

**RIVERSIDE COUNTY FLOOD CONTROL AND
WATER CONSERVATION DISTRICT
RIVERSIDE, CALIFORNIA**

**MASTER DRAINAGE PLAN
FOR THE
MURRIETA CREEK AREA**

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MAR. 1986

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Purpose

This master drainage plan is an engineering study, the purpose of which is to investigate and evaluate the drainage needs within the Murrieta Creek area, and to propose an economical drainage plan which provides flood protection for both existing and future development.

Five watershed subdivisions: the Wildomar Valley, Murrieta Valley, Warm Springs Valley, Santa Gertrudis Valley and the Temecula Valley, comprise the Murrieta Creek watershed. The Wildomar watershed area was addressed by the Wildomar Master Drainage Plan approved by the Riverside County Flood Control and Water Conservation District's Board of Supervisors in August 1980. The Wildomar area is not addressed by this master plan beyond acceptance of flows tributary to Murrieta Creek from the 10 square mile subarea. The former drainage study for Wildomar and its conclusions, are to remain in effect in conjunction with the establishment of the Master Drainage Plan for the Murrieta Creek area.

The overall Murrieta master plan watershed is generally described as being bounded by the eastern-most slopes of the Santa Rosa Mountains on the west, by the Santa Margarita/Santa Ana watershed drainage divide on the north, by Sage Road and Red Mountain on the east, and on the south by the drainage divide between the Temecula Creek and Murrieta Creek watersheds. Contained within this boundary are the unincorporated communities of Murrieta, Murrieta Hot Springs, Sage, Temecula, and portions of the expansive Rancho California development.

When implemented, the plan presented herein will provide the major flood control facilities required to relieve the area of its most serious flooding problems. The benefits of these master plan facilities include the removal of flood plain status from a large land area along Murrieta Creek, the control of severe bank erosion along Murrieta Creek and its tributaries, and the mitigation of severe drainage problems within the long-established Murrieta townsite. The master plan document serves as a guide for the long-term construction scheduling of primary drainage facilities. It will also assist developers and others in the area in planning the sizes and locations of drainage facilities that are essential to individual projects.

It should be noted that this study is a master plan; a study of the drainage problems that exist in a specific geographical area, and a conceptual solution to those problems. The selection of facilities presented in this plan is based upon engineering and economic considerations and is but one solution of many possible approaches to alleviating the drainage problems of the Murrieta Creek area.

The alignment and location of the facilities proposed by the master drainage plan are general; precise facility locations will be dictated by conditions and other factors existing at the time of design. Similarly, the sizing information shown on the enclosed map is preliminary. A more detailed analysis performed at the design stage will determine final sizing.

Scope

The drainage area considered in this plan consists of the 220 square mile drainage area tributary to Murrieta Creek upstream of its confluence with Temecula Creek. The area is characterized by diverse land forms, ranging from relatively flat valley areas to rolling foothills and more rugged, steep, semi-mountainous foothills. The primary watercourse of the area, Murrieta Creek, is located on the westerly side of the watershed area, creating a valley corridor between the Santa Rosa Mountains and the major highway serving the area, Interstate 15. It is within this corridor that the majority of drainage facilities are proposed by the master plan. The extent of the studies establishing this master plan includes:

1. Determination of the quantity and points of concentration of storm runoff in the area.
2. Preparation of a drainage area map.
3. Determination of the location, size and capacity of the proposed drainage structures.
4. Investigation of alternate routes and methods as a basis for selecting the most economically and engineeringly sound plan.
5. Preparation of preliminary design plans and supporting cost estimates.

General Discussion

This engineering study provides a master drainage plan for the Murrieta/Temecula area. The plan consists of the channelization of Murrieta Creek and its major tributaries and includes several concrete lined open channels and a small network of underground storm drains. The proposed system will carry storm runoff through the rapidly developing Murrieta Creek valley to outlet at the valley's south end where Murrieta Creek and Temecula Creek confluence to form the Santa Margarita River.

Presently, during periods of rainfall, runoff-flood waters, silt and other debris, impact a wide area of agricultural land and the established and developing community, causing property damage and leaving roads and highways impassable. Over the last several

years, commercial and residential subdivision activity has increased substantially in both the Murrieta Creek corridor and within the overall drainage area contributing to Murrieta Creek. As development continues to progress within the drainage area, drainage problems will increase, thus requiring a greater need for flood protection.

