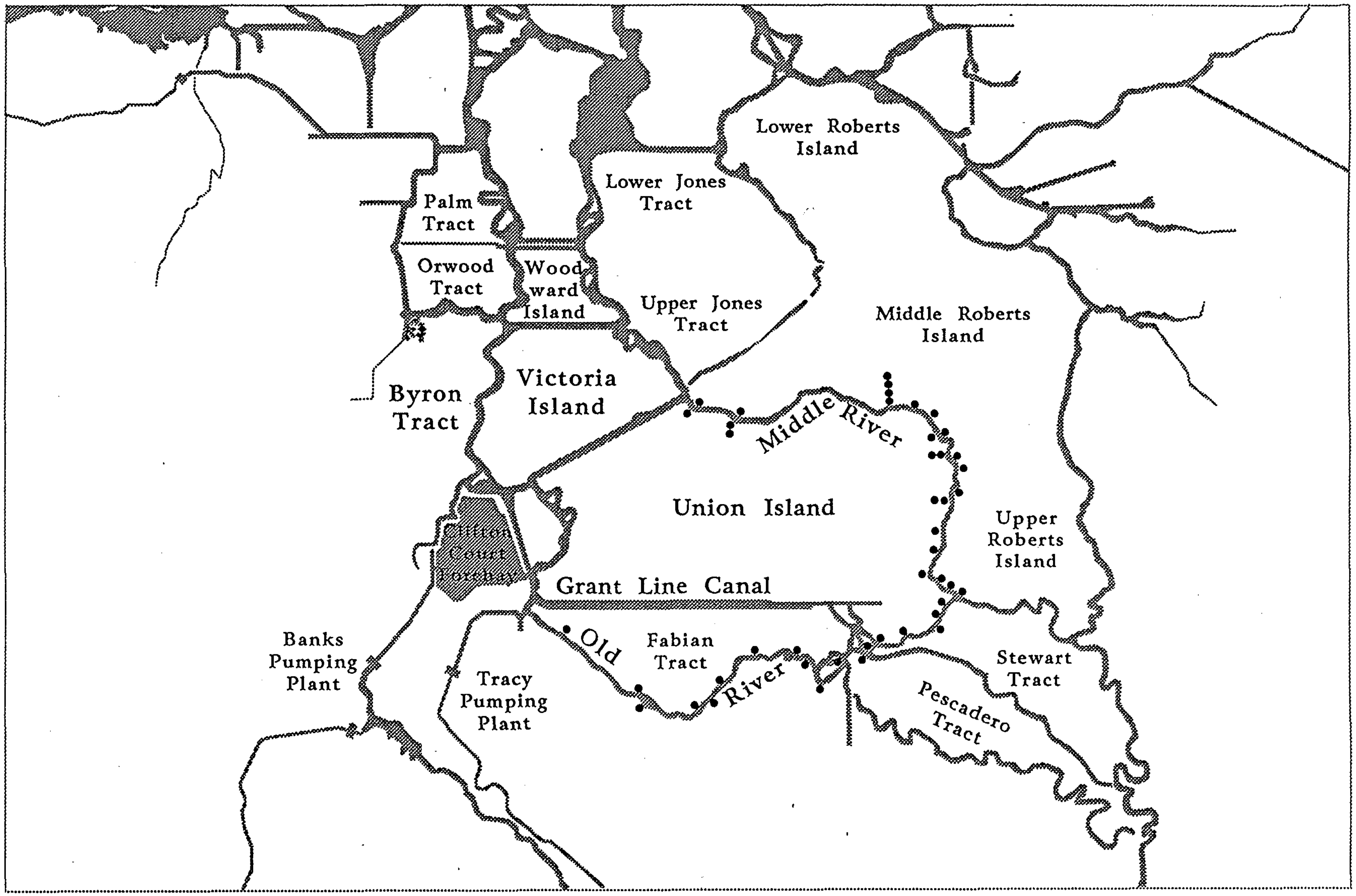

Figure 3-11. Locations of Existing Agricultural Diversions to be Extended and Screened.

C-086530

Table 3-4

Fisheries Alternative											
Pipeline Lengths from Reservoir to Original Pump Diversion Sites											
		Reservoir	Pump	Pipeline Length from Reservoir to Original Pump Diversion Sites, [ft]							Total Length
Site	Location	Capacity [ac-ft]	Number:	1	2	3	4	5	6	7	Per Site, [ft]
1	Old River	120		0	600	1,300					1,900
2	N. Paradise Cut	230		2,500	1,500	0	1,300				5,300
3	Middle River	300		2,200	1,600	400	0	800	1,700		6,700
4	Union Island A-East	920		4,600	2,300	1,600	0				8,500
5	Drexler Tract	420		3,100	1,900	0	2,800	3,500	5,700	6,200	23,200
6	Union Island B-East	100		1,900	1,300	0	200				3,400
7	Union Island C	600		0	1,100	4,100					5,200
8	Pico & Naglee A	90		1,500	0	200	700				2,400
9	Pico & Naglee B	20		250	850						1,100
10	Upper Roberts	280		2,200	1,000	0					3,200
										TOTAL, L [ft]	60,900
										TOTAL, L [mi]	11.53
Note: Zero values indicate that the pump is adjacent to the reservoir site.											

3.4.6 Component 5: Perform Channel Dredging Along A Reach Of Old River North Of Clifton Court Forebay

This component is the same as Component 2 of the preferred alternative as described in Section 2.2.2. The costs with hydraulic dredging is $3.4 million.

3.4.7 Component 6: Increase Diversions In Clifton Court Forebay And Pumping At Harvey O. Banks Pumping Plant To 10,300 cfs.

This component is the same as Component 5 of the preferred alternative as described in Section 2.2.5. There is no additional cost related to this component. The total construction costs for this alternative are estimated to be $69.9 million.

3.4.8 Hydrodynamics

The consolidation of diversions and extension of existing diversion in this alternative are intended to improve water levels and circulation in the south Delta during the irrigation season and hence meet the objective of the permanent barriers component of the proposed ISDP. The components of the proposed ISDP that been maintained in this alternative allow greater exports from the south Delta.

Methods. Computer simulations were performed to assess the hydrodynamic impacts to this alternative. The DWRSIM was used to show the percentage difference between this alternative and the base condition. The DWRDSM was used to simulate changes in water levels and salinities, evaluated at several south Delta locations. Appendix 3 contain a detailed analysis of related changes to storage, river flows, Delta inflow/outflow, exports, water levels, velocities, and average flows in the south Delta for both existing and future demands during all year types resulting from this alternative. The general patterns illustrated by the critical year averages are similar for the other year types. Although some elements differ from the general case, the critical year patterns exhibit the most extreme changes on a percentage basis.

