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RIALTO CHANNEL

SPLPD-WB

February 1985

FEB 1985

LETTER REPORT FOR COMBINED
INITIAL APPRAISAL AND RECONNAISSANCE INVESTIGATION
FOR
RIALTO CHANNEL, CALIFORNIA

1. Introduction.

The storms of 28 February through 4 March 1983 and more recently during the third week of August 1983 caused flooding of areas downstream of I-10 along the Rialto Channel in the City of Rialto, San Bernardino County, California. Major areas of damage included: a major tank farm supplying refined petroleum products to southern California, Arizona, Nevada, and all refined products to four Air Force Bases in southern California; their pipelines crossing the Rialto Channel; a sewage treatment plant further downstream; and a pipeline to the treatment plant that crosses the Rialto Channel. The August 1983 floodflows were within a few inches of damaging the electrical gear and pumping system of the tank farm which would have shut down the tank farm distribution systems for an indefinite period of time. Potential damages in and outside the flood plain and to the water quality could be disastrous if the storage tanks and pipelines ruptured, sending millions of gallons of flammable petroleum products and sewage downstream to the Santa Ana River. The City of Rialto owns the Sewage Treatment Plant and Southern Pacific Pipe Line Company owns and leases the tank farm and pipelines to numerous distributing companies. Cal-Nevada Pipeline Company owns two pipelines that cross the Rialto Channel.

2. Study Area.

The study area, 3 miles west of the City of San Bernardino, and 50 miles east of Los Angeles, is part of the Santa Ana River Basin (see figs. 1 and 2). The City of Rialto, rapidly urbanizing, has increased in population from 32,000 in 1975 to 44,000 in 1983. The study area was a portion of the Lytle Creek alluvial cone until construction of protective levees on Lytle Creek in 1948. (See map, fig. 2). However, flows generated wholly on the cone are sufficient to cause flood damage, especially south of I-10. In response to a request from the San Bernardino County Flood Control District, the Corps studied the potential flood damage for the 24-square mile drainage area during 1969-1972. The feasibility of a concrete outlet channel extending 9 miles from above the I-10 Freeway to the Santa Ana River was examined. The benefit-cost ratio was inadequate to support a Corps project, and additionally, Corps participation depended on development of a proposed lateral storm drain system to collect street flows which was not apparent at that time. The County of San Bernardino and the City of Rialto have now requested the Corps to examine the lower Rialto Channel below I-10 and above Agua Mansa Road (lower end of a concrete trapezoidal channel). This study considers this reach only.

U S. ARMY GINEER DISTRICT

CORPS OF ENGINEERS

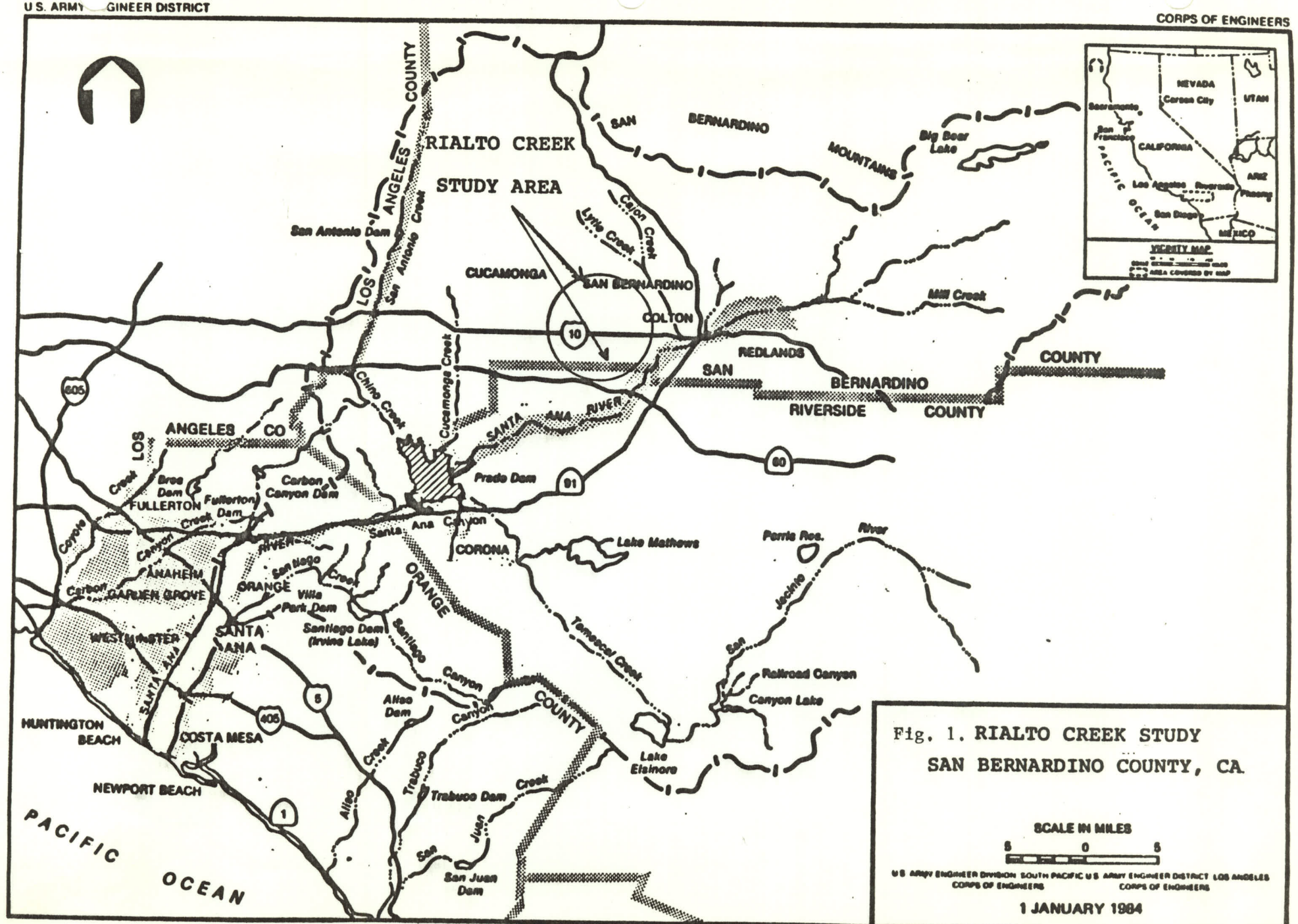


Fig. 1. RIALTO CREEK STUDY
SAN BERNARDINO COUNTY, CA.

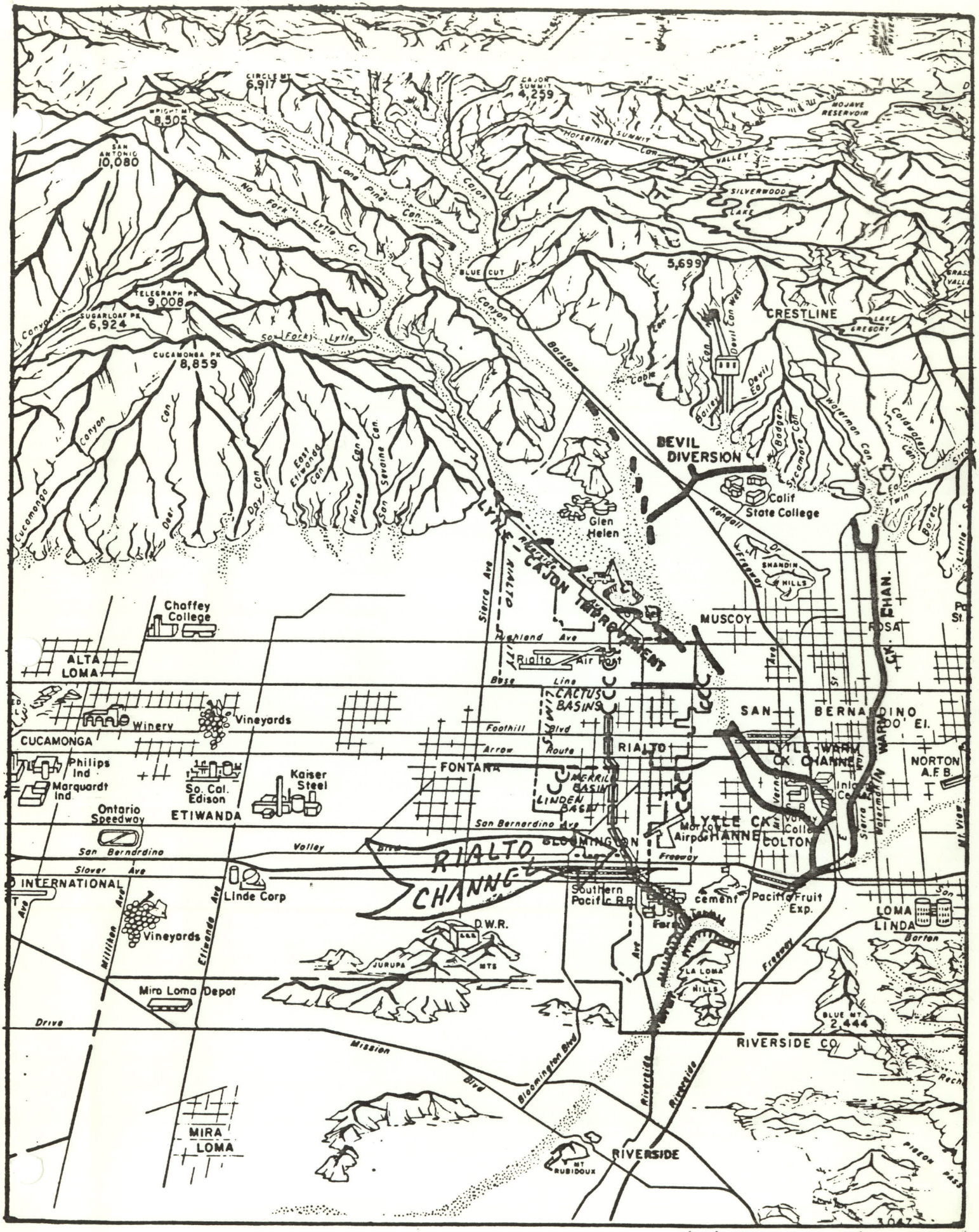


Figure 2. Rialto Channel Drainage Area

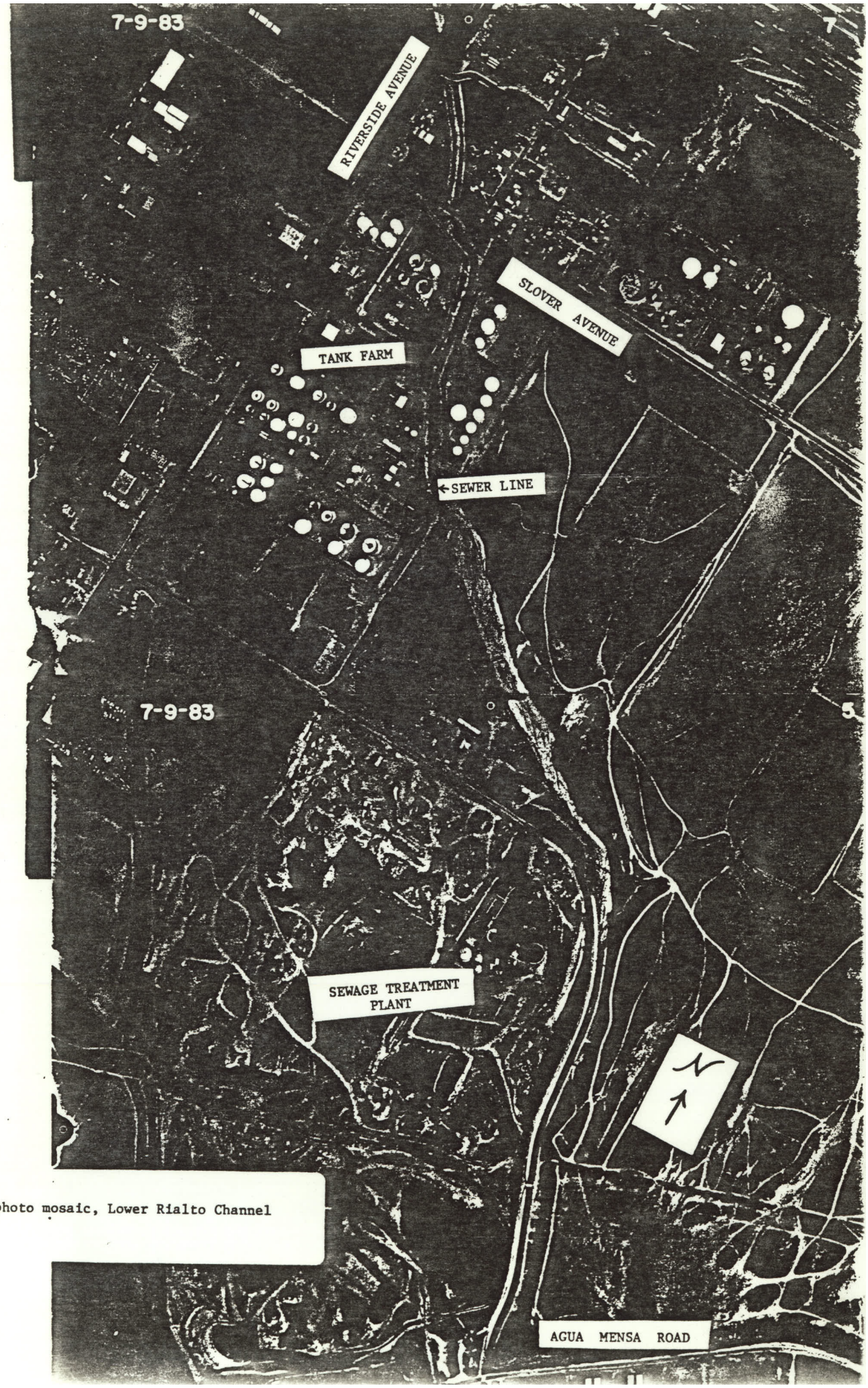


Figure 3. Airphoto mosaic, Lower Rialto Channel

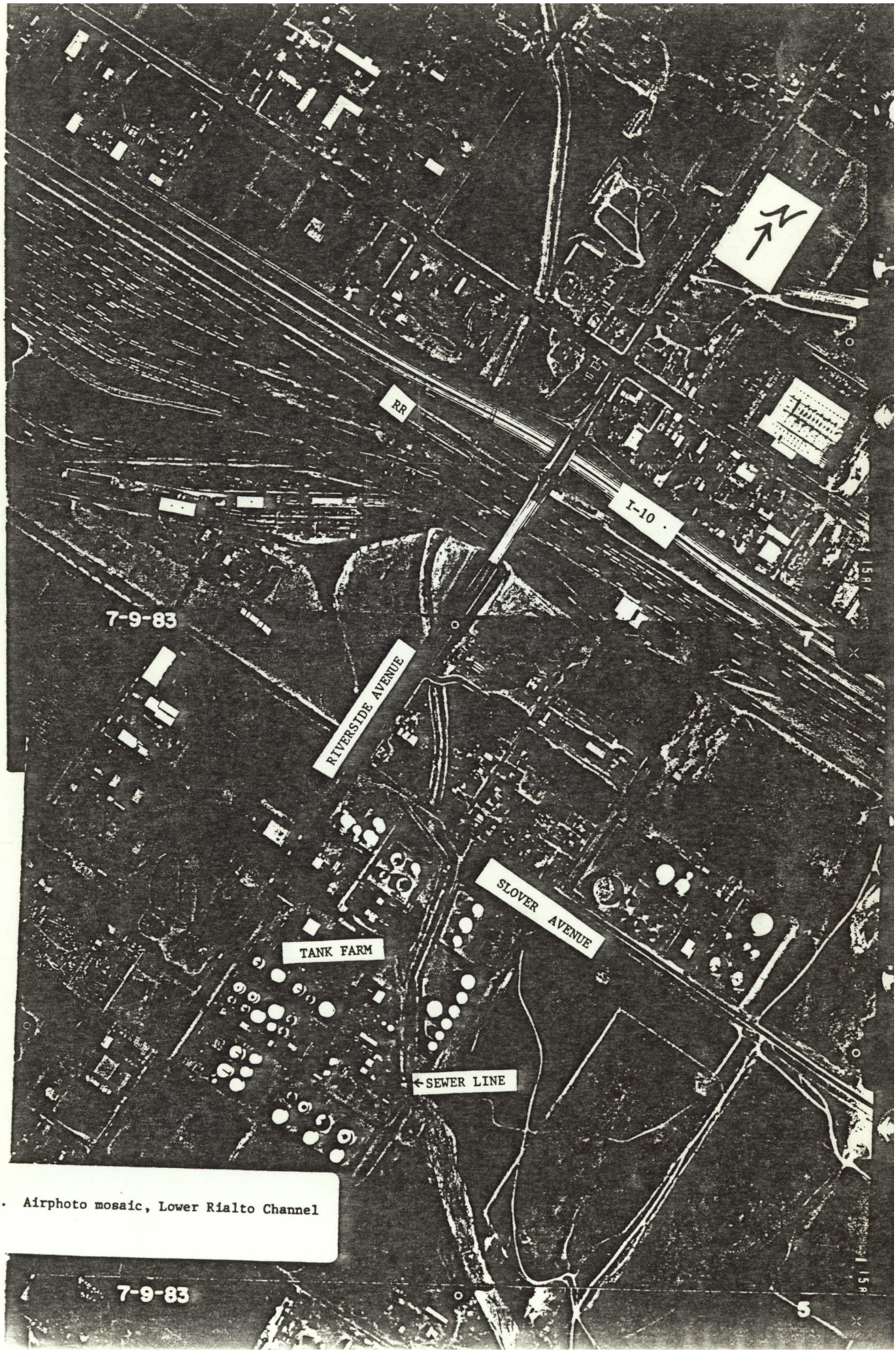


Figure 3(cont.). Airphoto mosaic, Lower Rialto Channel

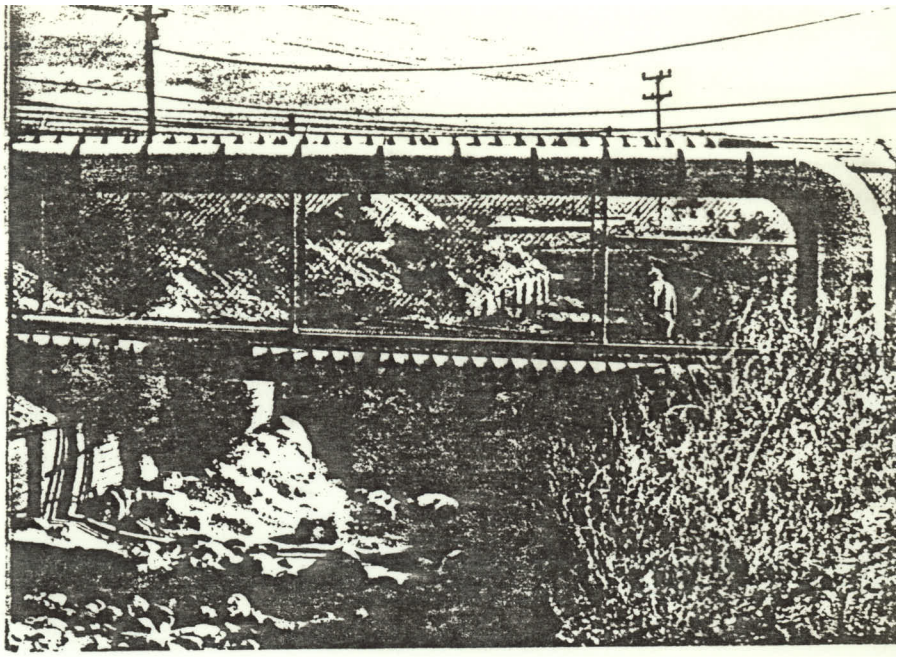
3. Hydrology and Hydraulics.