Most of the facilities proposed by this master drainage plan are located within the Murrieta Creek corridor, west of Interstate 15. (The exceptions would be: the Santa Gertrudis Channel improvement, which extends easterly to the Winchester Road crossing of Santa Gertrudis Creek, providing flood protection of this thoroughfare; the Tocalota Creek improvement at Route 3 in the Sage area; and the Warm Springs Creek improvement at Highway 79 in the Domenigoni Valley.) The predominately hilly terrain east of Interstate 15 is generally characterized by well defined natural drainage courses, and the current need for major flood control improvements is very minimal.

When completed, the facilities proposed by this master plan will provide the area with improved drainage and protection from the once in 100 year flood.

Criteria

All underground storm drains proposed in this plan are intended to collect local urban runoff and are located in existing street rights of way. Runoff from a 10 year frequency storm is allowed to accumulate in the streets until it reaches the top of the curb. At this point, the plan proposes the initiation of an underground drain which will intercept and convey the entire 10 year runoff to a downstream outlet. Flows exceeding the 10 year frequency storm will generally be carried within street rights of way and the combination of both the street and the underground storm drain provides 100 year protection.

The majority of facilities proposed by this plan are open channels carrying relatively large flows and are generally aligned along the paths of existing natural drainage courses. Open channels are designed to carry runoff from a 100 year frequency storm.

In some cases, these 100 year channel facilities are transitioned into underground, covered systems through areas where existing development and access restrictions dictate that open channel systems are infeasible.

The alignments of all drains and channels are based on hydraulic efficiency, the ability to drain tributary areas, and economics.

Hydrology

Two methods of hydrology were used in this plan to determine design discharges. For smaller tributary areas, up to 500 acres in size, the Modified Rational Hydrology Method was used. The Synthetic Unit Hydrology Method was used for larger areas. The design discharges used in sizing all future appurtenant facilities in the study area should be determined by one of these two methods.

Methodology and supportive data for the rational and synthetic hydrology methods can be found in the "Riverside County Flood Control and Water Conservation District Hydrology Manual", dated April 1978.

Future land use assumptions used throughout this plan were based upon a review of development proposals outlined in Specific Plans adopted in the area, the Riverside County "Comprehensive General Plan", dated April 1978, and consultation with the Riverside County Planning Department.

Existing Facilities

With the exception of portions of Murrieta Creek and the interim New Clay Channel, the District has no existing facilities in the master plan area. Other portions of Murrieta Creek are currently owned and maintained by the Kaiser Development Company. Facilities presently existing in the area primarily consist of highway culverts and bridges on Interstate 15, and some facilities built in conjunction with recent commercial, industrial and residential developments. Two of these developer-built facilities will serve as the downstream outlet for Master Plan Lines C and C-1. The maintenance responsibility for the existing portion of these facilities will remain with private interests, while the proposed extensions are to be owned and maintained by the District. As portions of Murrieta Creek, not owned or maintained by the District, are upgraded as proposed in the master plan, these portions will be taken over for District ownership and maintenance.

Recommended Improvements

The recommended improvements discussed briefly below are shown on the enclosed map found at the back of this report. Supporting data for all proposed facilities is available at the Riverside County Flood Control and Water Conservation District's office. Costs shown on the enclosed map include rights of way and 31% for engineering, administration and contingencies (see Table I, Cost Summary). This map not only shows proposed alignments, but pertinent preliminary size information as well as design flow rates.

The design engineer should be aware that during preparation of preliminary plan and profile drawings, a detailed utility search was not completed. This means that, while major known facilities were dealt with, a more thorough search may reveal utilities that will necessitate minor alignment or size changes, or utility relocations.