Hydrodynamic Effects. The DWRSIM analysis of existing demand showed changes in reservoir storage, exports and Delta Inflow: 1) San Luis Reservoir has an increase in storage as a result of this alternative; 2) exports decrease from April 15 to May 15, due to modification of CVP and SWP exports; and, 3) inflows to the Delta decrease during most of the year. In the future demand analysis: 1) San Luis Reservoir storage decreases; 2) exports also decrease, from April 15 to May 15 because of the CVP and SWP export modification; and, 3) SWP exports increase from September through January.

The conclusions of the DWRDSM analysis were similar for existing and future demand levels. The velocities and water surface elevations in the south Delta did not change when compared to the base condition existing and future demand. This alternative provides no improvement in water surface elevations or velocities. Also, the changes in flow as a result of this alternative, produces no improvement in reverse flows or, null zones, or circulation problems that continue to exist in the South Delta. As a result, this alternative does not meet the first project purpose.

3.4.9 Comparative Impact Evaluation

This alternative would alleviate some of the adverse impacts associated with proposed ISDP, but would also have additional adverse impacts. This alternative does not include fish or flow control structures, and would not produce increased negative flows in the south Delta channels. Furthermore, there would be substantial reductions in SWP and CVP exports during April and May, which would further reduce negative flows. Negative flows would be particularly high under the proposed ISDP during April and May because the head of Old River Fish Control Structure would be closed during at least part of these months. Many fish populations in the Delta are particularly susceptible to straying and entrainment losses during the spring months, so the reductions in exports would provide substantial benefits.

This alternative would compensate for much of the reduction in exports during April and May by increasing exports during the summer and fall. These increases would have a substantial impact on species with juveniles that rear in the Delta, including Delta smelt and Sacramento splittail. For many species, the benefits of export reductions in the spring would be partially or completely offset by the increased exports in the summer and fall.

This alternative would require much more extensive dredging than the proposed ISDP and would therefore result in greater loss of designated Delta smelt habitat and habitat of resident fish such as striped bass and splittail. On the other hand, the alternative includes consolidation and screening of many agricultural diversions, which would benefit resident species and those migrating through the south Delta. On balance, this alternative is expected to have fewer adverse impacts and more aquatic resource-related benefits than the proposed ISDP.

This alternative would have greater adverse operational and construction-related impacts upon water quality than would the proposed ISDP, including substantially larger amounts of dredging. The operation of the reservoirs on the islands would lead to increased seepage and degradation of groundwater conditions. In addition, the benefits of the barriers to the south Delta water levels and circulation would not be a part of this alternative.

3.5 Proposed ISDP Project With An Additional Clifton Court Forebay Intake At Italian Slough

3.5.1 Introduction

This alternative would include all of the proposed components of the ISDP project, with the addition of a new intake at Italian Slough. Accordingly, this alternative would include two proposed intakes, one at Italian Slough and one at the northeastern corner of Clifton Court Forebay. Table 3-5 provides details on the physical features and costs for this alternative. The additional intake at Italian Slough is described in the following.

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3.5.2 Facility Description

The additional intake facility would include a four-bay flashboard structure which would allow water from Italian Slough to be diverted into the intake channel of the California Aqueduct. The flashboard intake structure would consist of four 20-foot-wide bays which are 25 feet in height. This structure includes flashboard slots and a 24-foot-wide vehicular bridge. Steel flashboards would be placed in the slots when the structure is not in use. Figure 3-12 is a site map of the facilities.

Because of the limited hydraulic capacity of Italian Slough, Delta diversions are physically limited to approximately 2,300 cfs or 4,560 acre-feet per day. Therefore, diversions from Italian Slough would only occur during periods of very low SWP Delta exports. Water exported at Banks Pumping Plant via an Italian Slough diversion has a much shorter residence time than water diverted from Old River via the existing Clifton Court Forebay. Because of the decreased residence time, predation of fish may also decrease and screening efficiencies at Skinner Fish Facilities may increase. Under these conditions, direct losses of fish due to SWP Delta exports may decrease if diversions are made via an Italian Slough intake.

To prevent water in Clifton Court Forebay from mixing with water diverted from Italian Slough, a temporary rock dam would be placed in the 630-foot-long opening that connects the forebay to the intake channel. Approximately 23,000 cubic yards of rock must be placed in the breached section to isolate the forebay when the intake structure is opened. The rock material must be removed and stored when the forebay is in use.

The estimated construction period for the Italian Slough intake would be about 18 months. Construction of the intake would involve constructing an earthen plug, i.e. coffer dam, with the intake channel; pumping water out of the construction area; excavating material from the construction area; constructing concrete and formwork for the structure and bridge; fabricating the steel flashboards; relocating the existing road; and removing the earthen plug. A maximum of 30 to 40 workers would be employed during construction. The estimated cost of construction is $3.3 million. Operation and maintenance cost, not included in the $3.3 million, would be an additional yearly expense. A permit under Section 404 of the federal Clean Water Act would be required before the Italian Slough intake could be constructed.

The Italian Slough intake structure would be operated when Clifton Court Forebay was not in use. The opening that connects the forebay to the intake channel would be filled with rock. This breach would be filled either using a barge that would sit in Italian Slough or using trucks. The time required to place or remove the rock dam would be from four to six weeks. Once the temporary rock dam was in place, the flashboards would be removed from the intake structure. The intake structure would remain open and water would be pumped as allowed by tide levels. When the tides prevented pumping, the structure would remain open. When higher pumping was needed, the rock dam would be removed and the flashboards reinserted allowing access to the forebay.

Table 3-5 Physical Features of Alternative 3.5
Proposed Project with Additional Intake at Italian Slough

	Proposed Project[1]	Intake at Italian Slough	Totals
Type of Gates	Varied	Flashboards	N/A
Number and Dimensions of Gates	Varied	4@20x25	N/A
Capacity (cfs)	30,000	2,300	30,000/2,300
Structure Footprint (ft x ft)	Varied	100x30	N/A
Storage Pad (ft x ft)	Varied	300x300[2]	N/A
Boat Passage Facility	Varied	None	N/A
Excavation (cy)	254,200	33,500	287,700
Embankment/Backfill (cy)	259,300	39,800[3]	299,000
Structural Concrete (cy)	9,900	1,500	11,400
Levees Constructed (lf)	3,600	630[3]	26,600
Levees Removed (lf)	2,600	-0-	2,600
Riprap (sf)	221,000	79,000	300,000
Channel Dredging Length (mi)	4.9	-0-	4.9
Channel Dredging Amount (mil cy)	1.25	-0-	1.25
Forebay Enlargement Increase in Size (ac)	-0-	-0-	-0-
Construction Period (mos)	18-36	18	18-36
Construction Crew	10-100	30-40	10-100
1/96 Estimated Cost ($ million)	53.9	3.3	57.2

[1] See Table 2-1.
[2] For temporary rock storage.
[3] Including temporary rock dam, with 22,700 cy of rockfill.

