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JAN 8 1986
BARBARA BOYLE, Clerk
By Sylvia D Long Deputy

IN THE SUPERIOR COURT OF THE STATE OF ARIZONA

IN AND FOR THE COUNTY OF YAVAPAI

In the Matter of the VERDE DITCH COMPANY,	4772 Division 1 PETITION FOR APPROVAL AND AUTHORIZATION

TED ALLERT, VINCE V. HIGGINBOTHEM and GLEN W. EVERETT, Commissioners of the VERDE DITCH COMPANY, hereby Petition the Court to review and approve the plans for the construction of an underground siphon on the Verde Ditch by Yavapai County, for the purposes of surface water drainage in the Finnie Flats area, located near Camp Verde, Arizona. The Flood Plain Study and Plans for said construction are attached hereto as Exhibits "A" and "B", respectively.

The Commissioners further request that the Court authorize the Commissioners to sign any necessary easements to Yavapai County for the construction of the siphon, as shown by the attached Plans and Flood Plan Study.

RESPECTFULLY SUBMITTED this 8 day of January, 1986.

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O R D E R

Based upon the foregoing Petition, and good cause appearing therefrom,

IT IS HEREBY ORDERED that the Plans for the construction of an underground siphon on the Verde Ditch by Yavapai County are approved;

IT IS FURTHER ORDERED that the Commissioners of the Verde Ditch are authorized to sign any necessary easements to Yavapai County for the construction of the siphon, in accordance with the attached Plans and Flood Plain Study.

DONE IN OPEN COURT this 8 day of January, 1986.

JUDGE RICHARD ANDERSON

FINNIE FLAT ROAD

1.0 INTRODUCTION

A County road project is proposed for Finnie Flat Road near Camp Verde. Part of the project, repaving of the existing right-of-way, has been completed. The second portion involves a new alignment and is still in the planning stages.

As part of the repaving, culverts were installed under the road, at two locations. For the new alignment, culverts are planned at an additional two locations.

2.0 STUDY AREA

The study area is located south of the Verde River near Camp Verde. Approximately 3.5 square miles of drainage area are tributary to the area, as shown in Figure 2.1. The characteristic of the terrain is that of a flat, gently sloping alluvial bench. There are several washes south of the existing road, however due to the flat terrain all except one wash dies out north of the road. That wash, herein referred to as ("Big Wash"), follows a defined channel. In the small washes, water has historically spread out of its banks on the alluvial bench.

All of the development along Finnie Flat Road with the exception of townhouses near 7th Street and a gas station at I-17, is located south of the road. Extensive development is planned for north of the road. The Verde Ditch, which is used for irrigation purposes, also traverses the study area.

3.0 HISTORIC CONDITIONS

Flood problems have existed within the study area for several years. This has been due, primarily to the lack of defined drainage channels.

The predominate area for floodwater accumulation is at the foot of 7th Street, boardered by Finnie Flat Road and the irrigiation ditch. Water accumulates behind the banks of the irrigation ditch until the water overflows. Several years ago when Big Wash overflowed its banks, water accumulated behind the ditch until the water overflowed and breeched the ditch. Flooding subsequently occured in Ranch Acres Subdivision due not only to the floodwaters from Big Wash but also, irrigation water in the ditch (which is diverted from the Verde River).

EXHIBIT "A"

