RB5s/SJB/00003

WATER DIVERSION AND DISCHARGE POINTS ALONG THE SAN JOAQUIN RIVER: MENDOTA POOL DAM TO MOSSDALE BRIDGE

Volume 1: Main Report

California Regional Water Quality Control Board
Central Valley Region
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April 1989

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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Special acknowledgement goes to those staff who spent countless hours doing the field surveys: Rudy J. Schnagl, John L. Menke, Louis F. Pratt, Christopher Cooper, and Ron R. Thomasson and to Brenda Grewell who prepared all the report graphics. Special thanks goes to the land owners, without whose cooperation this program would not have been possible.

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SUMMARY

Little information is available on the extent and magnitude of diversions of water from the San Joaquin River. Discharges from agricultural and other nonpoint sources are also poorly documented. To develop the data needed to establish beneficial uses and water quality objectives on the river, a study was conducted in 1985-86 to gain information on the hydrologic influences on it. A 150-mile reach of the San Joaquin River from the Mendota Dam near Mendota to Mossdale Bridge near Tracy was surveyed for water use and discharge points. This section of the river has 193 discharge points with nearly half of them occurring in a 46-mile section from Hills Ferry Road Bridge near Newman to Airport Way near Vernalis.

There are 89 points of water diversion for beneficial use within this same 150-mile reach. The density of diversion sites increases as each east side tributary contributes flow to the river. The predominant beneficial use is for irrigated agriculture. A special survey of irrigation use was conducted for the 48 diversion points that occur in the river between Lander Avenue near Stevinson to Airport Way near Vernalis. This reach of the river is most directly affected by discharges of agricultural subsurface drainage water. These 48 points supply all or a portion of the irrigation supply for over 60,000 irrigated acres which produce a variety of crops.

INTRODUCTION

The State Water Resources Control Board hearings on the problems at Kesterson Reservoir identified the need to control the discharges of agricultural subsurface drainage into the San Joaquin River. Programs at the federal, State and local levels have been initiated to investigate the impacts this agricultural drainage may be having on the beneficial uses of the river. The Central Valley Regional Water Quality Control Board (Regional Board) has the primary responsibility for regulating the discharge of drainage water. As part of the development of this regulatory program, the Regional Board intensified monitoring of agricultural discharges and gathered data on the geographic distribution of discharge sources and users of San Joaquin River water.

The majority of the subsurface agricultural drainage pollutant load discharged to the San Joaquin River enters via Mud Slough (north) and Salt Slough in Merced County (James et al., 1988a and 1988b). The impact of these discharges, however, is highly modified by numerous diversions and discharges up and down stream of these two sloughs. The importance of these other discharges and diversions is manifested by the finding that the majority of the river in many months of the year is made up entirely of agricultural return flows, both surface and subsurface. Little information is available on the extent and magnitude of these diversion and discharge points. This study was initiated to gain information about the hydrology of the San Joaquin River as it relates to agricultural water use. The objective of the study was to physically characterize the San Joaquin River by identifying the surface hydrologic influences on it. The goals were a) to develop information that could be used in identifying the beneficial uses and appropriate water quality objectives for the San Joaquin River; b) to identify the need for regulatory actions; and c) to provide a data base for the flow model being developed for the San Joaquin River.

STUDY AREA

The study area consists of the 150-mile reach of the San Joaquin River extending from Mendota Dam at the Mendota Pool near Mendota to the Mossdale Bridge at the point where Interstate 5 crosses the San Joaquin River near Tracy. Due to the extensive length of the river and major differences in the intensity of use along its length, the river was divided into 20 segments for analysis. The river segments chosen are described in Table 1 and shown in Figures 1 to 7. The river miles shown throughout this report are those used by the U.S. Army Corps of Engineers (1984). In addition to the segments of the main channel that were surveyed, special surveys were conducted on Bear Creek, the West Stanislaus Irrigation District Main Intake Channel, and the Grayson Slough Channel which was formerly the main branch of the San Joaquin River. All of these special surveys were conducted as significant inflow and outflow points occur on these channels and the main channels are not monitored as they enter the San Joaquin River.

The flow in the San Joaquin River is highly regulated and different reaches are strongly influenced by discharges or diversions into the river. Flow in the river from Mendota Dam to the Salt Slough inflow (75 river miles) consists exclusively of irrigation water diversions from the Mendota Pool and operational spill waters. Few other discharges occur in this portion of the river. The river is often dry beyond points of diversion for irrigation, thus flow, although highly variable, is dependent upon irrigation operations and localized seepage. Flow in the river from the Salt Slough inflow to the Merced River (11 river miles) is principally irrigation return flows from Mud Slough (north) and Salt Slough. The remainder of the river downstream of the Merced River is influenced by natural flow from the main east side tributaries and numerous diversions and discharges.

STUDY METHODS

The study was initiated in spring 1985 with all field work completed by end of the summer 1986. The initial river survey was by air in April-May 1985. Additional information was obtained from U.S. Geological Survey Topographical Survey Maps, Soil Conservation Service records, and Regional Board files. This was followed by an on-the-ground inspection of the entire 150-mile reach of the San Joaquin River.

The on-the-ground survey of the San Joaquin River consisted of traveling its length, noting the location and type of all discharges and diversions. In addition, the source of the discharge was identified and the land being irrigated was noted for all diversions. Detailed photographs of each site are available in the Regional Board files.

RESULTS

The river segment discussion that follows will describe the discharge and diversion data from south to north or upstream to downstream. The river miles are assigned, however, from the lowest miles downstream to the highest values upstream (denotes miles from the river terminus). This discussion will only present a summary of each river segment. More detailed supporting information

Table 1 River Sections Used to Evaluate Influences of Water Development on San Joaquin River Hydrology

River Section	San Joaquin River Section Description	Section Length (miles)
1	Mendota Dam to Avenue 7-1/2	9.6
2	Avenue 7-1/2 to Sack Dam	13.2
3	Sack Dam to Santa Rita Bridge (Highway 152)	8.1
4	Santa Rita Bridge (Highway 152) to Mariposa Bypass (Intake)	5.4
5	Mariposa Bypass (Intake) to Turner Island Road	11.4
6	Turner Island Road to Mariposa Bypass (Outlet)	9.8
7	Mariposa Bypass (Outlet) to Bear Creek Inflow	11.4
8	Bear Creek Inflow to Lander Avenue Bridge (Highway 165)	3.0
9	Lander Avenue Bridge (Highway 165) to Upstream of Salt Slough	3.4
10	Salt Slough Inflow to Fremont Ford Bridge (Highway 140)	4.3
11	Fremont Ford Bridge (Highway 140) to Upstream of Mud Slough (north)	4.1
12	Mud Slough (north) to Hills Ferry Road Bridge	3.0
13	Hills Ferry Road Bridge to Crows Landing Road Bridge	11.0
14	Crows Landing Road Bridge to Patterson Bridge	8.3
15	Patterson Bridge to Grayson Road Bridge	9.7
16	Grayson Road Bridge to Maze Road Bridge (Highway 132)	11.9
17	Maze Road Bridge (Highway 132) to Airport Way (Vernalis)	4.9
18	Airport Way (Vernalis) to Upstream of Banta-Carbona Intake Canal	8.8
19	Banta-Carbona Intake to Paradise Dam	3.7
20	Paradise Dam to Mossdale Bridge (Interstate 5)	3.7
A[1]	Bear Creek-Eastside Bypass (Inflow) to San Joaquin River	4.0[2]
B[1]	Old Grayson Channel-Origin to San Joaquin River	4.5[2]
C[1]	West Stanislaus Irrigation District-Pumps to San Joaquin River	2.0[2]
	TOTAL RIVER MILES	148.7

[1] Special side-channel surveys conducted because of significant influence on San Joaquin River hydrology

[2] Not considered in the total river miles

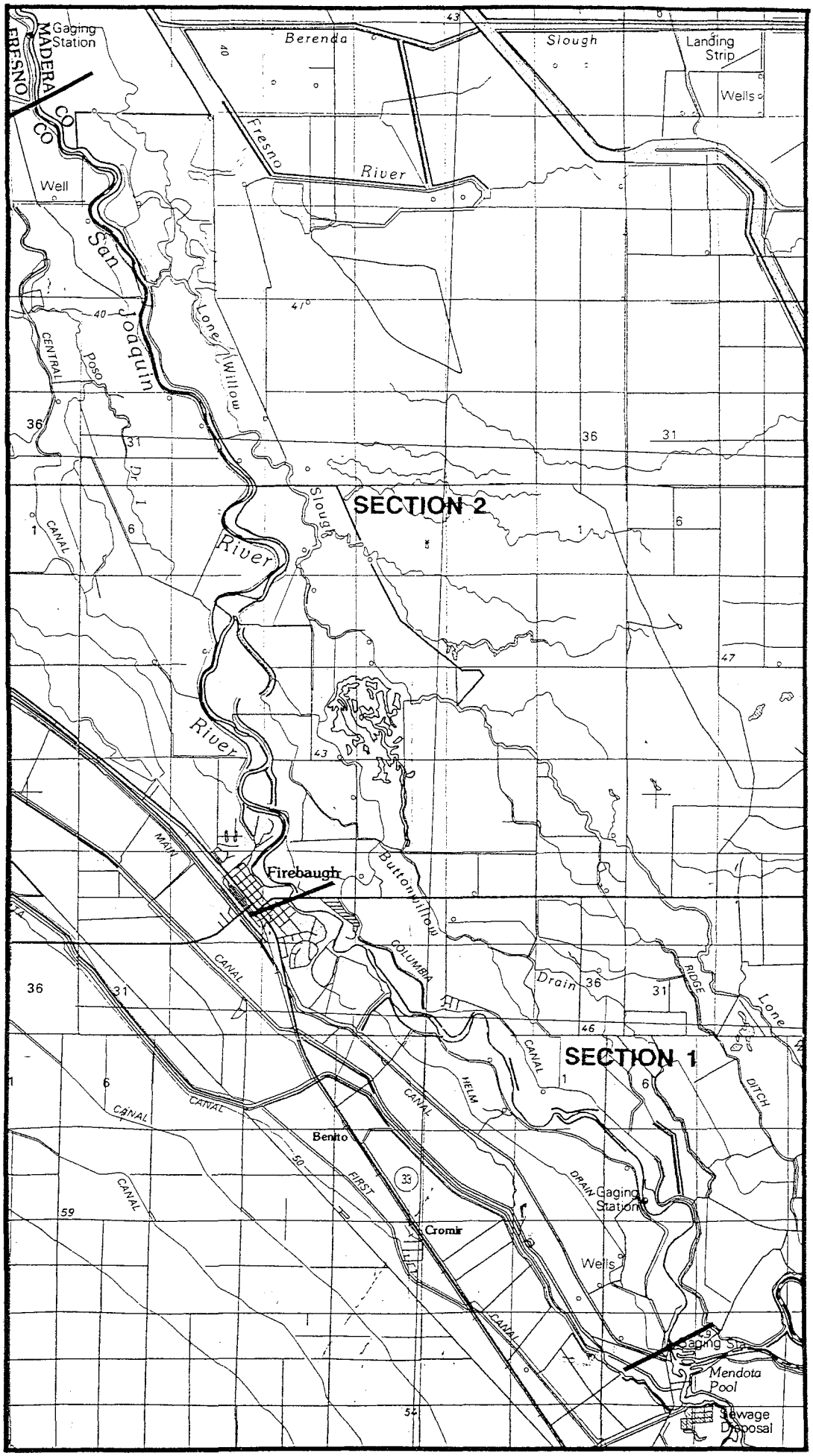

Figure 1. Location of River Sections 1 and 2 (Mendota Dam to Sack Dam) on the San Joaquin River Used to Describe Water

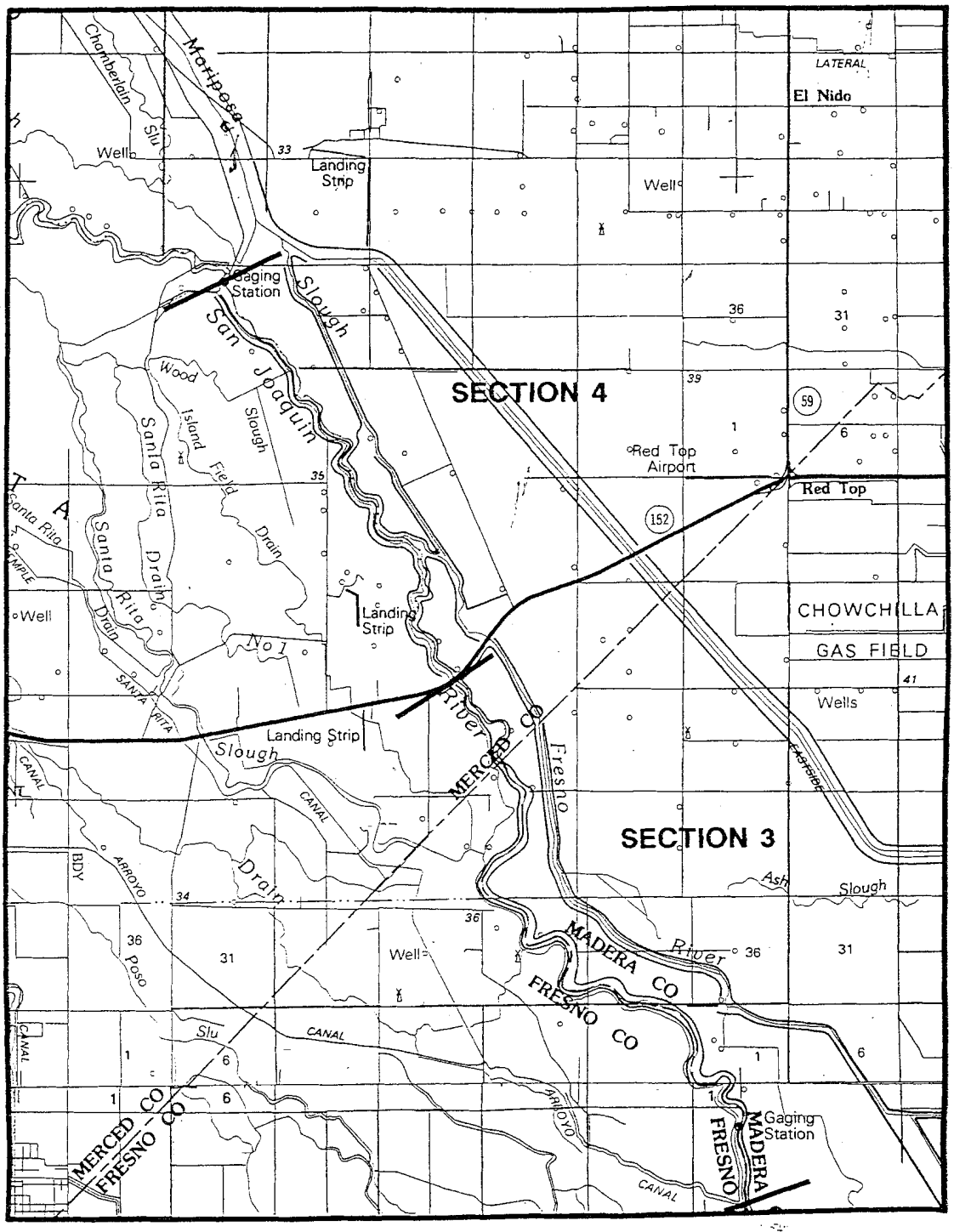

Figure 2. Location of River Sections 3 and 4 (Sack Dam to Mariposa Bypass (Intake)) on the San Joaquin River Used to Describe Water Diversions and Discharge Points.