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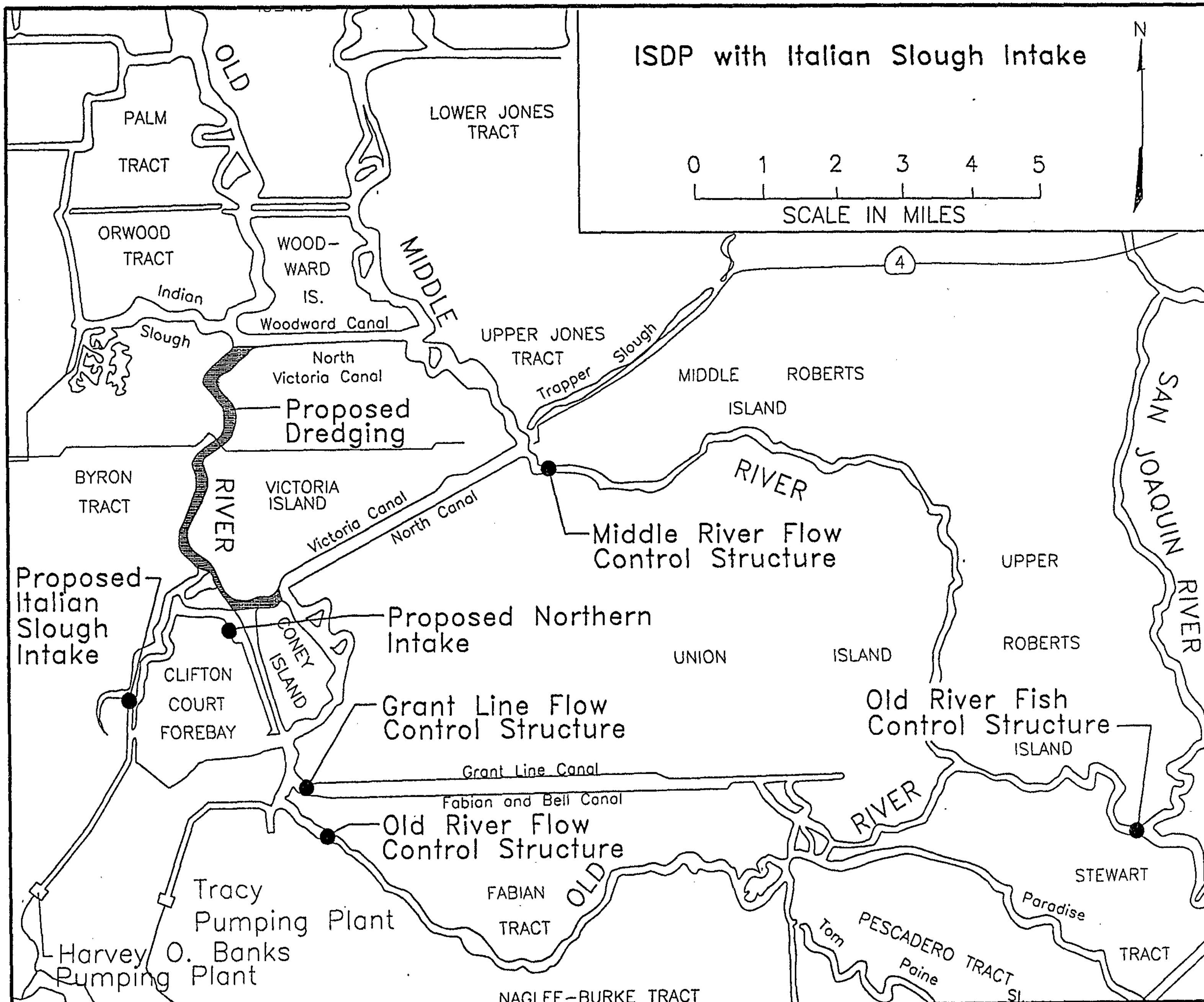

Figure 3-12. ISDP With Intake at Italian Slough.

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3.5.3 *Hydrodynamics*

This alternative differs from the proposed ISDP by providing an additional intake at Italian Slough. Owing to capacity limitations of Italian Slough, the intake would only be used when export pumping rates are less than 3,000 cfs. The alternative does not change the amount of increased export capability, and it assumes that demand is the same as for the proposed ISDP.

Since export capability is not changed in this alternative, it is likely that the pumping schedule modeled by DWRSIM for the proposed ISDP would not change for this alternative. If this is the case, then this alternative would not cause any changes other than those modeled for the proposed ISDP with respect to Delta Inflow, Delta Outflow, Delta Exports, or operation of SWP Reservoirs.

The effects upon the existing Within Delta flows for this alternative would differ from those modeled for the proposed ISDP in that changes in velocity may cause localized scour near the intake and in Italian Slough. No modeling of the magnitude of the increases have been performed, but they may increase to above three fps under some conditions. The effects of the barriers would be similar under this alternative to those modeled for the proposed ISDP.

3.5.4 *Comparative Impact Evaluation*

The implementation of this alternative would result in all of the environmental impacts associated with the proposed project, ISDP. In addition, the construction and operation of the Italian Slough intake facility would potentially result in additional significant impacts to several resources, including air quality, geology and soils, biological resources, special status species, and cultural resources, as outlined in Table 3-1.

3.6 *Proposed ISDP Without The Northern Intake, And With An Expanded Existing Intake*

3.6.1 *Introduction*

This alternative would include all of the proposed components of the ISDP project, except the existing Clifton Court Forebay intake would be expanded to accommodate the additional flow, instead of constructing a new intake either at Italian Slough or at the northeastern corner of Clifton Court Forebay. Dredging would be required in West Canal to accommodate flow into the expanded intake. Table 3-6 provides details of the physical features and costs for this alternative.