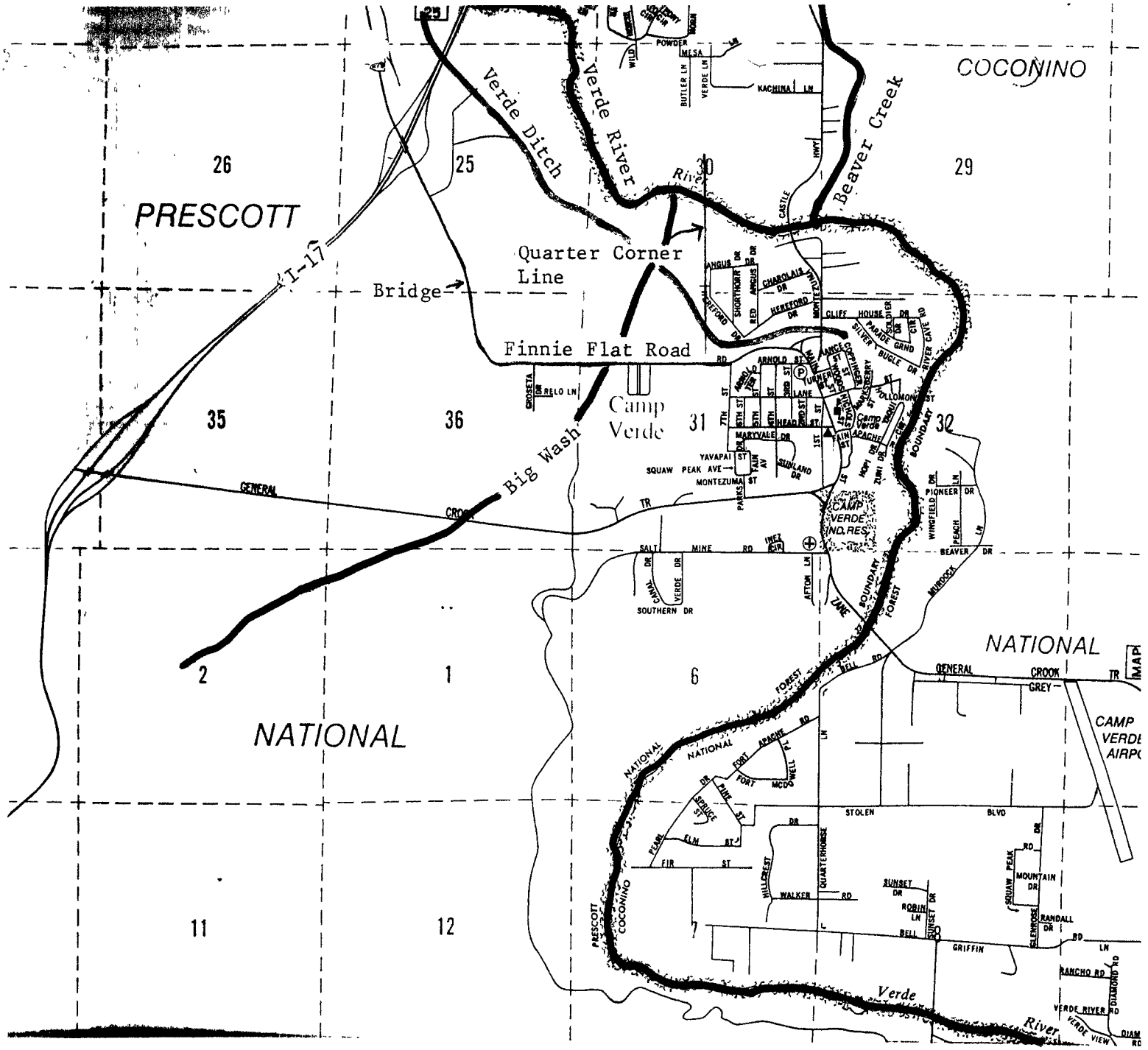

FIGURE 2.1

STUDY AREA

To the west of Big Wash floodwaters tend to spread out across the flat alluvial bench. Since there is no development north of the road between Big Wash and the Bridge, this type of flooding has not impacted structures. However, as development progesses, the uncontrolled nature of runoff will create problems. It is imperitive, therefore, to gain control of runoff prior to development of this area.

4.0 PROPOSED PROJECT

The proposed project can be divided into two sections, the repaving and the new alignment.

4.1 New Alignment

The new alignment is between Big Wash and I-17. It consists of constructing a new road east of the present location and installing new drainage structures.