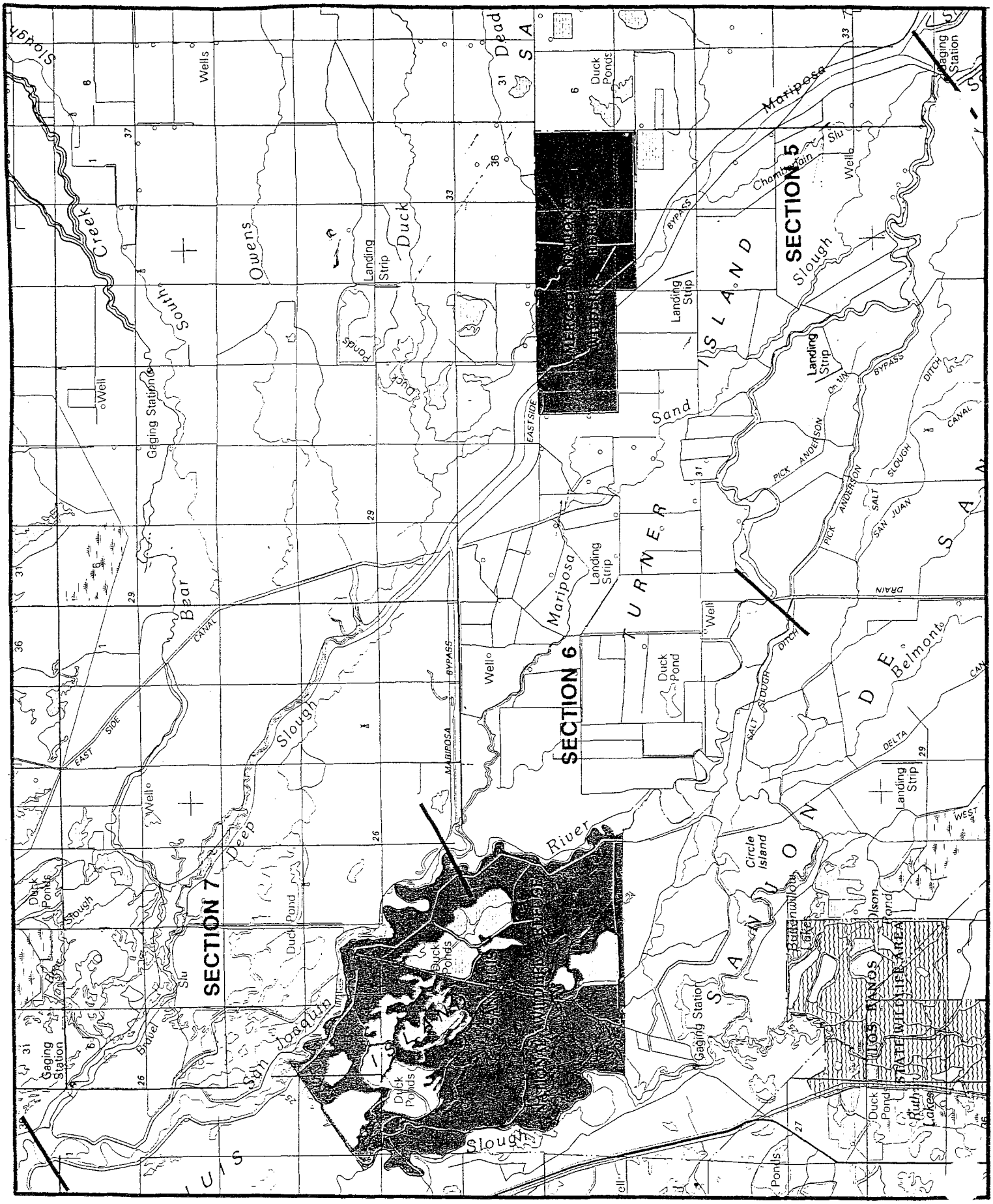

Figure 3. Location of River Sections 5, 6 and 7 (Mariposa Bypass (Intake) to Bear Creek Inflow) on the San Joaquin River Used to Describe Water Diversion and Discharge Points.

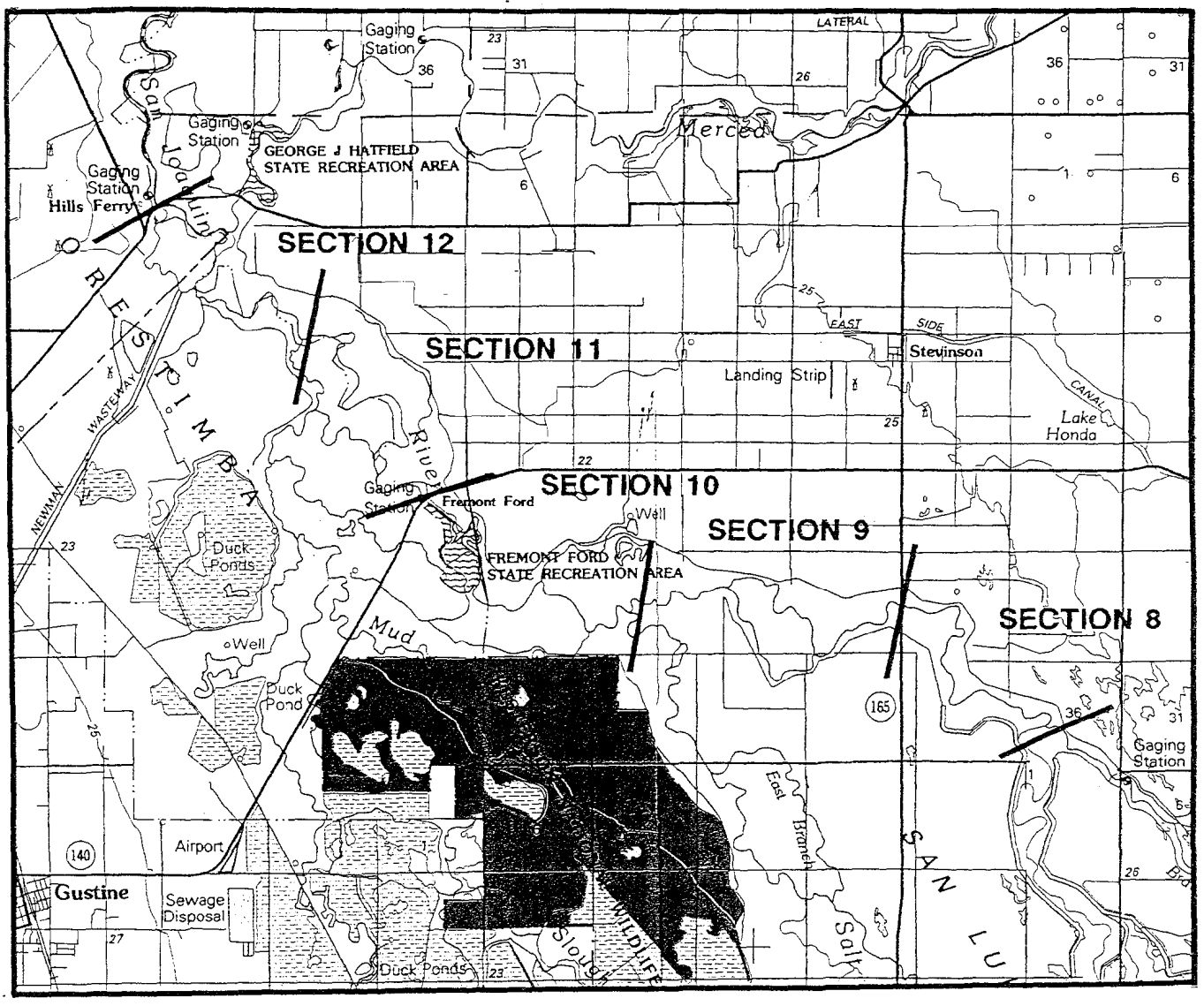

Figure 4. Location of River Sections 8, 9, 10, 11 and 12 (Bear Creek Inflow to Hills Ferry Road Bridge) on the San Joaquin River Used to Describe Water Diversion and Discharge Points.

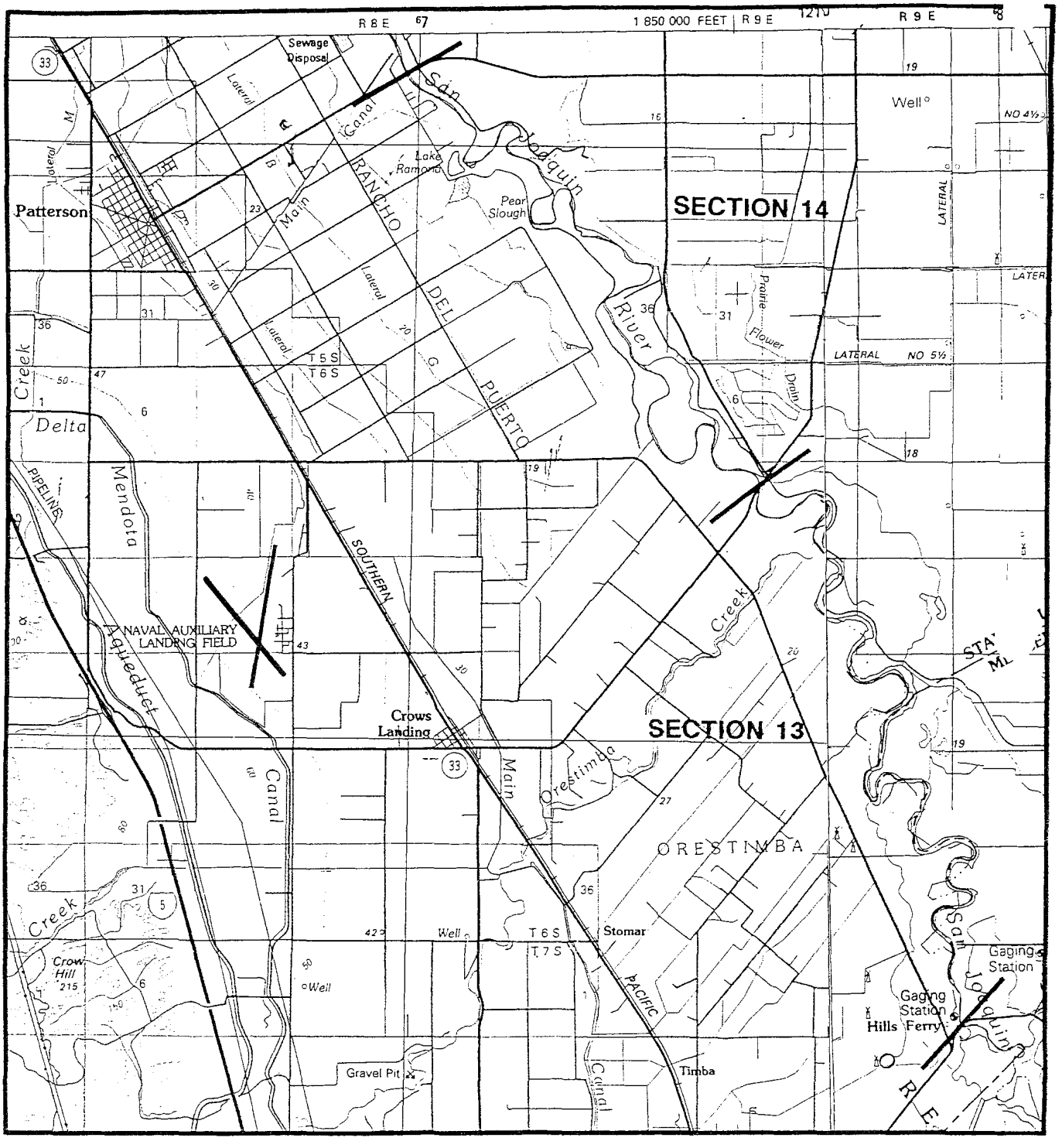

Figure 5. Location of River Sections 13 and 14 (Hills Ferry Road Bridge to Patterson Bridge) on the San Joaquin River Used to Describe Water Diversion and Discharge Points.

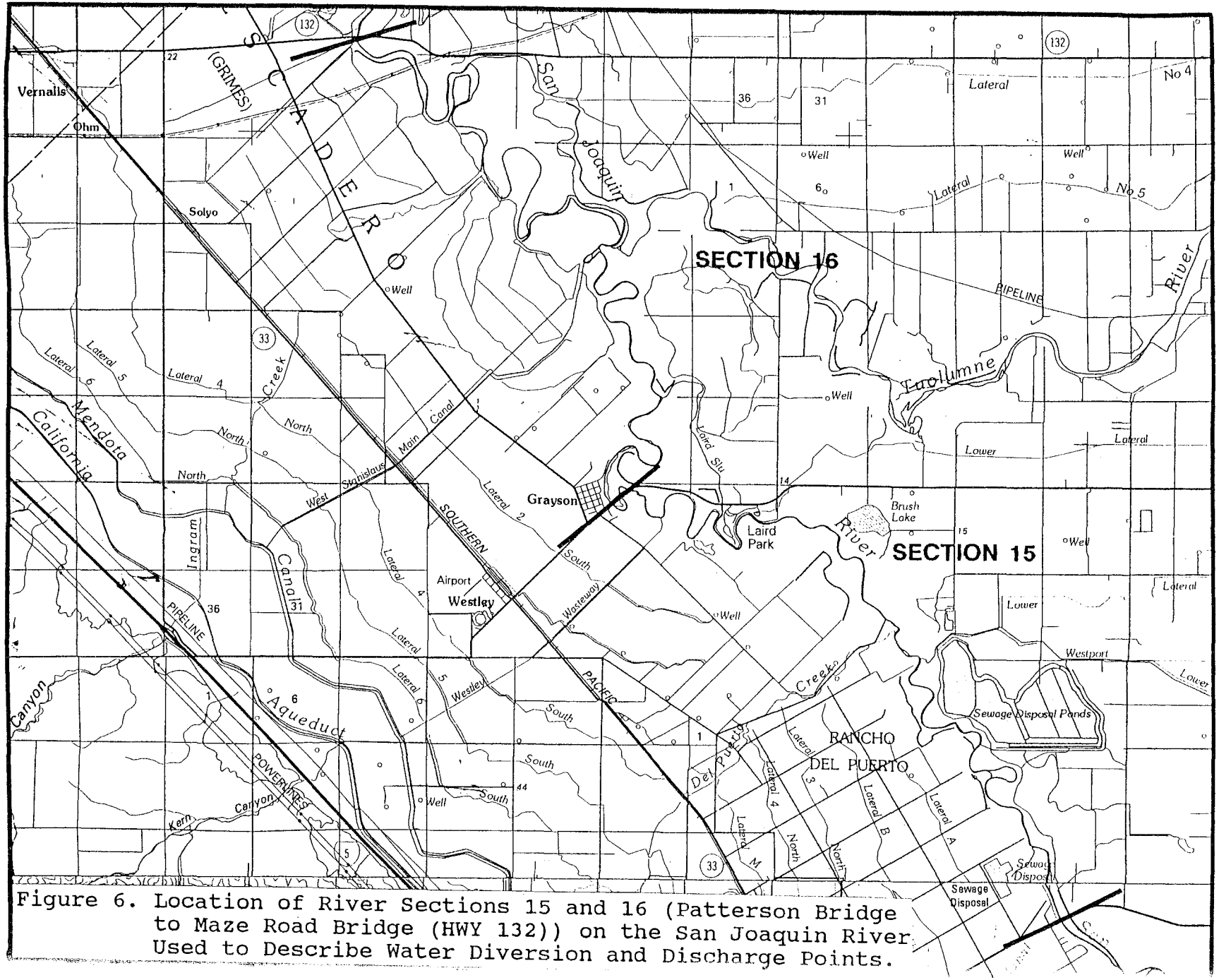

Figure 6. Location of River Sections 15 and 16 (Patterson Bridge to Maze Road Bridge (HWY 132)) on the San Joaquin River Used to Describe Water Diversion and Discharge Points.