3.6.2 *Facility Description*

The existing intake structure, which regulates flow into the forebay and isolates the forebay from the Delta, consists of five 20-foot-wide by 25.4-foot-high radial gates, housed in a reinforced concrete gate bay structure. A riprap lined channel 1,000 feet long with a 300-foot base width

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Table 3-6 Physical Features of Alternative 3.6
Proposed Project without Northern Intake, and with Expanded Existing Intake

	Proposed Project without Intake[1]	Expanded Existing Intake including West Canal Expansion [2]	Totals
Type of Gates	Varied	Radial	N/A
Number and Dimensions of Gates	Varied	5@20x25.4	N/A
Capacity (cfs)	-0-	30,000	30,000
Structure Footprint (ft x ft)	Varied	120x60	N/A
Storage Pad (ft x ft)	Varied	200x200	N/A
Boat Passage Facility	Varied	None	N/A
Excavation (cy)	121,200	1,173,800	1,295,000
Embankment/Backfill (cy)	98,300	896,400	994,700
Structural Concrete (cy)	8,300	1,500	9,800
Levees Constructed (lf)	1,000	10,500	10,000
Levees Removed (lf)	1,000	1,000[3]	2,000
Riprap (sf)	115,000	805,000	920,000
Channel Dredging Length (mi)	4.9	-0-	4.9
Channel Dredging Amount (mil cy)	1.25	-0-	1.25
Forebay Enlargement Increase in Size (ac)	-0-	-0-	-0-
Construction Period (mos)	18-36	30	18-36
Construction Crew	10-100	50-70	10-100
1/96 Estimated Cost ($ million)	36.4	35.8	72.2

[1] See Table 2-1.
[2] Quantities, except for capacity, are incremental (for the expansion).
[3] Breaching existing levee for conveyance.

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connects the control structure with West Canal. The existing channel and structure can divert a maximum flow of 16,000 cfs into the forebay.

The proposed modification adds an identical intake structure south of the existing intake (Figure 3-13). The maximum capacity of the expanded intake facility is 30,000 cfs. structures. To maintain the average velocity of three fps in the approach channel, the base width of the new channel would be increased from its present width of 300 feet to 560 feet. Increasing the base width of the approach channel would require relocating the south-east levee along the existing approach channel approximately 260 feet inland. A 230-kV transmission line which is near the levee and owned by the U.S. Bureau of Reclamation would also require relocation. A portion of the southern forebay embankment near the existing intake would also be relocated. A building housing the controls for the facility would be placed between the two gate.

Construction of the new intake would include the placement of a cellular cofferdam in the forebay; excavation for the intake structure; concrete construction of the five bays, vehicular bridge, and hoist platform; concrete construction of inlet and outlet transitions; fabrication of the five radial gates; construction of a control building; levee embankment; and channel excavation. It is anticipated that construction would occur over 30 months. At the peak of construction, the work crew is expected to be 50 to 70 people. Access to the construction site would be from Highway 4 to the SWP Skinner Fish Facility and along the road on the southern embankment of the forebay.

The location and extent of any required channel enlargement has been analyzed. It is anticipated that both dredging and setback levees would be required in West Canal and on coney Island to utilize the full pumping capacity at Banks Pumping Plant and avoid scouring the channel.

3.6.3 Hydrodynamics

This alternative differs from the proposed ISDP by eliminating the new northern intake, and by expanding the existing intake. The alternative does not change the amount of increased export capability, and it assumes that demand is the same as for the proposed ISDP.

Since export capability is not changed in this alternative, it is likely that the pumping schedule modeled by DWRSIM for the proposed ISDP would not change for this alternative. If this is the case, then this alternative would not create any changes other than those modeled for the proposed ISDP with respect to Delta Inflow, Delta Outflow, Delta Exports, or operation of SWP Reservoirs.

The impacts to existing Within Delta flows for this alternative would differ from those modeled for the proposed ISDP, as follows: 1) changes in velocity may cause localized scour near the enlarged intake; and 2) there would be a minor change in circulation patterns in the South Delta from those modeled for the proposed ISDP. These issues are discussed in more detail in this section.