The existing alignment has four drainage structures, a bridge and three culverts.

4.2 Repaving

The repaving work was conducted in 1984.

It consisted of repaving from Main Street in Camp Verde to Big Wash. As part of the repaving, an attempt was made to address the historic drainage problems along this portion of road.

Two sets of culverts were installed under the road, one set at 7th Street and one set 1320 feet to the west. The culverts were placed as part of a drainage plan to carry the natural runoff from south of Finnie Flat Road to the Verde River. Currently, the culverts are blocked.

After examining the historic flooding problems at this portion of the road it was felt that the flood waters would best be handled by carrying the water across Finnie Flat Road at two locations. The water would then be picked up north of the road in two separate drainage channels. The use of two channels minimizes the impact to the road and the properties immediately north of the road.

Both ditches will then travel north before turning toward each other and merging at the quarter corner line. At this point a single ditch will carry the combined flow north to the river.

A single ditch along the quarter corner line would minimize the impact to the irrigation ditch which the drainage channel must cross.

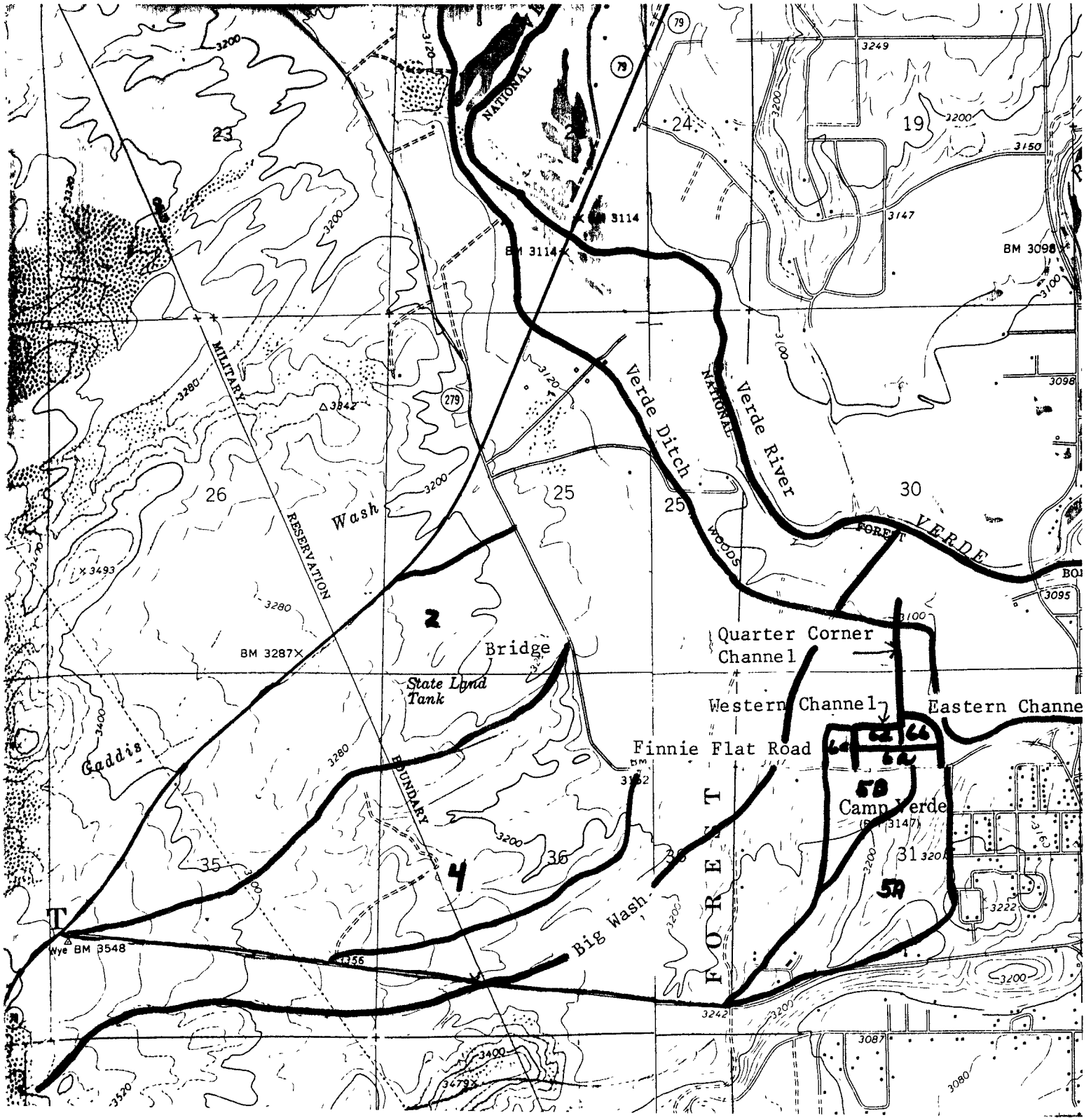

FIGURE 5.1

WATERSHED BOUNDARIES

Legend

- Watershed Boundary
- Proposed Drainage Channel
- 5A Watershed Number

USGS 7.5' Quad
Camp Verde and Middle Verde

N

1" = 2000'

TABLE 5.1

ASSUMPTIONS USED IN FLOW DETERMINATION

Watershed	2	4	5A	5B
Maximum elevation	3548 ft.	3548 ft.	3242 ft.	3240 ft.
Minimum elevation	3170 ft.	3150 ft.	3110 ft.	3120 ft.
Length	880 ft.	8400 ft.	5000 ft.	2100 ft.
Slope	4.3%	4.7%	2.9%	6.7%
Area	.55 mi^2	.53 mi^2	.17 mi^2	.06 mi^2
Vegetation Type	Herbaceous	Herbaceous	Herbaceous	Herbaceous