Not all sheet flow generated on the fan is collected by the present Rialto Channel. There is sheet flow across I-10 at Cedar Avenue (1-1/2 miles west of Riverside Avenue) and near the western boundary of the drainage area, Sierra Avenue. An earth channel extends above the I-10 Freeway, 3.8 miles to the Cactus percolating basin outlet, which itself has a 9-square-mile drainage area. Residential and scattered commercial zones predominate in the area above the I-10 Freeway. Assuming all flows above I-10 were directed to the Rialto Channel under fully developed conditions, the 50-year, 100-year, and Standard Project Floods at the I-10 Freeway culvert were estimated at 5000, 7500, and 15,000 cubic feet per second, respectively (based on 1969 estimates, Los Angeles District). The present I-10 culvert, a quadra 5x7 box culvert, has an estimated 2000 cubic feet per second capacity. At present, the earth channel can deliver approximately 2000 cubic feet per second to the I-10 culvert. However, the State of California Highway Department (CalTrans) has initiated construction (to be completed in December 1984) of a side drain parallel to I-10 capable of delivering an additional 2900 cubic feet per second from areas west of the Rialto Channel in order to reduce flows across the Freeway to the west of the Rialto Channel. This drain has been sized for the 50-year storm runoff, with development. In addition, several lateral storm drains constructed by the City of Rialto, could deliver another 2000 cubic feet per second to the Rialto Channel. However, culverts on these lateral drains are constricted. The County of San Bernardino has not allowed the City of Rialto to connect these drains to the Rialto Channel approximately one mile upstream of the I-10 Freeway, because of inadequate channel and culvert capacities downstream. At present, flows exceeding the capacity of the local drains travel as sheet flow down the fan and eventually cross the I-10 Freeway.

The collection system above the I-10 Freeway will be able to deliver approximately 5000 cubic feet per second by the end of 1984, roughly approximate to the 50-year flood, well in excess of the previously mentioned 2000 cubic feet per second capacity of the I-10 Freeway culvert. CalTrans officials have indicated their concern about the inadequate freeway culvert and have expressed a willingness to enlarge this culvert, but inadequate channel capacities downstream of the I-10 Freeway have restricted their response to this problem. The collection system above I-10 could convey roughly 7000 cubic feet per second (almost the 100-year flood) to the immediate vicinity of the I-10 culvert if the in-place storm drains were opened up. City of Rialto officials indicate that the collection system of lateral storm drains would be expanded within 1 to 2 years to deliver a SPF flow to the I-10 Freeway culvert if that culvert was sufficiently enlarged.

The hydrologic and hydraulic situation along the Rialto Channel is very complex and is continually changing. A detailed study would be required to determine the magnitude of flows presently delivered to the I-10 culvert along Rialto Channel. For the purpose of this Report, flows developed in the earlier 1969-72 study were used in the economic and design analysis. This assumes that all flows in the Rialto Channel drainage area upstream from I-10 are delivered to the I-10 culvert at the Rialto Channel.

Photo 1.
Petroleum Pipe lines at Rialto Channel. Lines crossing in middle foreground (behind individual) have less than 4 ft clearance. (View downchannel)



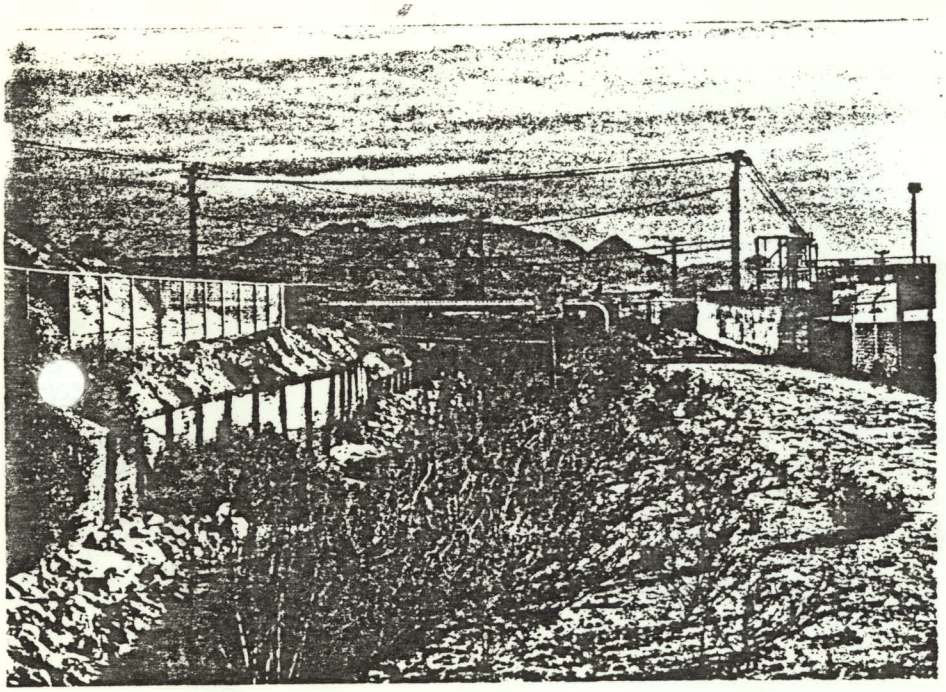
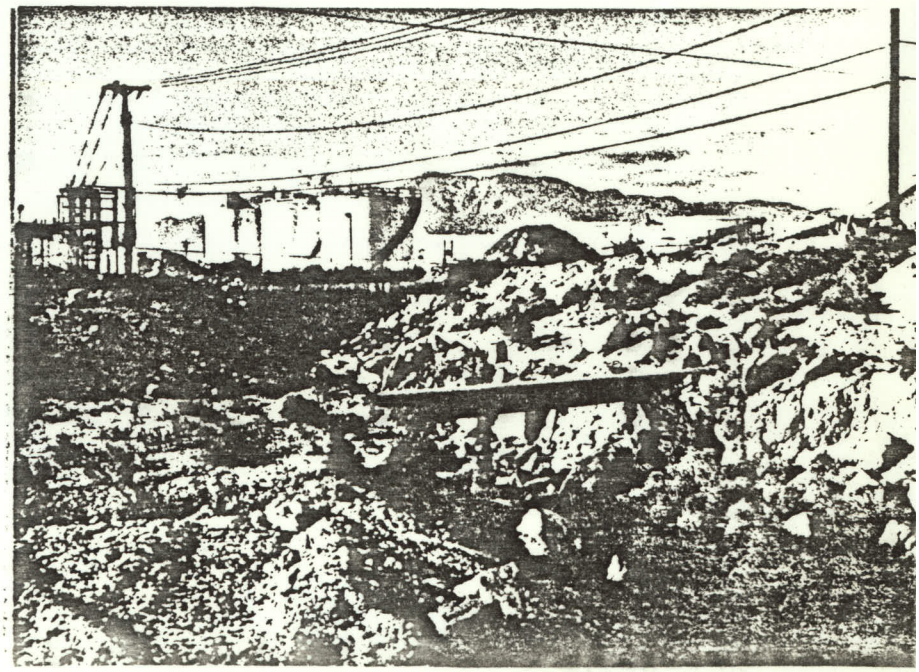


Photo 2.
Petroleum pipe lines & Tank farm (View downchannel)

Photo 3.
View upstream at Sewage pipe line towards Tank farm.



Just downstream of the I-10 culvert is a twin 15 x 15 box culvert under the Southern Pacific Railroad yards. The culvert was sized for SPF flows based on preliminary Los Angeles District hydrology in 1972. The grade and alignment was designed on the expectation of a future enlargement of the I-10 culvert. At present, overflow across the I-10 Freeway is directed by a railroad berm to the railroad culvert. In 1983, such stormflows partially eroded the railroad culvert headwalls. Eight hundred feet downstream is the 7500 cubic feet per second capacity Riverside Avenue culvert. Eight hundred feet further downstream, the Slover Avenue culvert, capacity 700 cubic feet per second, is a major obstruction to floodflow. It is plugged with sediment or debris by any substantial flow. When the culvert is plugged-up, as was the case during the 1983 storms, a portion of the flow is directed to a diversion ditch, approximately 100 cubic feet per second capacity, that runs through the Southern Pacific tank farm. The critical damage area along Rialto Channel is the reach (0.3 miles) between the Slover Avenue culvert and the downstream end of the tank farm. This reach of the Rialto Channel is partially improved with grouted stabilizers along the bottom and steel rails with galvanized steel sheets stabilizing the channel banks 4-6 feet above the invert (see photos 1 and 2). Twenty-seven oil pipelines suspended across the channel, and ranging from 6-inch to 24-inch in diameter, mostly lie between 7 to 20 feet above the invert. However, some pipelines have only a 3-foot clearance from the invert (see photos 1 and 2).

At a flow of about 1000 cubic feet per second which would have an 8-year frequency, the pipes begin to be hit by high velocity flows. During such moderate flows, erosion and undermining of the walls occur, exacerbated by flows directed toward the rear of the walls by the previously-mentioned diversion ditch through the tank farm. A 24-inch pipeline that carries raw sewage to the City of Rialto Sewage Treatment Plant is suspended 10 feet above the invert at the lower end of this reach. During the January-February and August 1983 storms, the sewage line was either washed out or damaged four times. About 4.5 million gallons of raw sewage over a one and one-half day period was dumped into the Rialto Channel and the Santa Ana River, 1.3 miles downstream during one of the January-February 1983 floodflows. Repair costs (to shore up the sewerline) were $95,000. During these storms, the suspended oil pipelines were also endangered by bank erosion and partial undermining of the walls. Additional flood damages to the tank farm complex during these storms due to the diversion at Slover Avenue consisted of undermining of firewalls surrounding several tanks. The 1983 flood damages to the tank farm and the pipelines and channel totalled $127,000. The 1983 floods were probably in the 15 to 25-year frequency range, according to local officials. As mentioned in the opening paragraph, major damages were narrowly avoided as the floodwaters rose to within 2 inches of the electrical switchgear of the tank farm; inundation would probably have resulted in a total shutdown of the distribution system for a month or more.

Downstream from the sewerline crossing, a natural flat-bottom and wide earth channel is incised at least 5 feet or more. This reach extends 2300 feet (see photo 3). A concrete trapezoidal channel extends downstream from the natural channel. The concrete channel was designed and constructed by the County of San Bernardino to keep damaging flows away from the City of Rialto Sewege Treatment Plant located to the west of the concrete channel.

Additionally, a 500-foot long earth embankment was constructed upstream of the concrete channel along the west side of the natural channel to insure that damaging flows would not bypass the concrete channel. The plant is susceptible to flooding from floods greater than a 50-year flood. A maintained earth channel extends downstream 1500 feet from the culvert at Agua Mansa Road (downstream end of the concrete trapezoidal channel) to the Santa Ana River. The County of San Bernardino spends about $10,000 to $15,000 per year to clean debris from the 25-foot wide bottom by 6-foot deep channel. Floodflows frequently overflow into the adjacent agricultural lands from the less than 5000 cubic feet per second-capacity channel.

4. Flood Damages.

Past flood damages are not indicative of future flood damages. Constructions by the State of California Highway Department (CalTrans) and by the City of Rialto are modifying existing flow patterns to collect and deliver storm drainage to the Rialto Channel. As discussed under paragraph 3, future flood damages were based on theoretical hydraulic and economic determinations on the assumption that all flows would be delivered to the I-10 culvert. Flood damage estimates were developed after discussions with officials representing the companies owning the properties subject to flood damage along the considered reach of Rialto Channel.

Estimated flood depths were based on the 1972 preliminary Corps study. Damages incurred during the 1983 floods provided some data for moderate floodflows. Property susceptible to major flood damages include the I-10 Freeway, the tank farm, oil pipelines, the raw sewage pipeline, and the City of Rialto Sewage Treatment Plant. In addition to structural damages to these properties, damages would accrue to petroleum products in the tanks and pipelines, and would include costs of alternative transport of fuel during tank farm shutdown, and costs for petroleum cleanup in the Rialto Channel and Santa Ana River downstream. Frequencies of non-damaging flows vary for the different reaches and are listed in table 1. Estimated flood damages for the 50-year, 100-year, and Standard Project Flood for each of the above properties and types of damages are listed in table 1.

a. Flood damages to the I-10 Freeway include traffic disruption and highway repair. CalTrans engineers estimate that a partial washout of the Freeway during a 100-year flood and a total freeway closure for 3 days with an additional 7 days of traffic delay would result in damages totalling $1 million. Non-damaging flows for this reach are of approximately 15-year frequency.

b. Tank farm damages include damages to the storage tanks and firewalls and damages to the electrical gear and pumps. SPF and 100-year flood damages would total $5 and $4 million, respectively. Representatives of the Southern Pacific Pipe Lines (SPPL), owner of most of the tank farm, estimated at least 45 days would be needed to repair the damages. Tosco Corporation, which leases pipelines from SPPL, estimates their system might be out of service for 90 days. The tank farm and pipelines supply nearly all liquid petroleum products for Phoenix, Las Vegas, Yuma, El Centro and surrounding areas. In addition, these facilities provide George, Edwards, Nellis, and Norton Air

Force Bases with nearly all their supplies of refined products. Included in these supplies is nearly all jet fuel for Edwards Air Force Base, lack of which would cease their test program and result in millions of dollars loss per day. An official at Edwards indicated no practical supply alternative.

It is questionable whether there are sufficient alternative transporation resources to replace the pipeline system; therefore liquid petroleum products would be in extremely short supply in the above mentioned areas.

The El Paso area was mentioned as a possible alternative source of supply. However, officials at SPPL did not believe that such an approach would be practical, inasmuch as they believed that the Tucson area would absorb most of El Paso's refined products directed westerly. A likely response to fuel shortages for military and civilian use would be the use of trucks or railroad tank cars from the San Pedro refineries. Under this approach, the cost of moving fuels to their destinations was estimated at $12 million greater than transport by pipeline.

Table 1. Estimated Flood Damages From Single Floods.
(Millions of Dollars)

FEATURE	NON-DAMAGING FLOOD FREQUENCY, YRS.	50-YR.	100-YR.	SPF
I-10 Damages	15	0.5	1.0	1.0
Railroad Damages		ND	ND	ND
Misc. (Automated Fuel Fac.)	50	0	0.1	0.15
Tank Farm Plant Damage	8	2.0	4.0	5.0
Oil Pipeline Repair/Reloc.	8	0.68	1.01	1.01
Petroleum Product Loss	8	0.04	1.17	2.29
Petroleum Cleanup	8	0.4	9.6	16.6
Sewage Pipeline	8	0.15	0.15	0.15
Raw Sewage Spill		ND	ND	ND
Sewage Treatment Plant	50	0	3.0	9.0
		$3.8*	$20.0*	$35.2*

ND = Not Determined
* = Additional costs would result from alternative fuel transport (see Table 4)

c. The City of Rialto Sewage Treatment Plant is not exposed to flooding from the adjacent trapezoidal concrete channel. However, inundation results from flows greater than 50-year frequency floods escaping from the channel above Slover Avenue. SPF flows with depths of 2 or more feet would inundate the plant causing approximately $9 million in damages, in excess of 80 percent of the plant's value. The Sewage Treatment Plant was recently expanded at a cost of $5-1/2 million to bring the total plant value to greater than $11 million. The plant is also susceptible to damages by bank erosion if the earth embankment upstream of the concrete trapezoidal channel should fail; the embankment has no protective cover. Sedimentation along this reach upstream of the concrete trapezoidal channel could allow floodflows to breach the embankment resulting in severe bank erosion and damage to the plant. This possibility was not included in the estimation of damage potential.

d. Oil spills, as the result of rupture of the oil pipelines and tanks, would severely affect the groundwater supply. Cleanup of oil spills is costly. For example, cleanup to remove 80,000 gallons of percolating oil from a pipeline break in the Lytle Creek Channel in nearby Devore in 1983 cost $600,000 not including still ongoing monitoring and recovery costs. Calculation of cleanup costs for a Rialto Channel oil spill assumed a non-damaging 8-year flow, ruptures on 50 to 75 percent of the pipelines and a subsequent spill for 1/4 hour for all floods equal to or larger than the 50-year flood. Assumptions of a tank rupture (75 percent loss to the channel) for the 100-year flood and two tanks ruptured (75 percent loss) for the Standard Project Flood were included in the assessment of damages. Cleanup costs for ruptures during 100-year and Standard Project Floods could total $9.6 million and $16.6 million, respectively.

e. Rupture of the 18-inch raw sewage line would quite significantly affect the Santa Ana River reach downstream. Directly downstream is a body contact recreation area; polluted water would make the area unfit for human contact. Recreation facilities would have to be closed until samplings indicated a safe water quality. In additional, raw sewage would be detrimental to fish populations because of reduced oxygen. A representative of the State Regional Water Quality Board stated that a raw sewage spill into the Santa Ana River would be catastrophic, with the actual damages hard to quantify. Benefits from prevention of raw sewage spills were not quantified in this report.

