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PRELIMINARY

HYDRAULIC REPORT

FOR

EASTERN 20 MILES

MARICOPA-MOBILE-GILA BEND HIGHWAY

STATE ROUTE 238

MARICOPA, ENID, MOBILE, AK CHIN INDIAN COMMUNITY, GILA RIVER INDIAN COMMUNITY, MARICOPA COUNTY, PINAL COUNTY, ARIZONA

PROJECT S-987-301

OCTOBER 1986

HYDRO LIBRARY

Prepared By:

DIBBLE AND ASSOCIATES
CONSULTING ENGINEERS
PHOENIX, ARIZONA

OCT 8 1986

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2. PROJECT OVERVIEW

2.1 PROJECT LOCATION

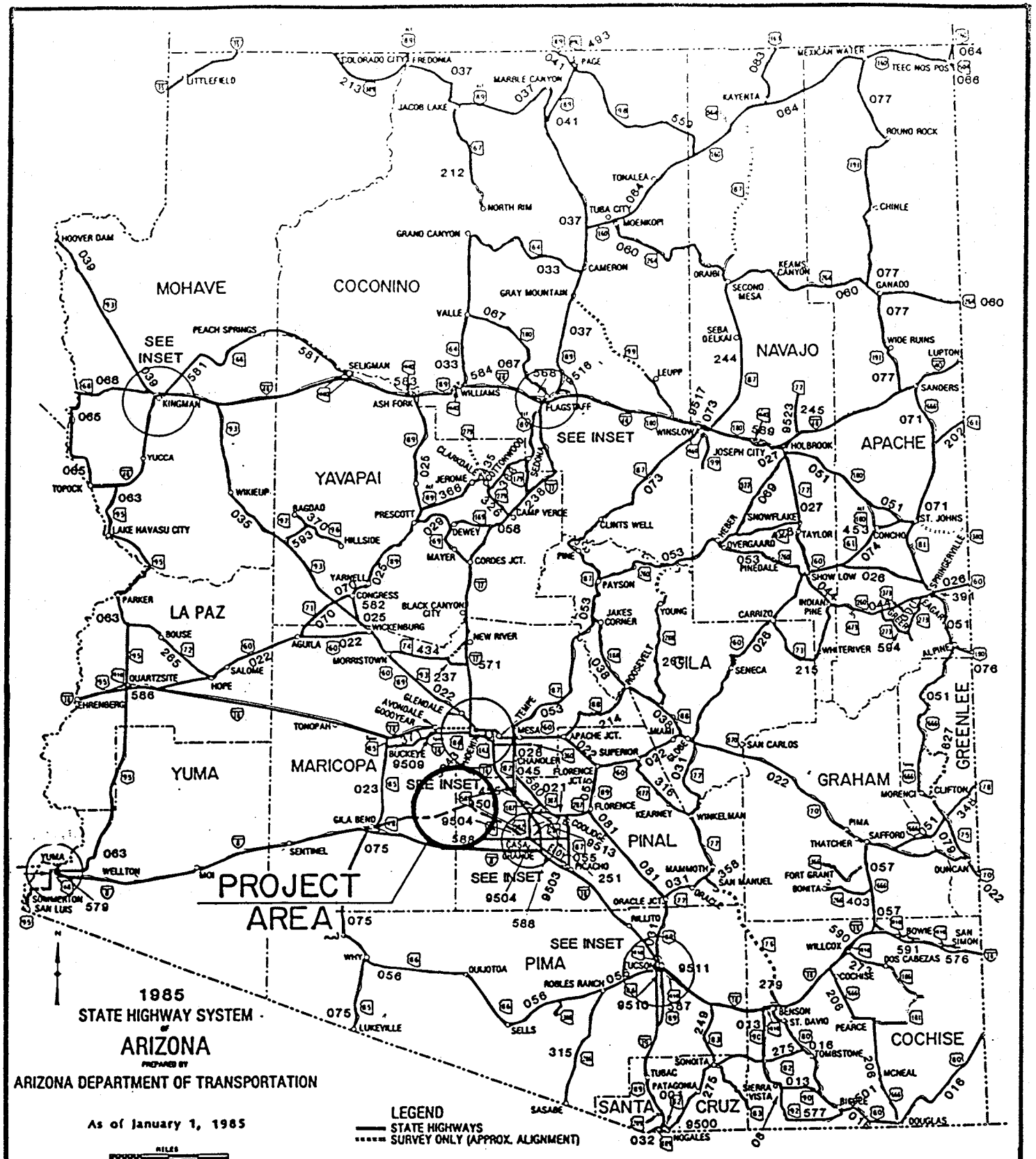
The project is the proposed improvement of the eastern 20 miles of the existing Maricopa-Mobile-Gila Bend Highway, State Route 238, in northwestern Pinal and southeastern Maricopa counties (see Vicinity Map, Exhibit 1, Page 2). The project begins in Pinal County at the intersection of Garvey Avenue and Maricopa Road in the community of Maricopa, extends westerly 9.4 miles to the county line, crosses into Maricopa County and continues westerly 10.4 miles through the town of Mobile ending approximately 6.5 miles southwest of Mobile (see Location Map, Exhibit 2, Page 3). With the exception of the easterly quarter mile and the westerly half mile, the alignment is contiguous with and north of the existing Southern Pacific Railway line. The alignment passes through sparsely populated predominately privately owned agricultural and desert land, the Maricopa Ak Chin Indian Reservation and Bureau of Land Management grazing allotments.

2.2 PROJECT DESCRIPTION AND PURPOSE

The proposed project consists of improving the present graded roadway (nominal 28-42 foot width) by regrading and paving one fourteen foot lane in each direction and providing a ten foot graded shoulder on each side. Although the present alignment will be followed for most of the route, alternative alignments are being investigated at each end of the project.

At the eastern end of the project, two alternate routes are being evaluated in addition to the existing alignment. The alternate alignments provide a by-pass around existing residential areas in the Community of Maricopa. Another realignment occurs at the extreme westerly end of the project to provide a better crossing location for the West Prong of the Waterman Wash.

The primary purpose of the roadway improvements is to provide improved access to areas of northwestern Pinal County and southeastern Maricopa County west of the community of Maricopa, including the communities of Mobile and Enid and the proposed Hazardous Waste Processing Facility. The existing graded roadway is readily damaged by erosion in the vicinity of major washes during storm events. Some sections of the roadway become impassable until major maintenance and reconstruction has occurred. Improvements in the roadway alignment and vertical profile are intended to improve safety and minimize the inconvenience to the traveling public and commercial traffic.