Percent Cover	30%	30%	30%	30%
Soil Type	C	C	C	C
Curve Number	85	85	85	85
A Watershed Lag	.74 hr	.68 hr	.57 hr	.19 hr

TABLE 5.2

ASSUMPTIONS USED IN OVERLAND FLOW DETERMINATION

Watershed	2a	2b	2c	2d
Length	1290 ft.	210 ft.	660 ft.	370 ft.
Area	.012 mi^2	.006 mi^2	.016 mi^2	.009 mi^2
Slope	.5%	.5%	.5%	.5%
Roughness	.12	.12	.12	.12
Channel Length	260 ft.	800 ft.	660 ft.	660 ft.
Channel Roughness	.025	.025	.025	.025
Channel Slope	.4%	.4%	1.0%	1.0%
Channel Shape	Trapazoidal	Trapazoidal	Trapazoidal	Trapazoidal

5.0 METHODOLOGY

A design storm of 4% exceedence probability (25 year return period) was used for design purposes. The HEC-1 computer model was used to generate runoff hydrographs for the 25 year storm.

Runoff from the watershed was simulated using the Soil Conservation Service curve number technique. For the area north of the road draining to the drainage channels, proposed in Section 4.2, a kinematic wave model was used to simulate the overland flow runoff present after development of this area.

5.1 Watershed Hydrology

The area south of the road was divided into the contributing watersheds, as shown in Figure 5.1. Runoff from Big Wash was not considered in this study since the low water crossing at the wash will not be altered from the existing condition.

Watershed assumptions are summerized in Table 5.1.

5.2 Overland Flow

The area north of the road, which will drain to the proposed drainage channel was modeled as overland flow. The reason for this is that there are no existing channels in the area and that the area will be developed into shopping centers with large parking areas. It is proposed that there be three drainage channels, the eastern channel, western channel and quarter corner channel.

The area tributary to the western channel was treated separately than the area tributary to the eastern channel.