Murrieta Creek, Santa Gertrudis Channel and Warm Springs Channel

Murrieta Creek is the major drainage course for all the drainage area considered in this study and is by far the largest and most important facility proposed by this master plan. The improved facility consists of a trapezoidal channel section ranging in size from a bottom width of 40' to a 260' width and ranges from a 9' depth to a depth of 21'. The section utilizes concrete lined sideslopes laid on a 1-1/2 to 1 slope. The slope lining extends below the channel invert grade a suitable depth to prevent scouring on the channel bottom from undermining it. The channel bottom is proposed to be unpaved with the exception of some short reaches under existing road crossings. The two other major watercourses in the plan, Santa Gertrudis Channel and the Warm Springs Channel, along with Lines J and K, have proposed channel sections similar to the Murrieta Creek design. Right of way requirements for these facilities will include space for access roads along both sides of the channel.

Concrete Lined Open Channels

All open channels, other than the major watercourses discussed above, are to be lined with concrete on the bottom and sides. A large majority of these channel facilities are trapezoidal channels with 1-1/2 to 1 sideslopes. However, in some cases, right of way restrictions necessitated using channels of rectangular cross section. The concrete lined facilities have bottom widths ranging in size from 3' to 36'. Channel depths range from 3' to 10.5'. Where open channels are proposed, the right of way required will accommodate the channel as well as one or two maintenance roads.

Underground Storm Drains

The underground facilities proposed in this master plan consist primarily of reinforced concrete pipe (RCP) and are designed to carry the 10 year frequency storm. In a few isolated cases, certain reaches of open channel facilities, designed for the 100 year frequency storm, are transitioned to underground reinforced concrete boxes (RCB). This is necessary where the only feasible alignment for these facilities is within traveled road rights of way. The costs of the underground drains shown in Table I include manholes and catch basins in addition to the in-place cost of the proposed conduit. Manholes are located as necessary, with a maximum spacing of 500 feet. Catch basins are not

specifically located, but the total number of lineal feet required is computed and costed.

Road Crossings

The road crossings included in the cost of this plan range in size and complexity from short span reinforced concrete boxes and concrete slab bridges to multiple-span girdered bridges. All anticipated bridges were considered in checking the hydraulic operation of the proposed facilities and the plan proposes to build all-weather road crossings at all points where proposed facilities intersect road rights of way currently maintained by the Riverside County Road Department. One exception to this criteria is Murrieta Creek. All-weather crossings for this facility are quite costly, so the master plan proposes to only build bridges at locations designated by the Riverside County Road Department's General Circulation Plan for study areas 5 and 6. Additionally, where possible, existing bridges are incorporated into the preliminary design of this facility. The cost of bridges on Murrieta Creek which are currently funded through assessment districts or other sources, are not included in the cost of this master plan.

Alternative Studies

In developing this Master Drainage Plan, a number of alternatives were developed and studied for their hydraulic and economic feasibility. Generally, alternatives were developed on a line by line basis, investigating the economic effects of both facility section and alignment.

Several alternative channel sections were explored for Murrieta Creek, weighing right of way requirements against the cost of constructing various channel dimensions. The option of providing a fully-lined channel for Murrieta Creek was investigated. It was concluded that, while the fully-lined facility consumes less right of way and is an easily maintained facility, it carried a total cost that exceeded other alternatives by over \$100 per foot of channel.

Once a channel type was chosen, various width and depth combinations were tried in an effort to arrive at a channel configuration which best utilized the existing District right of way on Murrieta Creek. Another consideration in choosing the most effective facility option was to provide a channel which conveys the design flow at depths which, if possible, do not exceed the existing bank elevations. When flow depths exceed the height of the ground adjacent to the channel, levee criteria set forth by the Federal Emergency Management Agency (FEMA) must be observed in the proposed design of the channel. Levees were unavoidable in certain reaches of Murrieta Creek, but their use was minimized by the selection of the most effective alternate.

In formulating the preliminary design for several of the facilities tributary to Murrieta Creek, alternate alignment studies were warranted, particularly in the flatter portions of the plan area within the Murrieta Valley. In these instances, the alignment often dictated the facility sizes, and the associated costs of each alignment alternative were compared in order to select the most cost effective facility.

Other alternatives were explored in the development of preliminary designs for the lateral facilities, primarily investigating the effect of various alignments on costs. In some cases, conditions dictated that the facility be aligned along the established watercourse path. This, along with the fact that compared to other facility types, the trapezoidal channel section carries the lowest construction cost, established that in some cases one option was clear cut, eliminating the need to explore other alternatives.