VICINITY MAP

MARICOPA-MOBILE-GILA BEND HIGHWAY
STATE ROUTE 238
PROJECT NO. S-987-301

EXHIBIT I

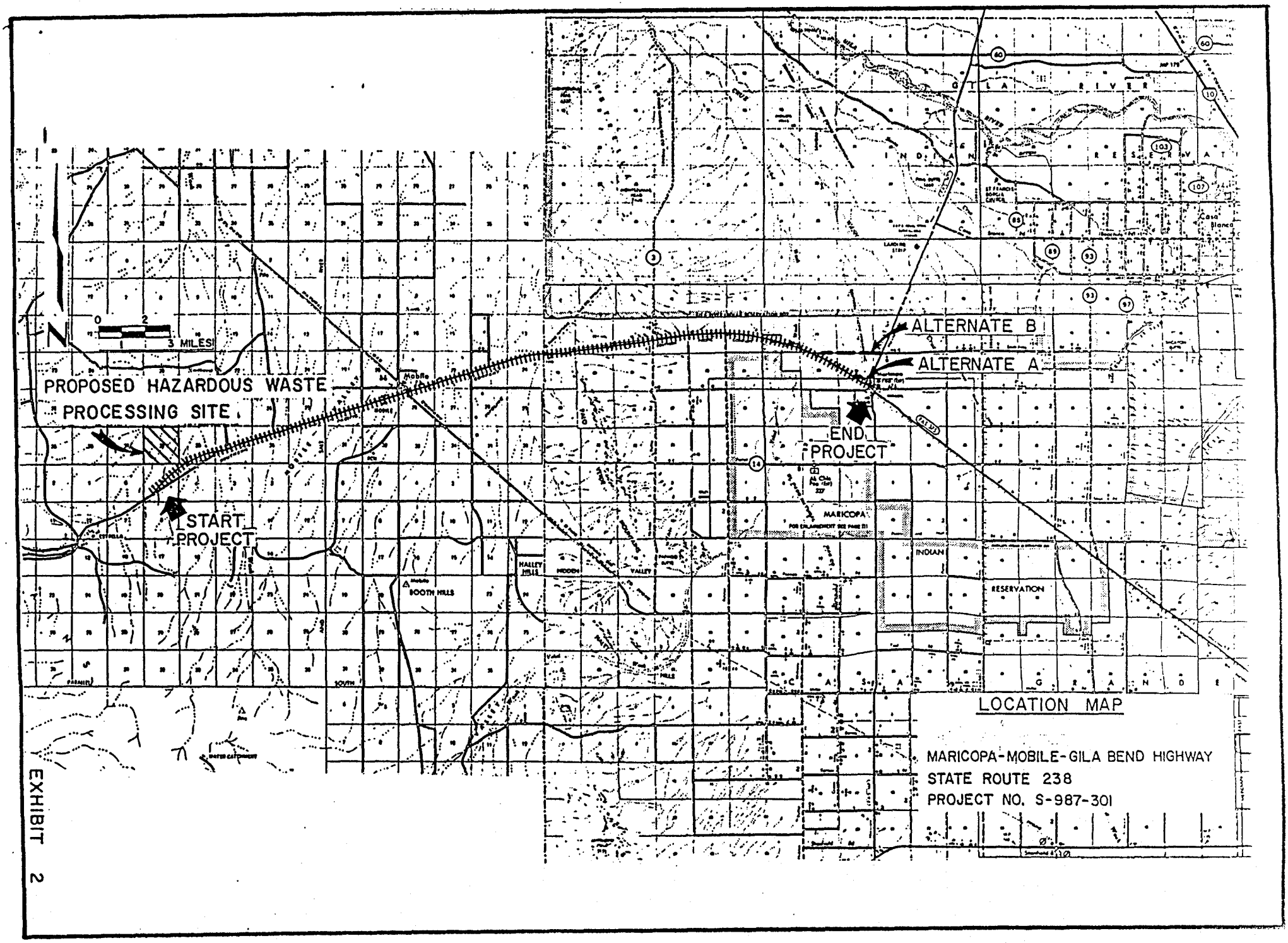

N
0 2
3 MILES
PROPOSED HAZARDOUS WASTE
PROCESSING SITE
START
PROJECT
END
PROJECT
ALTERNATE B
ALTERNATE A
MARICOPA
INDIAN
RESERVATION
GILA RIVER
INDIAN RESERVATION
Casa Blanca
Mobile
BOOTH HILLS
HALLEY HILLS
HIDDEN
VALLEY
SOUTH
LOCATION MAP
MARICOPA-MOBILE-GILA BEND HIGHWAY
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EXHIBIT 2

The drainage design is based on a 50 year, 1 hour design storm. With the exception of two all weather crossings at the west prong of Waterman Wash, all cross drainage will be conveyed across the proposed roadway surface using A.D.O.T. Standard fords with concrete walls.

2.3 EXISTING LAND USES

Existing land uses in the area consists of General Rural (GR), Heavy Industry (C1-2) and Indian Reservation on the eastern end of the project in Pinal County, (see Exhibit 3, page 5) and Rural-43, R1-18, and C-3 on the western end of the project in Maricopa County (see Exhibit 4, page 6). Alternate Alignments A and B pass through agricultural lands for the first one-quarter to one-half mile as they proceed west from Maricopa Road. For the next 5 miles the route passes through heavy industrial zoned properties with the exception of a one mile segment that passes through the Ak Chin Indian Reservation. The existing land uses in this area include feedlots, cotton gin, agriculture and automotive junk yards.