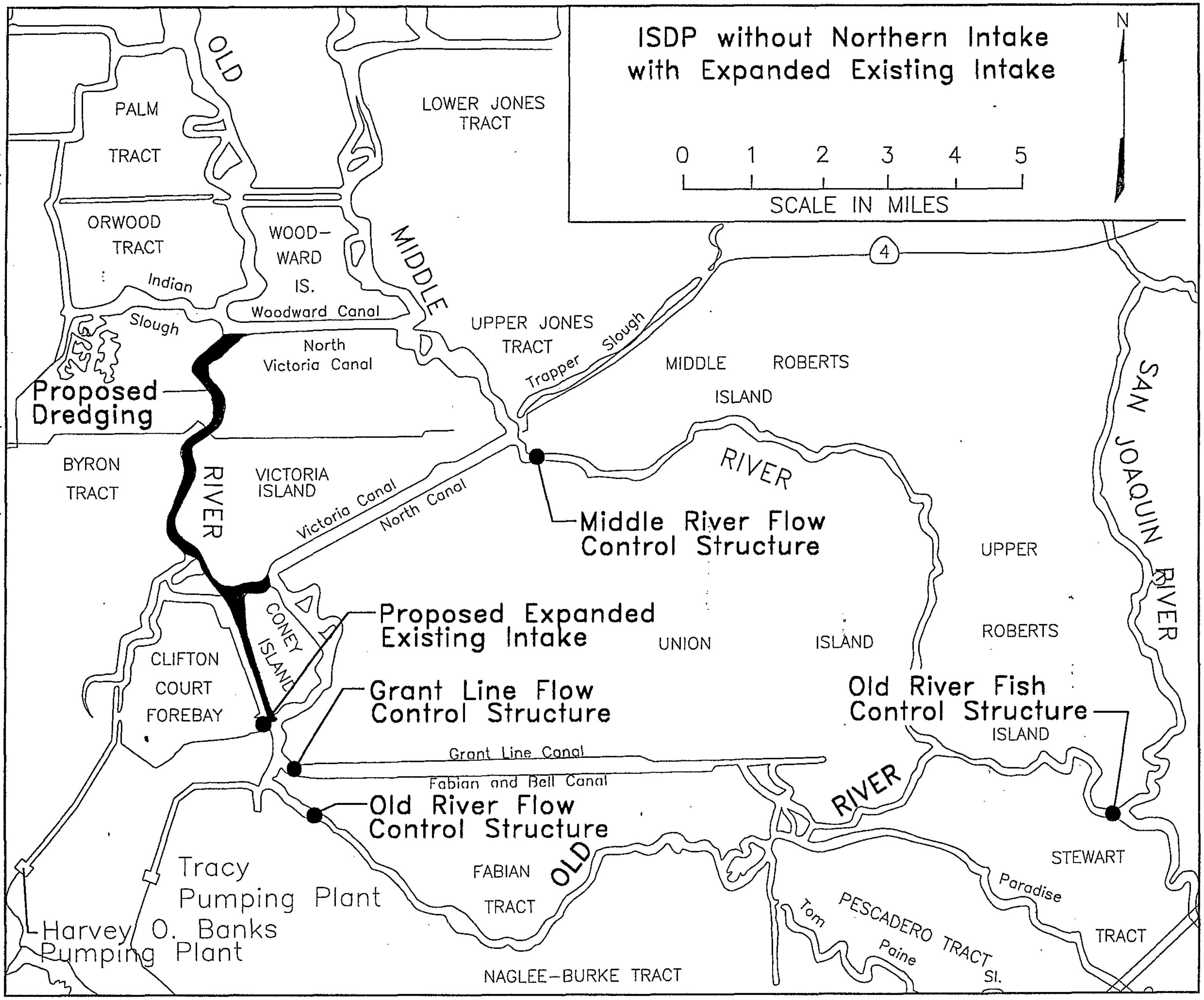

Figure 3-13. Proposed ISDP Without Northern Intake, With Expanded Existing Intake.

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The flow velocities in West Canal and Old River would be changed by the enlarged intake. No detailed modeling has been performed to evaluate the change, but velocities in channels may exceed the three fps likely to induce scouring.

There would be a change in local South Delta circulation patterns under this alternative, compared to the proposed ISDP. When the flow barriers are not operating, channel velocities in the reaches of Middle River, Grant Line Canal, and Old River that are upstream of the barriers would be greater using the enlarged intake of this alternative. When the barriers are operational, water surface elevation may decrease and velocities may increase downstream of the barriers on Old River near DMC and in Grant Line Canal. The velocities may exceed the three fps likely to induce scouring. When the barriers are operational, the circulation patterns should be similar under this alternative and the proposed ISDP. .

Other than the impacts described in the preceding paragraph, the effects of the barriers would be similar under this alternative to those modeled for the proposed ISDP.

3.6.4 Comparative Impact Evaluation

The implementation of this alternative would avoid the environmental impacts associated with the construction and operation of the northern intake structure. However, all of the impacts associated with other components of the proposed ISDP would occur with the implementation of this alternative, along with additional impacts relating to the expansion of West Canal and enlargement of the existing intake structure.

3.7 Proposed ISDP Without The Northern Intake, And With An Intake At Italian Slough

This alternative would include all of the proposed components of the ISDP project, except there would not be any dredging of Old River and the new intake would be constructed at Italian Slough instead of at the northeastern corner of Clifton Court Forebay. While this alternative was developed in consultation with several resource agencies, upon review, the intake at Italian Slough would provide insufficient capacity to support the development of proposed ISDP. The limited hydraulic capacity of Italian Slough would limit diversions to 2,300 cfs or 4,560 acre-feet per day. With this intake, proposed ISDP operations would be limited to periods of very low SWP Delta exports. Without the hydraulic improvements necessary to allow increased diversions into CCF, this alternative does not meet the second project purpose. The alternative of the proposed ISDP with both a new northern intake and an intake at Italian Slough, described above, provides the evaluation requested by the resource agencies, and assures compliance with the CEQA and NEPA guidance regarding the consideration of a reasonable range of alternatives. No further evaluation is provided for an alternative that includes an intake only in Italian Slough.

3.8 *No Action (Maintain Existing Conditions)*

This alternative would involve the maintenance of the environmental conditions as they exist at present. The proposed ISDP project would not be approved and would not be constructed. The potential adverse environmental effects of the proposed ISDP project would not occur, nor would the potential water supply, water quality, and environmental benefits occur.

This alternative differs from the proposed ISDP by maintaining conditions as they exist at present. The Delta environment and water project operations as they have existed from 1978 through 1991 are described as the existing conditions in Section 4.1. That section provides a representation of the variability in the existing environment, given changes in climate, changes in demand, and changes in regulatory constraints. In order to describe the existing conditions as they would be from now into the future, it is important to minimize the effects of historic variability in demand and regulatory constraints. For example, in 1990, the regulatory constraints were changed to include consideration of endangered species in water project operations, so there are in fact only two years of data available to describe the no action alternative under the existing demand and regulatory conditions. These years, 1991 and 1992, were critical year types and would not provide a complete picture of what the existing demand and regulatory conditions would produce during the other water year types. For this reason, a simulation of water project operations and the Delta environment was made to augment the description of the existing environment in evaluating the consequences of the no action alternative. The existing demand on the SWP was set at 3.6 maf to provide a base case study; this same model run was used as a baseline in evaluating the impacts of the proposed ISDP (Existing Demand Case Study).

The alternative differs from the proposed ISDP by maintaining current SWP pumping capacity constraints. In addition, this alternative does not require construction of barriers or dredging within the south Delta. The resulting differences in hydrodynamic elements, such as Delta inflow, Delta outflow, Delta exports, and within-Delta flows between this alternative and the proposed ISDP are described in Chapter 2.0 Proposed Project/Action. In that chapter, the environmental consequences of the proposed ISDP are measured against the no-action alternative.

The full pumping capabilities of the Banks Pumping Plant would not be utilized in this alternative and therefore changes to Delta outflow and within-Delta flows would occur. The changes in south Delta circulation resulting from the operation of barriers would not occur under this alternative.

The benefits of increased flexibility in water project operations, associated with the proposed ISDP would not be realized in this alternative. Under this no action alternative, the SWP operations would be narrowly constrained to meet both regulatory and demand requirements while maintaining pumping at existing levels.

The absence of barriers in this alternative means that more water from the San Joaquin River would enter the south Delta and that water levels and circulation would remain restricted. Other benefits of the barriers, such as diversion of aquatic resources from the pumping area and improvements in the quality of water pumped, would be lost under this no action alternative.

3.8.1 Comparative Impact Evaluation

Under this no action alternative the construction of the proposed ISDP facilities would not occur. Therefore, impacts associated with the construction and operation of these facilities would also not occur. This alternative would avoid all of the significant impacts previously identified, including impacts on local air quality, noise levels, aesthetics, recreation, land use, hazards, terrestrial biology, hazards, energy, public services, and navigation. The implementation of this alternative would not accomplish the project objectives of improved water levels and circulation in the south Delta for local agricultural diversions, and improve hydrologic conditions that allow for increase of diversion into the Clifton Court Forebay to maximize the frequency of full pumping capacity. In addition, under this alternative the beneficial affects of the proposed ISDP would not be achieved.