Estimated total flood damages and costs for the 50-year, 100-year, and Standard Project Floods would be nearly $4, $20, and $35 million, respectively. See table 1 for more detailed list of expected flood damages.

5. Alternatives.

Alternatives examined for Rialto Channel included 50-year, 100-year, and SPF concrete channels, and a combination of floodproofing and localized bank protection for the three levels of protection. Tables 2 and 3 are summaries of the alternatives examined. Costs for structural plans include the cost for a culvert under I-10; but not the costs for an inlet on the upchannel side of the culvert. Rectangular channels rather than trapezoidal channel are necessary for channelization alternatives because of limited right-of-way through the tank farm.

Channelization for SPF protection would include (see table 2):

(1) replacement of culvert under the I-10 Freeway; (2) enlarging the existing culvert under Riverside Avenue; (3) constructing a culvert at Slover Avenue; (4) enlarging the existing culvert at Agua Mansa Road; (5) constructing concrete rectangular channels from the culvert at the Railroad to Riverside Avenue, from Riverside Avenue to Slover Avenue, and from Slover Avenue to the point at which the sewerline crosses the channel; (6) grading and providing riprap slope protection from the sewerline to the existing trapezoidal channel; (7) improving the existing concrete trapezoidal channel above Agua Mansa Road by raising the channel walls to increase the channel capacity; and (8) raising the oil and sewer pipelines that cross the channel through tank farm.

Channelization for 100-year flood protection requires:

(1) replacement of the culvert under the I-10 Freeway; (2) constructing a culvert at Slover Avenue; (3) constructing a concrete rectangular channel from the Railroad culvert to the sewerline crossing; (4) grading and providing riprap slope protection from the sewerline to the existing trapezoidal channel; and (5) raising the pipelines that cross the channel. Channelization for 50-year flood protection is similar to the 100-year plan in terms of general improvements.

Table 2. Cost Estimates for Channel Alternatives.
(In Thousands of Dollars)

	50-YR.	100-YR.	SPF
Channel from railroad to Riverside Ave.	265	309	400
Channel from Riverside Ave. to Slover Ave.	266	309	400
Channel from Slover Ave. to sewerline	598	695	900
Channel from sewerline to existing concrete channel	494	614	759
Concrete trapezoidal channel improvements	---	---	---
Freeway culvert	731	814	965
Riverside Ave. culvert	---	---	500
Slover Ave. culvert	95	122	172
Agua Mansa Rd. culvert	---	---	172
Pipe relocations	125	250	250
Clear and grub	10	15	15
Mobilize and demobilize	10	15	15
Subtotal	2594	3143	4984
Contingencies 25%	649	785	1246
Subtotal	3243	3928	6230
Engineering and Design 10%	324	393	623
Supervision & Administration 7%	227	275	436
Lands, easements, and rights-of-ways	210	280	350
Total	4004	4876	7639
Say	4000	4900	7600
Operation and Maintenance	40	50	70

Several issues not analyzed within the preliminary scope of the Initial Appraisal and Reconnaissance Study will have to be addressed in the subsequent studies. The entire Rialto Channel is quite steep with very erodible channels. As such, sediment eroded from earth channels may cause channel damage and/or aggradation problems downstream in the improved channels. The above channel alternatives do not involve upstream channelization, and also leave a portion of the lower Rialto Channel (below the sewerline) with an earth bottom. Degradation of this lower Rialto earth-bottom channel may also cause aggradation further down.

The cost for the SPF channel alternative is $7,600,000. The annualized charge at 8-3/8 percent including operation and maintenance charges, is $710,000.

The costs for the 100-year and 50-year channels are, $4,900,000 and $4,000,000 respectively. Annualized costs are $460,000 and $380,000, respectively.

Combinations of limited channelization and floodproofing were also examined as possible solutions to the flooding problems along the Rialto Channel. The required improvements would include:

(1) small compacted earthen levees (dikes) around vulnerable areas within the tank farm, to provide more substantial protection than some of the fire walls now in place, and to protect portions of the tank farm now completely exposed to moderate floodflows; (2) compacted earthen levees (dikes), with riprap, around vulnerable areas of the sewage treatment plant; (3) riprap slope protection upstream of the existing concrete trapezoidal channel to protect the sewage plant; (4) either protective supports for the sewerline crossing the channel or bank and invert stabilization; (5) construction of a culvert at Slover Avenue and channel realinement downstream of Slover Avenue; and (6) relocation of oil pipelines that cross the channel and bank and invert stabilization. These improvements are listed in table 3. The required improvements for the SPF and the 100-year flood would be similar, with the exception that for the 50-year flood, no protection for the sewage treatment plant appears to be required.

The limited structural solution does not increase concentration of flows at the I-10 Freeway. Portions of existing channels downstream of the Freeway could not contain the increased flows if collected by a Freeway culvert. Thus Interstate 10 culvert costs are not included in this plan, and the combination structural/non-structural solution does not prevent flooding damages to the Freeway.

First costs for SPF, 100-year, and 50-year protection by these combinations of structural/ nonstructural measures are $2,300,000, $2,100,000 and $1,400,000, respectively. Average annual charges which include maintenance and operation costs, are estimated at $210,000, $200,000, and $140,000, respectively.

A "no action" alternative would leave the Rialto Channel and Santa Ana River still susceptible to catastrophic environmental impacts of oil and sewage spills as a result of rupture or undermining of the pipelines, storage tanks and sewage treatment plant. Flood damage to the oil pipelines and tank farm facilities could result in interruption of petroleum supplies, producing fuel shortages both commercial and military.

Table 3. Cost Estimates for Limited Structural Solution Alternative.
(In Thousands of Dollars)

	50-YR.	100-YR.	SPF
Channel realignment at Slover	100	100	100
Concrete slope protection for sewer and pipeline	113	130	147
Riprap protection upstream of concrete channel	60	60	60
Flood proofing oil tanks	214	309	375
Protective Dike around treatment plant and riprap protection	---	195	247
Pipeline relocations	250	250	250
Culvert at Slover	95	122	173
Clean and grub	10	15	15
Mobilize and demobilize	10	15	15
Subtotal	852	1248	1330
Contingencies 20%	213	312	333
Subtotal	1065	1560	1662
Engineering and Design 13%	138	203	216
Supervision and Administration 9%	96	140	150
Lands, easements, and rights-of-way	140	210	280
Total	1439	2113	2308
Say	1400	2100	2300
Operation and Maintenance	20	20	20

6. Economic Evaluation.

Annual benefits for specific degrees of protection for the structural alternatives are shown in tables 4 and 5. The benefit-cost ratios for the SPF, 100-year, and 50-year channel alternatives are 1.10, 1.10, and 0.7 to 1, respectively, while B:C ratios for SPF, 100-year, and 50-year nonstructural/ channelization alternatives are 3.5, 2.4, and 1.7 to 1, respectively.

Table 4. Annual Benefits.
(In Thousands of Dollars)

FEATURE	Level of Protection 50-YR	100-YR	SPF
I-10 Damages	13	30	37
Railroad Damages	ND	ND	ND
Misc (Automated Fuel. Fac.)	---	0.5	1
Tank Farm Plant Damage	57	87	118
Oil Pipeline Repair/Reloc.	35	44	51
Additional Fuel Transport Costs	120	240	324
Petroleum Product Loss	2	8	19
Petroleum Cleanup	21	71	163
Sewage Pipeline	9	10	11
Raw Sewage Spill	ND	ND	ND
Sewage Treatment Plant	---	15	57
	$257	$505	$781

ND = Not Determined

Table 5. ALTERNATIVE COST & BENEFITS ANALYSIS.
(In Thousands of Dollars)

	SPF ALTERNATIVE		100-YEAR ALTERNATIVE		50-YEAR ALTERNATIVE	
	Channelization	Non-Structural/ Channelization	Channelization	Non-Structural/ Channelization	Channelization	Non-Structural/ Channelization
Total First Cost	7,600	2,300	4,900	2,100	4,000	1,400
Annual Construction Cost at 8-3/8 percent	640	190	410	180	340	120
Annual Operations and Maintenance	70	20	50	20	40	20
Total Annual Cost at 8-3/8	710	210	460	200	380	140
Total Annual Benefits	781	744	505	475	257	244
Benefit/Cost Ratio	1.10	3.5	1.10	2.4	0.7	1.7
Net Annual Benefit	71	534	45	275	----	104

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7. Plan Evaluation.

Of the plans investigated, the channelization plans providing SPF and 100-year flood level of protection appear to have marginal justification. The combination floodproofing/channelization plans for 50-year, 100-year, and SPF levels of protection have substantial justification. The cost for the SPF and 100-year channelization plans are $7.6 million and $4.9 million, respectively. The SPF combination floodproofing/ channelization plan appear to have maximum economic justification. Net annual benefits total $534 thousand and the B:C ratio is 3.5. These estimates are of a reconnaissance grade and require more detailed analysis. The high benefit-cost ratio of the limited structural alternatives should not be the only basis for selection as the recommended plan. These alternatives do not provide protection to all properties located along both sides of the channel and within limits of the proposed improvement.

Several issues will have to be resolved at the Detailed Project Study stage. Included among these problems are:

-Definition and evaluation of the potential sedimentation problem along the relatively steep reaches of Rialto Channel and the impact of this problem along the considered reach of stream.

-A complete hydrologic and hydraulic analysis of the alluvial cone. This appraisal is based on 1972 hydrologic and overflow estimates by the Los Angeles District. The city is rapidly urbanizing and drainage patterns have been substantially altered since 1972. The cost of the required hydologic study will be reduced by County efforts. The County of San Bernardino is presently contracting an A & E firm to update present hydrology and hydraulic features of the study area; Corps personnel are advising the County as to Corps requirements and needs for this study in order to reduce and eliminate duplicative efforts on the part of the Corps.

-The actual impacts to the military, i.e., the Air Force bases, of reduced/short-term elimination of fuel supplies. The vulnerability of the tank farm/supply lines is potentially a National Defense concern. The Detailed Project Study will need to address military involvement and alternatives.

No major environmental problems are foreseen from the construction of the proposed projects based on information developed. However, a NEPA document will probably be required since the project could affect ecological resources. During cursory inspections of the channel banks no prehistoric or cultural resources were found, but there is a high probability that buried sites exist.

Test excavation may be necessary if the records search indicates that a site may be present. The entire length of the project area is highly disturbed, having relatively low esthetic and wildlife habitat quality. Informal consultation with the U.S. Fish and Wildlife Service has revealed that no Federally listed threatened or endangered species are known to occur in the project area; however a Category 1 candidate plant species may occur within the project-affected areas. Due to the absence of riparian species along the banks, the relatively low esthetic and wildlife habitat quality

8. Local Cooperation

San Bernardino County and the City of Rialto have indicated their support for a Section 205 Program. The San Bernardino County Board of Supervisors and the City Council of Rialto have adopted Resolutions (see appendix B) supporting the initial appraisal investigation and has requested that the Corps carry this study forward as a high priority project. The San Bernardino County Flood Control District has indicated their willingness to share study costs if requested (see Appendix C).

9. Cost Estimates for a Detailed Project Report.

The cost estimate for a Detailed Project Report is $370,000 as follows:

ITEM	COSTS
Survey	$10,000
Hydrology Studies	20,000*
Hydraulic Studies	85,000
Economic Evaluation	13,000
Environmental Studies	19,000
Non-structural Studies	7,000
Geology	12,000
Soils Design	30,000
Foundation and Materials	40,000
Real Estate	10,000
Recreation	5,000
Design, Cost Estimating & Drafting	54,000
Study Management	65,000
TOTALS	$370,000

*Hydrology's cost estimate is based upon coordination with the County of San Bernardino's contracting of an A & E hydrologic study (refer to page 10, issues to be resolved). If the A & E study is insufficient, the Hydrology Section's cost will be substantially more, in the range of $60,000.

It is estimated that a Detailed Project Report can be completed in about 18 months, including 4 months for review by SPD and OCE, as shown in Figure 4.

10. Recommendations.

The District Engineer recommends that a Detailed Project Study be made to arrive at the best solution to the flood problems along Rialto Channel, and to determine the impacts of these solutions and their economic justification. It is recommended that $370,000 be approved for the preparation of the Detailed Project Report.

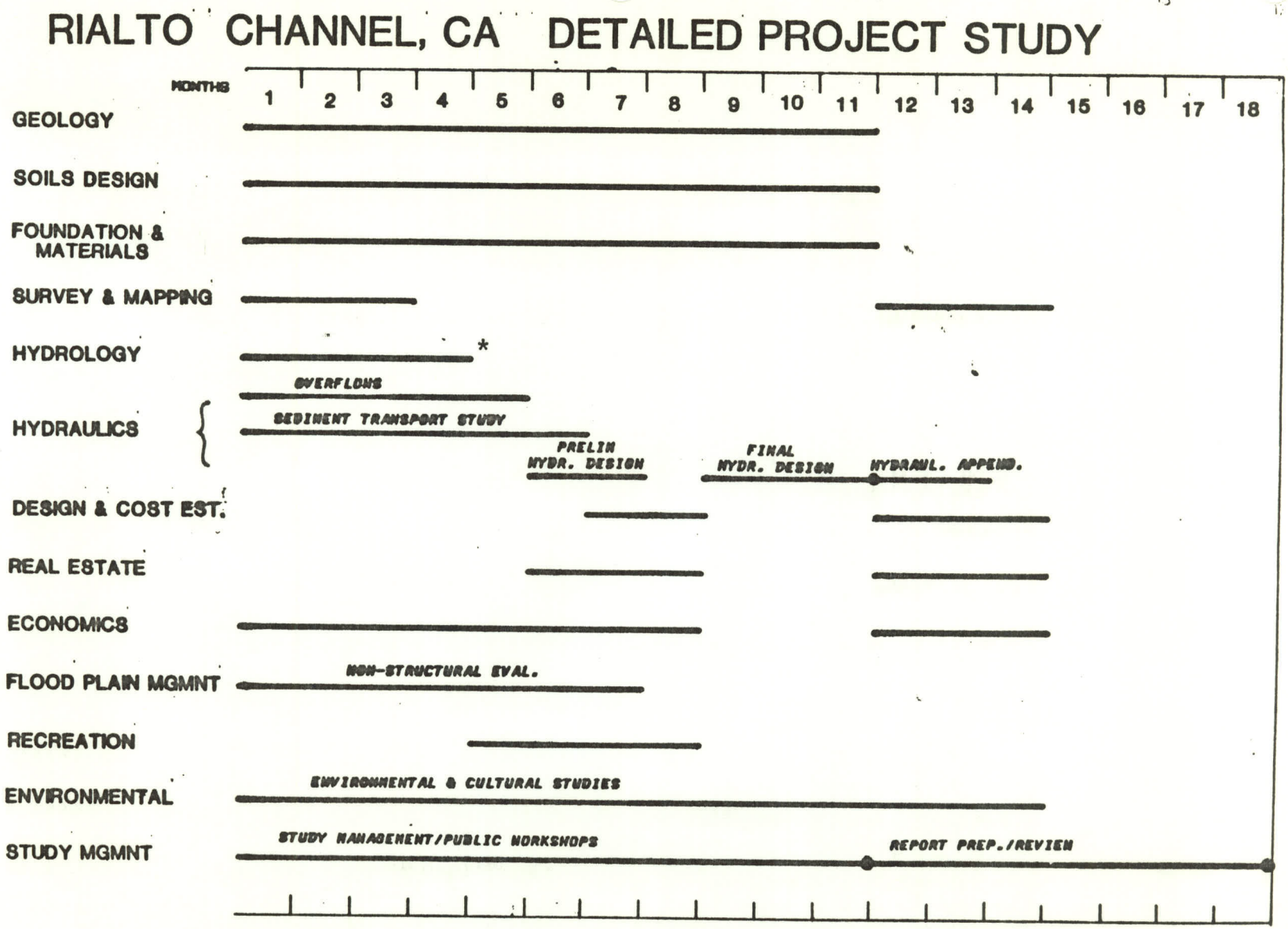


Figure 4. Rialto Channel, California Schedule for Detailed Project Study
* Note: Time will increase to 12 months if county of San Bernardino does not complete their hydrology study.

APPENDIX A

Reconnaissance Report

For

The Proposed Rialto Channel Improvement

City of Rialto, San Bernardino County, California

January 1984

Existing Environment. The proposed project is located along Rialto Channel in the city of Rialto in San Bernardino County, California. The project area extends from Interstate Highway 10 (I-10) just west of Riverside Avenue downstream about 2 miles to the Santa Ana River (see fig. 1). A 2,000 cfs culvert lies beneath I-10 and feeds into a twin box 15,000 cfs culvert just downstream near the Southern Pacific Railroad yard. The entire project area along the channel is highly disturbed. The upper reach of the channel (about 1.4 miles) is earth bottom, primarily gravel and large cobbles and boulders, with a grouted stone step approximately every 75 feet. Rail and wire fencing extends along both banks of the channel for stabilization. The channel in this upstream reach averages about 25 feet wide with side slopes of about 40 degrees. On the western side of the rail and wire fencing lies an approximately 8 foot wide dirt road beyond which several Southern Pacific pipeline storage tanks are situated. Several oil pipelines averaging approximately 20 in. in diameter are suspended across the channel to the tank farm. Many of the pipelines lie between 7-20 feet above the bottom of the channel; however, some pipelines allow only about 3 feet of clearance from the riverbed. A pipeline which carries sewage to a sewage treatment plant situated just west of the channel downstream is also suspended across the channel about 10 feet above the riverbed. The lower reach of the project area (about 0.6 miles) between Santa Ana Avenue downstream to Agua Mansa Road is a 7,500 cfs concrete trapezoidal channel about 11 feet deep with a top width of about 40 feet. The land use in the adjacent flood plain, aside from the oil tank farm and sewage treatment plant, is low-density residential.