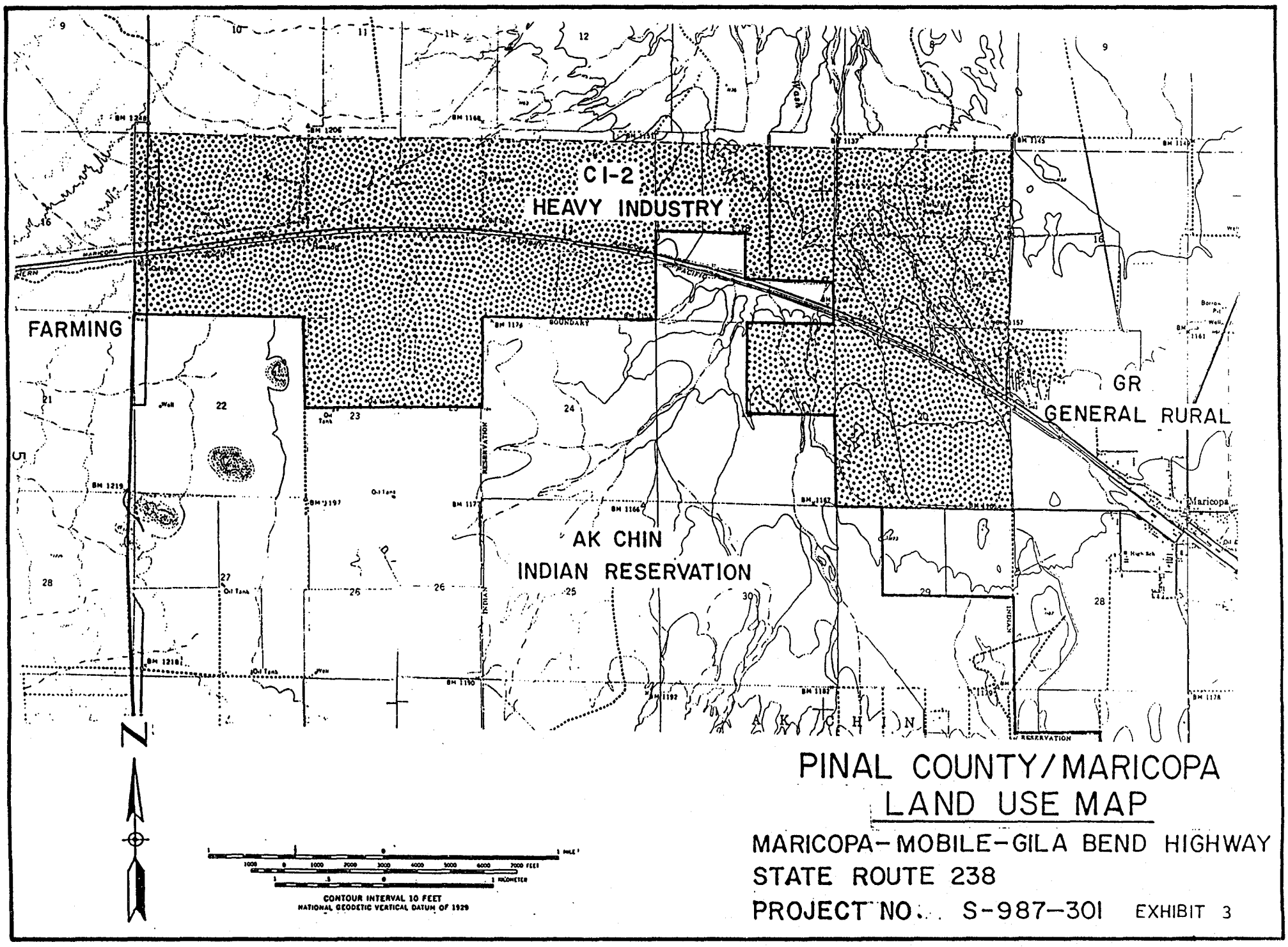
There are several residences on the north side of the alignment in the vicinity of Enid and in the area of Mobile. The Mobile School is adjacent to the roadway at its intersection with 99th Avenue. The area in the immediate vicinity of Mobile is zoned C-3, commercial, and a Special Uses parcel immediately south of the Southern Pacific Railroad that was once intended for an oil refinery. The remaining lands to the west are open range lands.

The only pending development in the area that would change the existing land uses is a proposed private residential development that lies directly south of Alternate Alignment A, immediately west of Maricopa Road.

2.4 HYDROLOGIC HISTORY OF PROJECT AREA

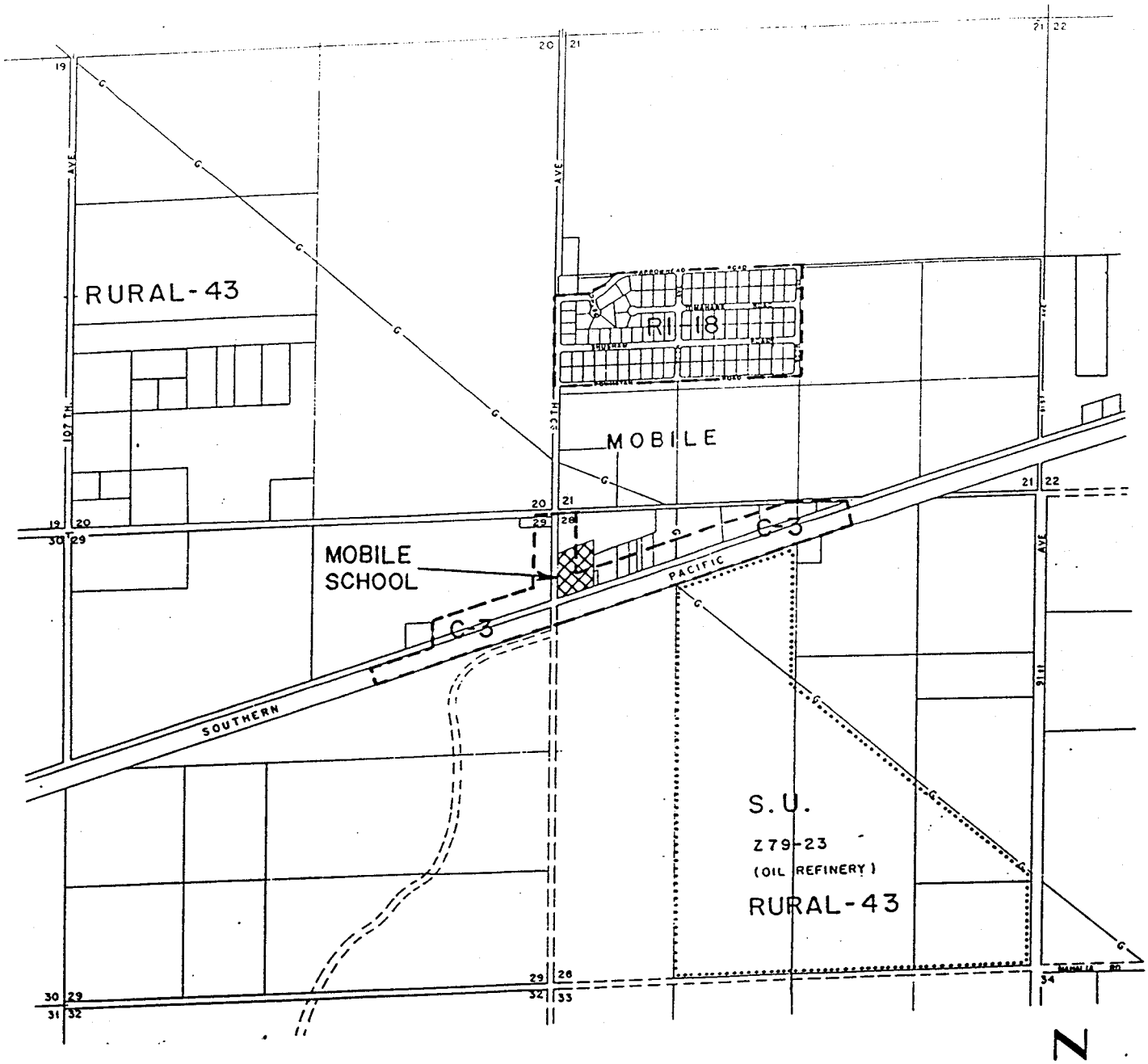
Two (2) major drainage basins are bisected by the proposed roadway facility: Waterman Wash on the west end of the project and Vekol Wash on the east end of the project. Both of these washes are tributary to the Gila River to the north.