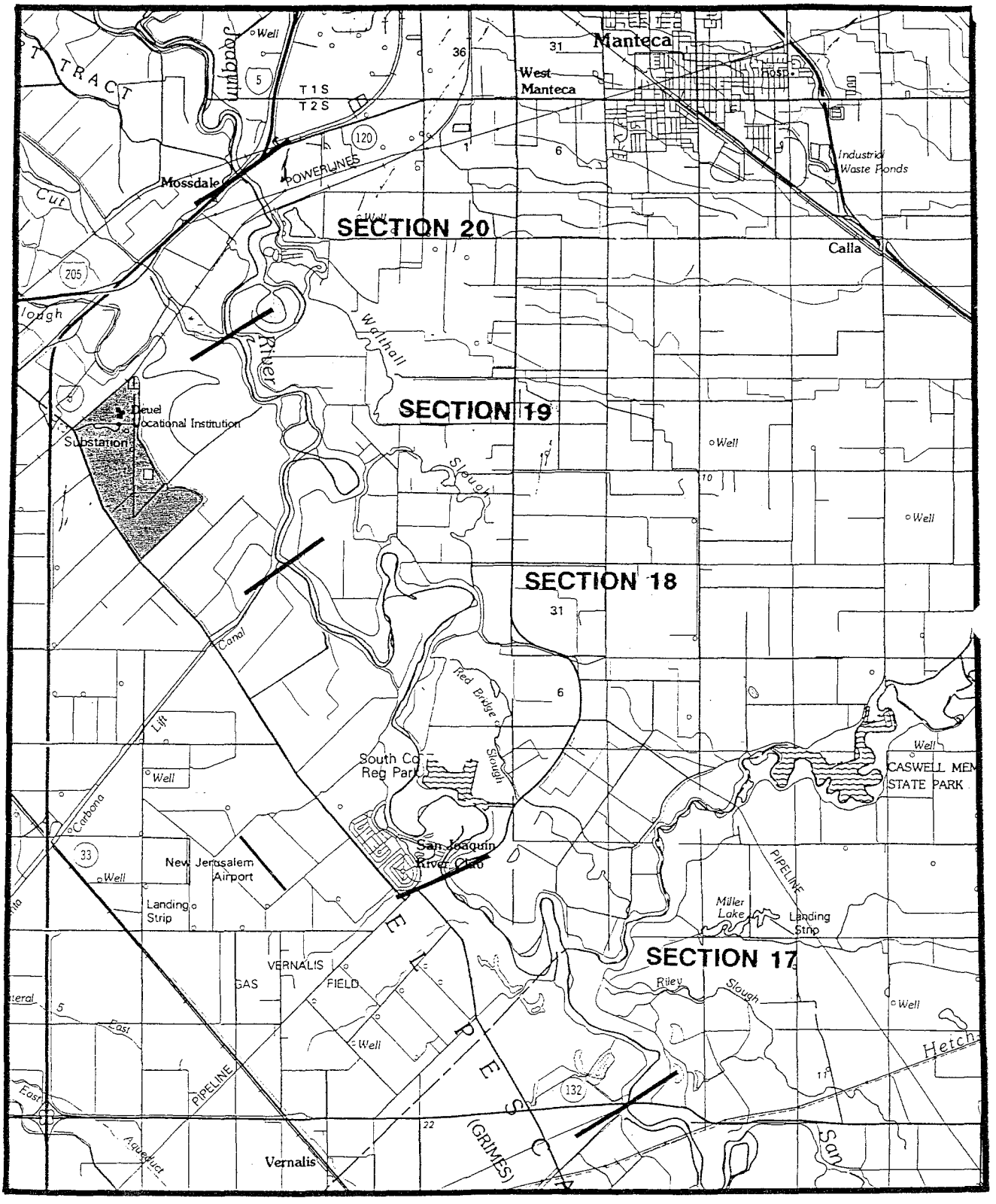

Figure 7. Location of River Sections 17, 18, 19 and 20 (Maze Road Bridge (HWY 132) to Mossdale Bridge (Interstate 5)) on the San Joaquin River Used to Describe Water Diversion and Discharge Points.

is presented in Appendices A and B. The information in the appendices is arranged by river segment for ease of access. The supporting information within each river segment identifies each site by a unique site number, locates the site along the San Joaquin River and provides a brief site description and where useful a site location map. The unique site number assigned to each site describes the site location. For example, site #SJW121.1D; the first two letters describe the site as being on the San Joaquin River (SJ) while the next letter describes whether the site is on the west (W) or east (E) side of the river. The four-digit numeric designation (121.1) describes the river miles as defined by the Corps of Engineers (1984). The final letter designation describes whether the site is a discharge (D) to the river or a diversion (P) from the river. A schematic diagram with site names and number has been compiled for each river section. Detailed information has been compiled on only selected sites. The emphasis has been on detailed information and location maps for sites downstream of Lander Avenue to Vernalis (River Sections 9-17). These are the sites most affected by the discharge of agricultural drainage water.

The 150-mile reach of the San Joaquin River surveyed in this study (Mendota Dam to Mossdale Bridge) has 193 discharge points. The greatest concentration of discharge points occurred from Section 13 (Hills Ferry Bridge) to Section 17 (Vernalis). In these sections 66 discharge points occurred in the 46 river miles, nearly twice the density found in any other river section. This is the section of the river immediately downstream of the subsurface tile drainage entering through Mud Slough (north) and Salt Slough (James et al., 1988a). The number of discharge points for each river section is summarized in Table 2.

The 150-mile reach of the San Joaquin River has 89 points of water diversion for beneficial use. The greatest density occurs in the lower reaches of the river. The density of diversion points increases downstream from the Hills Ferry Bridge (Section 13) as each east side tributary contributes flow to the river. The density per mile doubles in moving from Section 13 to Section 20. The number of diversion points within each river section is summarized in Table 2. Due to the importance of maintaining beneficial use of the water being diverted, a special use survey was conducted of the 48 water diversion points occurring in Sections 9-17. These 48 points supply all or a portion of the irrigation supply for over 60,000 irrigated acres which produce a variety of field, vegetable, orchard and pasture crops. All of the diversion points were putting the water to agricultural beneficial use with almost all using the water for irrigation. A detailed discussion of the results of this survey are given by section in Appendix B.

The discussion that follows will briefly describe the significant surface hydrological influences on the San Joaquin River within each of the river segments. Each segment description is supported by a flow diagram. Where appropriate, a discharge or diversion description is in Appendix A.

River Sections

River Section 1 - Mendota Dam to Avenue 7-1/2

This 9.6-mile section of the San Joaquin River is completely influenced by releases from the Mendota Pool for irrigation use downstream (Figure 8). The

Table 2 Hydrologic Influences Within Each San Joaquin River Section

River Section[1]	River Section Mileage[2]	Diversion Points	Irrigated Acres	Discharge/ Inflow Sites	Flood Gates
1	195.2-204.8	1	[4]	3	0
2	182.0-195.2	1	[4/5]	4	0
3	173.9-182.0	1	[4/5]	0	0
4	168.5-173.9	3	[5]	2	0
5	157.1-168.5	2	[5]	1	0
6	147.3-157.1	2	[5]	2	0
7	135.9-147.3	3	[5]	14	20
8	132.9-135.9	0	--	4	11
9	129.5-132.9	1	500	0	19
10	125.2-129.5	0	--	4	4
11	121.1-125.2	1	300	0	9
12	118.1-121.1	0	--	5	8
13	107.1-118.1	11	1,850	14	0
14	98.8-107.1	8	7,900	9	0
15	89.1- 98.8	8	15,100	16	0
16	77.2- 89.1	13	33,100	22	0
17	72.3- 77.2	6	1,900	4	0
18	63.5- 72.3	12	[6]	10	0
19	59.8- 63.5	8	18,600	6	0
20	56.1- 59.8	8	[6]	2	0
A[3]	--	2	[5]	7	0
B[3]	--	1	[5]	9	0
C[3]	--	6	[5]	1	0
		98	79,250	139	71

[1] As described in Table 1
[2] Estimated from Corps of Engineers' Records (1984)
[3] Special channel surveys were conducted on channels where water development significantly altered hydrology past the upstream stream flow gaging stations
[4] Not estimated as not potentially affected by discharge of subsurface drainage water
[5] A multiple use diversion making an estimate impossible
[6] Not surveyed

SAN JOAQUIN RIVER

Section 1: Mendota Dam to Avenue 7 1/2

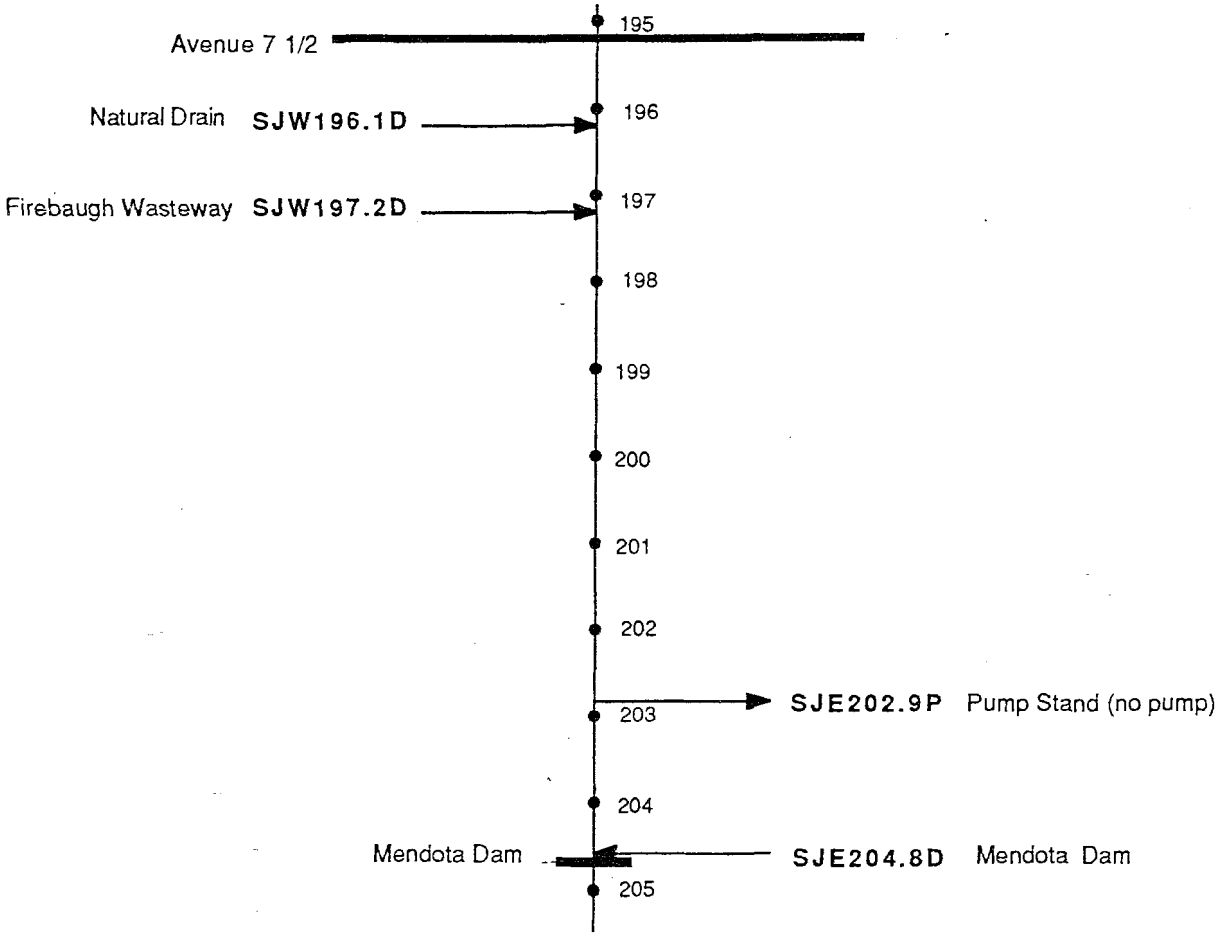

Figure 8. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Mendota Dam to Avenue 7 1/2 (River Section 1).

Firebaugh Wasteway (SJW197.2D) also contributes significant inflows from operational spills from the Delta Mendota Canal and tail water from farming operations.

River Section 2 - Avenue 7-1/2 to Sack Dam

This 13.2 mile section of the San Joaquin River receives minor inflows from three surface drains leaving the Columbia Canal Company on the east side of the river (Figure 9). Almost all of the flow in this section of the river is diverted into the Arroyo Canal (SJW182.0P) for irrigation. The only flow going beyond the Sack Dam is seepage in the irrigation season and high flow occurring during floods in the winter period. During certain periods in the irrigation season water is diverted past the Sack Dam for further irrigation diversion downstream.

River Section 3 - Sack Dam to Santa Rita Bridge at Highway 152

This 8.1 mile section of the San Joaquin River has only one diversion into the Poso Canal (SJW180.8P) (Figure 10). Flow in this section is seepage or occasional releases at the Sack Dam for irrigation diversion into the Poso Canal or further downstream.

River Section 4 - Santa Rita Bridge (Highway 152) to Mariposa Bypass (Intake)

This 5.4 mile section of the San Joaquin River is characterized by low flows consisting mostly of seepage water (Figure 11). Operational spills from upstream irrigation operations often provide sufficient flows for the three diversion pumps within this reach. Although the Fresno River enters in this section, there is almost no flow reaching the San Joaquin River except during periods of flood flows.

River Section 5 - Mariposa Bypass (Intake) to Turner Island Road

This 11.4 mile section of the San Joaquin River has very low flow almost all of which consists of seepage water and operational spills from upstream (Figure 12). Almost all of this available water is utilized for diversion by the two pumping systems within this reach.

River Section 6 - Turner Island Road to Mariposa Bypass (outlet)

This 9.8 mile section of the San Joaquin River has two diversion points within river mile 156 and almost no flow goes beyond this point (Figure 13). Flow beyond this point is entirely seepage into the river. A major surface inflow occurs at the Mariposa Bypass. The majority of the water entering at this point is surface return flows from Turner Island Water District during the irrigation season or during the flood flow in the winter period.