Biological Resources. The entire length of the project area is highly disturbed, having relatively low esthetic and wildlife habitat quality values. Vegetation along the banks is dominated by a moderately dense stand of tumbleweeds (i.e. Russian thistle), and various grasses. A few composite species; (Perizia microcephala), (Conyza sp.), and a sunflower species, as well as horehound (Marrubium vulgare), and buckwheat (Eriogonum spp.) also occur in the project area but they have an extremely sparse distribution along the channel banks. No riparian species (e.g. mulefat, willow, etc.) or wildlife activity was observed during the 5 January 1984 field visit by the environmental coordinator; however, the vegetation along the banks provides forage for passerines, and possibly raptors. Informal consultation with the U.S. Fish and Wildlife Service (FWS) has revealed that no Federally listed threatened or endangered species are known to occur in the project area; however, a Category 1 candidate plant species, the slender-horned spineflower (Centrostegia leptoceras) may occur within project-affected areas. This annual is threatened by sand and gravel operations and it is anticipated that a listing package for the species will be completed within the next couple of years. (Category 1 consists of those species for which the FWS has enough

information to support proposing to list the species as Endangered or Threatened, and for which other data is currently being gathered. Candidate species are not protected under the Endangered Species Act; however, it is possible that the candidate species could become a formal proposal and be listed during the construction stage.) A formal list of Federal and State listed threatened and endangered species has been requested from the FWS Endangered Species Office in Sacramento.

Cultural Resources. A cursory inspection of the channel banks during the 5 January 1984 field visit by a staff archeologist revealed no prehistoric or historic cultural resources. The ground surface is quite disturbed in this area; however there is a high probability for buried sites. A cultural resources literature search is currently underway at the Regional Clearinghouse.

The area subjected to project impacts should be thoroughly inspected at the time project boundaries are defined, and before construction activities are planned. If the records search indicates that a site may be present, test excavations to determine the condition and significance of the site may be necessary. These test excavations should be conducted by a qualified archeologist.

Environmental Impacts and the Potential for Mitigation.

The proposed project consists of several potential alternatives for channel improvement. Alternatives which propose either a rectangular concrete channel or widening of the existing channel would eliminate a large portion of the little vegetation that occurs along the banks, assuming a right-of-way of about 15-20 feet. Existing access roads to the channel precludes disturbance of additional biological resources in the area should the project be implemented. Due to the absence of riparian species along the banks, relatively low esthetic and wildlife habitat quality values, and the overall high degree of disturbance the project area has incurred, impacts resulting from channel improvements should be easily mitigated, providing neither cultural resources, the slender-horned spineflower, nor any threatened or endnagered species are present. Studies on groundwater recharge within the project area would be necessary to determine whether a concrete channel would significantly affect groundwater recharge in the project area and downstream reaches.

The overall environmental impacts which would result from alternatives that include raising the oil and sewage pipelines to higher elevations, in combination with non-structural flood control measures (e.g. levees) would be beneficial in the long-term. Should a no-action alternative be selected, the largest potentially adverse environmental impact would be the rupture or undermining of the pipelines, discharging oil and/or untreated wastes into Rialto Channel which would then be carried downstream to the Santa Ana River. (In 1983, the sewage pipeline was undermined by flows and ruptured, releasing untreated sewage downstream.) Extreme care in bypassing the oil and sewage from the present pipelines while installing pipelines at a higher elevation would need to be taken and would require coordination with Environmental Resources Branch and pertinent agencies.

Rialto Channel

USGS: Rialto
San Bernardino County
1972

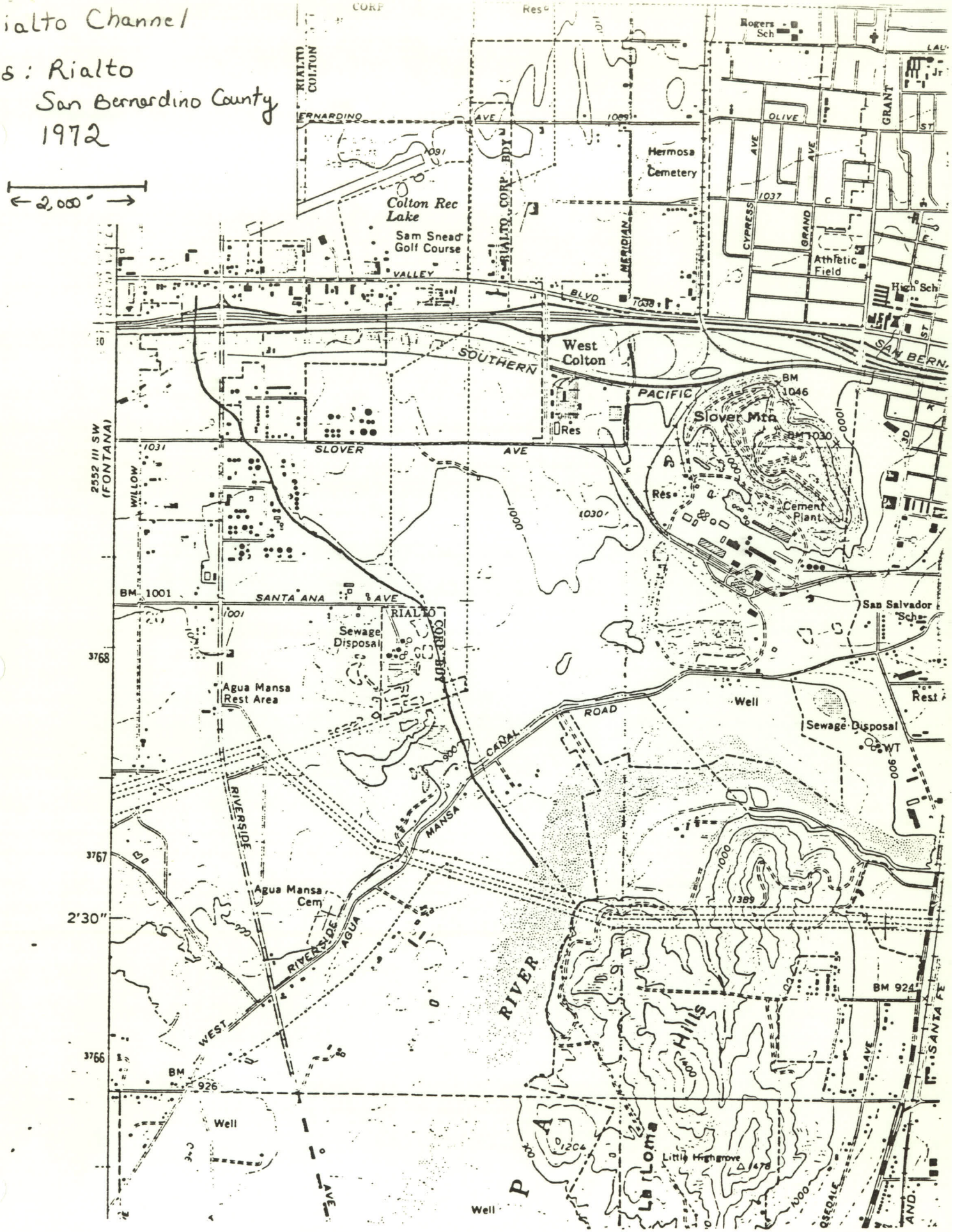


Fig. 1

MINUTES OF THE BOARD OF SUPERVISORS OF SAN BERNARDINO COUNTY, CALIFORNIA

February 27, 1984

FROM: CHARLES L. LAIRD, Assistant Director
Flood Control

SUBJECT: FCD ZONE 2 RIALTO CHANNEL CORPS OF ENGINEERS PROPOSED PROJECT SUPERVISORIAL DISTRICT 3 AND 5, SUPPORT OF THE U.S. CORPS OF ENGINEER INITIAL AND EXPANDED RECONNAISSANCE STUDY ON THE RIALTO CHANNEL
File 2-120/1.00

RECOMMENDATION: Adopt resolution supporting the initial reconnaissance investigation and report and the expanded reconnaissance study on the Rialto Channel being prepared by the U.S. Corps of Engineers (C/E) to carry this forward as a high priority project.

BACKGROUND INFORMATION: The Flood Control District has recently experienced several flooding problems along the Rialto Channel, especially in the area south of Slover through the tank farm. High magnitude floods could endanger major high pressure petroleum lines and tanks. As per District request, the U.S. C/E, Los Angeles District is preparing a reconnaissance report.

REASON FOR RECOMMENDATION: Damage to the above-mentioned facilities, in addition to the multi-million dollar loss in repair and revenue and interruption of petroleum supply, would produce shortages in both commercial and military fuel supplies in the states of Nevada and Arizona as well as Southern California. By studying the project, the U.S. C/E may find an acceptable solution to this serious problem.

REVIEW BY OTHER DEPARTMENTS: This was reviewed by Deputy County Counsel E.H. Robinson on February 17, 1984.

FINANCIAL DATA: Eventual construction of a project will require local cost for lands, easements and rights-of-way as necessary. Also, this project is proposed under the small projects program which has a limit of $4 million. Local cost sharing will be required if the project exceeds $4 million. It is anticipated the project will not exceed this amount.

RESOLUTION NO. 84-88

Resolutions to:
CC: Flood Control (3)
County Counsel
EPWA
Auditor
File

Action of the Board of Supervisors
APPROVED BOARD OF SUPERVISORS
COUNTY OF SAN BERNARDINO

MOTION SECOND ABSENT X MOTION X
1 2 3 4 5

MARTHA M. SEKERAK, CLERK OF THE BOARD
BY Esther Rockenbaugh
DATED: FEB 27 1984

ITEM 40

14-9507-000
Rev. 10/81

RESOLUTION NO. 84-88

INDICATING DISTRICT'S SUPPORT OF THE INITIAL RECONNAISSANCE REPORT AND THE EXPANDED RECONNAISSANCE STUDY ON THE RIALTO CHANNEL BEING PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS

On motion by Supervisor Townsend, seconded by Supervisor Joyner and carried, the Board of Supervisors adopts the following resolution:

WHEREAS, the partially improved channel through the tank farm area was badly eroded during the floods of 1983 thereby exposing and threatening several high pressure petroleum fuel and gas lines, undermined retaining walls, eroded the fill area adjacent to the large petroleum tanks and ruptured the city's sewer main; and

WHEREAS, the Flood Control District has recently experienced several flooding problems along the Rialto Channel, especially in the area south of Slover through the tank farm; and

WHEREAS, several major facilities belonging to Southern Pacific Pipeline, Calnev Pipeline, Tosco, Chevron, Arco Petroleum, Shell Oil Corporation, Texaco, Mobil Oil, Union, and other companies could be endangered by high magnitude floods overtopping and/or undermining the existing channel; and

WHEREAS, damages to the above-mentioned facilities, in addition to the multi-million dollar loss in repair and revenues, interruption of petroleum supply would produce critical shortages in both commercial and military fuel supplies in the states of Nevada and Arizona as well as the Southern California area; and

WHEREAS, it is doubtful that there are sufficient alternate transportation resources to replace the pipeline system; therefore, liquid petroleum products would be in extremely short supply in Pheonix, Las Vegas, Yuma, El Centro, and surrounding areas in addition to the critical situation which could affect Norton Air Force Base, George Air Force Base, Edwards Air Force Base, and Nellis Air Force Base; and

WHEREAS, the rupture of the above-mentioned facilities and the sewer lines would severely affect the underground water from sewage and oil spills which will create a health problem and immeasurable cost of cleaning; and

WHEREAS, the U.S. Army Corps of Engineers is preparing an initial reconnaissance investigation and report on the Rialto Channel system whose objectives are to define the flood problems and identify potential solutions; and

WHEREAS, the U.S. Army corps of Engineers, if appropriate, will prepare an expanded Reconnaissance Study of different feasible alternatives to select the most likely recommendation for detailed engineering and design.

NOW, THEREFORE, BE IT RESOLVED by the San Bernardino County Flood Control District Board of Supervisors respectfully request the U.S. Army Corps of Engineers to carry this forward as a high priority project.

PASSED AND ADOPTED by the Board of Supervisors of the County of San Bernardino, State of California, by the following vote:

AYES: Joyner, Riordan, Townsend, Hammock, McElwain
NOES: None
ABSENT: McElwain

February 27, 1984 #40

• • • • • •

STATE OF CALIFORNIA
COUNTY OF SAN BERNARDINO } ss.

I, MARTHA M. SEKERAK, Clerk of the Board of Supervisors of San Bernardino County, California, hereby certify the foregoing to be a full, true and correct copy of the record of the action taken by said Board of Supervisors, by vote of the members present, as the same appears in the Official Minutes of said Board of its meeting of February 27, 1984

MARTHA M. SEKERAK
Clerk of said Board

By Esther Hockenbrough
Deputy

84-835-183 Rev. 7/83

MAR 5 - 1984

RESOLUTION NO. 2566

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIALTO, CALIFORNIA, FORMALLY SUPPORTING THE FUNDING OF INTERIM REPORT II PROJECTS BY THE CALIFORNIA WATER COMMISSION.

WHEREAS, the Rialto Channel system is the main outlet for accumulated drainage and flood flows within the City of Rialto; and

WHEREAS, the Rialto Channel system is of interim construction and inadequate to convey major flood flows; and

WHEREAS, the City of Rialto recently experienced severe flood damage to the Rialto Channel system particularly in the vicinity south of I-10 through the tank farm area; and

WHEREAS, the partially improved channel through the tank farm area eroded badly during the floods of 1983, thereby exposing and threatening several high pressure petroleum fuel and gas lines, undermined retaining walls, eroded the fill area adjacent to large petroleum tanks and ruptured the City's sewer main; and

WHEREAS, the City of Rialto is concerned a major disaster could occur during subsequent floods due to further erosion of the channel and ultimate rupture and failures of the previously threatened installation; and

WHEREAS, the California Water Commission will soon be reviewing an Agenda Item No. 14-A on the "Vote on Each Project", which is the "Santa Ana River and Orange County Interim Report II, Zanja, San Timoteo Creek, Wilson Creek, Rialto Channel and San Jacinto River" and adopting recommended projects for FY 1984-85;

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Rialto, that immediate action be strongly encouraged to this most critical project within the City of Rialto and do hereby formally

which includes the Rialto Channel system and respectfully request the California Water Commission carry this forward as a high priority project.

Gerald R Eaves

GERALD R. EAVES, Mayor

ATTEST:

Joseph H. Sampson

CITY CLERK

APPROVED AS TO FORM:

Robert G. Koch Jr.

ROBERT G. KOCH, Jr. City Attorney

STATE OF CALIFORNIA)
COUNTY OF SAN BERNARDINO) SS.
CITY OF RIALTO)

I, JOSEPH H. SAMPSON, City Clerk of the City of Rialto, DO HEREBY CERTIFY that the foregoing Resolution No. 2566 was duly passed and adopted at a regular meeting of the City Council of the City of Rialto held on the 20th day of September, 1983.

Upon Motion of Councilmember Holland seconded by Councilmember Curtis, the foregoing Resolution No. 2566 was duly passed and adopted. Vote on Motion:

AYES: Mayor Eaves; Councilmen: Curtis, Holland, Longville and Sawyer
NOES: None

ABSENT: None

IN WITNESS WHEREOF, I have hereunto set my hand and the Official Seal of the City of Rialto this 21st day of September, 1983.

Joseph H. Sampson

JOSEPH H. SAMPSON, City Clerk

**DEPARTMENT OF TRANSPORTATION/
FLOOD CONTROL/AIRPORTS**

COUNTY OF SAN BERNARDINO
ENVIRONMENTAL
PUBLIC WORKS AGENCY

East Third Street • San Bernardino, CA 92415-0835 • (714) 383- 1665

November 19, 1984

Col. Dennis F. Butler
Department of the Army
Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053-2325

Dear Col. Butler:

This is in regards to the Rialto Channel Study which the Corps of Engineers is currently preparing. The continuation of this study and proposed project is of major importance to the County of San Bernardino and the City of Rialto. Accordingly, the County of San Bernardino is committing its time and effort to demonstrate support of this important project. We are willing to share study costs in a manner that is agreeable to the Congress and Administration providing those funds are available.

I would very much appreciate your keeping me posted on the status of this important study as it progresses.

Yours very truly,

MICHAEL G. WALKER
Director

MGW:na

cc: Fala Powers
Supervisor Barbara Cram Riordan
J.E. Peddy
B.L. Ingram

SEPT 23, 1983

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2711
LOS ANGELES, CALIFORNIA 90053

REPLY TO
ATTENTION OF:

SPLPD-WB

SUBJECT: Initial Appraisal Report for Rialto Channel, California

Commander, South Pacific Division
ATTN: SPDPD-L

1. Reference

a. SPLPD-WB letter, dated September 23, 1983, subject: "Initiation of Reconnaissance Report, Rialto Channel, California."

b. Paragraph 4-5(c) and 4-7(a) of ER 1105-2-10 dated February 5, 1982.

2. Pursuant to the Small Flood Control Project Authority under Section 205 of the Flood Control Act of 1948 as amended, the Initial Appraisal study (formerly Reconnaissance Report) is now complete.