3.9 No Action (Maintain Conditions As They Would Exist In The Future)

This No Action, future case alternative involves conditions, policies, laws, ordinances, rules, regulations, programs and projects that exist or would likely be developed in the absence of the proposed ISDP, leading to a determination of the likelihood that California's future water requirements would be met without ISDP. This alternative includes a discussion of projected water use estimates, the current institutional framework, existing water facilities and water programs, programs and policies with future facilities, and projects which are judged to have a high likelihood of being constructed.

It should be noted that under this no action alternative the construction of the proposed ISDP facilities would not occur. Therefore, impacts associated with the construction and operation of these would also not occur. This alternative would avoid all of the significant impacts previously identified, including impacts on local air quality, noise levels, aesthetics, recreation, land use, hazards, terrestrial biology, hazards, socioeconomics, public services, and navigation. Implementation of this alternative would not accomplish the project objectives of improved water levels and circulation in the south Delta for local agricultural diversions, and improve hydrologic conditions that allow for increase of diversion into the Clifton Court Forebay to maximize the frequency of full pumping capacity. In addition, under this alternative the beneficial affects of the proposed ISDP would not be achieved.

For convenience, this section is divided into three components: The Institutional Framework Governing Water Use in California; Water Supply and Demand Management Programs; and, Operational Criteria and Summary.

3.9.1 Institutional Framework Governing Water Use In California

- *California's Water Needs*

The Delta provides water for over 20 million of California's 30 million residents. By the year 2020, the population of California is expected to reach nearly 50 million. About half of the projected population increase would occur in Southern California, according to the Department of Finance.

Population, its geographic location, and the percentage of water used in a community by residences, industry, government, and commercial enterprises generally determines urban water use. The implementation of local water conservation programs and current housing development trends, such as increased multiple-family dwellings and reduced lot sizes, has actually lowered the per capita water use in some areas of the state. However, gross urban water demands continue to grow, and urban water demand is expected to increase from 6.8 maf in 1990 to 10.5 maf in 2020.

California's 31 million acres of farmland, of which only one-third is irrigated, accounts for only three percent of the country's farmland, but produces about 11 percent of the total U.S. agricultural value. California agriculture is considered one of the most diverse in the world with over 250 different crops and livestock commodities, while no one crop dominating the States farm economy. According to the California Water Plan Update, Bulletin 160-93, California's agriculture acreage will decline by about 378,000 acres between 1990 and 2020. from 9,178,000 acres to about 8,800,000 acres, required approximately a reduction from 26.8 maf to 24.9 maf, or 1.9 maf less water.

Today, many of the State's biological resources are at low levels due to natural and human conditions. Both State and federal policies look to restore endangered and threatened species, restore lost wetlands, and protect other valuable natural resources. In 1990, 28.4 maf were dedicated to environmental uses in California. This includes 17.8 maf of flows for North Coast Wild and Scenic Rivers in an average year. By 2020, the environmental water demand is estimated to be 28.8 maf in an average year. Recent regulatory agency actions have proposed a number of changes in instream flow for major rivers, including the Sacramento and San Joaquin. The proposed flow requirements are not necessarily additive; however, an increase statewide may range from one to three maf for potential environmental water needs.

- *Key Policies, Laws, Agreements and Acts*

Proper management of the California's water resources is at a critical juncture as evolving policies and physical limits of the State's water supply infrastructure collide. Water resources management in California is governed by many complex policies, laws, ordinances, rules, regulations, permit requirements, and physical limitations which together determine the State's water supply for all its users and major interest groups. The three major interest groups - urban, agricultural and environmental are currently working together toward solutions that should benefit all Californians and their environment. Many laws, policies, agreements and acts focus attention on the Delta, since the Delta receives runoff from over 40 percent of the State's land area.

A list of the State's institutional framework is provided below. A detailed discussion is found in Appendix 4, Regulatory Framework.

- *Water Quality Standards*
- *SWRCB Water Rights/December 15, 1994 State-Federal Principles Of Agreement*
- *Governor's Water Policy*
- *Federal and State Endangered Species Acts*
- *Central Valley Project Improvement Act Of 1992*
- *Safe Drinking Water Act*
- *Delta Flood Protection Act Of 1988*
- *Delta Protection Act Of 1959*

3.9.2 Water Supply And Demand Management Options

California's existing water supplies can be summarized into the following categories which represent the State's existing water supplies and water supply programs: local surface and local imported supplies; groundwater supplies; the State Water Project; the Central Valley Project; the Colorado River; and, water reclamation and desalination.

• *Local Surface And Imported Supply Development*

Available surface water supplies for California total 78 maf when out-of-state supplies from the Colorado River are added. Uneven distribution of water resources is part of the State's geography. roughly 75 percent of the natural runoff occurs north of Sacramento, while 75 percent of the net water demand is south of Sacramento. The largest urban water users in the South Coast Region, where nearly half of California's population resides.

Currently over 1,200 non-federal dams are under the State's supervision. The reservoirs formed by these dams provide gross reservoir capacity of roughly 20 maf. There are also 181 federal reservoirs in California, with a combined capacity of 22 maf. Combined these 1,400 or so reservoirs hold about 42 maf water of the 71 maf total available runoff in California.

Some of California's water supplies are transferred to needed destinations through aqueduct systems. California has five inter-regional conveyance projects: the Los Angeles Aqueduct, the Mokelumne Aqueduct, the Hetch Hetchy Aqueduct system, the All American Canal System, and the Colorado River Aqueduct.

- *Ground Water Supplies*

In an average year, about 40 percent of the urban and agricultural applied water use or over 20 percent of total applied water in California is provided by ground water extraction. There are over 450 groundwater basins in the state. The statewide total amount of ground water stored in these ground water basins is estimated to be 850 maf, about 100 times the annual net ground water use in California.

Probably less than half of this total is usable because: extraction would induce sea water intrusion into the aquifer; the ground water in the basin is already too saline; the depth to the ground water makes it too costly to extract the water; and, extraction of ground water could cause unacceptable amounts of land surface subsidence. The large quantity of good quality ground water in storage makes it an extremely important component of California's total water resource that must be managed in conjunction with surface water supplies to ensure sustained availability.

- *The State Water Project*

California voters authorized construction of the SWP in 1960 by ratifying the Burns-Porter Act. California designed and constructed the State Water Project to help mitigate the effects of droughts in the State. Originally, 32 agencies or districts signed long-term contracts with the Department. (As of June 30, 1992, 29 agencies have contracts).