The drainage basins, totaling more than 345 square miles, vary from less than 0.1 square mile to almost 248 square miles. With the exception of a 10 square mile area which drains from north to south, the natural terrain slopes to the north at an average slope of approximately 1.0 percent. The Maricopa, Sand Tank and Table Top Mountains define the



PINAL COUNTY/MARICOPA LAND USE MAP

MARICOPA-MOBILE-GILA BEND HIGHWAY
STATE ROUTE 238
PROJECT NO. S-987-301 EXHIBIT 3



LEGEND

ZONING DISTRICT BOUNDARY

BOUNDARY DELINEATING SPECIAL USES OR UNIT PLANS OF DEVELOPMENT

N

GRAPHIC SCALE IN FEET

0 300 600 1200 1800 2400 3000 3600

MOBILE AREA LAND USE MAP

MARICOPA-MOBILE-GILA BEND HIGHWAY
STATE ROUTE 238
PROJECT NO. S-987-301

EXHIBIT 4

southern boundary of the overall drainage area. The basins are predominantly desert brush rising from elevation 1150 at the railroad drainage structures to elevation 3500 at the highest end of one of the watersheds. The 50 year, 1 hour design frequency storm event yielded flows varying from 25 cfs to 26,723 cfs.

At the eastern end of the project the Vekol Wash drainage area, covering more than 248 square miles, is not only bisected by the proposed project but also by Interstate 8 approximately 15 miles to the south. During major storm events the Vekol Wash area experiences extensive flooding.

Prior to the late 1800's both of these drainage areas were sparsely vegetated native desert with little to no development. Other than wagon roads traversing the basins, no other evidence of man's presence effected the basin. By the late 1870's the railroad was completed. This facility is an elevated track along its present day alignment. The railroad is the one significant improvement that has effected the hydrologic aspects of the basins. Practically speaking, all of the runoff flows are intercepted by the elevated railroad bed and are routed through each of the respective drainage structures. During major storm events the railroad structures effectively meter the flow into the downstream washes. According to local residents, the railroad has replaced a number of these structures damaged by storm runoff with new larger structures.

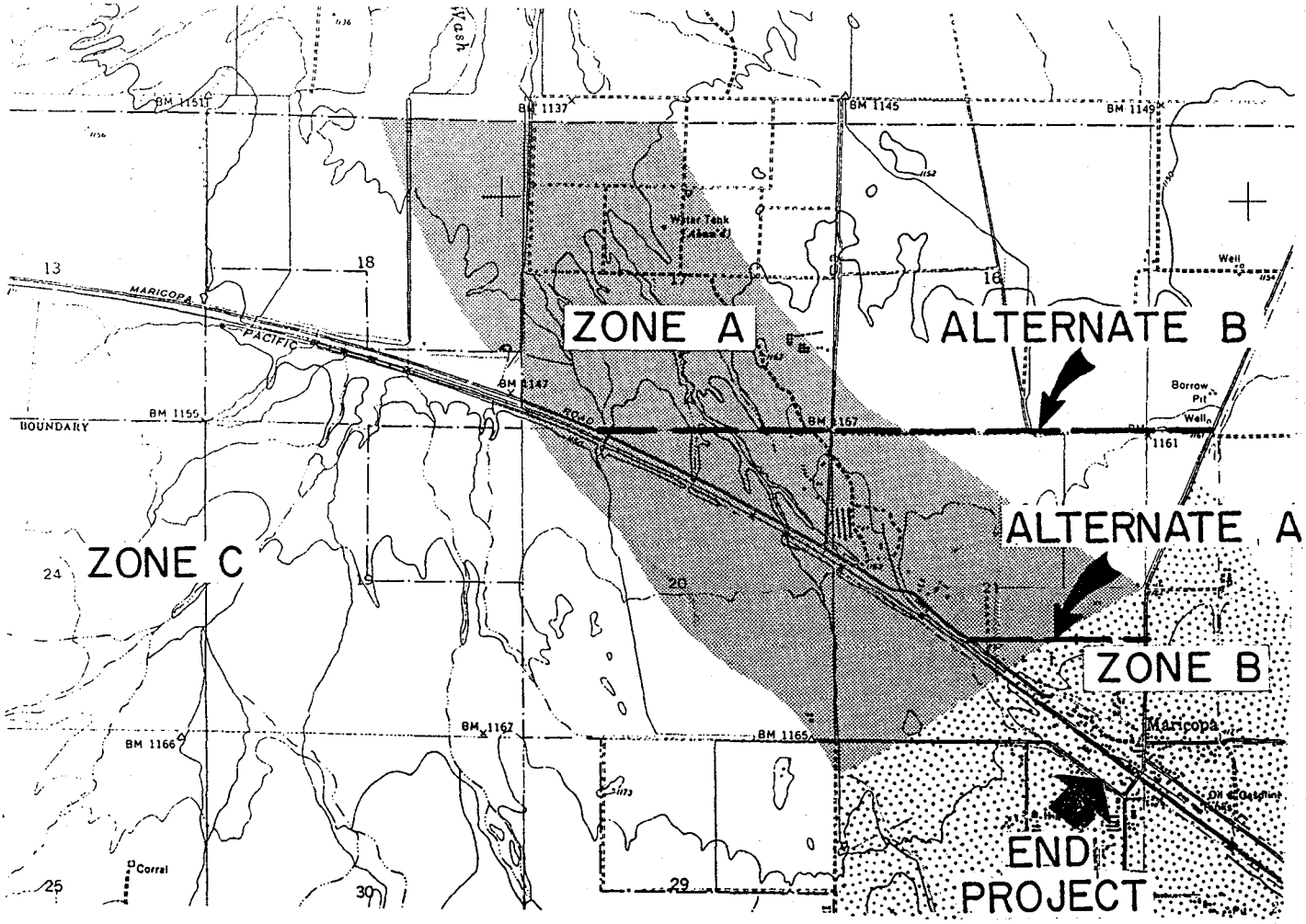
The roadway which parallels the Southern Pacific tracks to the north, is one of the earliest automobile roads of the region. The existing horizontal and vertical alignment of the roadway also result in the diversion of water from many of the washes. Existing cross slopes in some areas are so small compared with the longitudinal slope of the roadway that flows are diverted along the roadway until a low gradient wash that is lower than the roadway can be found.