3. Inclosed are 5 copies of a Letter Report on the Initial Appraisal for Rialto Channel, California. There is Federal interest in a small flood control project in the study area. Alternatives have been developed that are economically justified, and the County of San Bernardino and the City of Rialto have adopted resolutions supporting the Initial Appraisal Investigations and have requested that the Corps carry this study forward as a high priority project. In addition, very strong support for this project has been expressed by Representative George E. Brown, Jr., U.S. House of Representatives.

4. It is recommended that the Corps of Engineers proceed to a Reconnaissance Investigation. The investigation can be completed in about 12 months at a cost of $80,000.

5. The Initial Appraisal is now complete. Reimbursement of District revolving fund account (cost key VW60180000) for this initial appraisal study is hereby requested. All changes to this fund are complete and the total balance to be reimbursed is $7,500.

5 Incl
Ltr rpt dtd 23 Sep 83

DENNIS F. BUTLER
COL, CE
Commanding

RECEIVED
JUL 25 1984
DIRECTOR OF
TRANSPORTATION

Copies Furnished:

SPLPD (2)
SPLED
SPLPD-W
SPLPD-WB
CDR

Charles L. Laird
Assistant Director
Flood Control District
Dept. of Transportation & Flood Control
County of San Bernardino
825 East Third St.
San Bernardino, CA 92415

Renato Renoa
City Engineer
City of Rialto
150 South Palm Ave.
Rialto, CA 92376

George Brown, Jr.
U.S. Congressman
36th District, Calif.
657 North La Cadena Dr.
Colton, CA 92324

SPLPD-WB

LETTER REPORT FOR COMBINED INITIAL APPRAISAL AND RECONNAISSANCE INVESTIGATION FOR RIALTO CHANNEL, CALIFORNIA

1. Introduction.

The storms of 28 February through 4 March 1983 and more recently during the third week of August 1983 caused flooding of areas downstream of I-10 along the Rialto Channel in the City of Rialto, San Bernardino County, California. Major areas of damage included: a major tank farm supplying refined petroleum products to southern California, Arizona, Nevada, and all refined products to four Air Force Bases in southern California; their pipelines crossing the Rialto Channel; a sewage treatment plant further downstream; and a pipeline to the treatment plant that crosses the Rialto Channel. The August 1983 floodflows were within a few inches of damaging the electrical gear and pumping system of the tank farm which would have shut down the tank farm distribution systems for an indefinite period of time. Potential damages in and outside the flood plain and to the water quality could be disastrous if the storage tanks and pipelines ruptured, sending millions of gallons of flammable petroleum products and sewage downstream to the Santa Ana River. The City of Rialto owns the Sewage Treatment Plant and Southern Pacific Pipe Line Company owns and leases the tank farm and pipelines to numerous distributing companies. Cal-Nevada Pipeline Company owns two pipelines that cross the Rialto Channel.

2. Study Area.

The study area, 3 miles west of the City of San Bernardino, and 50 miles east of Los Angeles, is part of the Santa Ana River Basin (see figs. 1 and 2). The City of Rialto, rapidly urbanizing, has increased in population from 32,000 in 1975 to 44,000 in 1983. The study area was a portion of the Lytle Creek alluvial cone until construction of protective levees on Lytle Creek in 1948. (See map, fig. 2). However, flows generated wholly on the cone are sufficient to cause flood damage, especially south of I-10. In response to a request from the San Bernardino County Flood Control District, the Corps studied the potential flood damage for the 24-square mile drainage area during 1969-1972. The feasibility of a concrete outlet channel extending 9 miles from above the I-10 Freeway to the Santa Ana River was examined. The benefit-cost ratio was inadequate to support a Corps project, and additionally, Corps participation depended on development of a proposed lateral storm drain system to collect street flows which was not apparent at that time. The County of San Bernardino and the City of Rialto have now requested the Corps to examine the lower Rialto Channel below I-10 and above Agua Mansa Road (lower end of a concrete trapezoidal channel). This study considers this reach only.