The first water service contract was signed with the Metropolitan Water District in 1960. The first water project deliveries were made in 1962, although contract entitlements did not begin until 1967. That year, water entitlements totaled 11,538 acre-feet. Water entitlements are structured to gradually increase until they reach their maximum entitlement. In 1995, SWP Total Entitlements are 4.163 maf. The SWP maximum entitlement, 4.217 maf, would be reached in 2021.

Key features of the SWP include Lake Oroville (3.5 maf) located in the foothills of the Sierra Nevada. In the Delta, the Banks Pumping plant pumps water from the Sacramento-San Joaquin Delta into the 444-mile California Aqueduct which extends down to Lake Perris south of Riverside. The 2.0 maf San Luis Reservoir is shared with the CVP. At the southern end of the San Joaquin Valley, the Edmonston Pumping plan lift water 1,926 feet, sending flows through the Techachapi Mountains by tunnels and into Southern California. Currently, the Coastal Branch Aqueduct is under construction by DWR to provide water to San Luis Obispo and Santa Barbara Counties.

Of contracted amounts, 2.5 maf is destined for south of the Techachapi Mountains, nearly 1.36 maf to the San Joaquin Valley and the remaining 0.37 maf to the San Francisco Bay area, Central Coast regions and the Feather River area.

- *The Central Valley Project*

The U.S. Bureau of Reclamation's Central Valley Project is the largest water storage and delivery system in California, covering 29 of the State's 58 counties. The projects features include 18 federal reservoirs, plus 4 additional reservoirs jointly owned with the SWP. The keystone of the CVP is the 4.6 maf Lake Shasta, the largest reservoir in California. The reservoirs in this system proved a total storage capacity of over 12 maf, nearly 30 percent of the total surface storage in California.

Like the SWP, the CVP pumps water from the Delta at the Tracy Pumping Plant and sends the water south via the Delta-Mendota Canal. Other key facilities include Friant Dam, the Contra Costa Canal and the Friant-Kern Canal, Folsom Dam, New Melones Dam and the San Luis Reservoir (shared with the SWP). The CVP supplies service to over 250 long-term water contractors who contracts total 9.3 maf, including 1.4 maf of Friant Division class 2 supply available in wet years. Of the 9.3 maf, 6.2 maf is project water and 3.1 is water right settlement water.

- *The Colorado River*

In a 1964 the Supreme Court decree, annual use of 7.5 maf of Colorado River water was apportioned among three states: Arizona, Nevada, and California. Of this total, California's apportionment is 4.4 maf, plus half of any excess or surplus water. California's use of Colorado river water can be limited in the future to 4.4 maf in any year by the Secretary of State. Water is transferred into California via the All American Canal (approximately 3 maf) and the Colorado River Aqueduct.

- *Water Reclamation and Desalination*

Water recycling, formerly known as waste water reclamation, has been intentionally used as a source of no potable water in California for nearly a century. In recent years, more stringent treatment requirements for disposal of municipal and industrial waste water have reduced the incremental cost of obtaining the higher level of treatment required for use of recycled water. Technology available today allows municipal waste water treatment systems in some regions to consistently produce safe water supplies at competitive costs. According to the Water Reuse Association of California, water reuse had increased from about 270,000 af in 1987 to over 380,000 af in 1993.

Used household water, gray water, can sometimes be directly reused in subsurface systems to irrigate lawns, fruit trees, ornamental trees and shrubs, flowers, and other ornamental ground cover. In 1992, recognizing that gray water could be used safely with proper precautions, the California Legislature amended the Water Code to allow gray water systems in residential buildings subject to appropriate standards and with the approval of local jurisdictions. Residential use of gray water became legal in 1994.

Sea water desalination can be a cost-effective water supply for some coastal communities that have limited local supplies and are relatively far from the statewide distribution system, or communities that are concerned about water service reliability. However, a major limitation for sea water desalting is its high cost, much of which is directly related to its high energy requirements.

- *Future Water Supply Projects*

Future water supply projects considered for the no action alternative include projects or programs that have both certified Environmental Impact Reports and received permits for project construction. Two off-stream storage projects currently meet this criteria: the Domenigoni Valley Reservoir (MWDSC) and the Los Vaqueros Reservoir (CCWD). The 800,000 acre-foot Domenigoni Valley Reservoir is designed to provide annual supply of 264,000 acre-feet of water in drought years, and the Los Vaqueros Reservoir is a 100,000 acre-foot reservoir that would provide off-stream emergency supply for the CCWD.

In addition to off-stream storage projects, other water supply programs and projects include: reclamation programs, conjunctive use programs and conveyance facilities are also important water supply management programs. A summary is given in Table 3-1 Water Supply and Demand Management Options.

- *Water Demand Programs*

Ongoing demand management options that would continue independent of the proposed ISDP include both long term and short-term programs. Long term programs include: urban water conservation, agricultural water conservation and land retirement, and a canal lining project. Short term demand management programs include demand reduction, and short-term land fallowing coupled with short term water transfers.

Urban water conservation includes installation of ultra-low-flush toilet retrofit and residential water audit programs. Estimated demand reductions are listed in Table 3-7 Water Supply and Demand Management Options.

- *Water Supply Balance*

According to the 1993 California Water Plan Update (DWR Bulletin 160-93) by 2020, without additional facilities and improved water management, an annual shortage of 3.7 to 5.7 maf could occur during average years, depending on the outcome of the various actions listed above. Similarly, by 2020, annual drought year shortages could amount to 7 to 9 maf under D-1485 criteria.

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Table 3-7. State Water Project and State Water Project Service Area Water Balance Assumed for Inclusion in No Action Alternative

	1990 Average Year (maf)	1990 Drought Year (maf)	2020 Average Year (maf)	2020 Drought Year (maf)
SWP Entitlement	4.1	4.1	4.2	4.2
SWP Delivery Capability	2.8*	2.1*	3.3*	2.0*
SWP Balance	**-1.3**	**-2.0**	**-0.9**	**-2.2**
SWP Area Demand	10.1	9.3	10.9	11.2
SWP Area Supply Capability	10.1	10.3	9.9	8.3
SWP Area Balance	**0**	**-1.0**	**-1.0**	**-2.9**

* Bulletin 160-93, California Water Plan Update, Table 11-6

** Includes Programs/Projects listed in Table 3-8 , Water Supply and Demand Management

Options Assumed for Inclusion in the No Action Future Alternative

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With the inclusion of the projects and programs listed in Table 3-7 Water Supply and Demand Management Options Assumed for Inclusion in the No Action Future Alternative, shortages in the year 2020 would be reduced to 2.8 maf to 4.8 maf in average years, and 3.9 to 5.9 maf in drought years.