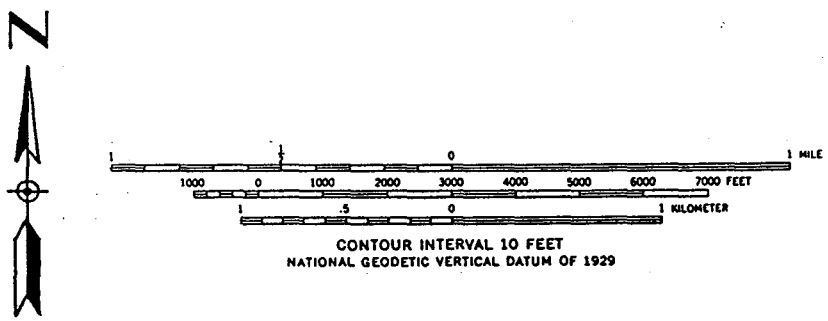
Agricultural operations to the south of the roadway have also had significant impact on the drainage patterns of the area. As crop land was leveled for irrigation, storm water drainage was routed around the cultivated fields. More recently the Maricopa Ak Chin Indian Reservation has embarked upon a major irrigation project with assistance from the U.S. Bureau of Reclamation. Several new floodways are being constructed, as well as a major diversion dike associated with the Santa Rosa Canal that delivers water from the Central Arizona Project. The new floodways will effectively divert waters in the Vekol Wash area from Interstate 8 through the Ak Chin Indian Reservation to a point approximately 1 mile south of the Vekol Wash crossing of the railroad.

There are no major changes to the drainage patterns along the proposed route as a result of the proposed roadway project. The improved roadway provides for ford and dip sections at the major wash crossings maintaining (within proposed design parameters) the existing drainage flow patterns. An exception to this occurs at the West Prong of Waterman Wash where new drainage structures are planned to provide for all-weather access across this major drainage.

A review of the Federal Emergency Management Agency (FEMA) mapping program indicates that no flood maps are available for the western half of the project. The eastern half of the project is covered by FEMA panel number 04077 0450 C (see Exhibit 5) delineating a Flood Zone A that impacts the projects various alignments. It should be noted however that this flood mapping only addresses the Santa Rosa Wash and does not provide mapping for the Vekol Wash drainage.

Due to the location of the existing alignment and the alignment of Alternates A and B, significant encroachment into the flood plain will occur. No practical alternative alignments exist that would eliminate this encroachment. However, the proposed project configuration does not include major excavation, fill or construction of drainage facilities other than concrete fords at the washes. Minimal construction activities confined to the 100 foot right-of-way will result in only minor environmental impact to existing drainageways.





REFERENCE: F.E.M.A. PANEL NO. 040077 0450 C

PINAL COUNTY/MARICOPA FLOOD PLAIN AREA

MARICOPA-MOBILE-GILA BEND HIGHWAY
STATE ROUTE 238
PROJECT NO. S-987-301 EXHIBIT 5

3. HYDROLOGIC AND HYDRAULIC METHODOLOGY

3.1 A.D.O.T. METHOD

Drainage basins less than 10 square miles are analyzed using A.D.O.T.'s modified Soil Conservation Service Method Part I to determine the peak discharge for each drainage area for the specified 50 year 1 hour design frequency. The S.C.S. Part I method is a modification of United States Department of Agriculture Soil Conservation Service (S.C.S.) methods developed for estimating runoff from drainage areas less than ten (10) square miles and is based on recorded rainfall data and drainage basin characteristics such as area, shape, slope, vegetation type, percent of vegetative cover and the infiltration capacity of the basin soil.

3.2 TR-20 METHOD

Drainage basins larger than 10 square miles are analyzed using the 1982 version of the S.C.S. TR-20 Computer Program for Project Formulation Hydrology. The program is a single event model which computes direct runoff resulting from any synthetic or natural rainstorm, develops flood hydrographs from runoff and routes the flow through stream channel reaches and reservoirs. It combines routed hydrographs with those from other tributaries and computes peak discharges, their times of occurrence and water surface elevations at any desired cross section or structure. Stream channel reach routing is accomplished using a modified attenuation-kinematic (Att-Kin) coefficient method and reservoir routing is calculated using the storage indication method. Characteristics considered in the development of runoff hydrographs are the same as for A.D.O.T.'s S.C.S. Part I method.

3.3 DISCUSSION

The total drainage basin contributing runoff to this project is divided into 41 drainage areas corresponding to the existing railroad structures transmitting these flows. The railroad structures provide a convenient basis for the drainage design of the proposed roadway since they meter flow under the railroad and across the roadway. Based on the size of the drainage area either A.D.O.T.'s S.C.S. Part I method or the TR-20 program is used to evaluate the peak discharge at the railroad structure. Aerial observation and ground site visits, as well as available maps, were utilized to delineate individual drainage areas and to determine soil types and the type of and density of vegetative cover. Maps depicting the drainage areas and TR-20 routing schematics are included in the Appendix.

The proposed roadway drainage facilities are designed for a 50 year storm. The 50 year, 1 hour design storm is assumed to cover the entire drainage basin at the same time with no real reduction. This is highly unlikely on such a large area but was used to simplify the analysis.

Survey information at each railroad structure is utilized to determine the maximum discharge that would be transmitted under the railroad to the proposed roadway. Many of the structures are filled with dirt and debris. In these cases the largest reasonable area is calculated on the assumption that the structures are periodically cleaned.

Hydrologic analysis reveals that for the design storm, many drainage areas generate more runoff than the existing railroad structures can convey, forcing the excess flow to be diverted to the next structure to the east. There is evidence of major flows being conveyed along the south side of the railroad in an easterly direction from one structure to the next substantiating this flowby phenomenon.

When calculating the total flow at a given railroad drainage structure, any flowby from an upstream structure is directly added to the peak runoff calculated at the structure. No adjustment is made for differences in peak times or for flowby travel time when combining the flows. Therefore, the results are conservative, since any timing differences would reduce the combined total flow. This is substantiated by the fact that according to the results of the analysis the railroad would be overtopped by the runoff from the 50 year 1 hour design storm, but historical data indicates that the railroad tracks have not been overtopped since they were built.