The flow from the eastern and western channels will be combined at the quarter corner line. From this point the water would be carried in a single channel to the river.

The runoff from the overland flow area was determined assuming a developed condition. The assumptions used in determining flow are shown in Table 5.2.

6.0 RESULTS

Runoff from the watershed was modeled using the assumptions found in Tables 5.1 and 5.2, input into the HEC-1 computer model. The results are summerized in Table 6.1.

6.1 Watershed Runoff

Flow to the new alignment was determined for the two principle watersheds. Watershed four is estimated to have a 25 year discharge of 209 cfs. Watershed two is estimated to have 219 cfs for the 25 year flow.

There are two small watersheds located between watersheds two and four which will, with the new alignment, be combined with watershed two.

6.2 Overland Flow

The watersheds tributary to each drainage channel were modeled by determining the natural flow generated south of the road (watersheds 5A and 5B) and combining this with the developed overland flow north of the road. Inflow to the drainage channels was assumed to occur laterally along the channels.

The 25 year flows at the road from watersheds 5A and 5B were estimated to be 78 and 56 cfs respectively. These flows will be handled by the existing double 43" x 27" and double 36" x 22" cmpa's, respectively. In both cases the pipes will operate under a slight headwater.

Combining the flows generated south of the road with the flows from the developed area north of the road yields 88 cfs for the eastern channel and 74 cfs for the western channel. Combining the two hydrographs at the quarter corner channel yields a peak flow of 147 cfs. This is estimated to be the peak flow that the single channel must carry to the river, including under the irrigation ditch.

7.0 CONCLUSIONS

Based upon the flows estimated from the computer model and summarized in section 6.0, culverts were sized. Table 7.1 summarizes the culverts. The total project is depicted in figure 7.1.