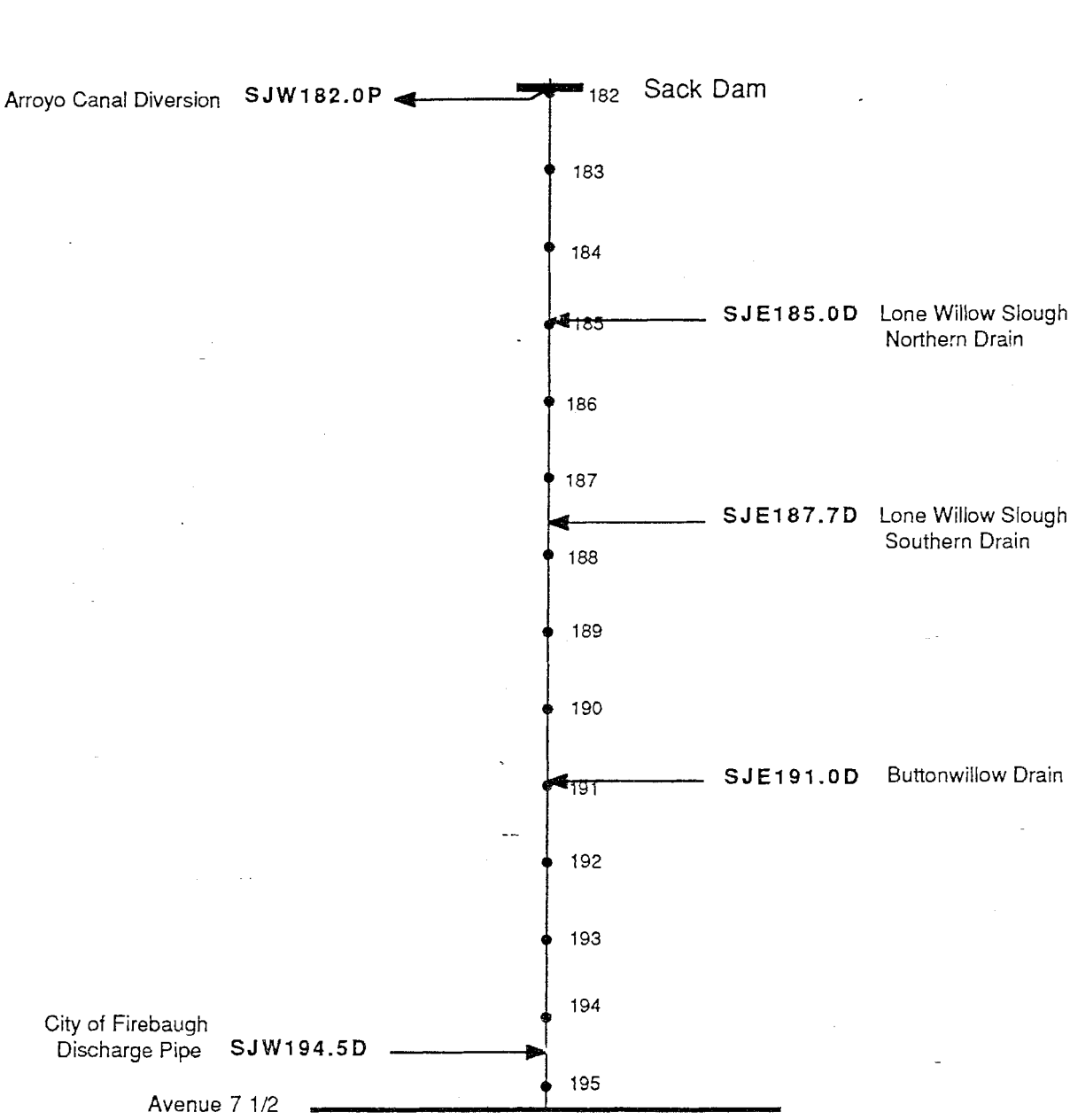

Figure 9. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Avenue 7 1/2 to Sack Dam (River Section 2).

SAN JOAQUIN RIVER

Section 3: Sack Dam to Santa Rita Bridge (Hwy. 152)

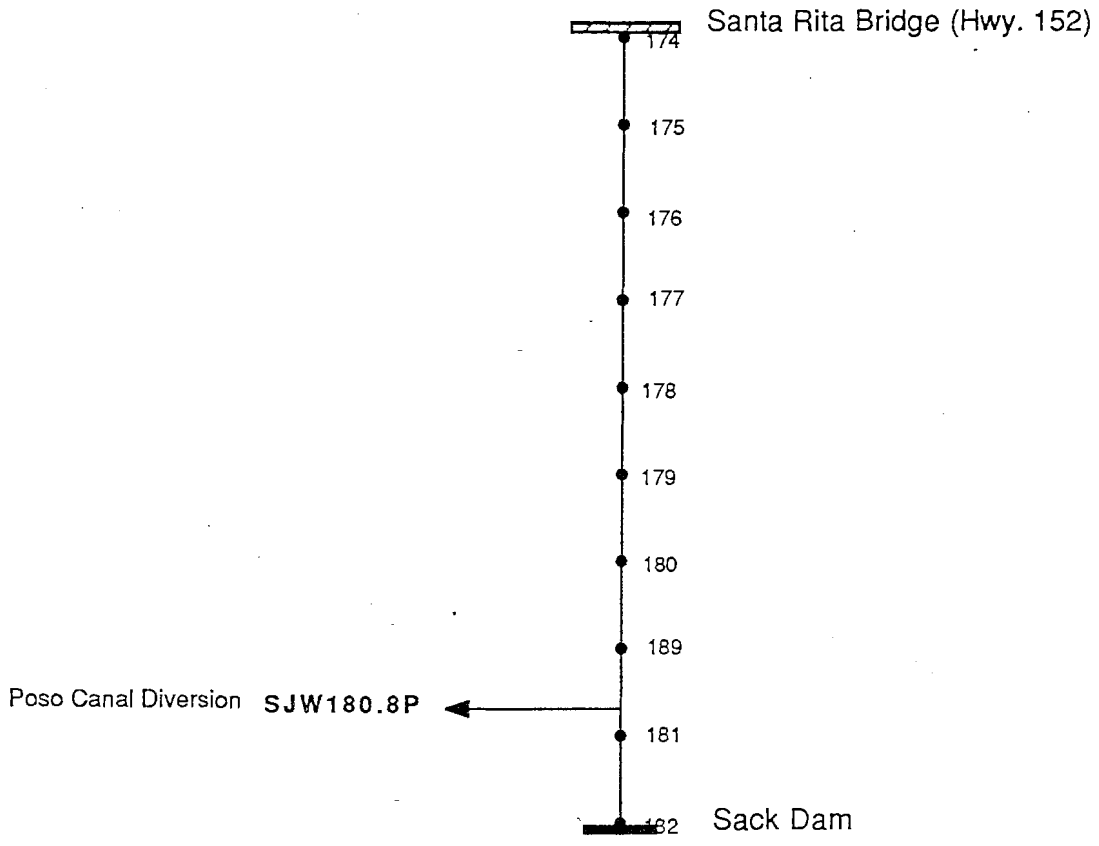

Figure 10. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Sack Dam to Santa Rita Bridge - Hwy. 152 (River Section 3).

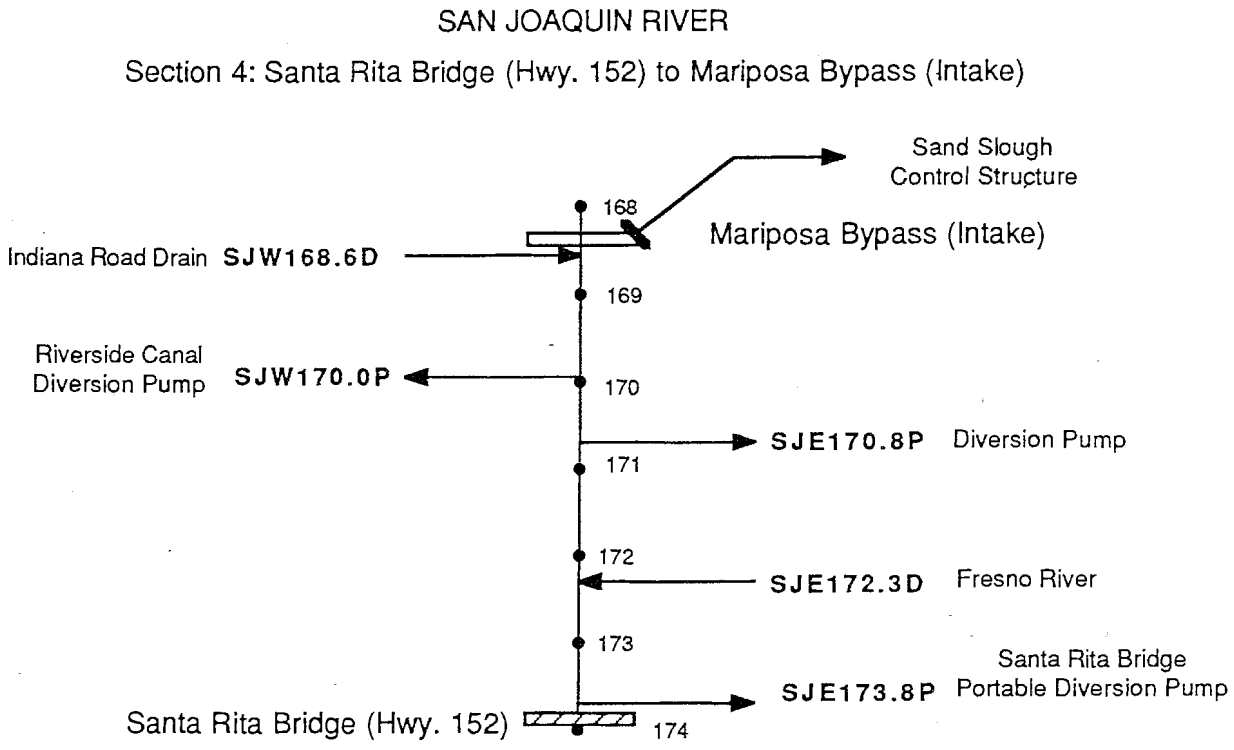

Figure 11. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Santa Rita Bridge - Hwy. 152 to Mariposa Bypass (Intake) (River Section 4).

SAN JOAQUIN RIVER

Section 5: Mariposa Bypass (Intake) to Turner Island Road

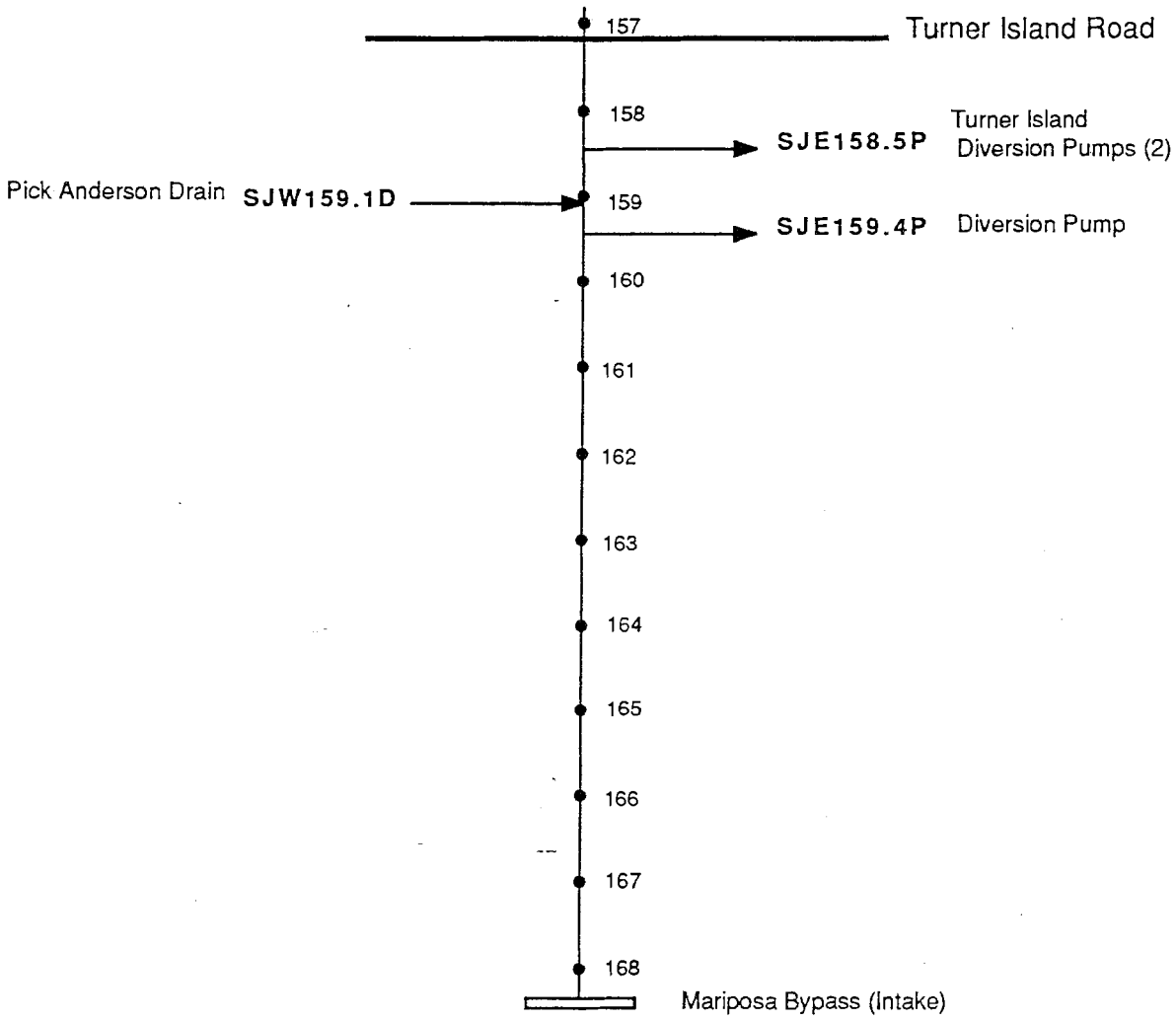

Figure 12. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Mariposa Bypass (Intake) to Turner Island Road (River Section 5).

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Section 6: Turner Island Road to Mariposa Bypass (Outlet)

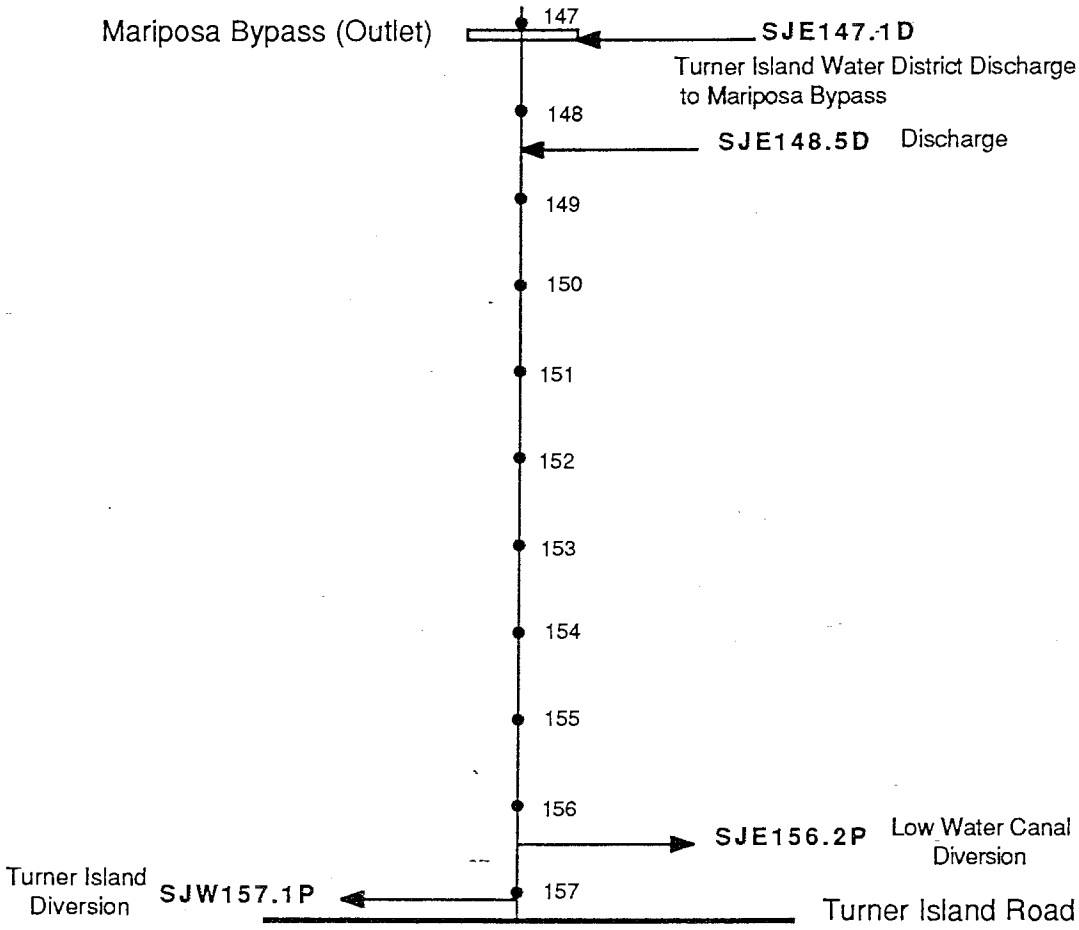


Figure 13. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Turner Island Road to Mariposa Bypass (Outlet)(River Section 6).