The capacity of the railroad bridge structures is calculated based on the structures maximum available cross sectional area assuming a flow velocity of 10 feet per second. The capacity of existing railroad pipe culvert installations is calculated using U.S.D.O.T. Hydraulic Engineering Circular No. 5, Hydraulic Charts for the Selection of Highway Culverts. Inlet control is assumed for all pipe culverts with the inlet highwater (HW) one foot below the railroad tracks. The capacity of the existing channels downstream of the railroad structure is estimated using Manning's equation.

Drainage Basin #40 is unique in that it is the only drainage basin north of the proposed roadway and has a general runoff flow from north to south. The runoff from Drainage Area #40 does not reach the proposed roadway as it is intercepted by a large dike and channel and redirected to the east and to

the north. Calculations on the dike and channel indicate that no water from area #40 will reach or cross the proposed roadway.

Drainage Basin #41 located at the east end of the project is unique in that it is the largest of all the basins, a major portion of the basin is agricultural farm land, and Highway I-8 cuts off a major portion of this basin to the south. In general the characteristics of Drainage Basin #41 are such that during a major storm event, runoff is conveyed by sheet flow and has been observed to "spread out for miles". This sheet flow is conveyed across the proposed roadway through twenty-four (24) separate railroad structure (#43 - #66). Since Highway I-8 bisects basin #41 all flow from south of the highway is concentrated and metered through the existing highway structures. This flow is assumed to not contribute significantly to the peak flows at the railroad structures which are located approximately 16 miles to the north due to the differences in peak times.

3.4 CONCRETE FORD DESIGN

A.D.O.T. standards specify that concrete ford walls must extend one foot above the design ford high water level. Therefore, wash geometry, wash flows, and proposed roadway vertical alignment are analyzed to determine the design depth of flow across the fords.

Using the flows from TR-20 and S.C.S. Part I analysis, the surveyed wash cross sections and Manning's formula, the depth of water in each wash is obtained. In order to simplify preliminary design five representative flows are chosen (200 cfs, 600 cfs, 1000 cfs, 2500 cfs) to represent the complete range of flows. Wash flow depths in each range are then averaged to obtain a mean depth to associate with these representative flows.

It is assumed that the wash geometry will be similar on both sides of the proposed roadway and that the depth of flow in the wash upstream and downstream of the ford will be the same. Given this assumption, it is apparent that the depth of flow in the ford will be the same as the depth of flow in the existing wash. The required ford lengths are then calculated based on these flow depths plus the required one foot of freeboard.

3.5 SUMMARY OF RESULTS

Results of the drainage analysis are summarized in the Appendix in Tables 1 through 3. Table 1 provides a Hydrologic Design Data Summary sheet of the A.D.O.T.S.C.S. Part I method for drainage areas 1 through 40. Table 2, Hydrologic Hydraulic Summary, provides a tabulated summary of the drainage areas analyzed, the amount of flowby assumed for each railroad structure, railroad structure capacity, downstream channel capacity, and assumed flow over the proposed roadway at each location. The design flow and flow depth for each ford is summarized in Table 3. The TR-20 Input and Summary Tables are also included in the Appendix.

4. REFERENCES

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Sheldon, M., et al.
Hydrologic and Hydraulic Training Session, Phoenix: Arizona Department of Transportation, October 16, 17, 18, 1972 (rev. December 1973).

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APPENDIX

CONTENTS

Table No. 1
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Drainage Area 28
Drainage Area 38
Drainage Area 40
Drainage Area 41

Drainage Area Map

TR-20 Routing Schematics

ARIZONA DEPARTMENT OF TRANSPORTATION
MARICOPA - MOBILE - GILA BEND HIGHWAY
STATE ROUTE 238 PROJECT NO. S-987-301

HYDROLOGIC DESIGN DATA SHEET SUMMARY
SCS METHOD: PART I

AREA	1	2	3	4	5	6	7	8	9	10
DESIGN DATA:										
Design Frequency - years	50	50	50	50	50	50	50	50	50	50
Drainage Area - sq miles	0.26	1.84	0.06	2.36	0.21	0.94	1.34	0.16	0.07	0.75
Drainage Length - feet	5,800	21,600	2,600	25,900	7,900	12,400	8,400	4,000	2,400	13,200
Elevation										
Top of Drainage Area - feet	1,550	2,500	1,500	3,270	1,540	1,950	2,050	1,460	1,445	1,950
At Structure - feet	1,485	1,475	1,475	1,460	1,455	1,440	1,420	1,420	1,420	1,420
Drainage Area Slope - %	1.1%	1.9%	1.0%	1.8%	1.1%	1.1%	1.2%	1.0%	1.0%	0.9%
Drainage Width - feet	1,250	2,375	643	2,540	741	2,113	4,447	1,115	813	1,584
Width Factor - Wf	1.10	*	1.24	*	*	1.00	0.89	1.10	1.10	*
Vegetative Cover Type	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH
Vegetative Cover Density - %	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Soil Group	B	B	B	B	B	B	B & D	B	B	B & D
Precipitation										
P = 6 hour - inches	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22
P = 24 hour - inches	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
DESIGN COMPUTATIONS:										
Precipitation										
P = 1 hour - inches	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Curve Number	83	83	83	83	83	83	84	83	83	85
Runoff Q - inches	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.00	1.00	1.10
Time of Conc Tc - hours	1.12	1.27	0.95	1.50	0.73	0.62	0.5	1.08	0.95	1.16
Time of Peak										
Tp = (Tc)x(Wf) - hours	1.23		1.18			0.62	0.45	1.19	1.05	
Peak Discharge										
Qp = 484 A Q/Tp - cfs	102	699	25	764	139	734	1,530	65	32	345