In summary, the Master Drainage Plan for the Murrieta Creek area, as presented herein, is the coalescence of the most economical and feasible alternatives explored.

Conclusions

Based on the studies and investigations made for this report, it is concluded that:

1. The Murrieta Creek area has experienced serious flooding problems in the past. As this area converts from primarily rural type uses to more urban uses, these problems are expected to worsen. A more orderly growth pattern can safely occur with the construction of these proposed facilities.
2. A drainage system is required to safely convey storm runoff through the area with the least interruption to public services. The Master Drainage Plan presented in this report is such a system and is the most feasible of the alternatives studied.
3. The proposed plan leads itself to staged construction as funds become available.
4. The total cost of the recommended improvements, including rights of way, engineering, contingencies and administration is estimated to be \$45,503,000.

Recommendations

It is recommended that:

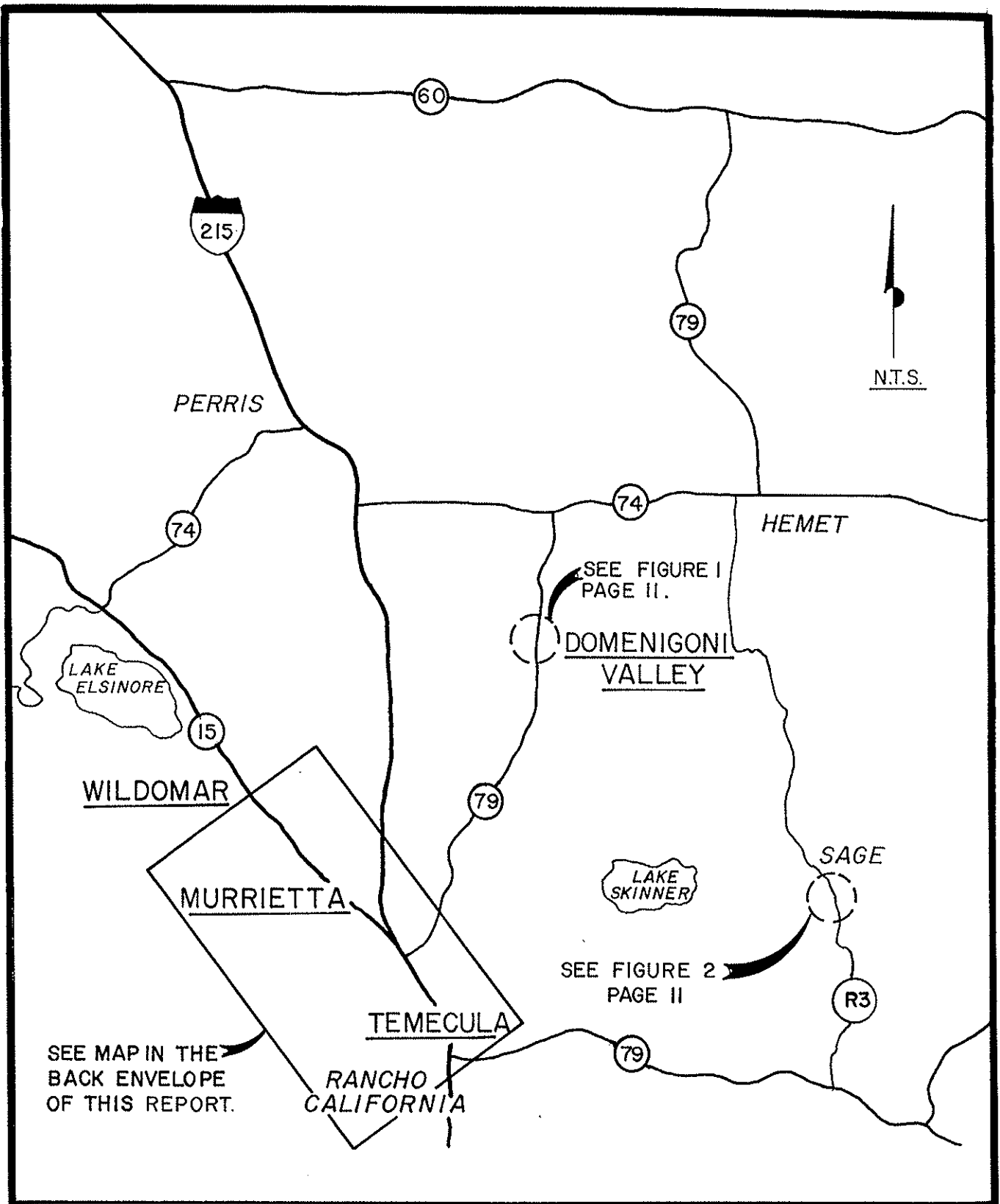
1. The Master Drainage Plan, as set forth herein, be approved by the Riverside County Flood Control and Water Conservation District's Board of Supervisors as part of the overall master plan for the County.
2. The Master Drainage Plan, as set forth herein, be used as a guide for all future development in the study area and that such developments be required to conform to the plan insofar as possible.
3. The right of way required for the plan be protected from encroachment.
4. The Murrieta Creek Area Drainage Plan, prepared by the Riverside County Flood Control and Water Conservation District, be adopted by the Riverside County Board of Supervisors as a means through which funding may be procured for implementation of the plan and that other funding sources be investigated and adopted so as to complete the plan at the earliest possible date.