TABLE 6.1

RESULTS OF HYDROLOGIC ANALYSIS

WATERSHED NUMBER	DISCHARGE (CFS)
2	209
4	219
5A	78
5B	52
6A	86
6B	88
6C	63
6D	74
OUT 6*	147

* Combined flow at 1/4 corner ditch

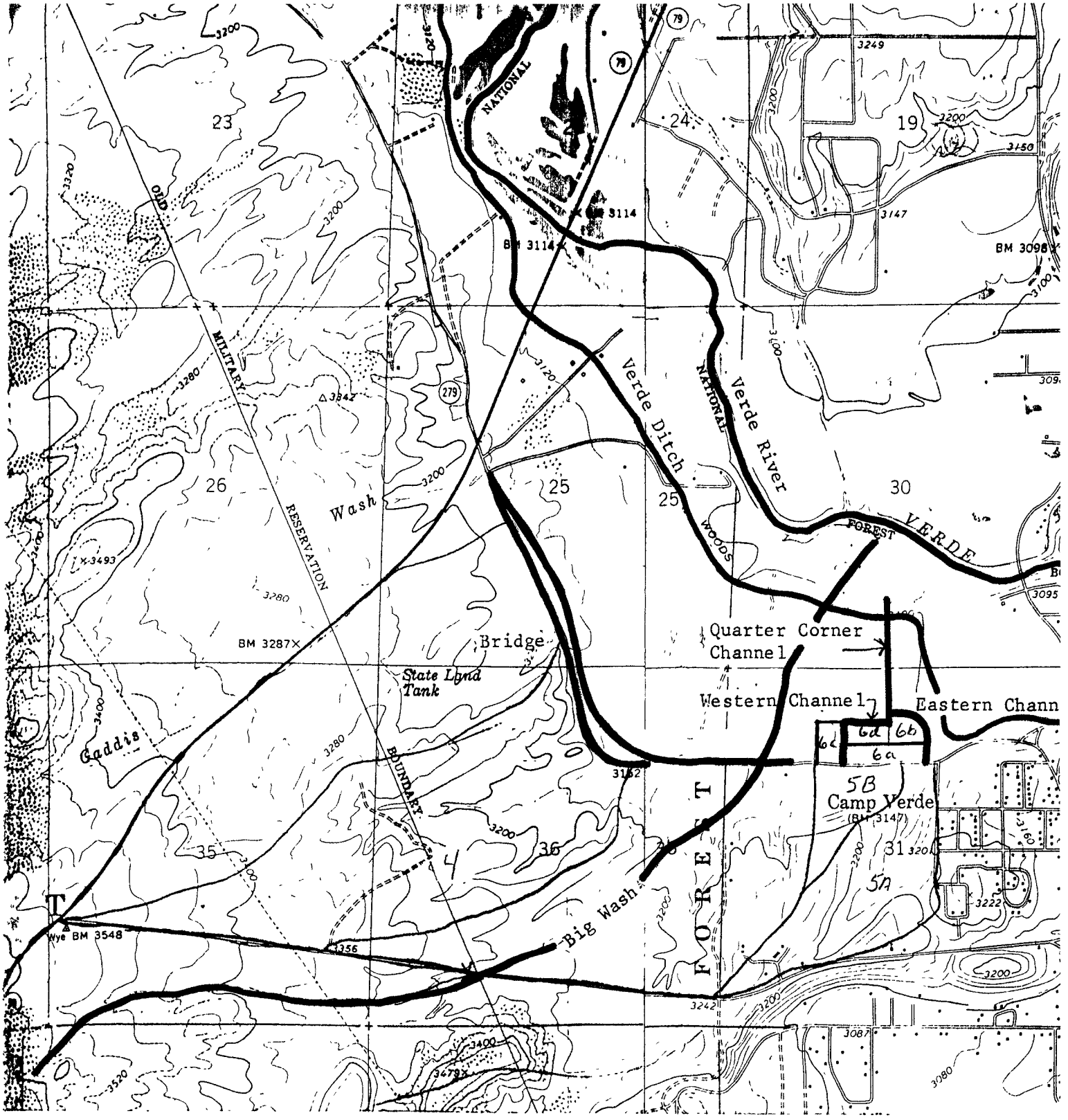

FIGURE 7.1

FINNIE FLAT ROAD PROJECT

Existing Road
Realigned Road
* Existing Culvert
\# Proposed Culvert

TABLE 7.1

CULVERT SIZES

WATERSHED	DISCHARGE	CULVERT SIZE	NUMBER OF CULVERTS	HEADWATER
2	209	96"	1	.67
4	219	43"X27"	5	1.45
5A	78	43"X27"	2*	1.35
5B	52	36"X22"	2*	1.45
6A	86	**	----	----
6B	88	**	----	----
6C	63	**	----	----
6D	74	**	----	----

** Open Ditch
* Culvert currently in place

7.1 Realigned Road

Finnie Flat Road currently has three culverts and a bridge along the section to be realigned. The bridge will be replaced by a single 96 inch cmp culvert downstream of the bridge. In addition, the single 48" culvert currently located between the bridge and I-17 will be removed and the flow channelized to the 96" culvert. The culvert size was determined so that cattle may pass through and is more than ample to carry the 209 cfs estimated to be tributary to the culvert.

Flows from watershed two, that used to cross the bend in Finnie Flat Road and flows tributary to the two culverts north of the bend will be combined for the realigned section. The reason for combing the flows is that the ground contours concentrate both flow areas prior to reaching the new alignment. To handle the estimated 219 cfs, 5-43" x 27" cmpa's will be used. With minor headwater depth, the culverts can carry 44 cfs each. Headwalls will be used on the upstream and downstream ends.

7.2 Drainage Channel

As stated earlier, the drainage between 7th Street and Big Wash will be picked up in three drainage channels; the eastern channel, western channel and the quarter corner channel.

The eastern and western channels pick up natural flow south of the road in addition to flow from the proposed commerical areas north of the road. The quarter corner channel picks up the combined flow of the other two channels and carries it to the river.