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

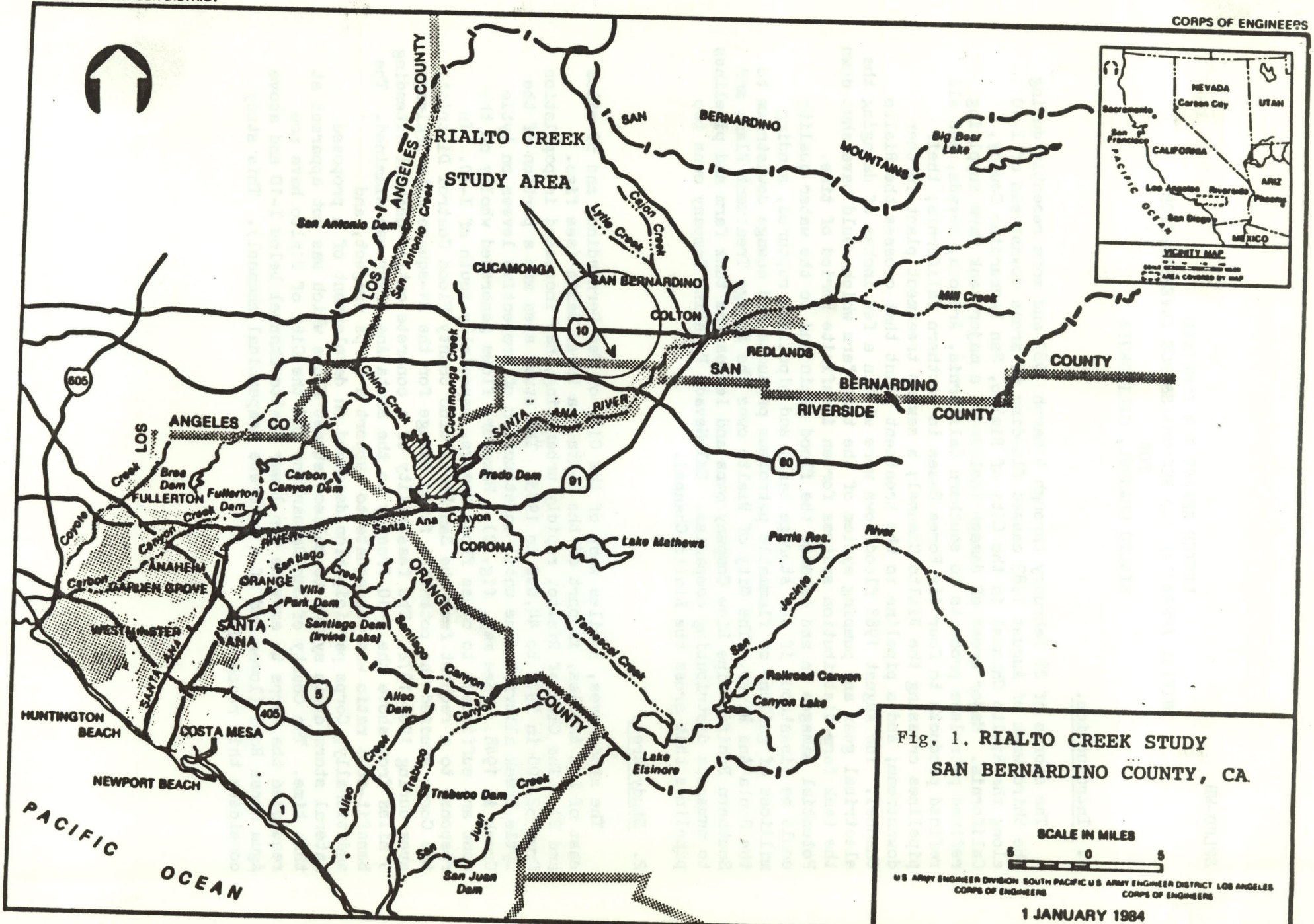


Fig. 1. RIALTO CREEK STUDY
SAN BERNARDINO COUNTY, CA

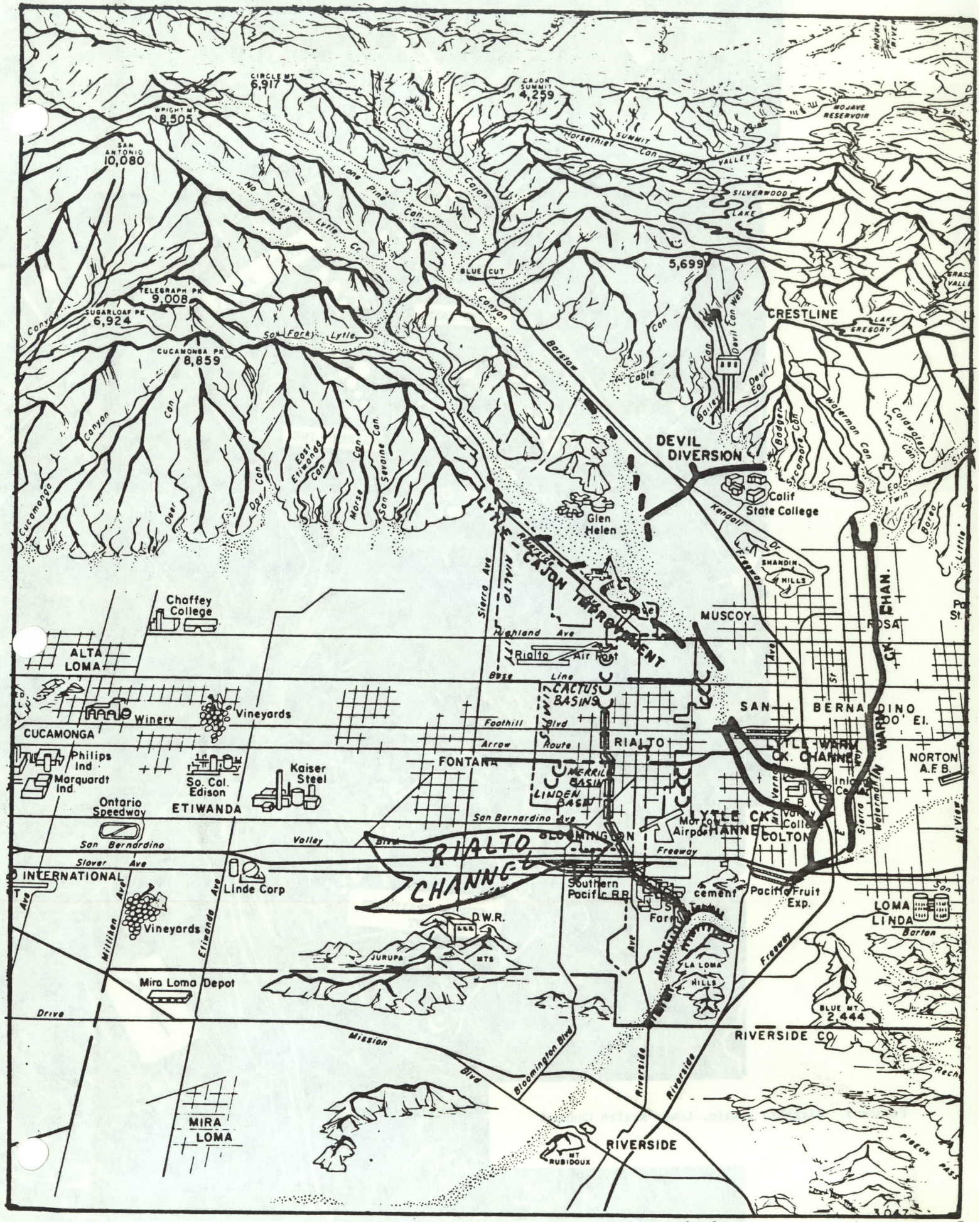


Figure 2. Rialto Channel Drainage Area

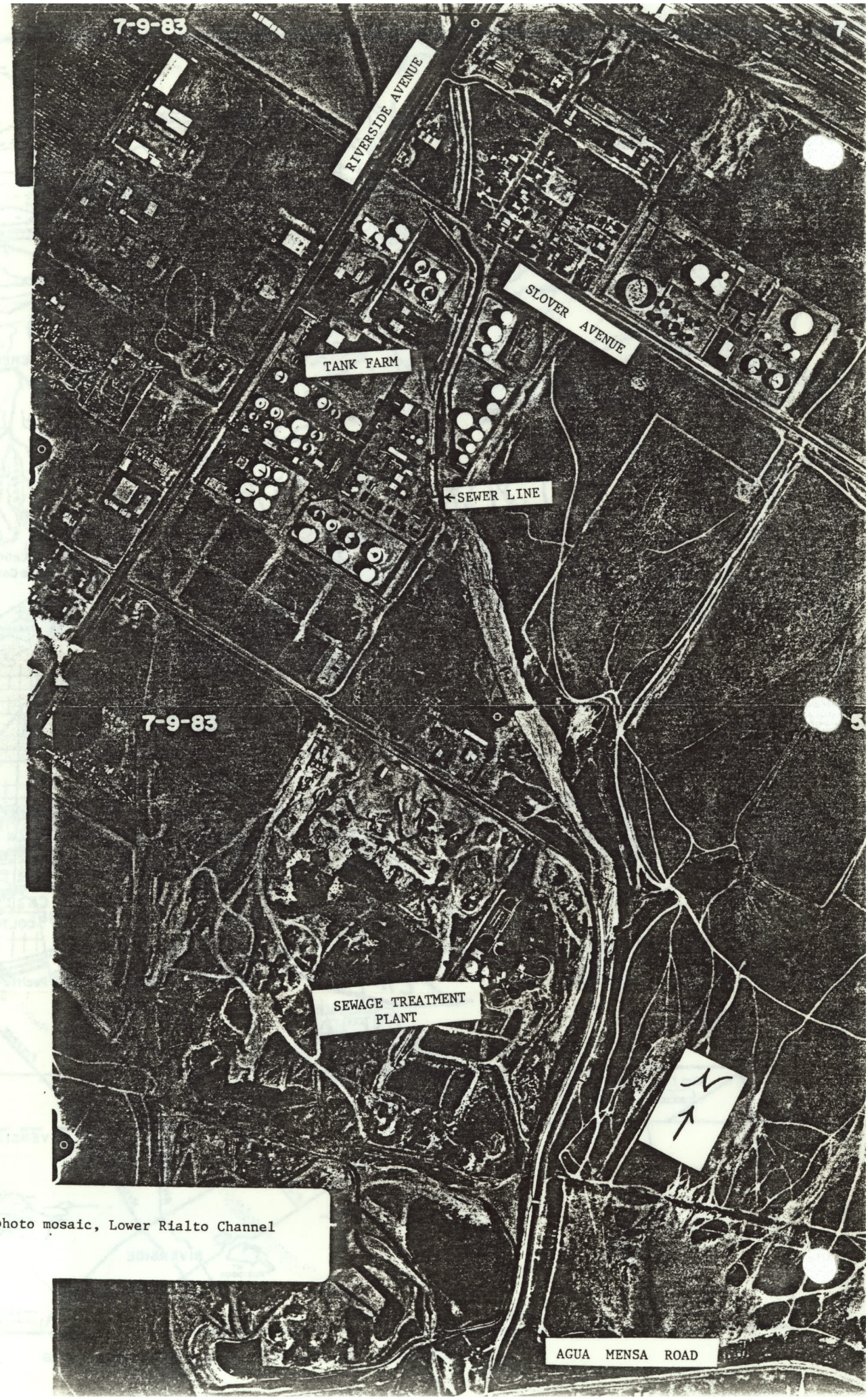


Figure 3. Airphoto mosaic, Lower Rialto Channel

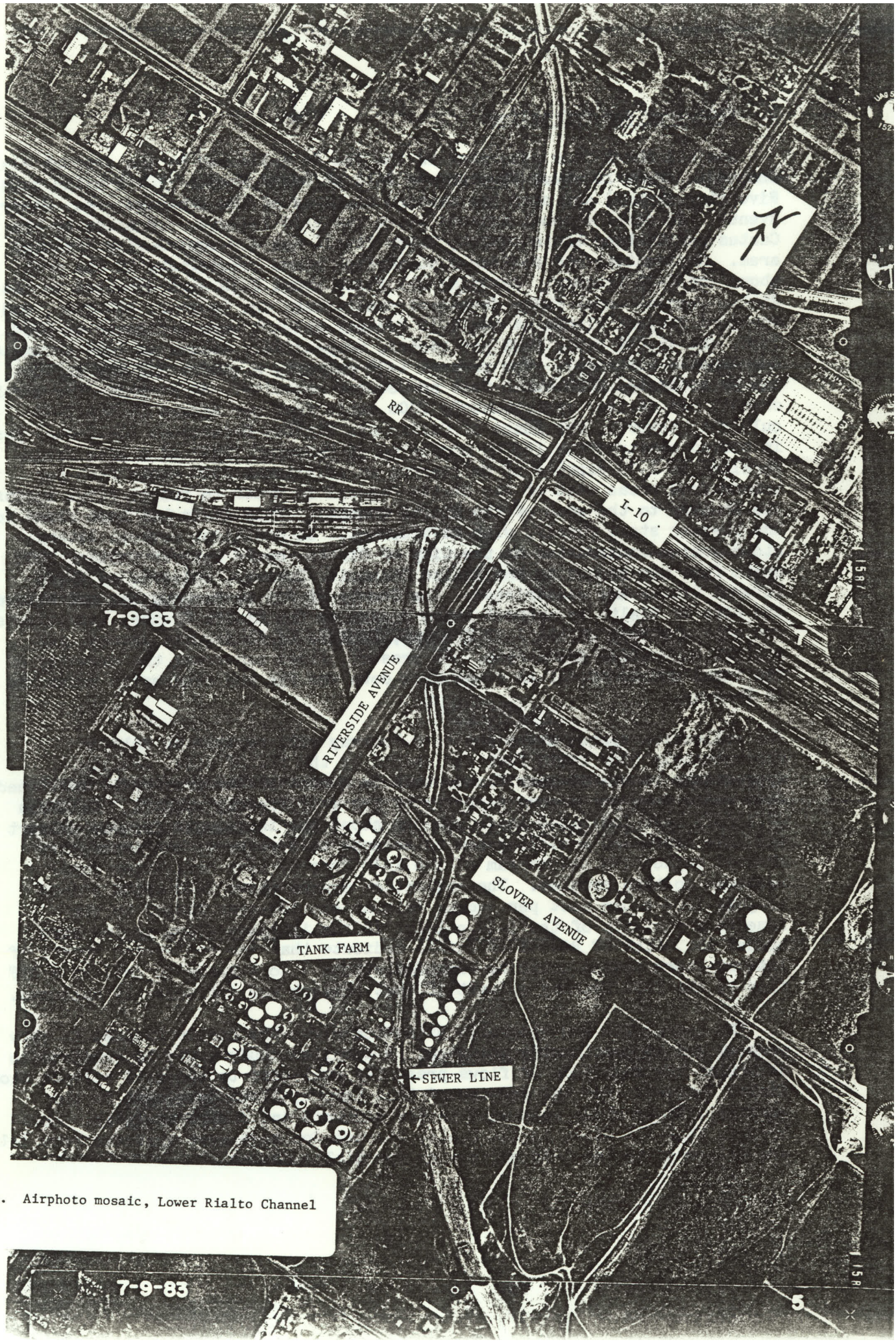


Figure 3(cont.). Airphoto mosaic, Lower Rialto Channel

3. Hydrology and Hydraulics.

Not all sheet flow generated on the fan is collected by the present Rialto Channel. There is sheet flow across I-10 at Cedar Avenue (1-1/2 miles west of Riverside Avenue) and near the western boundary of the drainage area, Sierra Avenue. An earth channel extends above the I-10 Freeway, 3.8 miles to the Cactus percolating basin outlet, which itself has a 9-square-mile drainage area. Residential and scattered commercial zones predominate in the area above the I-10 Freeway. Assuming all flows above I-10 were directed to the Rialto Channel under fully developed conditions, the 50-year, 100-year, and Standard Project Floods at the I-10 Freeway culvert were estimated at 5000, 7500, and 15,000 cubic feet per second, respectively (based on 1969 estimates, Los Angeles District). The present I-10 culvert, a quadra 5x7 box culvert, has an estimated 2000 cubic feet per second capacity. At present, the earth channel can deliver approximately 2000 cubic feet per second to the I-10 culvert. However, the State of California Highway Department (CalTrans) has initiated construction (to be completed in December 1984) of a side drain parallel to I-10 capable of delivering an additional 2900 cubic feet per second from areas west of the Rialto Channel in order to reduce flows across the Freeway to the west of the Rialto Channel. This drain has been sized for the 50-year storm runoff, with development. In addition, several lateral storm drains constructed by the City of Rialto, could deliver another 2000 cubic feet per second to the Rialto Channel. However, culverts on these lateral drains are constricted. The County of San Bernardino has not allowed the City of Rialto to connect these drains to the Rialto Channel approximately one mile upstream of the I-10 Freeway, because of inadequate channel and culvert capacities downstream. At present, flows exceeding the capacity of the local drains travel as sheet flow down the fan and eventually cross the I-10 Freeway.

The collection system above the I-10 Freeway will be able to deliver approximately 5000 cubic feet per second by the end of 1984, roughly approximate to the 50-year flood, well in excess of the previously mentioned 2000 cubic feet per second capacity of the I-10 Freeway culvert. CalTrans officials have indicated their concern about the inadequate freeway culvert and have expressed a willingness to enlarge this culvert, but inadequate channel capacities downstream of the I-10 Freeway have restricted their response to this problem. The collection system above I-10 could convey roughly 7000 cubic feet per second (almost the 100-year flood) to the immediate vicinity of the I-10 culvert if the in-place storm drains were opened up. City of Rialto officials indicate that the collection system of lateral storm drains would be expanded within 1 to 2 years to deliver a SPF flow to the I-10 Freeway culvert if that culvert was sufficiently enlarged.

The hydrologic and hydraulic situation along the Rialto Channel is very complex and is continually changing. A detailed study would be required to determine the magnitude of flows presently delivered to the I-10 culvert along Rialto Channel. For the purpose of this Report, flows developed in the earlier 1969-72 study were used in the economic and design analysis. This assumes that all flows in the Rialto Channel drainage area upstream from I-10 are delivered to the I-10 culvert at the Rialto Channel.

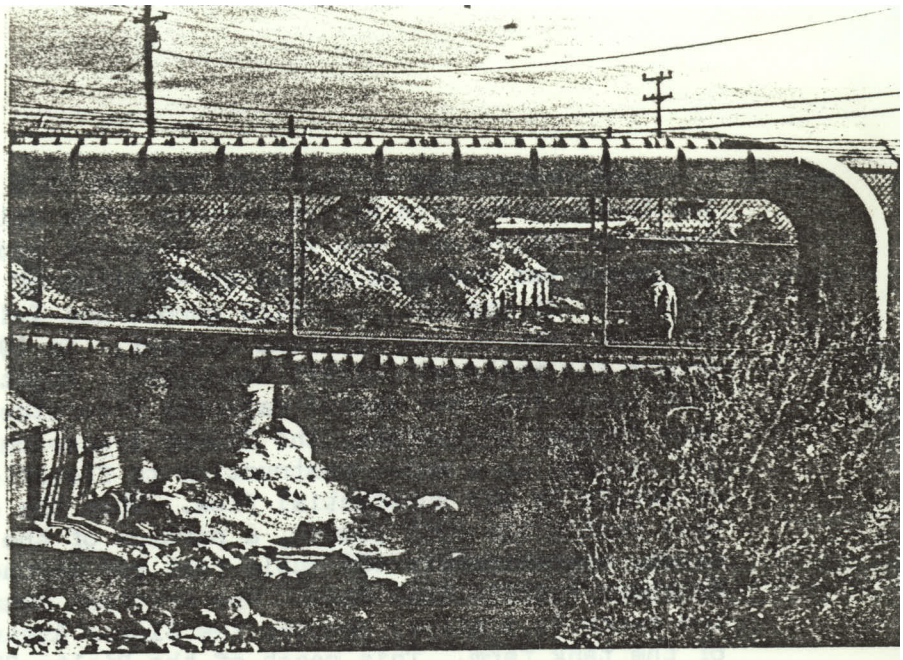


Photo 1.
Petroleum Pipe lines at Rialto Channel. Lines crossing in middle foreground (behind individual) have less than 4 ft clearance. (View downchannel)

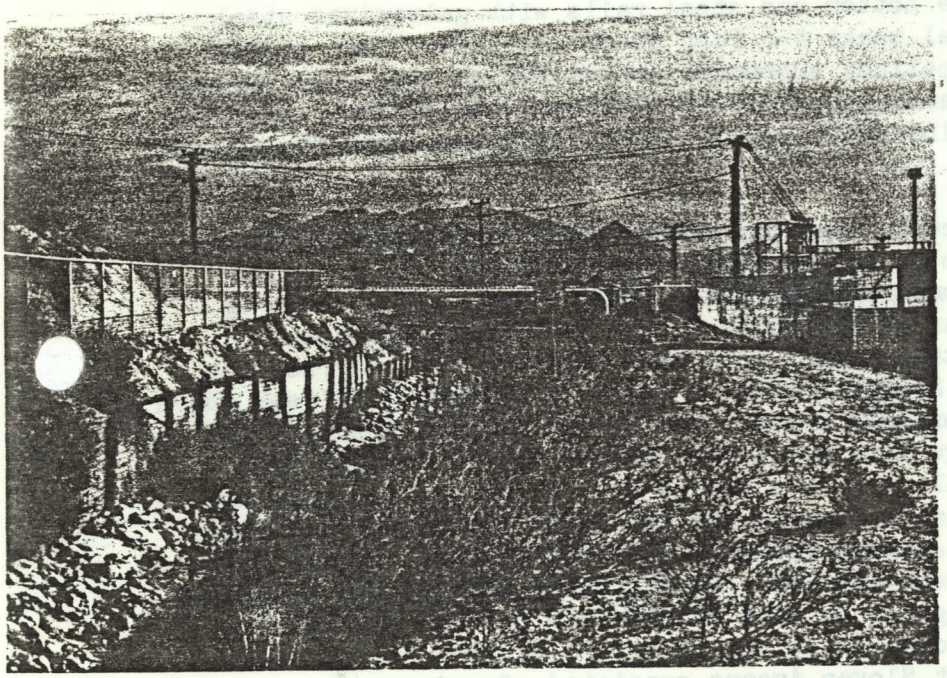


Photo 2.
Petroleum pipe lines & Tank farm (View downchannel)

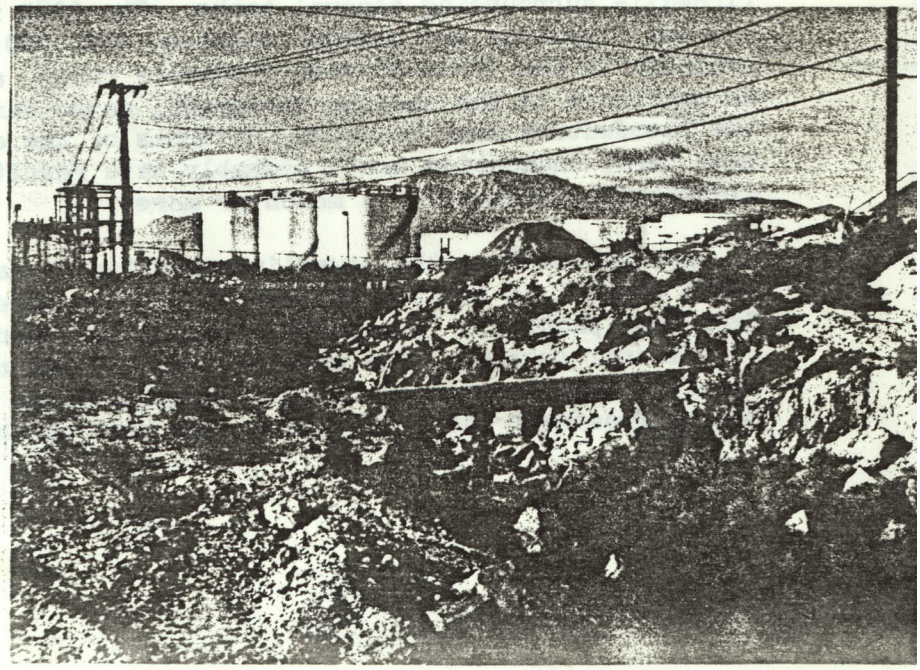


Photo 3.
View upstream at Sewage pipe line towards Tank farm.

Just downstream of the I-10 culvert is a twin 15 x 15 box culvert under the Southern Pacific Railroad yards. The culvert was sized for SPF flows based on preliminary Los Angeles District hydrology in 1972. The grade and alinement was designed on the expectation of a future enlargement of the I-10 culvert. At present, overflow across the I-10 Freeway is directed by a railroad berm to the railroad culvert. In 1983, such stormflows partially eroded the railroad culvert headwalls. Eight hundred feet downstream is the 7500 cubic feet per second capacity Riverside Avenue culvert. Eight hundred feet further downstream, the Slover Avenue culvert, capacity 700 cubic feet per second, is a major obstruction to floodflow. It is plugged with sediment or debris by any substantial flow. When the culvert is plugged-up, as was the case during the 1983 storms, a portion of the flow is directed to a diversion ditch, approximately 100 cubic feet per second capacity, that runs through the Southern Pacific tank farm. The critical damage area along Rialto Channel is the reach (0.3 miles) between the Slover Avenue culvert and the downstream end of the tank farm. This reach of the Rialto Channel is partially improved with grouted stabilizers along the bottom and steel rails with galvanized steel sheets stabilizing the channel banks 4-6 feet above the invert (see photos 1 and 2). Twenty-seven oil pipelines suspended across the channel, and ranging from 6-inch to 24-inch in diameter, mostly lie between 7 to 20 feet above the invert. However, some pipelines have only a 3-foot clearance from the invert (see photos 1 and 2).

At a flow of about 1000 cubic feet per second which would have an 8-year frequency, the pipes begin to be hit by high velocity flows. During such moderate flows, erosion and undermining of the walls occur, exacerbated by flows directed toward the rear of the walls by the previously-mentioned diversion ditch through the tank farm. A 24-inch pipeline that carries raw sewage to the City of Rialto Sewage Treatment Plant is suspended 10 feet above the invert at the lower end of this reach. During the January-February and August 1983 storms, the sewage line was either washed out or damaged four times. About 4.5 million gallons of raw sewage over a one and one-half day period was dumped into the Rialto Channel and the Santa Ana River, 1.3 miles downstream during one of the January-February 1983 floodflows. Repair costs (to shore up the sewerline) were $95,000. During these storms, the suspended oil pipelines were also endangered by bank erosion and partial undermining of the walls. Additional flood damages to the tank farm complex during these storms due to the diversion at Slover Avenue consisted of undermining of firewalls surrounding several tanks. The 1983 flood damages to the tank farm and the pipelines and channel totalled $127,000. The 1983 floods were probably in the 15 to 25-year frequency range, according to local officials. As mentioned in the opening paragraph, major damages were narrowly avoided as the floodwaters rose to within 2 inches of the electrical switchgear of the tank farm; inundation would probably have resulted in a total shutdown of the distribution system for a month or more.

Downstream from the sewerline crossing, a natural flat-bottom and wide earth channel is incised at least 5 feet or more. This reach extends 2300 feet (see photo 3). A concrete trapezoidal channel extends downstream from the natural channel. The concrete channel was designed and constructed by the County of San Bernardino to keep damaging flows away from the City of Rialto Sewege Treatment Plant located to the west of the concrete channel.

Additionally, a 500-foot long earth embankment was constructed upstream of the concrete channel along the west side of the natural channel to insure that damaging flows would not bypass the concrete channel. The plant is susceptible to flooding from floods greater than a 50-year flood. A maintained earth channel extends downstream 1500 feet from the culvert at Agua Mansa Road (downstream end of the concrete trapezoidal channel) to the Santa Ana River. The County of San Bernardino spends about $10,000 to $15,000 per year to clean debris from the 25-foot wide bottom by 6-foot deep channel. Floodflows frequently overflow into the adjacent agricultural lands from the less than 5000 cubic feet per second-capacity channel.

4. Flood Damages.

Past flood damages are not indicative of future flood damages. Constructions by the State of California Highway Department (CalTrans) and by the City of Rialto are modifying existing flow patterns to collect and deliver storm drainage to the Rialto Channel. As discussed under paragraph 3, future flood damages were based on theoretical hydraulic and economic determinations on the assumption that all flows would be delivered to the I-10 culvert. Flood damage estimates were developed after discussions with officials representing the companies owning the properties subject to flood damage along the considered reach of Rialto Channel.

Estimated flood depths were based on the 1972 preliminary Corps study. Damages incurred during the 1983 floods provided some data for moderate floodflows. Property susceptible to major flood damages include the I-10 Freeway, the tank farm, oil pipelines, the raw sewage pipeline, and the City of Rialto Sewage Treatment Plant. In addition to structural damages to these properties, damages would accrue to petroleum products in the tanks and pipelines, and would include costs of alternative transport of fuel during tank farm shutdown, and costs for petroleum cleanup in the Rialto Channel and Santa Ana River downstream. Frequencies of non-damaging flows vary for the different reaches and are listed in table 1. Estimated flood damages for the 50-year, 100-year, and Standard Project Flood for each of the above properties and types of damages are listed in table 1.

a. Flood damages to the I-10 Freeway include traffic disruption and highway repair. CalTrans engineers estimate that a partial washout of the Freeway during a 100-year flood and a total freeway closure for 3 days with an additional 7 days of traffic delay would result in damages totalling $1 million. Non-damaging flows for this reach are of approximately 15-year frequency.

b. Tank farm damages include damages to the storage tanks and firewalls and damages to the electrical gear and pumps. SPF and 100-year flood damages would total $5 and $4 million, respectively. Representatives of the Southern Pacific Pipe Lines (SPPL), owner of most of the tank farm, estimated at least 45 days would be needed to repair the damages. Tosco Corporation, which leases pipelines from SPPL, estimates their system might be out of service for 90 days. The tank farm and pipelines supply nearly all liquid petroleum products for Phoenix, Las Vegas, Yuma, El Centro and surrounding areas. In addition, these facilities provide George, Edwards, Nellis, and Norton Air

Force Bases with nearly all their supplies of refined products. Included in these supplies is nearly all jet fuel for Edwards Air Force Base, lack of which would cease their test program and result in millions of dollars loss per day. An official at Edwards indicated no practical supply alternative.

It is questionable whether there are sufficient alternative transporation resources to replace the pipeline system; therefore liquid petroleum products would be in extremely short supply in the above mentioned areas.

The El Paso area was mentioned as a possible alternative source of supply. However, officials at SPPL did not believe that such an approach would be practical, inasmuch as they believed that the Tucson area would absorb most of El Paso's refined products directed westerly. A likely response to fuel shortages for military and civilian use would be the use of trucks or railroad tank cars from the San Pedro refineries. Under this approach, the cost of moving fuels to their destinations was estimated at $12 million.