Under the No Action Future alternative, an adequate future water supply would not be assured within the SWP service areas, either. Table 3-8 , State Water Project and State Water Project Service Area Water Balance Assumed for Inclusion In No Action Alternative, summarizes the supply and demand balances, assuming the same projects and programs as listed in Table 3-7 Water Supply and Demand Management Options Assumed for Inclusion in the No Action Future Alternative.

3.9.3 Operational Criteria and Summary

The SWP and CVP would continue to coordinate their operations under the following criteria:

- SWRCB Water Rights/December 15, 1994 State-Federal Principles of Agreement
- Federal and State Endangered Species Act
- Central Valley Project Improvement Act of 1992
- Safe Drinking Water Act
- Delta Flood Protection Act of 1988
- Delta Protection Act of 1959

Two new off-stream water supply facilities would be constructed in the upcoming years: the 800,000 acre-foot Domenigoni Valley Reservoir, and the 100,000 acre-foot Los Vaqueros Reservoir. In addition, reclamation programs, conjunctive use programs, and conveyance facilities would play key roles in managing California's future water supply. In addition to off-stream storage projects, other important water supply programs and projects include: reclamation programs, conjunctive use programs and conveyance facilities are also important water supply management programs. A summary is given in Table 3-7 Water Supply and Demand Management Options.

Together, however, these measures would not be able to assure an adequate water supply for a growing California in the future. By the year 2020, in an average water year, the state would still experience shortages between 2.8 maf to 4.8 maf in average years, and 3.9 to 5.9 maf in drought years. In the SWP service area, shortages are predicted in the year 2020, where a 1.06 maf deficit would occur in average years, and a 2.7 maf deficit would occur in drought years.

Table 3-8. Water Supply and Demand Management Options Assumed for Inclusion in No Action Future Alternative

WATER SUPPLY MANAGEMENT OPTIONS						
Program	**Type**	**Capacity (1,000 AF)**	**Annual Supply (1,000 AF) average**	**drought**	**Economic Unit Cost ($/AF) (1)**	**Comments**
Statewide Water Management						
Coastal Branch Phase II (Santa Ynez Extension)	SWP Conveyance Facility	57	N/A	N/A	630-1,110	Notice of Determination was filed in July 1992; construction began in late 1993.
Local Water Management						
Water Recycling	Reclamation	1,321	923	923	125-840	New water supply
Ground Water Reclamation	Reclamation	200	100	100	350-900	Primarily in South Coast
Los Vaqueros Reservoir-Contra Costa Water District	Offstream Storage Emergency Supply Water Quality	100	N/A	N/A	320-950	EIR certified in October 1993, 404 permit issued in April 1994
EBMUD	Conjunctive Use and Other Options		N/A	43	370	Final EIR certified in October 1993.
Domenigoni Valley Reservoir-MWDSC	Offstream storage of SWP and Colorado River water, drought year supply	800	0	264	410	Final EIR certified
San Felipe Extension-PVWA	CVP Conveyance Facility		N/A	N/A (2)	140	Capital costs only; convey 18,000 AF annually
DEMAND MANAGEMENT OPTIONS						
Program		**Applied Water Reduction (1,000 AF)**	**Net Water Demand Reduction (1,000 AF) average**	**drought**	**Economic Unit Cost ($/AF) (1)**	**Comments**
Long-term Demand Management						
Urban Water Conservation		1,300	900	900	315-390 (3)	Urban BMPs
Agricultural Water Conservation		1,700	300	300	Not Available	Increased irrigation efficiency
Land Retirement		130	130	130	60	Retirement of land with drainage problems in west San Joaquin Valley; cost is at the Delta.
All American Canal Lining		68	68	68		Water conservation project; increase supply to South Coast Region
Short-term Demand Management						
Demand Reduction		1,300	0	1,000	Not Available	Drought year supply
Land Fallowing/Short-term Water Transfers		800	0	800	125	Drought year supply; cost is at the Delta.

(1) Economic costs include capital and OMP&R costs discounted over a 50-year period at 6 percent discount rate. These costs do not include applicable transportation and treatment costs.
(2) Yield of this project is in part or fully comes from the CVP.
(3) Costs are for the ultra-low-flush toilet retrofit and residential water audit programs.

3.10 Alternatives Considered But Eliminated From Detailed Study

In addition to the selected alternatives, the preparers of this DEIR/EIS considered an extensive list of potential alternatives to the proposed project. More than three dozen potential alternatives were considered but eliminated from detailed study in the DEIR/EIS, consistent with the direction contained in the CEQA Guidelines and the NEPA CEQ Regulations, as outlined briefly in the following.

Several potential alternatives were eliminated because they would likely have environmental consequences of greater magnitude than the proposed project. The preparers of the DEIR/EIS tried to focus the evaluation upon alternatives that had the potential to be environmentally preferable to the proposed project. Several other potential alternatives were eliminated because they were much larger in scale and/or were oriented toward a longer-term resolution of the Delta water supply issues and concerns. The potential alternatives considered but eliminated from detailed study are as follows and descriptions are contained in Appendix 5:

- *Peripheral Canal*
- *Dual transfer system*
- *Modified Folsom-South Canal*
- *Pay For Agricultural Pump Damage In The South Delta*
- *Delta Mendota Canal/Westley Wasteway Plan*
- *Reduce San Joaquin River Agricultural Drainage*
- *Chipps Island Barrier*
- *Dillon Point Barrier*
- *Point San Pablo Barrier*
- *Submerged Sill, Carquinez Strait*
- *Robert Island Canal Plan*
- *New Hope Cross Channel (With And Without Forebay Enlargement)*
- *Isleton Cross Channel (With And Without Forebay Enlargement)*
- *Pumping Water From Clifton Court Forebay To A Portion Of SDWA Users*
- *Enlarge Clifton Court Forebay With: Byron Tract; North Victoria; South Victoria; Coney Island; Or Union Island.*

- *South Delta Channel Control Structures, Channel Enlargement, And Enlarged Forebay At: Byron Tract; North Victoria; South Victoria; Coney Island; Or Union Island.*
- *Mathena Landing Canal*
- *West/Central Delta Canal*
- *Montezuma Hills Reservoir and Canal*
- *Waterway Control Plan*
- *North Stub Canal*
- *South Stub Canal*
- *Mathena Landing Cross Channel And South Stub Canal*