River Section 7 - Mariposa Bypass (outlet) to Bear Creek

This 11.4 mile section of the San Joaquin River has 14 area drains which periodically carry irrigation surface return flows from limited acreage immediately adjacent to the river (Figure 14). The actual flow in these drains is limited to short duration and does not appear to influence the river hydrology. In addition to the area drains, there are 20 flood gates within the river section which can carry either irrigation return flows or flood waters. There are three intake pumps within this reach but the source of water is either seepage to the river or return flow that entered via the Mariposa Bypass. Flows in this river section are very low.

River Section 8 - Bear Creek to Lander Avenue Bridge (Highway 165)

This 3 mile section of the San Joaquin River has no diversions and three insignificant and one significant discharge points (Figure 15). In addition there are 11 flood gates within this river section which can carry either irrigation return flows or flood waters. The main inflow comes from Bear Creek. Flow from Bear Creek often exceeds the natural flow in the San Joaquin River upstream of the inflow point. The Bear Creek flow originates from irrigation return flows in Bear Creek and flows entering Bear Creek from the Eastside Bypass which joins Bear Creek only four miles upstream of the Bear Creek confluence with the San Joaquin River. The Lander Avenue Bridge site is often used as the reference site for background water quality in the San Joaquin River prior to significant inflows of subsurface tile drainage entering the river. A special survey of the Bear Creek area was conducted and is reported later under special channel surveys.

River Section 9 - Lander Avenue Bridge (Highway 165) to upstream of Salt Slough

This 3.4 mile section of the San Joaquin River has only one diversion point for 500 acres of cropping within the Stevinson Water District (Figure 16). In addition, there are 19 flood gates within this section which can carry either irrigation return flows or flood waters. Flow in this reach of the river is low and influenced by upstream flows and inflow from Salt Slough (in river section 10). During periods of low natural river flow and high discharge rates from Salt Slough, backwater or upstream flow of Salt Slough flow is not uncommon.

River Section 10 - Salt Slough to Fremont Ford Bridge (Highway 140)

This 4.3 mile section of the San Joaquin River has no diversions (Figure 17). There are three operational spills from the Stevinson Water District on the east side of the river as well as four flood gates on the east side of the river which can carry either irrigation return flows or flood water. The most significant inflow in this reach is Salt Slough (SJW129.5D) which makes up a major percentage of the river flow at the Fremont Ford Bridge. Flows in Salt Slough can make up greater than 75 percent of the river flow at the Bridge during the irrigation season.

SAN JOAQUIN RIVER

Section 7: Mariposa Bypass (Outlet) to Bear Creek Inflow

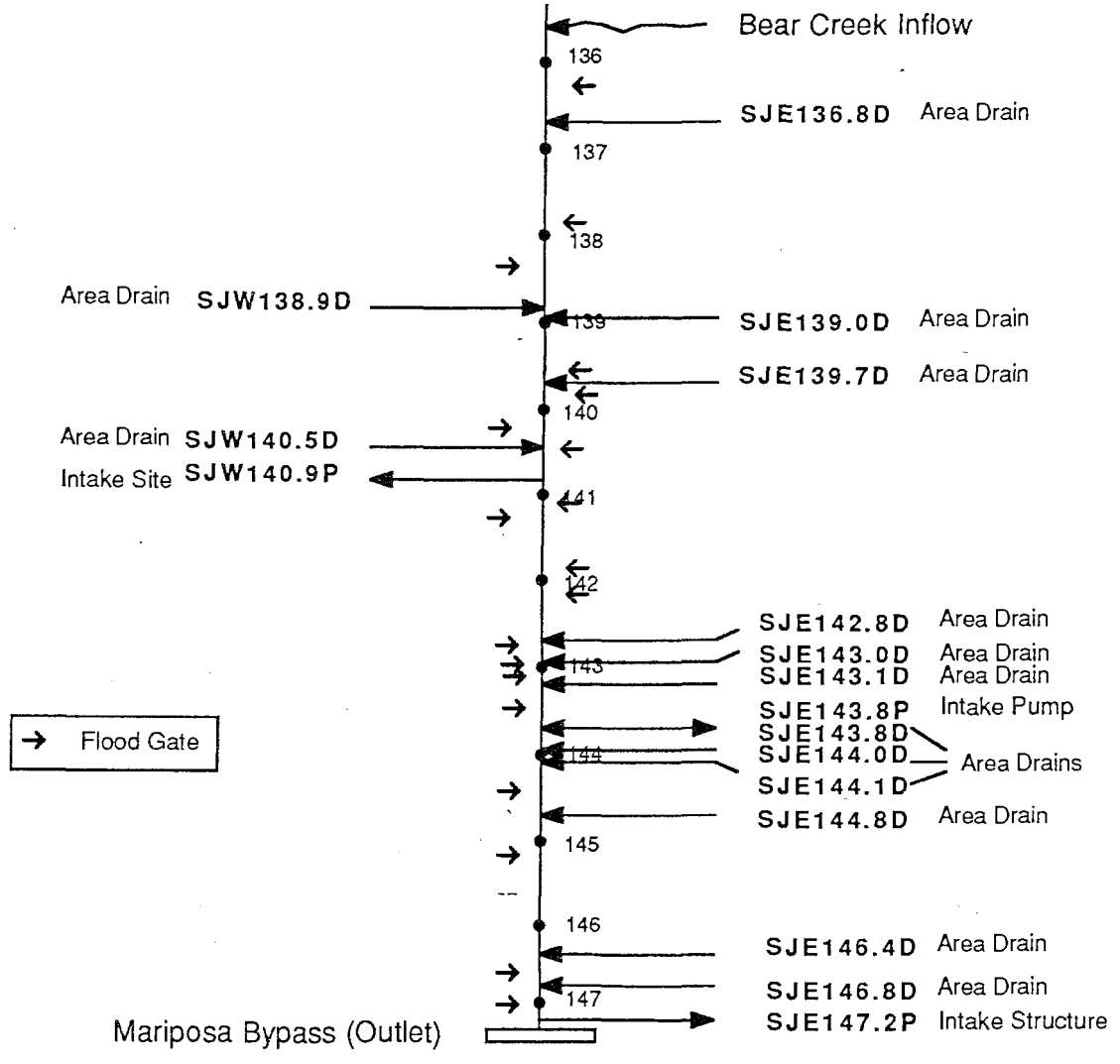


Figure 14. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Mariposa Bypass (Outlet) to Bear Creek Inflow (River Section 7).

SAN JOAQUIN RIVER

Section 8: Bear Creek Inflow to Lander Avenue Bridge (Hwy. 165)

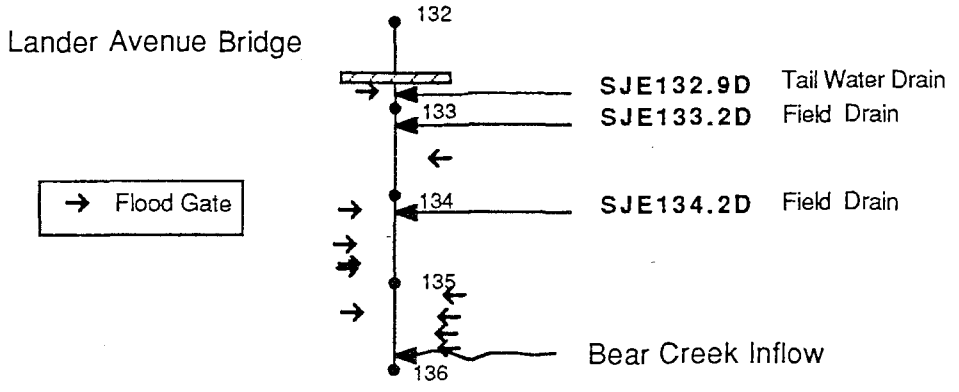


Figure 15. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Bear Creek Inflow to Lander Avenue Bridge (Hwy.165) (River Section 8).

SAN JOAQUIN RIVER

Section 9: Lander Avenue Bridge (Hwy. 165) to Upstream of Salt Slough

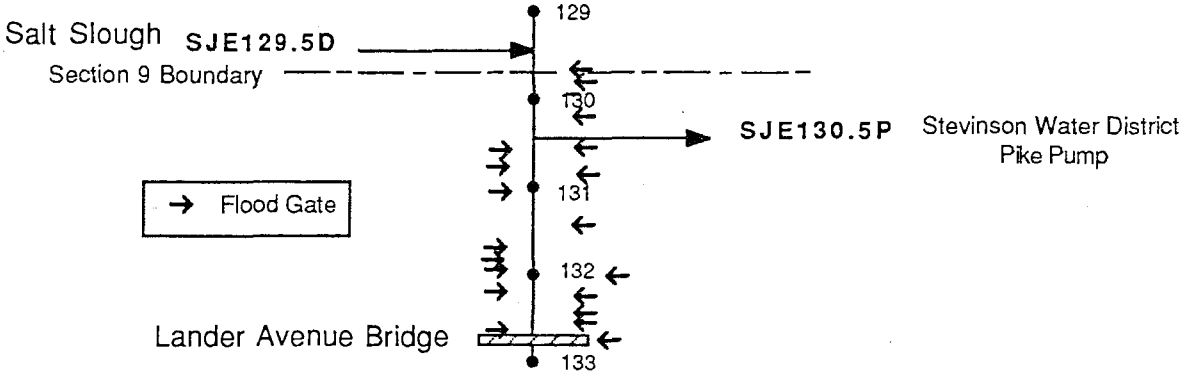


Figure 16. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Lander Avenue Bridge (Hwy.165) to Upstream of Salt Slough (River Section 9).

SAN JOAQUIN RIVER

Section 10: Salt Slough Inflow to Fremont Ford Bridge (Hwy. 140)

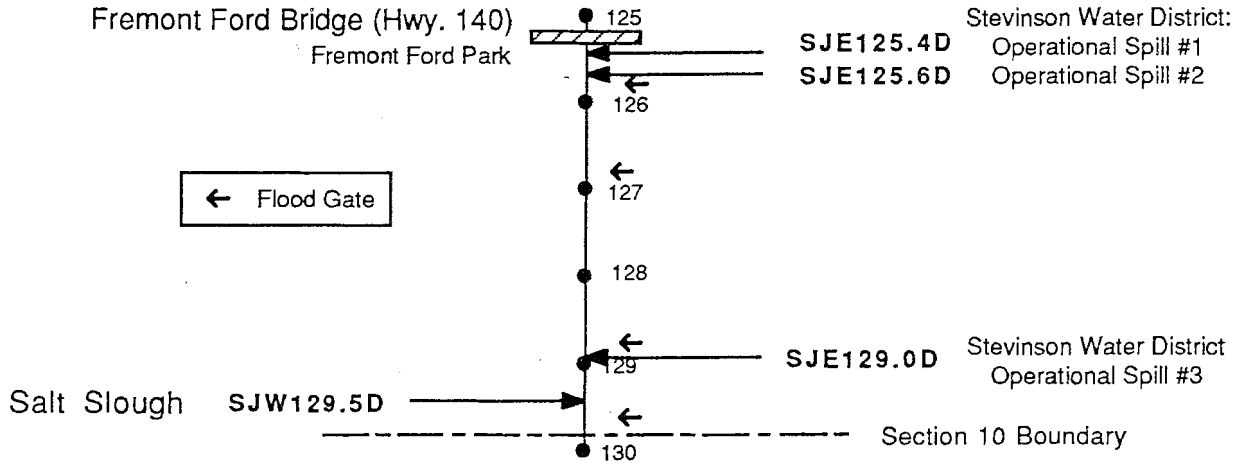


Figure 17. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Salt Slough Inflow to Fremont Ford Bridge (Hwy.140) (River Section 10).

River Section 11 - Fremont Ford Bridge (Highway 140) to above Mud Slough (north)

This 4.1 mile section of the San Joaquin River has only one diversion which is used to supply 300 acres of cropland (Figure 18). In addition, there are nine flood gates on the east side of the river which can carry either irrigation return flows or flood waters. Flow in this section is mostly unchanged from those recorded at the Fremont Ford Bridge.

River Section 12 - Mud Slough (north) to Hills Ferry Road Bridge

This 3 mile section of the San Joaquin River is hydrologically influenced by three major inputs and has no diversion points (Figure 19). In addition, there are eight flood gates on the east side of the river which carry either irrigation return flows or flood waters. Each of the three major inflows vary considerably in flow but each has a significant influence. The inflows are Mud Slough (north) (SJW121.1D), Newman Wasteway (SJW119.5D) and the Merced River (SJE118.2D). Mud Slough (north) carries predominately irrigation return flows and return flows from waterfowl management areas. The Newman Wasteway carries operational spill water from the Delta-Mendota Canal and surface return flows from irrigated agriculture. Another significant inflow is the Newman Slough which enters from the west at river mile 119.0. This slough carries flow from an 800-acre tile drainage system as well as surface runoff from 4,500 acres of irrigated land. In addition, the City of Newman wastewater treatment plant occasionally discharges to this slough. The Merced River is the first of three major east side tributaries that enter the San Joaquin River upstream of Vernalis (river mile 72.3).

River Section 13 - Hills Ferry Road Bridge to Crows Landing Road Bridge

This 11 mile section of the San Joaquin River is highly developed (Figure 20). This section has 14 discharge sites and 11 diversions. Eight of the diversion sites are on the east side of the river and serve 1,250 acres of cropland. The remaining 3 pumps on the west side serve 590 acres although one of the pumps has recently (1981) been discontinued. Only three of the discharge sites are on the east side. The nine discharge sites on the west side of the river drain approximately 16,000 acres. The most significant discharge in this reach is Orestimba Creek which receives both operational spill water from the Central California Irrigation District Main Canal and return flows from irrigated land. The other significant discharge is the Newman Drainage District (SJW117.5D) which discharges surface tile drainage water from 2,450 acres of irrigated land.

River Section 14 - Crows Landing Bridge to Patterson Bridge

This 8.3 mile section of the San Joaquin River is highly developed with eight diversions and nine discharge sites (Figure 21). Of the eight diversion pumps, two are quite large and have a significant influence on river hydrology. The Twin Oaks Irrigation Company Pumps (SJW104.0P) serve 6,200 acres of irrigated land on the west side of the river while on the east side, the Hailwood Ranch Southern Pump (SJE100.8P) serves approximately 520 acres. The remaining six pumps serve approximately 1,150 acres on both sides of the river. The five discharge sites on the west side of the river drain approximately 14,300 irrigated acres with the majority occurring in the Ramona Lake (SJW100.0D) and

SAN JOAQUIN RIVER

Section 11: Fremont Ford Bridge (Hwy. 140) to Upstream of Mud Slough (North)

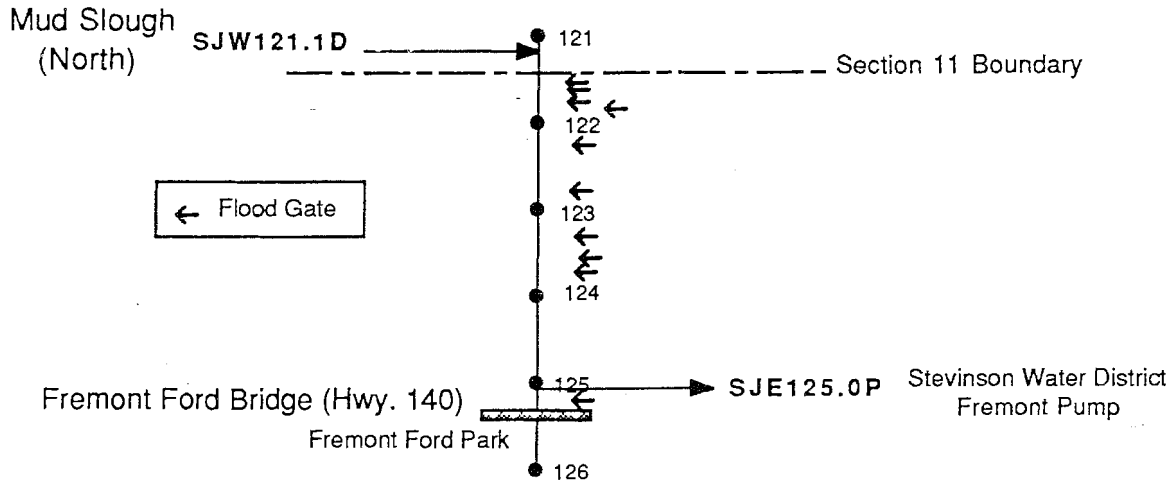


Figure 18. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Fremont Ford Bridge (Hwy.140) to Upstream of Mud Slough (North) (River Section 11).