Table 1. Estimated Flood Damages From Single Floods.
(Millions of Dollars)

FEATURE	NON-DAMAGING FLOOD FREQUENCY, YRS.	50-YR.	100-YR.	SPF
I-10 Damages	15	0.5	1.0	1.0
Railroad Damages		ND	ND	ND
Misc. (Automated Fuel Fac.)	50	0	0.1	0.15
Tank Farm Plant Damage	8	2.0	4.0	5.0
Oil Pipeline Repair/Reloc.	8	0.68	1.01	1.01
Petroleum Product Loss	8	0.04	0.96	1.94
Petroleum Cleanup	8	0.4	9.6	16.6
Sewage Pipeline	8	0.15	0.15	0.15
Raw Sewage Spill		ND	ND	ND
Sewage Treatment Plant	50	0	3.0	7.0
		$3.8	$19.8	$32.9

ND = Not Determined

c. The City of Rialto Sewage Treatment Plant is not exposed to flooding from the adjacent trapezoidal concrete channel. However, inundation results from flows greater than 50-year frequency floods escaping from the channel above Slover Avenue. SPF flows with depths of 2 or more feet would inundate the plant causing approximately $7 million in damages, in excess of 50 percent of the plant's value. The Sewage Treatment Plant was recently expanded at a cost of $5-1/2 million to bring the total plant value to greater than $11 million. The plant is also susceptible to damages by bank erosion if the earth embankment upstream of the concrete trapezoidal channel should fail; the

embankment has no protective cover. Sedimentation along this reach upstream of the concrete trapezoidal channel could allow floodflows to breach the embankment resulting in severe bank erosion and damage to the plant. This possibility was not included in the estimation of damage potential.

d. Oil spills, as the result of rupture of the oil pipelines and tanks, would severely affect the groundwater supply. Cleanup of oil spills is costly. For example, cleanup to remove 80,000 gallons of percolating oil from a pipeline break in the Lytle Creek Channel in nearby Devore in 1983 cost $600,000 not including still ongoing monitoring and recovery costs. Calculation of cleanup costs for a Rialto Channel oil spill assumed a non-damaging 8-year flow, ruptures on 50 to 75 percent of the pipelines and a subsequent spill for 1/4 hour for all floods equal to or larger than the 50-year flood. Assumptions of a tank rupture (75 percent loss to the channel) for the 100-year flood and two tanks ruptured (75 percent loss) for the Standard Project Flood were included in the assessment of damages. Cleanup costs for ruptures during 100-year and Standard Project Floods could total $9.6 million and $16.6 million, respectively.

e. Rupture of the 18-inch raw sewage line would quite significantly affect the Santa Ana River reach downstream. Directly downstream is a body contact recreation area; polluted water would make the area unfit for human contact. Recreation facilities would have to be closed until samplings indicated a safe water quality. In additional, raw sewage would be detrimental to fish populations because of reduced oxygen. A representative of the State Regional Water Quality Board stated that a raw sewage spill into the Santa Ana River would be catastrophic, with the actual damages hard to quantify. Benefits from prevention of raw sewage spills were not quantified in this report.

Estimated total flood damages for the 50-year, 100-year, and Standard Project Floods would be nearly $4, $20, and $33 million, respectively. See table 1 for more detailed list of expected flood damages.

5. Alternatives.

Alternatives examined for Rialto Channel included 50-year, 100-year, and SPF concrete channels, and a combination of floodproofing and localized bank protection for the three levels of protection. Tables 2 and 3 are summaries of the alternatives examined. Costs for structural plans include the cost for a culvert under I-10; but not the costs for an inlet on the upchannel side of the culvert. Rectangular channels rather than trapezoidal channel are necessary for channelization alternatives because of limited right-of-way through the tank farm.

Channelization for SPF protection would include (see table 2):
(1) replacement of culvert under the I-10 Freeway; (2) enlarging the existing culvert under Riverside Avenue; (3) constructing a culvert at Slover Avenue; (4) enlarging the existing culvert at Agua Mansa Road;
(5) constructing concrete rectangular channels from the culvert at the Railroad to Riverside Avenue, from Riverside Avenue to Slover Avenue, and from Slover Avenue to the point at which the sewerline crosses the channel;

(6) grading and providing riprap slope protection from the sewerline to the existing trapezoidal channel; (7) improving the existing concrete trapezoidal channel above Agua Mansa Road by raising the channel walls to increase the channel capacity; and (8) raising the oil and sewer pipelines that cross the channel through tank farm.

Channelization for 100-year flood protection requires:
(1) replacement of the culvert under the I-10 Freeway; (2) constructing a culvert at Slover Avenue; (3) constructing a concrete rectangular channel from the Railroad culvert to the sewerline crossing; (4) grading and providing riprap slope protection from the sewerline to the existing trapezoidal channel; and (5) raising the pipelines that cross the channel. Channelization for 50-year flood protection is similar to the 100-year plan in terms of general improvements.

Table 2. Cost Estimates for Channel Alternatives.
(In Thousands of Dollars)

	50-YR.	100-YR.	SPF
Channel from railroad to Riverside Ave.	344	406	512
Channel from Riverside Ave. to Slover Ave.	344	406	512
Channel from Slover Ave. to sewerline	774	913	1152
Channel from sewerline to existing concrete channel	352	435	577
Concrete trapezoidal channel improvements	---	---	321
Freeway culvert	731	814	965
Riverside Ave. culvert	---	---	500
Slover Ave. culvert	95	122	172
Agua Mansa Rd. culvert	---	---	172
Pipe relocations	125	250	250
Clear and grub	10	15	15
Mobilize and demobilize	10	15	15
Subtotal	2785	3376	5163
Contingencies 15%	418	506	774
Engineering and Design	288	338	516
Lands, easements, and rights-of-ways	210	280	350
Total	3701	4500	6803
Say	3700	4500	6800
Operation and Maintenance	30	40	60

Several issues not analyzed within the preliminary scope of the Initial Appraisal and Reconnaissance Study will have to be addressed in the subsequent studies. The entire Rialto Channel is quite steep with very erodible channels. As such, sediment eroded from earth channels may cause channel damage and/or aggradation problems downstream in the improved channels. The above channel alternatives do not involve upstream channelization, and also

leave a portion of the lower Rialto Channel (below the sewerline) with an earth bottom. Degradation of this lower Rialto earth-bottom channel may also cause aggradation further down.

The cost for the SPF channel alternative is $6,800,000. The annualized charge at 8-3/8 percent including operation and maintenance charges, is $630,000.

The costs for the 100-year and 50-year channels are, $4,500,000 and $3,700,000 respectively. Annualized costs are $420,000 and $350,000, respectively.

Combinations of limited channelization and floodproofing were also examined as possible solutions to the flooding problems along the Rialto Channel. The required improvements would include:

(1) small compacted earthen levees (dikes) around vulnerable areas within the tank farm, to provide more substantial protection than some of the fire walls now in place, and to protect portions of the tank farm now completely exposed to moderate floodflows; (2) compacted earthen levees (dikes), with riprap, around vulnerable areas of the sewage treatment plant; (3) riprap slope protection upstream of the existing concrete trapezoidal channel to protect the sewage plant; (4) either protective supports for the sewerline crossing the channel or bank and invert stabilization; (5) construction of a culvert at Slover Avenue and channel realinement downstream of Slover Avenue; and (6) relocation of oil pipelines that cross the channel and bank and invert stabilization. These improvements are listed in table 3. The required improvements for the SPF and the 100-year flood would be similar, with the exception that for the 50-year flood, no protection for the sewage treatment plant appears to be required.

The combination structural/non-structural solution does not increase concentration of flows at the I-10 Freeway. Portions of existing channels downstream of the Freeway could not contain the increased flows if collected by a Freeway culvert. Thus Interstate 10 culvert costs are not included in this plan, and the combination structural/non-structural solution does not prevent flooding damages to the Freeway.

First costs for SPF, 100-year, and 50-year protection by these combinations of structural/ nonstructural measures are $1,890,000, $1,670,000 and $1,240,000, respectively. Average annual charges which include maintenance and operation costs, are estimated at $180,000, $150,000, and $120,000, respectively.

A "no action" alternative would leave the Rialto Channel and Santa Ana River still susceptible to catastrophic environmental impacts of oil and sewage spills as a result of rupture or undermining of the pipelines, storage tanks and sewage treatment plant. Flood damage to the oil pipelines and tank farm facilities could result in interruption of petroleum supplies, producing fuel shortages both commercial and military.

Table 3. Cost Estimates for Non-Structural/Channelization Alternative.
(In Thousands of Dollars)

	50-YR.	100-YR.	SPF
Channel realinement at Slover	100	100	100
Concrete slope protection for sewer and pipeline	215	253	320
Riprap protection upstream of concrete channel	60	60	60
Flood proofing oil tanks	140	156	160
Protective Dike around treatment plant and riprap protection	---	195	195
Pipeline relocations	250	250	250
Culvert at Slover	95	122	173
Clean and grub	10	15	15
Mobilize and demobilize	10	15	15
Subtotal	880	1166	1288
Contingencies 15%	132	175	193
Engineering and Design	88	117	129
Lands, easements, and rights-of-way	140	210	280
Total	1240	1668	1890
Say	1240	1670	1890
Operation and Maintenance	10	10	20

6. Economic Evaluation.

Annual benefits for specific degrees of protection for the structural alternatives are shown in tables 4 and 5. The benefit-cost ratios for the SPF, 100-year, and 50-year channel alternatives are 1.08, 1.0, 0.99 and 0.5 to 1, respectively, while B:C ratios for SPF, 100-year, and 50-year nonstructural/channelization alternatives are 3.6, 2.6, and 1.3 to 1, respectively.

Table 4. Annual Benefits.
(In Thousands of Dollars)

FEATURE	Level of Protection 50-YR	100-YR	SPF
I-10 Damages	13	30	37
Railroad Damages	ND	ND	ND
Misc (Automated Fuel. Fac.)	---	0.5	1
Tank Farm Plant Damage	57	87	118
Oil Pipeline Repair/Reloc.	35	44	51
Additional Transport Losses	30	150	234
Petroleum Product Loss	2	7	17
Petroleum Cleanup	21	71	163
Sewage Pipeline	9	10	11
Raw Sewage Spill	ND	ND	ND
Sewage Treatment Plant	---	15	50
	$166	$414	$683

ND = Not Determined

Table 5. ALTERNATIVE COST & BENEFITS ANALYSIS.

(In Thousands of Dollars)

	SPF ALTERNATIVE		100-YEAR ALTERNATIVE		50-YEAR ALTERNATIVE	
	Channelization	Non-Structural/ Channelization	Channelization	Non-Structural/ Channelization	Channelization	Non-Structural/ Channelization
Total First Cost	~~6,800~~ 7,6	~~1,890~~ 2,3	~~4,500~~ 4,9	~~1,670~~ 2,1	3,700 4,000	1,240
Annual Construction Cost at 8-3/8 percent	570	160	380	140	320	110
Annual Operations and Maintenance	60	20	40	10	30	10
Total Annual Cost at 8-3/8	630	180	420	150	350	120
Total Annual Benefits	683	644	414	384	166	154
Benefit/Cost Ratio	1.08	3.6	0.99	2.6	0.5	1.3
Net Annual Benefit	53	464	----	234	----	34

7. Plan Evaluation.

Of the plans investigated, the channelization plans providing SPF and 100-year flood level of protection appear to have marginal justification. The combination floodproofing/channelization plans for 50-year, 100-year, and SPF levels of protection have substantial justification. The cost for the SPF channelization plan is $6.8 million. The SPF combination floodproofing/ channelization plan appear to have maximum economic justification. Net annual benefits total $464 thousand and the B:C ratio is 3.6. These estimates are of a reconnaissance grade and require more detailed analysis.

Several issues will have to be resolved at the Detailed Project Study stage. Included among these problems are:

-Definition and evaluation of the potential sedimentation problem along the relatively steep reaches of Rialto Channel and the impact of this problem along the considered reach of stream.

-A complete hydrologic and hydraulic analysis of the alluvial cone. This appraisal is based on 1972 hydrologic and overflow estimates by the Los Angeles District. The city is rapidly urbanizing and drainage patterns have been substantially altered since 1972. The cost of the required hydologic study will be reduced by County efforts. The County of San Bernardino is presently contracting an A & E firm to update present hydrology and hydraulic features of the study area; Corps personnel are advising the County as to Corps requirements and needs for this study in order to reduce and eliminate duplicative efforts on the part of the Corps.

-The actual impacts to the military, i.e., the Air Force bases, of reduced/short-term elimination of fuel supplies. The vulnerability of the tank farm/supply lines is potentially a National Defense concern. The Detailed Project Study will need to address military involvement and alternatives.

No major environmental problems are foreseen from the construction of the proposed projects based on information developed. However, a NEPA document will probably be required since the project could affect ecological resources. During cursory inspections of the channel banks no prehistoric or cultural resources were found, but there is a high probability that buried sites exist.

Test excavation may be necessary if the records search indicates that a site may be present. The entire length of the project area is highly disturbed, having relatively low esthetic and wildlife habitat quality. Informal consultation with the U.S. Fish and Wildlife Service has revealed that no Federally listed threatened or endangered species are known to occur in the project area; however a Category 1 candidate plant species may occur within the project-affected areas. Due to the absence of riparian species along the banks, the relatively low esthetic and wildlife habitat quality values, and the overall high degree of disturbance of the project area, impacts resulting from channel improvements should be easily mitigated, unless cultural resources, or threatened or endangered species are found. An Environmental Reconnaissance Report is included in this Report (Appendix A).

8. Local Cooperation

San Bernardino County and the City of Rialto have indicated their support for a Section 205 Program. The San Bernardino County Board of Supervisors and the City Council of Rialto have adopted Resolutions (see appendix B) supporting the initial appraisal investigation and has requested that the Corps carry this study forward as a high priority project. The San Bernardino County Flood Control District has indicated their willingness to share study costs if requested (see Appendix C).

9. Cost Estimates for a Detailed Project Report.

The cost estimate for a Detailed Project Report is $370,000 as follows:

ITEM	COSTS
Survey	$10,000
Hydrology Studies	11,000*
Hydraulic Studies	62,000
Economic Evaluation	13,000
Environmental Studies	19,000
Non-structural Studies	10,000
Geology	12,000
Soils Design and Estimating	30,000
Foundation and Materials	44,000
Real Estate	10,000
Recreation	5,000
Design	54,000
Study Management	90,000
TOTALS	$370,000

*Hydrology's cost estimate is based upon coordination with the County of San Bernardino's contracting of an A & E hydrologic study (refer to page 10, issues to be resolved). If the A & E study is insufficient, the Hydrology Section's cost will be substantially more.

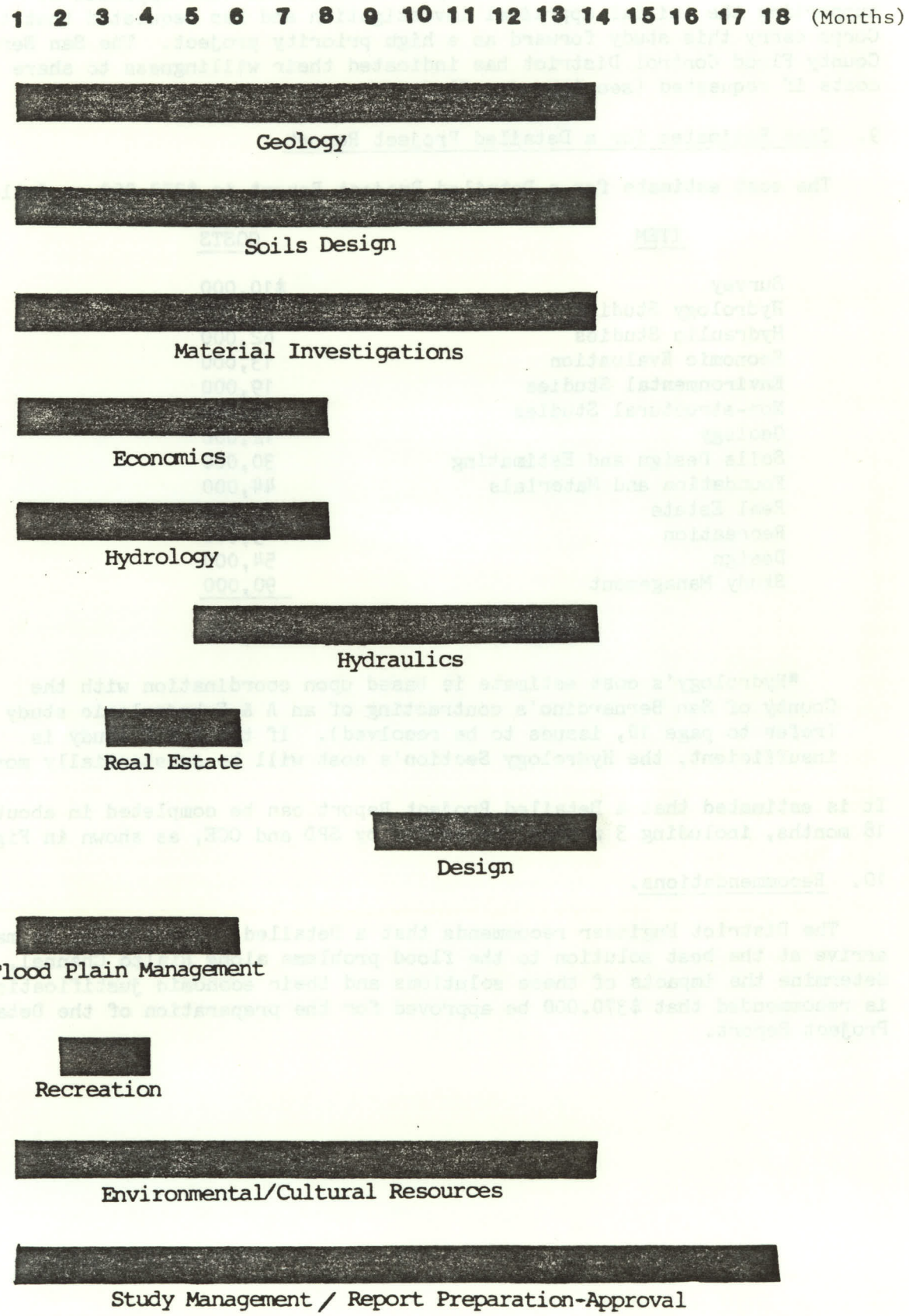
It is estimated that a Detailed Project Report can be completed in about 18 months, including 3 months for review by SPD and OCE, as shown in Figure 4.

10. Recommendations.

The District Engineer recommends that a Detailed Project Study be made to arrive at the best solution to the flood problems along Rialto Channel, and to determine the impacts of these solutions and their economic justification. It is recommended that $370,000 be approved for the preparation of the Detailed Project Report.