ARIZONA DEPARTMENT OF TRANSPORTATION
MARICOPA - MOBILE - GILA BEND HIGHWAY
STATE ROUTE 238 PROJECT NO. S-987-301

HYDROLOGIC DESIGN DATA SHEET SUMMARY
SCS METHOD: PART I

AREA	11	12	13	14	15	16	17	18	19	20
DESIGN DATA:										
Design Frequency - years	50	50	50	50	50	50	50	50	50	50
Drainage Area - sq miles	0.24	6.41	0.05	1.20	0.05	0.70	1.87	0.37	0.34	0.13
Drainage Length - feet	6,800	36,400	1,800	20,600	2,100	29,600	29,000	10,500	7,200	4,000
Elevation										
Top of Drainage Area - feet	1,480	3,270	1,420	1,570	1,415	1,660	1,660	1,460	1,430	1,400
At Structure - feet	1,420	1,410	1,400	1,400	1,400	1,390	1,380	1,380	1,370	1,370
Drainage Area Slope - %	0.9%	1.2%	1.1%	0.8%	0.7%	0.9%	1.0%	0.8%	0.8%	0.8%
Drainage Width - feet	984	4,909	774	1,624	664	659	1,798	973	1,316	906
Width Factor - Wf	*	*	1.10	*	1.10	*	*	*	1.00	1.10
Vegetative Cover Type	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH
Vegetative Cover Density - %	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Soil Group	B	B & D	B	B	B	B	B	B	B	B
Precipitation										
P = 6 hour - inches	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22
P = 24 hour - inches	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
DESIGN COMPUTATIONS:										
Precipitation										
P = 1 hour - inches	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Curve Number	83	85	83	83	83	83	83	83	83	83
Runoff Q - inches	1.00	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Time of Conc Tc - hours	0.70	2.27	0.95	1.69	0.95	2.15	2.07	1.05	1.35	1.20
Time of Peak										
Tp = (Tc)x(Wf) - hours			1.05		1.05				1.35	1.32
Peak Discharge										
Qp = 484 A Q/Tp - cfs	166	1,505	23	344	23	158	438	171	122	48

ARIZONA DEPARTMENT OF TRANSPORTATION
MARICOPA - MOBILE - GILA BEND HIGHWAY
STATE ROUTE 238 PROJECT NO. S-987-301

HYDROLOGIC DESIGN DATA SHEET SUMMARY
SCS METHOD: PART I

AREA	21	22	23	24	25	26	27	28	29	30
DESIGN DATA:										
Design Frequency - years	50	50	50	50	50	50	50	50	50	50
Drainage Area - sq miles	0.12	0.09	1.70	0.06	17.06	0.16	6.80	14.07	1.67	0.08
Drainage Length - feet	4,700	2,600	22,200	2,600	62,300	5,500	44,900	51,700	24,500	2,400
Elevation										
Top of Drainage Area - feet	1,400	1,375	1,640	1,370	2,860	1,370	2,040	2,920	1,460	1,330
At Structure - feet	1,360	1,360	1,350	1,350	1,340	1,335	1,330	1,320	1,320	1,310
Drainage Area Slope - %	0.9%	0.6%	0.7%	0.8%	0.9%	0.6%	0.8%	0.8%	0.6%	0.8%
Drainage Width - feet	712	965	2,135	643	7,634	811	4,222	7,587	1,893	929
Width Factor - Wf	*	1.10	*	1.10	*	*	*	*	*	1.10
Vegetative Cover Type	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH
Vegetative Cover Density - %	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Soil Group	B	B	B	B	B & D	B	B	B & D	B	B
Precipitation										
P = 6 hour - inches	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22
P = 24 hour - inches	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
DESIGN COMPUTATIONS:										
Precipitation										
P = 1 hour - inches	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Curve Number	83	83	83	83	88	83	83	84	83	83
Runoff Q - inches	1.00	1.00	1.00	1.00	1.30	1.00	1.00	1.05	1.00	1.00
Time of Conc Tc - hours	0.53	1.80	1.90	1.20	3.83	0.67	3.11	3.47	2.23	1.20
Time of Peak										
Tp = (Tc)x(Wf) - hours		1.98		1.32						1.32
Peak Discharge										
Qp = 484 A Q/Tp - cfs	109	22	433	22	2,806	115	1,059	2,064	363	29

ARIZONA DEPARTMENT OF TRANSPORTATION
MARICOPA - MOBILE - GILA BEND HIGHWAY
STATE ROUTE 238 PROJECT NO. S-987-301

HYDROLOGIC DESIGN DATA SHEET SUMMARY
SCS METHOD: PART I

AREA	31	32	33	34	35	36	37	38	39	40
DESIGN DATA:										
Design Frequency - years	50	50	50	50	50	50	50	50	50	50
Drainage Area - sq miles	0.17	1.38	0.28	8.82	0.16	0.66	0.32	14.28	0.46	10.43
Drainage Length - feet	4,200	20,100	7,900	33,300	4,700	17,400	5,300	55,400	5,800	36,400
Elevation										
Top of Drainage Area - feet	1,335	1,425	1,355	1,920	1,320	1,385	1,320	1,840	1,320	3,580
At Structure - feet	1,305	1,300	1,295	1,295	1,295	1,295	1,295	1,300	1,300	1,200
Drainage Area Slope - %	0.7%	0.6%	0.8%	0.7%	0.5%	0.5%	0.5%	1.0%	0.3%	6.5%
Drainage Width - feet	1,128	1,914	988	7,384	949	1,057	1,683	7,186	2,211	7,988
Width Factor - Wf	1.10	*	*	*	1.10	*	1.00	*	1.00	0.89
Vegetative Cover Type	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH	DES BRSH
Vegetative Cover Density - %	10%	10%	10%	10%	10%	10%	10%	10%	10%	30%
Soil Group	B	B	B	B	B	B	B	B & D	B	D
Precipitation										
P = 6 hour - inches	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22	3.22
P = 24 hour - inches	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
DESIGN COMPUTATIONS:										
Precipitation										
P = 1 hour - inches	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Curve Number	83	83	83	83	83	83	83	85	83	90
Runoff Q - inches	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.00	1.45
Time of Conc Tc - hours	1.45	1.84	0.83	2.60	1.30	1.77	1.50	3.39	2.20	0.74
Time of Peak										
Tp = (Tc)x(Wf) - hours	1.60				1.43		1.50		2.20	0.66
Peak Discharge										
Qp = 484 A Q/Tp - cfs	52	363	163	1,643	54	181	103	2,242	101	11,114