SAN JOAQUIN RIVER

Section 12: Mud Slough (North) to Hills Ferry Road Bridge

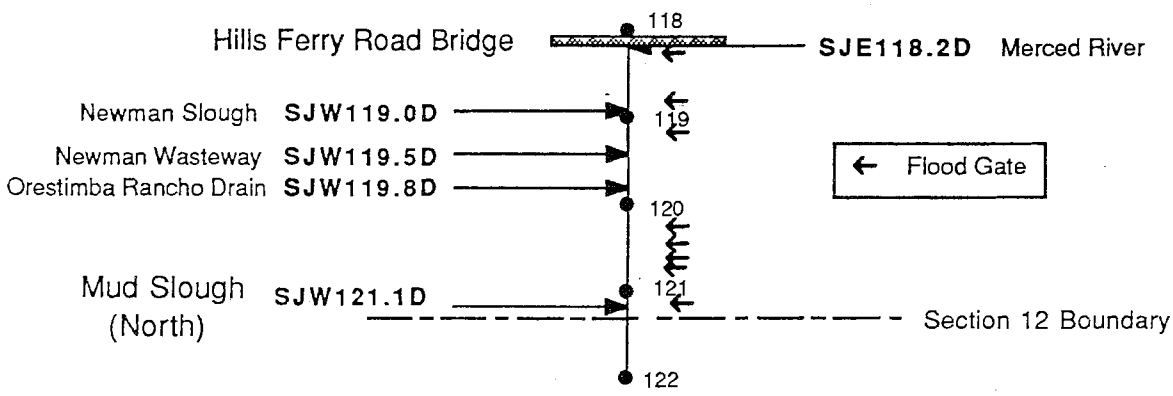


Figure 19. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Mud Slough (North) to Hills Ferry Road Bridge (River Section 12).

SAN JOAQUIN RIVER

Section 13: Hills Ferry Road Bridge to Crows Landing Road Bridge

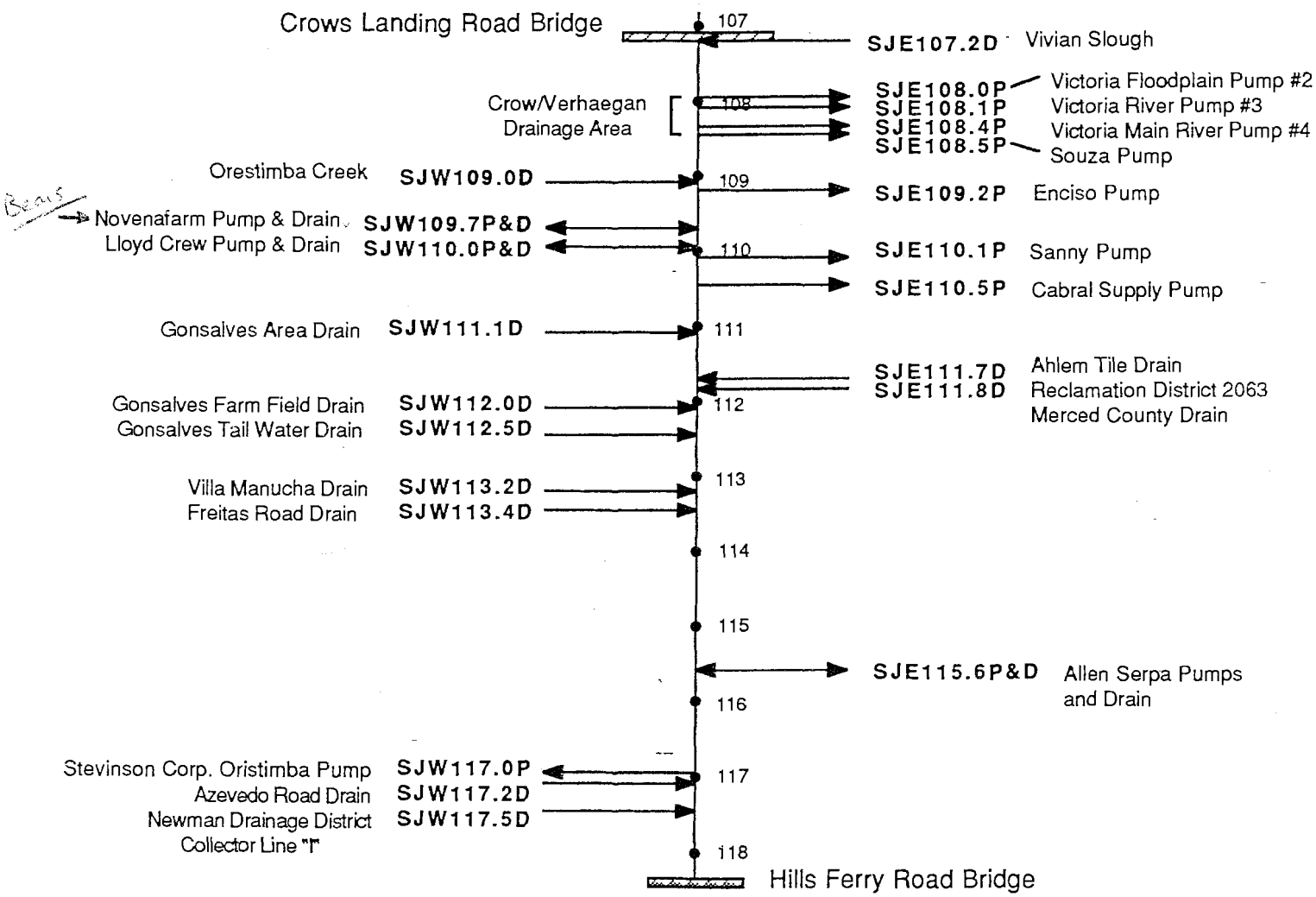


Figure 20. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Hills Ferry Road Bridge to Crows Landing Road Bridge (River Section 13).

SAN JOAQUIN RIVER

Section 14: Crows Landing Road Bridge to Patterson Bridge

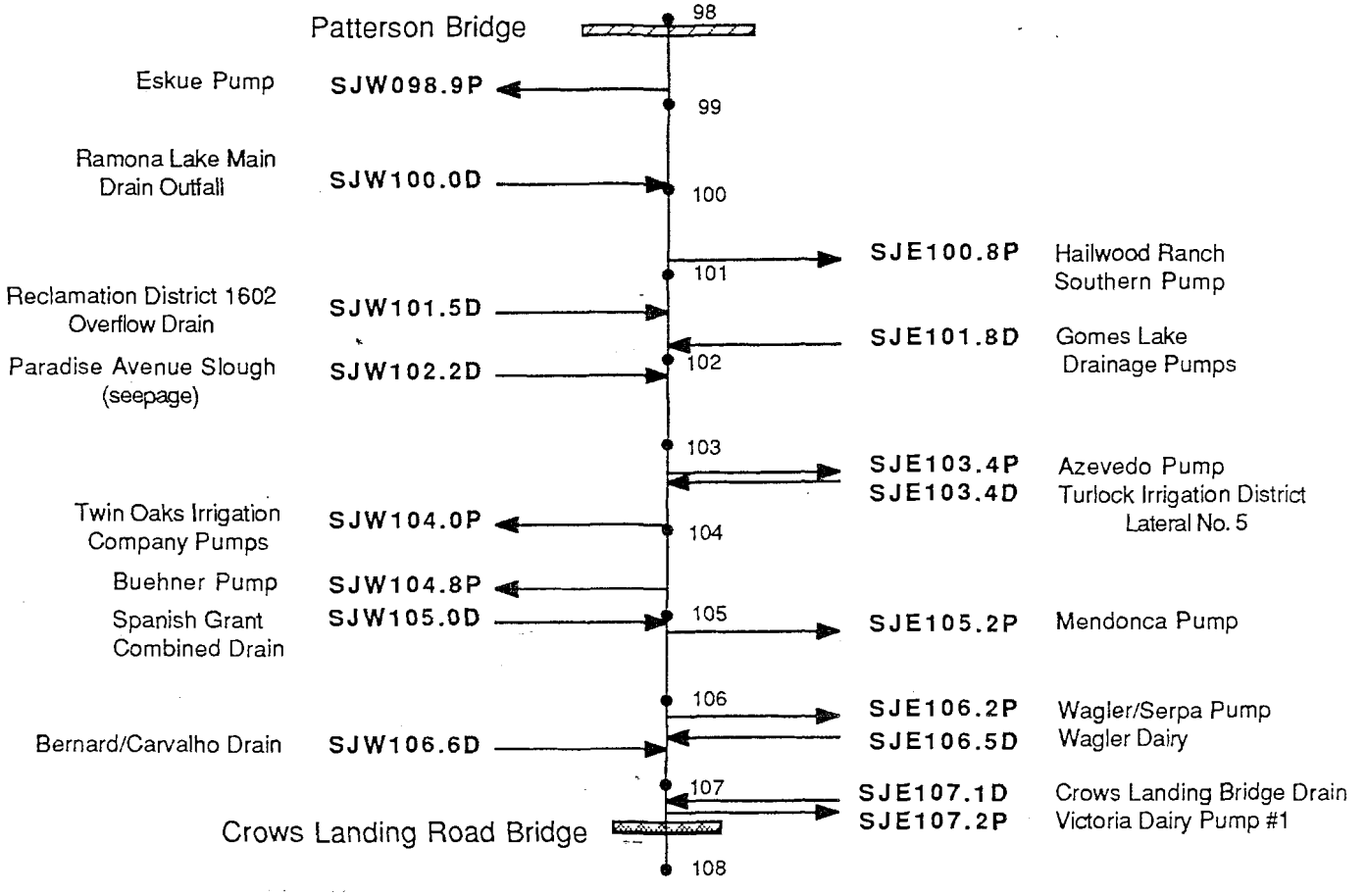


Figure 21. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Crows Landing Road Bridge to Patterson Bridge (River Section 14).

Spanish Grant (SJW105.0D) Drain service areas. The largest discharge from the eastside occurs from the Turlock Irrigation District Lateral No. 5 (SJE103.4D). This lateral discharges predominantly operational spill water.

River Section 15 - Patterson Bridge to Grayson Road Bridge

This 9.7 mile section of the San Joaquin River is highly developed with eight diversion sites and 16 discharge sites (Figure 22). Of the eight diversion sites, one is dominant in influencing river hydrology. The Patterson Water District Main Lift Pumps (SJW098.5P) supply all or portions of water to their 14,000 acre service area. The remaining seven diversion pumps supply water to approximately 1,100 acres of irrigated land on both the east and west sides of the river. The 13 discharge sites on the west side of the river drain an area of approximately 18,200 acres. The actual drainage area may be larger as this only considers land on the east side of the Delta-Mendota Canal. There are three dominant west side discharges; the Olive Avenue Drain (SJW097.5D), Del Puerto Creek (SJW093.0D) and the Houk Ranch Drain (SJW091.5D). All three carry predominantly surface return flows from irrigated land but can also carry some tile drainage or seepage water. One of the most dominant discharges in this river section is the Modesto Wastewater Treatment Plant (SJE095.3D) which enters the river from the east side. Long term plans however are to cease this discharge and reuse the water for crop production.

River Section 16 - Grayson Road Bridge to Maze Road Bridge (Highway 132)

This 11.9 mile section of the San Joaquin River is the most highly developed and subject to the greatest changes in river hydrology due to irrigation development (Figure 23). This section has 13 diversions and 22 discharge points. Of the 13 diversions, four are dominant, three on the west and one on the east side of the river. The main diversion on the eastern side is the three pumps at the Bogetti Farms Pump Site No. 2 (SJE086.2P) which serve approximately 1,100 acres of cropland. The Blewett Mutual Water Company (SJW077.3P) serves a similar size area on the west side of the river. The other two dominant west side diversions, the West Stanislaus Irrigation District Main Canal (SJW084.0P) and the El Solyo Water District Pumping Station (SJW077.5P) supply water to 28,500 acres. The largest of these is West Stanislaus Irrigation District serving all or portions of water to 24,800 acres.

This section of the San Joaquin River has 15 discharge sites from the west side of the river which drain approximately 28,500 acres of irrigated land that lies to the east of the Delta Mendota Canal. The major drains on the west bank are the Blewett Drain (SJW077.4D), Ingram-Hospital Creek Combined Outfall (SJW079.9D) and the Old Grayson Channel (SJW087.0D). The Blewett Drain and the Ingram-Hospital Creek Combined Outfall drain the majority of the land on the north side of the east-west trending West Stanislaus Irrigation District Main Canal (SJW084.0P). Old Grayson Channel receives drainage from the majority of the area on the south side of this main canal. The most dominant discharge is the Ingram-Hospital Creek Combined Outfall. It receives both surface and subsurface flows from approximately 13,195 acres including 2,300 acres of tile drain flows. Flow originates in both the Ingram and Hospital Creeks in addition to receiving flows from the White Lake Mutual-Hagemann Ranch Main Drain and the Hagemann Ranch Southern Drain Pump.

SAN JOAQUIN RIVER

Section 15: Patterson Bridge to Grayson Road Bridge

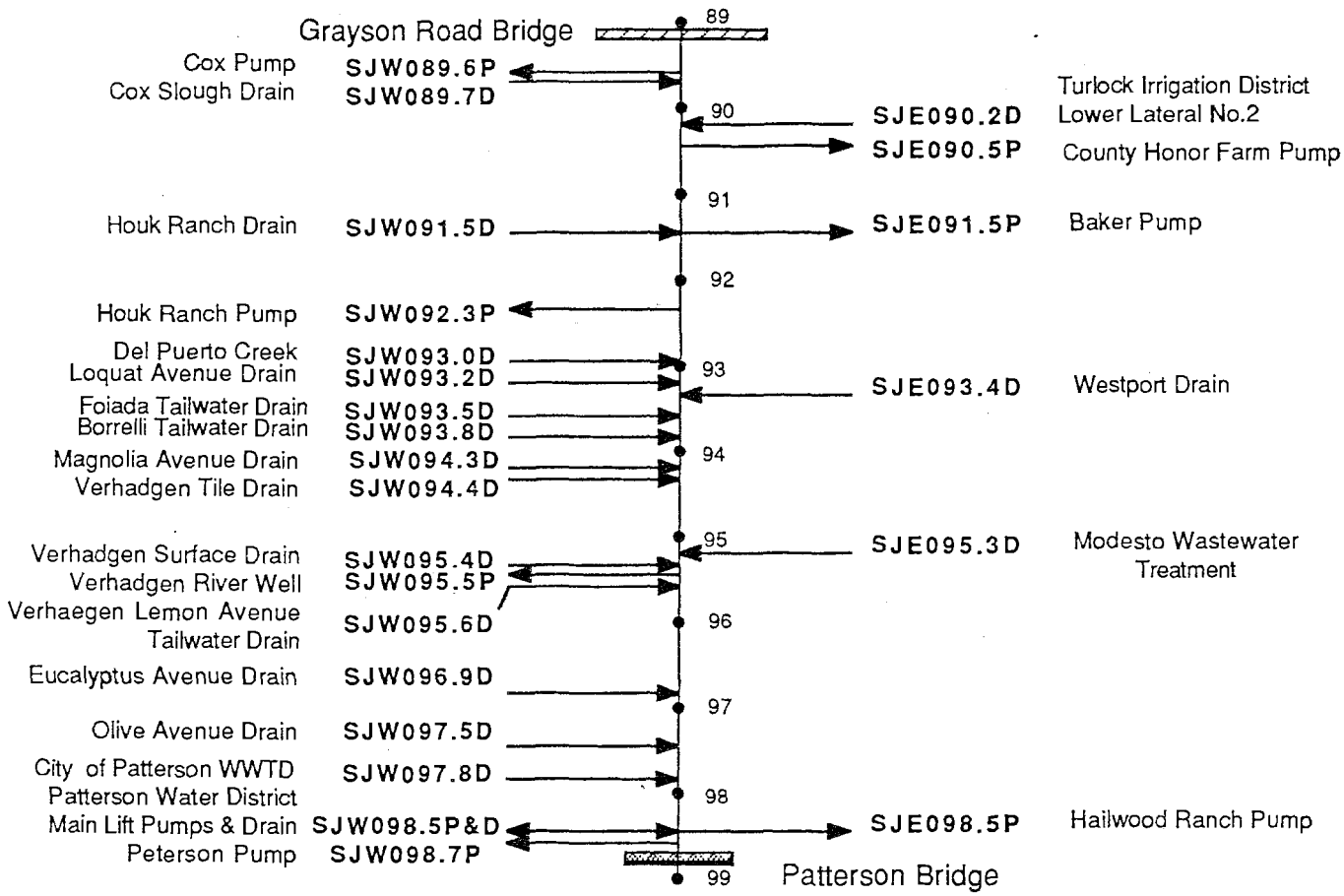


Figure 22. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Patterson Bridge to Grayson Road Bridge (River Section 15).