Figure 4

RIALTO CHANNEL, CA



APPENDIX A

Reconnaissance Report

For

The Proposed Rialto Channel Improvement

City of Rialto, San Bernardino County, California

January 1984

Existing Environment. The proposed project is located along Rialto Channel in the city of Rialto in San Bernardino County, California. The project area extends from Interstate Highway 10 (I-10) just west of Riverside Avenue downstream about 2 miles to the Santa Ana River (see fig. 1). A 2,000 cfs culvert lies beneath I-10 and feeds into a twin box 15,000 cfs culvert just downstream near the Southern Pacific Railroad yard. The entire project area along the channel is highly disturbed. The upper reach of the channel (about 1.4 miles) is earth bottom, primarily gravel and large cobbles and boulders, with a grouted stone step approximately every 75 feet. Rail and wire fencing extends along both banks of the channel for stabilization. The channel in this upstream reach averages about 25 feet wide with side slopes of about 40 degrees. On the western side of the rail and wire fencing lies an approximately 8 foot wide dirt road beyond which several Southern Pacific pipeline storage tanks are situated. Several oil pipelines averaging approximately 20 in. in diameter are suspended across the channel to the tank farm. Many of the pipelines lie between 7-20 feet above the bottom of the channel; however, some pipelines allow only about 3 feet of clearance from the riverbed. A pipeline which carries sewage to a sewage treatment plant situated just west of the channel downstream is also suspended across the channel about 10 feet above the riverbed. The lower reach of the project area (about 0.6 miles) between Santa Ana Avenue downstream to Agua Mansa Road is a 7,500 cfs concrete trapezoidal channel about 11 feet deep with a top width of about 40 feet. The land use in the adjacent flood plain, aside from the oil tank farm and sewage treatment plant, is low-density residential.

Biological Resources. The entire length of the project area is highly disturbed, having relatively low esthetic and wildlife habitat quality values. Vegetation along the banks is dominated by a moderately dense stand of tumbleweeds (i.e. Russian thistle), and various grasses. A few composite species; (Perizia microcephala), (Conyza sp.), and a sunflower species, as well as horehound (Marrubium vulgare), and buckwheat (Eriogonum spp.) also occur in the project area but they have an extremely sparse distribution along the channel banks. No riparian species (e.g. mulefat, willow, etc.) or wildlife activity was observed during the 5 January 1984 field visit by the environmental coordinator; however, the vegetation along the banks provides forage for passerines, and possibly raptors. Informal consultation with the U.S. Fish and Wildlife Service (FWS) has revealed that no Federally listed threatened or endangered species are known to occur in the project area; however, a Category 1 candidate plant species, the slender-horned spineflower (Centrostegia leptoceras) may occur within project-affected areas. This annual is threatened by sand and gravel operations and it is anticipated that a listing package for the species will be completed within the next couple of years. (Category 1 consists of those species for which the FWS has enough

information to support proposing to list the species as Endangered or Threatened, and for which other data is currently being gathered. Candidate species are not protected under the Endangered Species Act; however, it is possible that the candidate species could become a formal proposal and be listed during the construction stage.) A formal list of Federal and State listed threatened and endangered species has been requested from the FWS Endangered Species Office in Sacramento.

Cultural Resources. A cursory inspection of the channel banks during the 5 January 1984 field visit by a staff archeologist revealed no prehistoric or historic cultural resources. The ground surface is quite disturbed in this area; however there is a high probability for buried sites. A cultural resources literature search is currently underway at the Regional Clearinghouse.

The area subjected to project impacts should be thoroughly inspected at the time project boundaries are defined, and before construction activities are planned. If the records search indicates that a site may be present, test excavations to determine the condition and significance of the site may be necessary. These test excavations should be conducted by a qualified archeologist.

Environmental Impacts and the Potential for Mitigation.

The proposed project consists of several potential alternatives for channel improvement. Alternatives which propose either a rectangular concrete channel or widening of the existing channel would eliminate a large portion of the little vegetation that occurs along the banks, assuming a right-of-way of about 15-20 feet. Existing access roads to the channel precludes disturbance of additional biological resources in the area should the project be implemented. Due to the absence of riparian species along the banks, relatively low esthetic and wildlife habitat quality values, and the overall high degree of disturbance the project area has incurred, impacts resulting from channel improvements should be easily mitigated, providing neither cultural resources, the slender-horned spineflower, nor any threatened or endnagered species are present. Studies on groundwater recharge within the project area would be necessary to determine whether a concrete channel would significantly affect groundwater recharge in the project area and downstream reaches.

The overall environmental impacts which would result from alternatives that include raising the oil and sewage pipelines to higher elevations, in combination with non-structural flood control measures (e.g. levees) would be beneficial in the long-term. Should a no-action alternative be selected, the largest potentially adverse environmental impact would be the rupture or undermining of the pipelines, discharging oil and/or untreated wastes into Rialto Channel which would then be carried downstream to the Santa Ana River. (In 1983, the sewage pipeline was undermined by flows and ruptured, releasing untreated sewage downstream.) Extreme care in bypassing the oil and sewage from the present pipelines while installing pipelines at a higher elevation would need to be taken and would require coordination with Environmental Resources Branch and pertinent agencies.

Rialto Channel

USGS: Rialto
San Bernardino County
1972

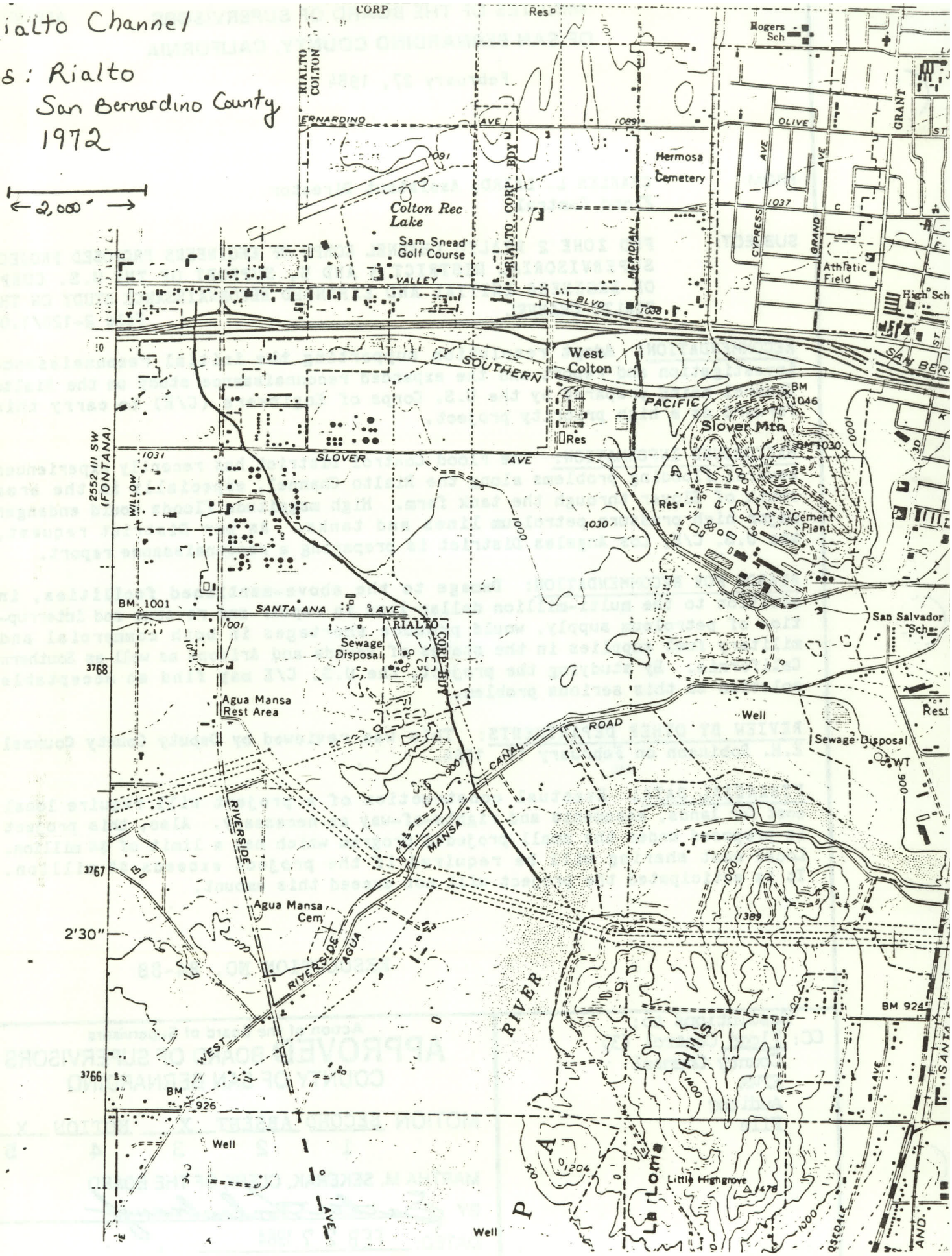


Fig. 1

MINUTES OF THE BOARD OF SUPERVISORS OF SAN BERNARDINO COUNTY, CALIFORNIA

February 27, 1984

FROM: CHARLES L. LAIRD, Assistant Director
Flood Control

SUBJECT: FCD ZONE 2 RIALTO CHANNEL CORPS OF ENGINEERS PROPOSED PROJECT SUPERVISORIAL DISTRICT 3 AND 5, SUPPORT OF THE U.S. CORPS OF ENGINEER INITIAL AND EXPANDED RECONNAISSANCE STUDY ON THE RIALTO CHANNEL
File 2-120/1.00

RECOMMENDATION: Adopt resolution supporting the initial reconnaissance investigation and report and the expanded reconnaissance study on the Rialto Channel being prepared by the U.S. Corps of Engineers (C/E) to carry this forward as a high priority project.

BACKGROUND INFORMATION: The Flood Control District has recently experienced several flooding problems along the Rialto Channel, especially in the area south of Slover through the tank farm. High magnitude floods could endanger major high pressure petroleum lines and tanks. As per District request, the U.S. C/E, Los Angeles District is preparing a reconnaissance report.

REASON FOR RECOMMENDATION: Damage to the above-mentioned facilities, in addition to the multi-million dollar loss in repair and revenue and interruption of petroleum supply, would produce shortages in both commercial and military fuel supplies in the states of Nevada and Arizona as well as Southern California. By studying the project, the U.S. C/E may find an acceptable solution to this serious problem.

REVIEW BY OTHER DEPARTMENTS: This was reviewed by Deputy County Counsel E.H. Robinson on February 17, 1984.

FINANCIAL DATA: Eventual construction of a project will require local cost for lands, easements and rights-of-way as necessary. Also, this project is proposed under the small projects program which has a limit of $4 million. Local cost sharing will be required if the project exceeds $4 million. It is anticipated the project will not exceed this amount.

RESOLUTION NO. 84-88

Resolutions to:
CC: Flood Control (3)
County Counsel
EPWA
Auditor
File

Action of the Board of Supervisors
APPROVED BOARD OF SUPERVISORS
COUNTY OF SAN BERNARDINO

MOTION SECOND ABSENT X MOTION X
1 2 3 4 5

MARTHA M. SEKERAK, CLERK OF THE BOARD
BY Esther Rockenbaugh
DATED: FEB 27 1984

ITEM 40

14-9507-000
Rev. 10/81

RESOLUTION NO. 84-88

INDICATING DISTRICT'S SUPPORT OF THE INITIAL RECONNAISSANCE REPORT AND THE EXPANDED RECONNAISSANCE STUDY ON THE RIALTO CHANNEL BEING PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS

On motion by Supervisor Townsend, seconded by Supervisor Joyner and carried, the Board of Supervisors adopts the following resolution:

WHEREAS, the partially improved channel through the tank farm area was badly eroded during the floods of 1983 thereby exposing and threatening several high pressure petroleum fuel and gas lines, undermined retaining walls, eroded the fill area adjacent to the large petroleum tanks and ruptured the city's sewer main; and

WHEREAS, the Flood Control District has recently experienced several flooding problems along the Rialto Channel, especially in the area south of Slover through the tank farm; and

WHEREAS, several major facilities belonging to Southern Pacific Pipeline, Calnev Pipeline, Tosco, Chevron, Arco Petroleum, Shell Oil Corporation, Texaco, Mobil Oil, Union, and other companies could be endangered by high magnitude floods overtopping and/or undermining the existing channel; and

WHEREAS, damages to the above-mentioned facilities, in addition to the multi-million dollar loss in repair and revenues, interruption of petroleum supply would produce critical shortages in both commercial and military fuel supplies in the states of Nevada and Arizona as well as the Southern California area; and

WHEREAS, it is doubtful that there are sufficient alternate transportation resources to replace the pipeline system; therefore, liquid petroleum products would be in extremely short supply in Pheonix, Las Vegas, Yuma, El Centro, and surrounding areas in addition to the critical situation which could affect Norton Air Force Base, George Air Force Base, Edwards Air Force Base, and Nellis Air Force Base; and

WHEREAS, the rupture of the above-mentioned facilities and the sewer lines would severely affect the underground water from sewage and oil spills which will create a health problem and immeasurable cost of cleaning; and

WHEREAS, the U.S. Army Corps of Engineers is preparing an initial reconnaissance investigation and report on the Rialto Channel system whose objectives are to define the flood problems and identify potential solutions; and

WHEREAS, the U.S. Army corps of Engineers, if appropriate, will prepare an expanded Reconnaissance Study of different feasible alternatives to select the most likely recommendation for detailed engineering and design.

NOW, THEREFORE, BE IT RESOLVED by the San Bernardino County Flood Control District Board of Supervisors respectfully request the U.S. Army Corps of Engineers to carry this forward as a high priority project.

PASSED AND ADOPTED by the Board of Supervisors of the County of San Bernardino, State of California, by the following vote:

AYES: Joyner, Riordan, Townsend, Hammock, McElwain
NOES: None
ABSENT: McElwain

February 27, 1984 #40

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STATE OF CALIFORNIA
COUNTY OF SAN BERNARDINO } ss.

I, MARTHA M. SEKERAK, Clerk of the Board of Supervisors of San Bernardino County, California, hereby certify the foregoing to be a full, true and correct copy of the record of the action taken by said Board of Supervisors, by vote of the members present, as the same appears in the Official Minutes of said Board of its meeting of February 27, 1984

MARTHA M. SEKERAK
Clerk of said Board

By Esther Hockenbrough
Deputy

14-635-103 Rev. 7/83

MAR 5 - 1984

RESOLUTION NO. 2566

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF RIALTO, CALIFORNIA, FORMALLY SUPPORTING THE FUNDING OF INTERIM REPORT II PROJECTS BY THE CALIFORNIA WATER COMMISSION.

WHEREAS, the Rialto Channel system is the main outlet for accumulated drainage and flood flows within the City of Rialto; and

WHEREAS, the Rialto Channel system is of interim construction and inadequate to convey major flood flows; and

WHEREAS, the City of Rialto recently experienced severe flood damage to the Rialto Channel system particularly in the vicinity south of I-10 through the tank farm area; and

WHEREAS, the partially improved channel through the tank farm area eroded badly during the floods of 1983, thereby exposing and threatening several high pressure petroleum fuel and gas lines, undermined retaining walls, eroded the fill area adjacent to large petroleum tanks and ruptured the City's sewer main; and

WHEREAS, the City of Rialto is concerned a major disaster could occur during subsequent floods due to further erosion of the channel and ultimate rupture and failures of the previously threatened installation; and

WHEREAS, the California Water Commission will soon be reviewing an Agenda Item No. 14-A on the "Vote on Each Project", which is the "Santa Ana River and Orange County Interim Report II, Zanja, San Timoteo Creek, Wilson Creek, Rialto Channel and San Jacinto River" and adopting recommended projects for FY 1984-85;

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Rialto, that immediate action be strongly encouraged to this most critical project within the City of Rialto and do hereby formally support funding of the aforementioned, Interim Report II Projects,

which includes the Rialto Channel system and respectfully request the California Water Commission carry this forward as a high priority project.

Gerald R Eaves

GERALD R. EAVES, Mayor

ATTEST:

Joseph H. Sampson

CITY CLERK

APPROVED AS TO FORM:

Robert G. Koch Jr.

ROBERT G. KOCH, Jr. City Attorney

STATE OF CALIFORNIA)
COUNTY OF SAN BERNARDINO) SS.
CITY OF RIALTO)

I, JOSEPH H. SAMPSON, City Clerk of the City of Rialto, DO HEREBY CERTIFY that the foregoing Resolution No. 2566 was duly passed and adopted at a regular meeting of the City Council of the City of Rialto held on the 20th day of September, 1983.

Upon Motion of Councilmember Holland seconded by Councilmember Curtis, the foregoing Resolution No. 2566 was duly passed and adopted. Vote on Motion:

AYES: Mayor Eaves; Councilmen: Curtis, Holland, Longville and Sawyer
NOES: None

ABSENT: None

IN WITNESS WHEREOF, I have hereunto set my hand and the Official Seal of the City of Rialto this 21st day of September, 1983.

Joseph H. Sampson

JOSEPH H. SAMPSON, City Clerk

**DEPARTMENT OF TRANSPORTATION/
FLOOD CONTROL/AIRPORTS**

COUNTY OF SAN BERNARDINO
ENVIRONMENTAL
PUBLIC WORKS AGENCY

825 East Third Street • San Bernardino, CA 92415-0835 • (714) 383- 1665

November 19, 1984

Col. Dennis F. Butler
Department of the Army
Corps of Engineers
P.O. Box 2711
Los Angeles, CA 90053-2325

Dear Col. Butler:

This is in regards to the Rialto Channel Study which the Corps of Engineers is currently preparing. The continuation of this study and proposed project is of major importance to the County of San Bernardino and the City of Rialto. Accordingly, the County of San Bernardino is committing its time and effort to demonstrate support of this important project. We are willing to share study costs in a manner that is agreeable to the Congress and Administration providing those funds are available.

I would very much appreciate your keeping me posted on the status of this important study as it progresses.

Yours very truly,

MICHAEL G. WALKER
Director

MGW:na

cc: Fala Powers
Supervisor Barbara Cram Riordan
J.E. Peddy
B.L. Ingram