7.2.1 Eastern Channel

The eastern channel will begin near the foot of 7th Street. It picks up the flow from watershed 5A carried by 2-43" x 27" cmpa's

The channel will proceed north for 250 feet until reaching the townhouse property line. It will then travel northeast along the property line for 620 feet, before bending to the west. The channel terminates at the quarter corner line.

The channel will be a trapazoidal shape at a .4% slope. In areas where banks are steep, the banks will be stabilized with vegetation and a nonerosive blanket.

7.2.2 Western Channel

The western channel will begin approximately 1320 feet to the west of the eastern channel. Flow enters the channel from watershed 5B through twin 36" x 22" cmpa"s.

The channel will be trapazoidal in shape and at approxiamtely 1% slope. It will flow north for approximately 660 feet then travel 330 feet east and terminate at the quarter corner line.

7.2.3 Quarter corner channel

This channel will pick up the combined flow of the eastern and western channels and transport the flow across the irrigation ditch to the river.

The ditch is trapazoidal in shape with a slope of .4%.

The channel will carry the runoff over the proposed inverted siphon in the irrigation ditch. The proposed inverted siphon will allow for free flow of the drainage water and debris past the irrigation ditch with minimal interference.

8.0 SUMMARY

Drainage along Finnie Flat Road will be handled by adding culverts to the realigned section and defining the drainage pattern near 7th Street. Defining the drainage pattern will help eliminate a historic flooding problem, a problem which will only get worse with time.

The culverts to be used in the project, their locations and estimated flows are summarized in Table 8.1.

The characteristics of the drainage channels, including shape, alignment and earthwork are summarized in Appendix A.

TABLE 8.1

CULVERT SUMMARY

STATION	CULVERT SIZE	NUMBER OF CULVERTS	DESIGN DISCHARGE
20+14	96"	1	209
33+00	43"X27"	5	219
76+59	36"X22"	2	52
89+40	43"X27"	2	78

APPENDIX A

CHANNEL CHARACTERISTICS

A.0 Introduction

Three drainage channels are proposed for north of Finnie Flat Road to pick up the natural runoff generated south of the road. The channels will also carry the runoff generated north of the road on the properties over which the channels traverse.

A.1 Channel Alignment

The alignment of the draiange channels is shown in Figure A.1.

The alignment is designed so as to follow property lines. This does not however, always follow the ground slope. The natural ground along the eastern ditch rises along much of its length. Therefore, this particular ditch gets deeper as it travels toward the quarter corner ditch.

A.2 Channel Shape

All three channels have trapazoidal cross sections. The bottom width however, varies between channels.

The eastern channel for example, has a bottom width that varies from 6 feet to 10 feet, depending upon the depth.

The quarter corner channel has a constant bottom width of 10 feet, while the western channel varies depending upon the width of the easement.

Typical cross sections for the channels are shown in Figure A.2.

A.3 Earthwork

The volume of material to be excavated for this project was computed and is shown in Table A.1.

TABLE A.1

EXCAVATED VOLUMES

Channel	Excavated Volume (yds^3)
Eastern	1997
Western	2143
Quarter Corner	11,057

A.4 Irrigation Ditch Crossing

The runoff carried in the quarter corner channel will flow across the irrigation ditch at the inverted siphon.

A maintenance access road will be incorporated in the quarter corner channel to provide vehicular access along the channel. The access road must cross the irrigation ditch at the inverted siphon. Based upon a flow of 60 cfs in the ditch, the inverted siphon shall be constructed of a 48" concrete pipe with concrete headwalls upstream and downstream. The upstream headwall shall have an emergency spillway incorporated into it to be used at the discretion of the irrigation company. The discharge from the emergency spillway shall be carried in the quarter corner channel.

Plan and profile views of the irrigation ditch crossing are shown in the Irrigation Siphon Plans.