TABLE I
MASTER DRAINAGE PLAN FOR THE MURRIETA CREEK AREA

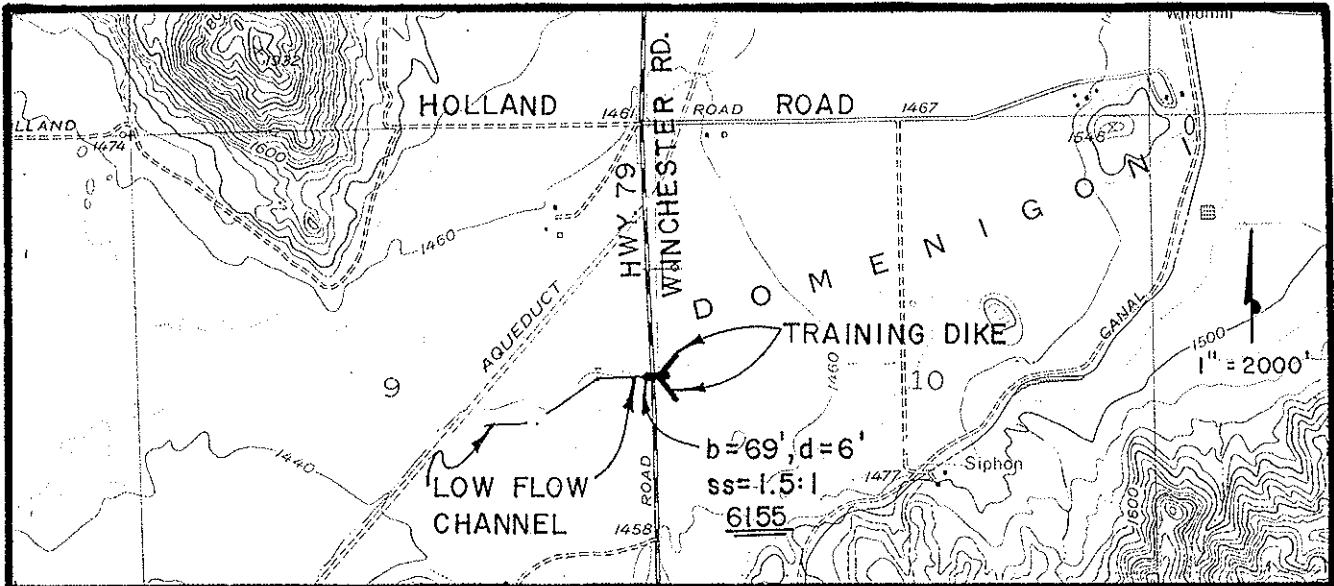
COST SUMMARY

Facility	Construction Cost*	Right of Way Cost	Total MDP Cost
Line A	\$ 107,000	\$ 11,000	\$ 118,000
Line C	108,000	4,000	112,000
Line C-1	73,000	2,000	75,000
Line D	1,501,000	182,000	1,683,000
Line D-1	220,000	38,000	258,000
Line E	1,821,000	123,000	1,944,000
Line E-1	160,000	24,000	184,000
Line E-2	400,000	0	400,000
Line E-3	192,000	0	192,000
Line E-4	215,000	0	215,000
Line E-5	53,000	6,000	59,000
Line F	2,520,000	175,000	2,695,000
Line F-1	895,000	125,000	1,020,000
Line F-2	183,000	0	183,000
Line F-3	540,000	0	540,000
Line G	788,000	113,000	901,000
Line H	331,000	40,000	371,000
Line J	1,192,000	78,000	1,270,000
Line K	333,000	138,000	471,000