SAN JOAQUIN RIVER

Section 16: Grayson Road Bridge to Maze Road Bridge (Hwy.132)

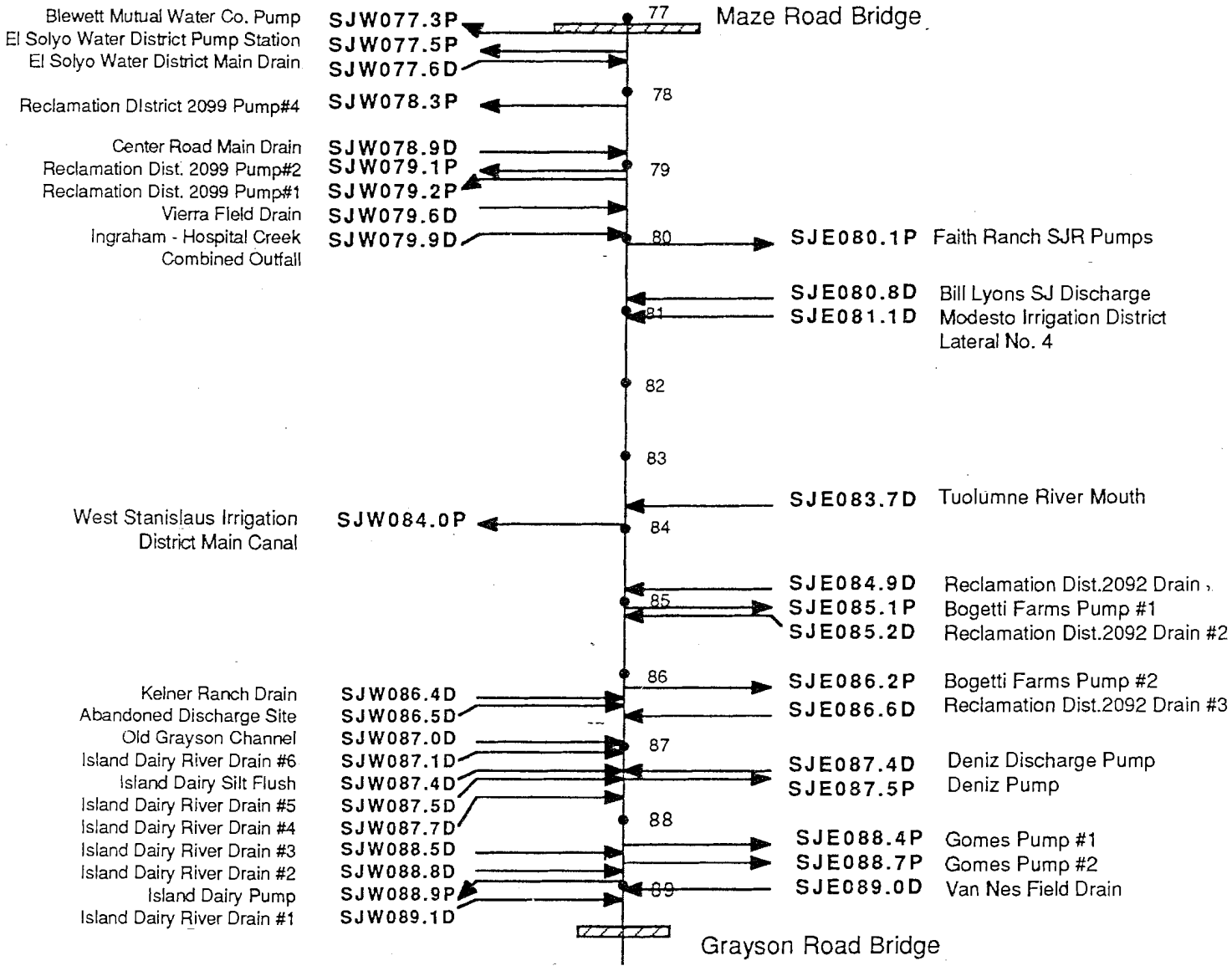


Figure 23. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Grayson Road Bridge to Maze Road Bridge (Hwy. 132) (River Section 16).

The Old Grayson Channel also contributes significant discharge flows to the river. These flows however originate from a number of smaller drains that flow into the Channel upstream of the discharge point. Because these drains influence the Channel flow significantly, a special channel survey was conducted and is reported separately as a special side branch of the river. The discussion of the channel follows the individual river section discussions.

The Tuolumne River inflow (SJE083.7P) is the most significant discharge from the east side. The Tuolumne River is the second of the three inflows from east side tributaries. Its flow has a significant impact on hydrology downstream.

River Section 17 - Maze Road Bridge (Highway 132) to Airport Way (Vernalis)

This 4.9 mile section of the San Joaquin River has six diversion sites and four discharge or inflow points (Figure 24). The largest diversions occur for Reclamation District 2101 through their two main pumping stations (SJW077.2P) and SJW075.9P). These two pumps serve approximately 1,300 acres of irrigated land. The most significant discharge in this section would be the Stanislaus River inflow from the east side. The Stanislaus River is the third and final east side tributary inflow to the sections of San Joaquin River reviewed in this study. The San Joaquin City Drain is the most significant inflow from the west side of the River. It receives drainage from approximately 4,200 acres that enter through three main drains into the San Joaquin City Drain.

River Section 18 - Airport Way (Vernalis) to Upstream of the Banta Carbona Intake Canal

This 8.8 mile section of the San Joaquin River is developed with a number of smaller diversions and discharges (Figure 25). There are 12 diversion pumps, 8 of which are on the east side of the San Joaquin River. In contrast to areas upstream, there are only 5 discharge sites on the west side of the river and each is small in contrast to the ones upstream that had a major influence on river hydrology. The 5 discharge sites on the east side of the river serve for both storm water and irrigation return flow to the river. During the year, the majority of water discharged through these sites is storm flow.

River Section 19 - Banta Carbona Intake Canal to Paradise Dam

This 3.7 mile section of the San Joaquin River has 8 diversion pumps and 6 discharge sites (Figure 26). The diversions are all smaller pumps serving 20-300 acres except the Intake Canal for the Banta-Carbona Irrigation District (SJW063.5P) which serves all or a portion of water to 17,800 acres of irrigated land. On the east side of the river there are 2 discharge pumps (SJE063.1D and SJE062.0D) which discharge surface water from Reclamation District No. 2075 which covers 5,000 acres. On the west side of the river a significant discharge of tile drainage water occurs from the New Jerusalem Outlet (SJW063.4D). This discharge carries subsurface drain flows from an 11,000 acre drainage district. Flows often exceed 25 cfs in this discharge throughout most of the year.

SAN JOAQUIN RIVER

Section 17: Maze Road Bridge (Hwy.132) to Airport Way (Vernalis)

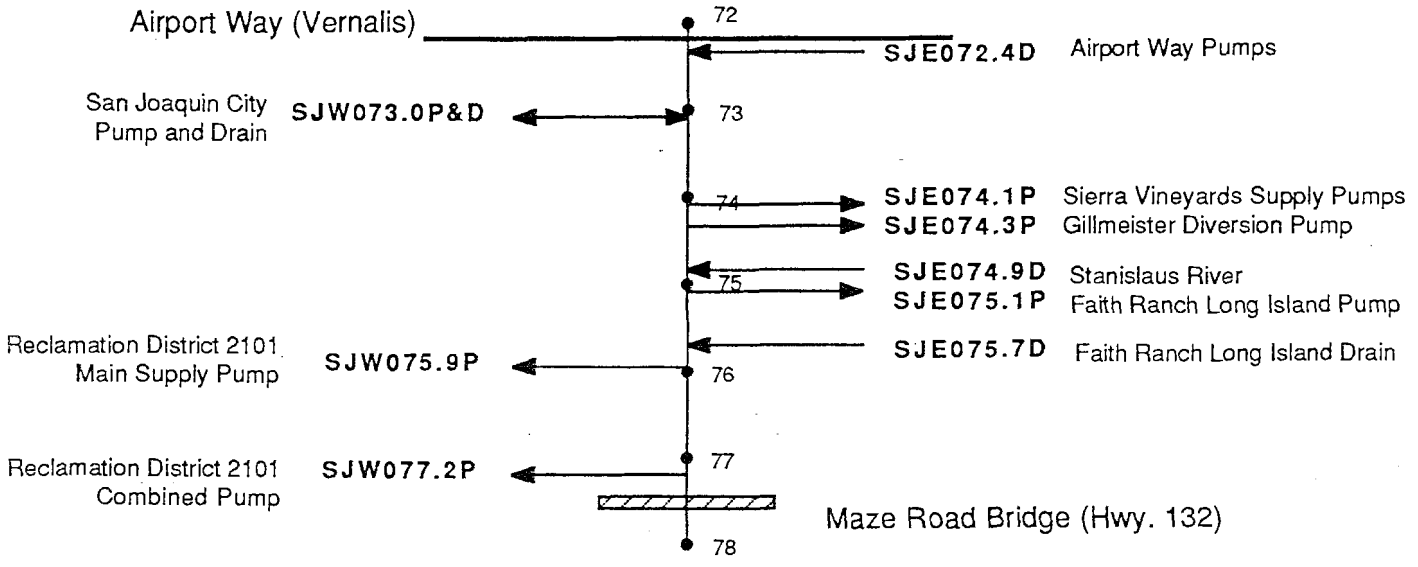


Figure 24. Schematic Diagram for Water Diversions and Discharges on theSan Joaquin River from Maze Road Bridge (Hwy. 132) to Airport Way (Vernalis) (River Section 17).

SAN JOAQUIN RIVER

Section 18: Airport Way (Vernalis) to Upstream of Banta-Carbona Intake Canal

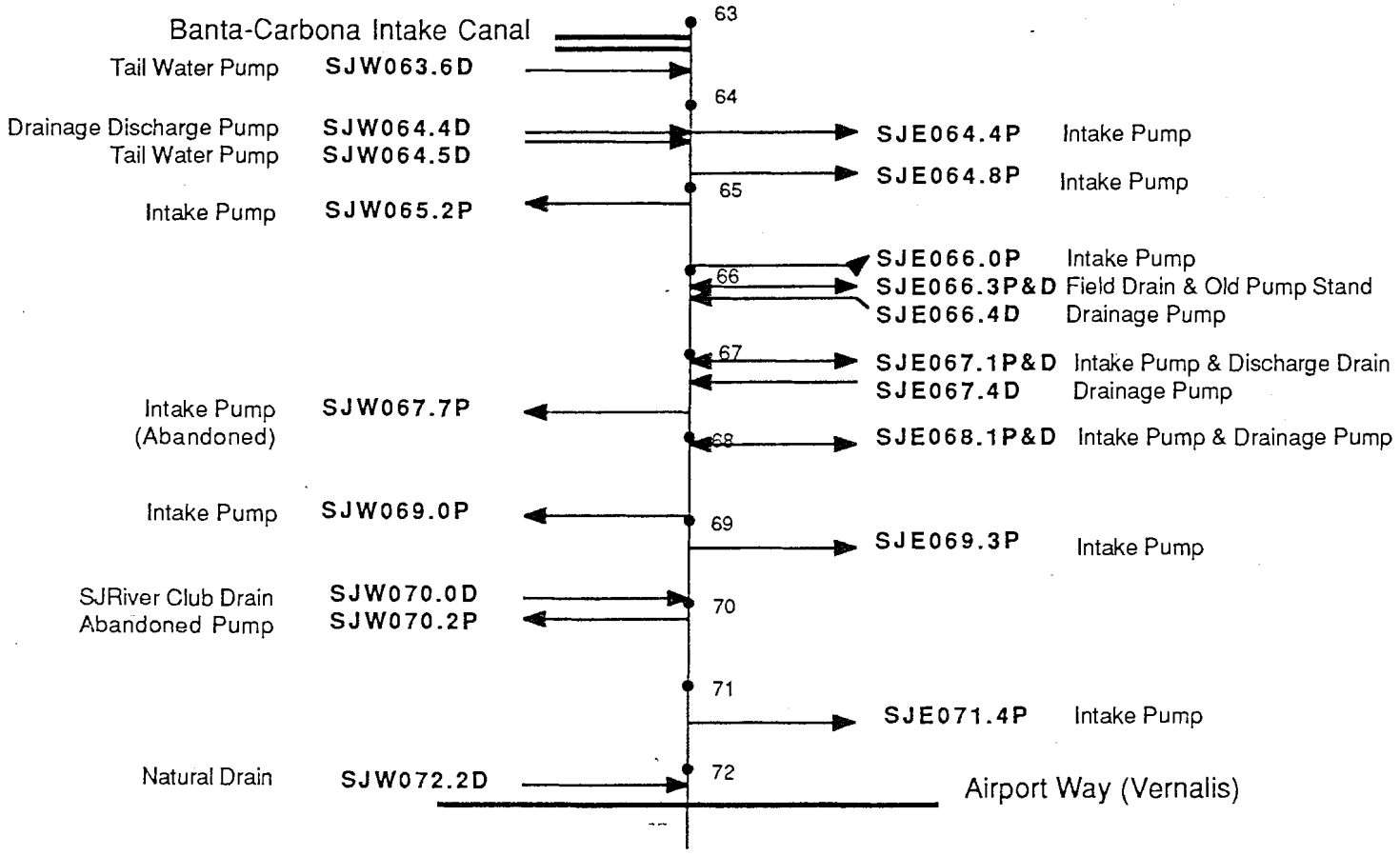


Figure 25. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Airport Way (Vernalis) to Upstream of Banta-Carbona Intake Canal (River Section 18).

SAN JOAQUIN RIVER

Section 19: Banta-Carbona Intake Canal to Paradise Dam

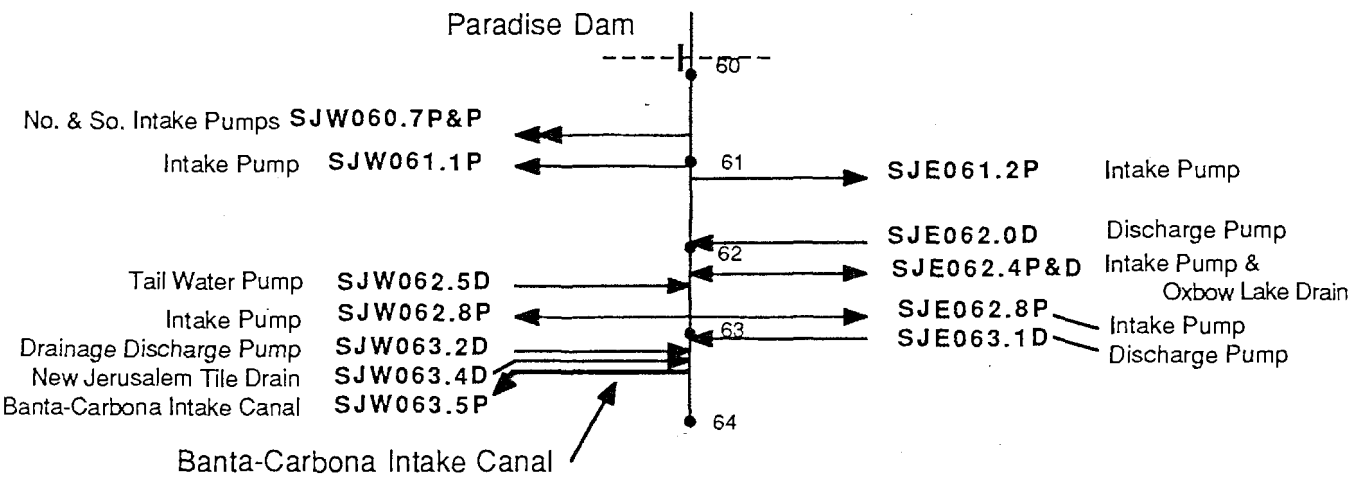


Figure 26. Schematic Diagram for Water Diversions and Discharges on the San Joaquin River from Banta-Carbona Intake Canal to Paradise Dam (River Section 19).

River Section 20 - Paradise Dam to Mossdale Bridge (Interstate 5)

This 3.7 mile section of the San Joaquin River is developed as a water supply reach but few significant discharges occur in this reach (Figure 27). There are 8 diversion sites within this section and depending upon river flow and pump usage upstream, this reach can affect flow hydrology at the Mossdale Bridge. A significant diversion can be the use of the Paradise Cut Dam (SJW059.9P) although this is rarely used in the irrigation season or low flow period.

SPECIAL CHANNEL SURVEYS

Special Channel Survey A Bear Creek from Eastside Bypass Inflow to San Joaquin River

This 4 mile section of Bear Creek has 7 discharge sites and one diversion site (Figure 28). The discharge sites are area drains that serve farming operations within a few miles of the Creek. The flow in these drains is intermittent and normally is associated with field irrigation.

Special Channel Survey B Old Grayson Channel from Origin to San Joaquin River

This 4.5 mile channel is the old main branch of the San Joaquin River near Laird Slough (Figure 29). The river now follows a course through Laird Slough. There are 9 discharge sites along this slough and one diversion pump. The pump is located at the upstream end of the channel in a depression; the depression is replenished during the irrigation season by West Stanislaus Irrigation District drainage water and seepage from the San Joaquin River and the Old Grayson Channel. The nine discharge sites, however, are located on the main channel and their flows move directly to the San Joaquin River at the Old Grayson Channel Outflow (SJW087.0D). Four of the nine discharge sites (Minnie Road Drain-OLDWSJID, Grayson Road Drain-OLDW2.4D, Westley Wasteway-OLDW3.3D and Del Mar Drain OLDW4.2D) contribute the major portion of the flow to the Old Grayson Channel. All carry surface return water from irrigated cropland in the West Stanislaus Irrigation District. The Westley Wasteway also carries a significant flow of operational spill water from the Delta Mendota Canal.

Special Channel Survey C - West Stanislaus Irrigation District Main Lift Pumps to the San Joaquin River

This 2 mile channel is the intake canal to the West Stanislaus Irrigation District Main Lift Pumps (Figure 30). There are 6 diversion pumps within the 2-mile section from the river to the main lift pumps. Those diversions irrigate land on both sides of the main canal. There is one discharge site which is located immediately downstream of the trash racks which sit approximately 0.2 miles into the canal. The discharge from this site is small in comparison to other west side discharges.

SAN JOAQUIN RIVER

Section 20: Paradise Dam to Mossdale Bridge (Interstate 5)

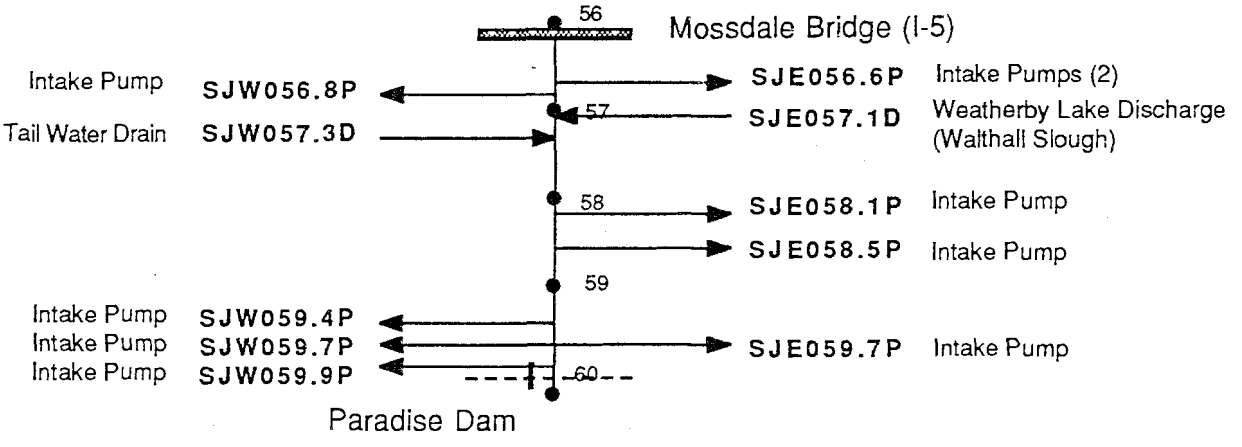


Figure 27. Schematic Diagram for Water Diversions and Discharges on theSan Joaquin River from Paradise Dam to Mossdale Bridge (Interstate 5) (River Section 20).

Special Channel Survey A: Bear Creek from Eastside Bypass Inflow to San Joaquin River

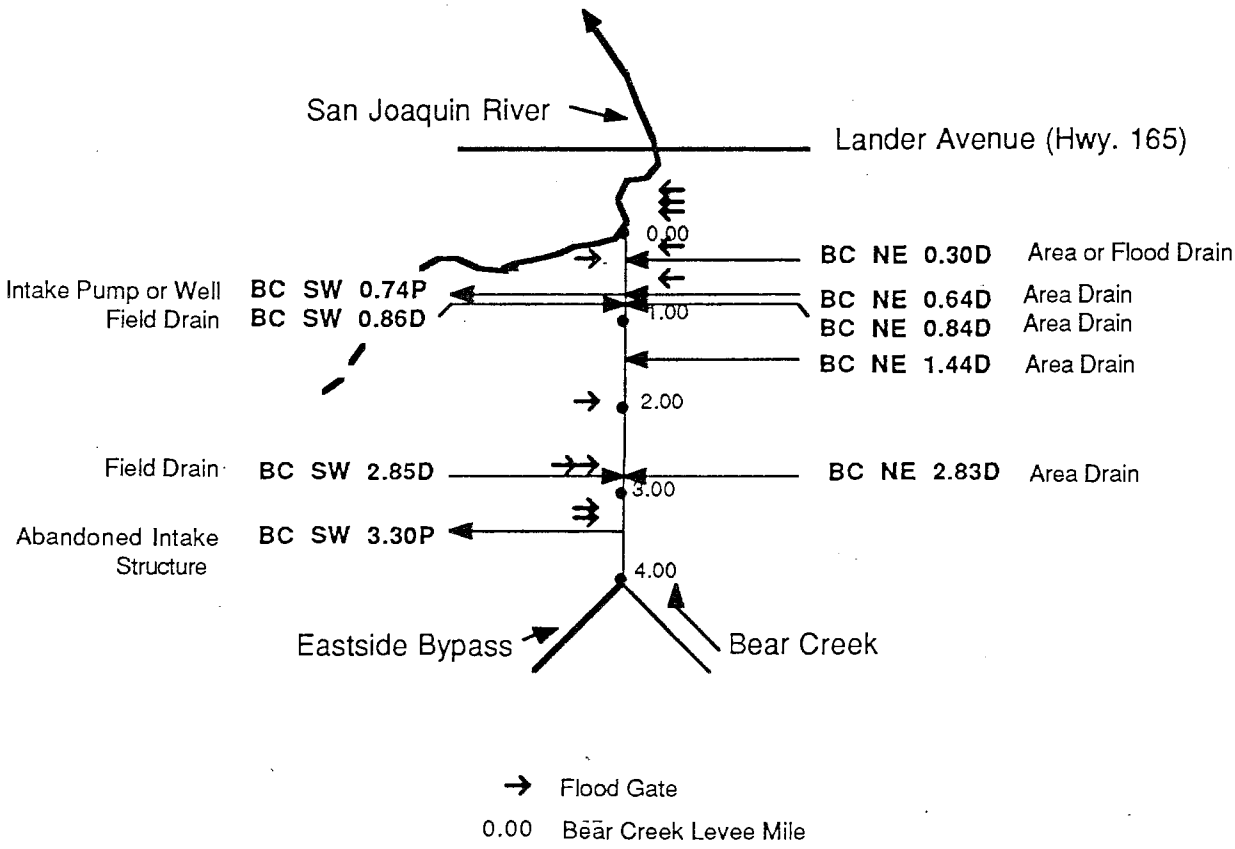


Figure 28. Schematic Diagram for Special Channel Survey A: Bear Creek from Eastside Bypass Inflow to San Joaquin River.

Special Channel Survey B: Old Grayson Channel from Origin to San Joaquin River

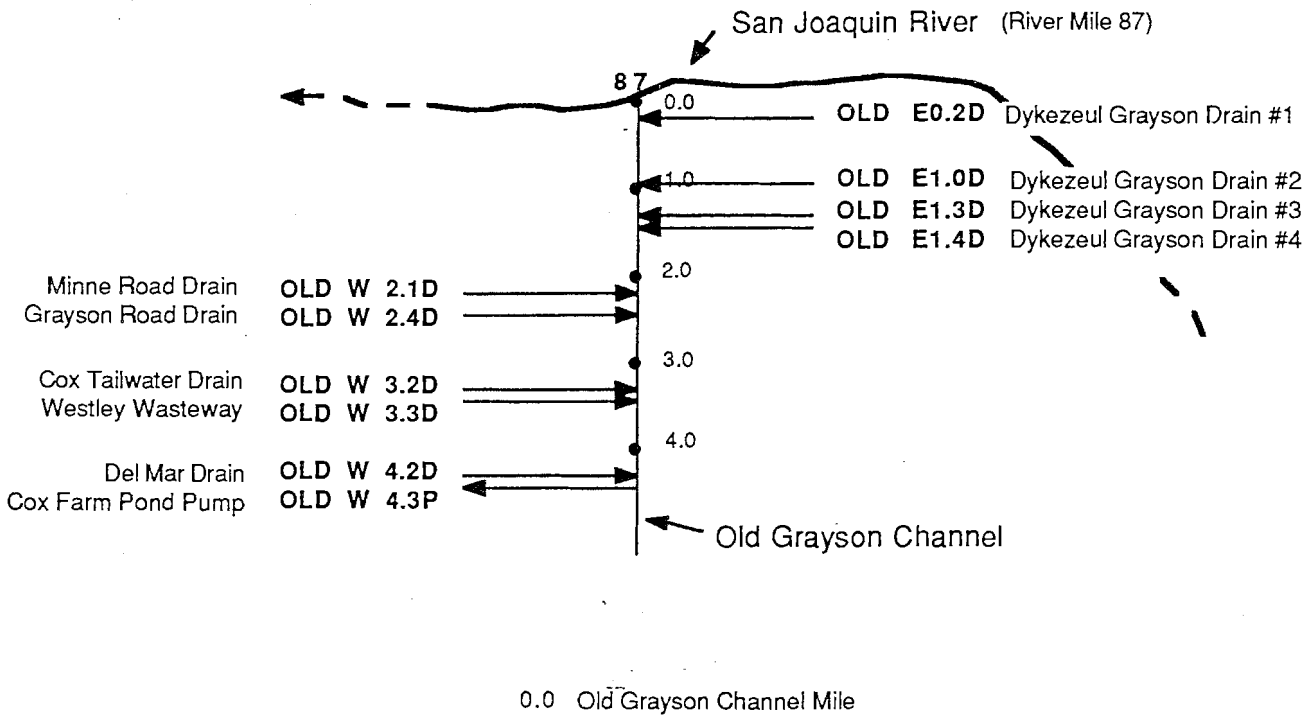
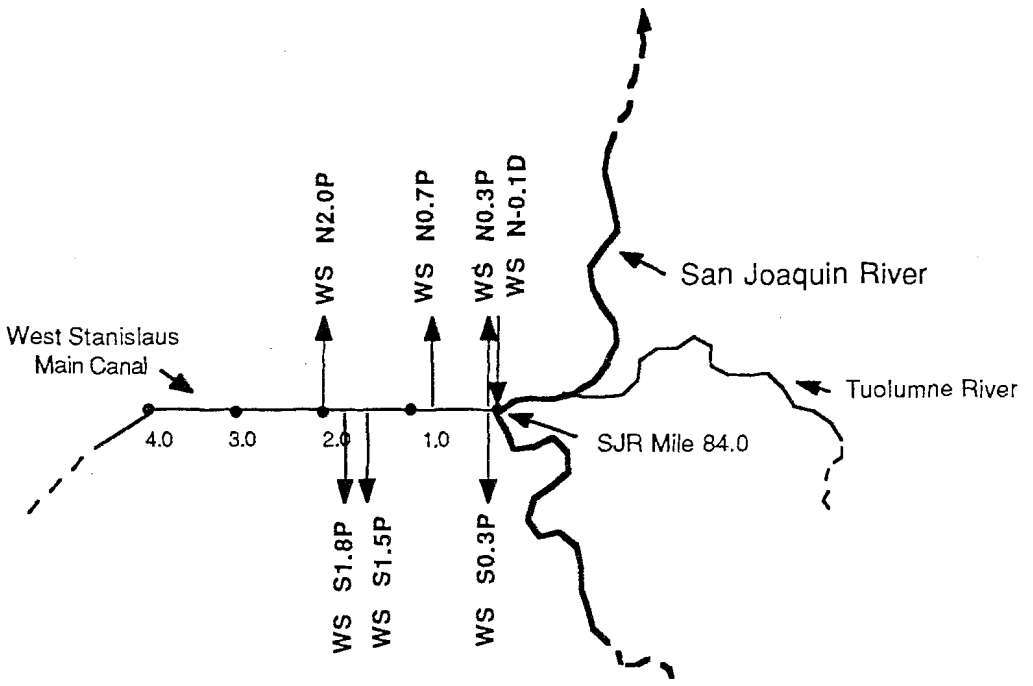


Figure 29. Schematic Diagram for Special Channel Survey B: Old Grayson Channel from Origin to San Joaquin River.

Special Channel Survey C: West Stanislaus Irrigation District
Pumps to San Joaquin River



1.0 West Stanislaus Main Canal Mile

WS N-0.1D	Tail Water Discharge Pump	**WS S0.3P**	Diversion Pump
WS N0.3P	Diversion Pump	**WS S1.5P**	Diversion Pump
WS N0.7P	Diversion Pump	**WS S1.8P**	Diversion Pump
WS N2.0P	Diversion Pump		

Figure 30. Schematic Diagram for Special Channel Survey C: West Stanislaus Irrigation District from Pumps to San Joaquin River.

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