Line L	515,000	78,000	593,000
Line L-1	42,000	8,000	50,000
Line M	125,000	19,000	144,000
Line M-1	69,000	8,000	77,000
Line N	366,000	59,000	425,000
Line P	339,000	82,000	421,000
Hwy 79 Crossing	313,000	5,000	318,000
Route 3 Crossing	578,000	5,000	583,000
Santa Gertrudis Ck.	5,124,000	699,000	5,823,000
Warm Springs Ck.	1,530,000	155,000	1,685,000
Murrieta Creek	20,848,000	1,845,000	22,693,000
Total	\$41,481,000	\$4,022,000	\$45,503,000

* includes 31% for Engineering, Administration and Contingencies



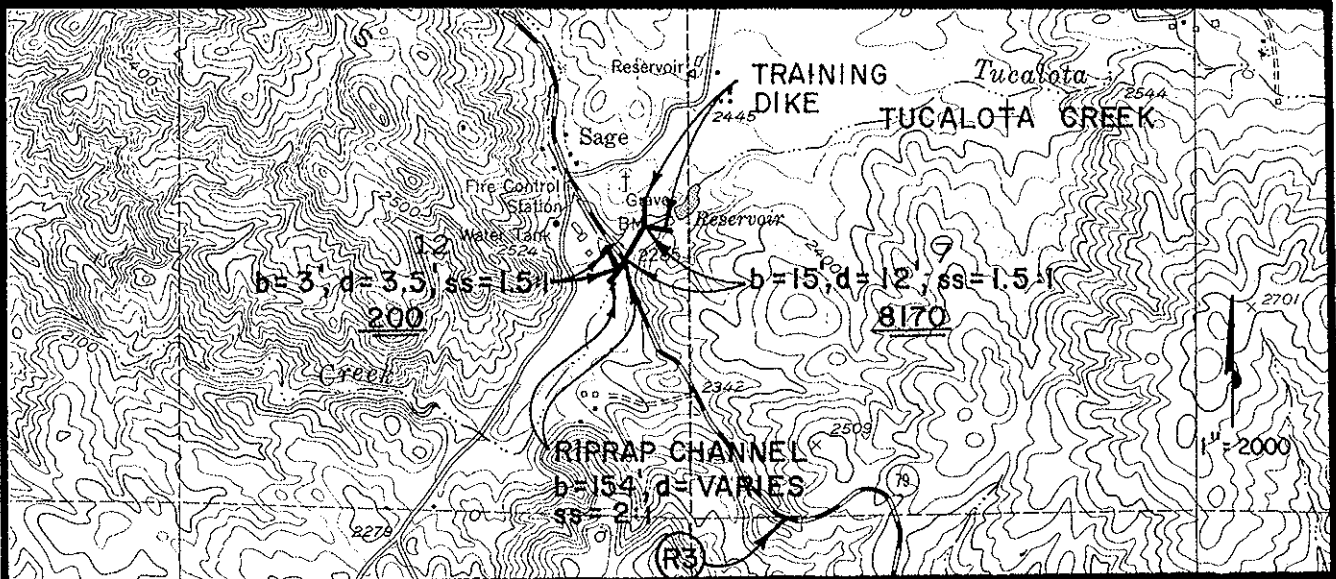
PROJECT LOCATION MAP



COST = \$ 318,000

PROPOSED DRAINAGE IMPROVEMENT FOR WARM SPRINGS CREEK IN THE DOMENIGONI VALLEY AT HIGHWAY 79.

FIGURE 1



COST = \$ 583,000

PROPOSED DRAINAGE IMPROVEMENT FOR TUCALOTA CREEK AT ROUTE 3 IN SAGE.

FIGURE 2