MARICOPA—MOBILE—GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

HYDROLOGIC-HYDRAULIC SUMMARY

STR. #	TYPE	DRAINAGE AREA ID #	DRAINAGE AREA Q's SCS (CFS)	DRAINAGE AREA Q's TR-20 (CFS)	FLOWBY	TOTAL Q (CFS)	STR. CAPACITY Q (CFS)	CHANNEL CAPACITY Q (CFS)	ASSUMED FLOW OVER ROADWAY
		1	102	—					
					102				
1	2-42" CSP	2	699	—		801	160	911	160
					641				
2	20' WOOD BRIDGE	3	25	—		666	723	1095	723
					0				
3	2-42" CSP	4	764	—		764	166	1317	166
					598				
4	2-48" CSP	5	139	—		737	216	901	216
					521				
5	20' WOOD BRIDGE	6	734	—		1255	1023	1563	1023
					232				
6	57.1' CONC. BRIDGE	7	1530	—		1762	3619	—	3619
					0				
7	12.8' CONC. ABUT.	8	65	—		65	622	—	622
					0				
8	13.8' CONC. W\ PIERS	9	32	—		32	517	513	517
					0				
9	12.8' CONC. ABUT.	10	345	—		345	512	1040	512
					0				
10	2-58" X 36" CSPA	11	166	—		166	214	740	214
					0				
12	22.6' CONC. ABUT.	12	1505	—		1505	1000	207	1000
					505				
13	18' CONC. W\ PIERS	13	23	—		528	685	966	685
					0				
14	12.2' CONC. BRIDGE	14	344	—		344	305	662	305
					39				
15	12.2' CONC. BRIDGE	15	23	—		62	196	308	196
					0				
16	17.9' CONC. BRIDGE	16	158	—		158	636	2190	636
					0				
17	17.8' CONC. ABUT.	17	438	—		438	616	3528	616
					0				
18	10.2' CONC. ABUT.	18	171	—		171	418	633	418
					0				
19	3-27" STEEL PIPES	19	122	—		122	76	369	76
					46				
20	20.3' WOOD BRIDGE	20	48	—		94	525	1406	525
					0				
21	2-48" CSP	21	109	—		109	220	267	220
					0				

MARICOPA--MOBILE--GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

HYDROLOGIC-HYDRAULIC SUMMARY

STR. #	TYPE	DRAINAGE AREA ID #	DRAINAGE AREA Q's SCS (CFS)	DRAINAGE AREA Q's TR-20 (CFS)	FLOWBY	TOTAL Q (CFS)	STR. CAPACITY Q (CFS)	CHANNEL CAPACITY Q (CFS)	ASSUMED FLOW OVER ROADWAY
22	2-58" X 36" CSPA	22	22	—		22	220	319	220
					0				
23	2-58" X 36" CSPA	23	433	—		433	212	253	212
					221				
24	11.7' CONC. & STEEL	24	22	—		243	226	845	226
					17				
25	10.1' CONC. & I-BEAM	25	4099	9772		9789	540	759	540
					9249				
26	30' CONC. BRIDGE	26	115	—		9364	909	162	909
					8455				
27	18' CONC. ABUT.	27	1059	—		9514	820	901	820
					8694				
28	10.6' CONC. ABUT.	28	2064	4065		12759	647	802	647
					12112				
29	60.1' WOOD BRIDGE	29	363	—		12475	2943	1194	2943
					9532				
31	10.4' CONC. & I-BEAMS	30	29	—		9561	291	1593	291
					9270				
32	12' CONC. & STEEL	31	52	—		9322	332	578	332
					8990				
33	12' CONC. BOX	32	363	—		9353	348	409	348
					9005				
34	10.3 CONC. ABUT.	33	163	—		9168	503	1985	503
					8665				
35	35.6' CONC. ABUT.	34	1634	—		10299	1734	1181	1734
					8565				
36	18' CONC. & WOOD BEAMS	35	54	—		8619	579	528	579
					8040				
37	4-40" STEEL PIPES	36	181	—		8221	364	240	364
					7857				
38	2-58" X 36" CSPA	37	103	—		7960	192	273	192
					7768				
39	3' X 3' WOOD BOX	38	2242	3949		11717	84	141	84
					11633				
40	2-4' X 2.5' WOOD BOXES	38	0	—		11633	200	499	200
					11433				
41	3' X 1.7' WOOD BOX	39	101	—		11534	54	64	54
					11480				
42	2-4' X 2.5' BOXES	39	0	—		11480	200	33	200
					11280				
43	10.2' CONC. 7 STEEL BEAM	41A	**	**		**	378	—	378
					—				

MARICOPA--MOBILE--GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

HYDROLOGIC-HYDRAULIC SUMMARY

STR. #	TYPE	DRAINAGE AREA ID #	DRAINAGE AREA Q's SCS (CFS)	DRAINAGE AREA Q's TR-20 (CFS)	FLOWBY	TOTAL Q (CFS)	STR. CAPACITY Q (CFS)	CHANNEL CAPACITY Q (CFS)	ASSUMED FLOW OVER ROADWAY
44	3' X 2.1' WOOD BOX	41A	**	**	—	**	63	—	63
45	4' X 1.5' WOOD BOX	41A	**	**	—	**	60	—	60
46	13.7' CONC. ABUT.	41A	**	**	—	**	575	—	575
47	17.4' CONC. ABUT.	41A	**	**	—	**	330	—	330
48	18.5' CONC. ABUT.	41A	**	**	—	**	170	—	170
49	18' CONC. ABUT.	41A	**	**	—	**	359	—	359
50	12.2' CONC. ABUT.	41	—	*	—	*	171	—	171
51	8' CONC. ABUT.	41	—	*	—	*	120	—	120
52	13.4' CONC. ABUT.	41	—	*	—	*	201	—	201
53	22.1' CONC. ABUT.	41	—	*	—	*	530	—	530
54	22.4' CONC. ABUT.	41	—	*	—	*	760	—	760
55	21.7' CONC. ABUT.	41	—	*	—	*	989	—	989
56	58.4' CONC. W\ WOOD BEAM	41	—	*	—	*	2530	—	2530
57	58.' CONC. W\ WOOD BEAMS	41	—	*	—	*	2376	—	2376
58	21.6' CONC. ABUT.	41	—	*	—	*	780	—	780
59	13' CONC. ABUT.	41	—	*	—	*	655	—	655
60	38' CONC. W\ WOOD BEAMS	41	—	*	—	*	1486	—	1486
61	17.9' CONC. ABUT.	41	—	*	—	*	700	—	700
62	38.1' CONC. W\ WOOD BEAM	41	—	*	—	*	1660	—	1660
63	43.2' CONC. ABUT.	41	—	*	—	*	1497	—	1497
64	38' CONC. W\ WOOD BEAMS	41	—	*	—	*	1324	—	1324

MARICOPA--MOBILE--GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

HYDROLOGIC-HYDRAULIC SUMMARY

STR. #	TYPE	DRAINAGE AREA ID #	DRAINAGE AREA Q's SCS (CFS)	DRAINAGE AREA Q's TR-20 (CFS)	FLOWBY	TOTAL Q (CFS)	STR. CAPACITY Q (CFS)	CHANNEL CAPACITY Q (CFS)	ASSUMED FLOW OVER ROADWAY
65	22.9' CONC. ABUT.	41	---	*	---	*	1060	---	1060
66	44' WOOD BRIDGE	41	---	*	---	*	1421	---	1421

* TOTAL DRAINAGE FLOW FROM AREA #41 = 26723 C.F.S.

** TOTAL DRAINAGE FLOW FROM AREA #41A = C.F.S.

TOTAL STRUCTURE CAPACITY IN AREA #41 = 18260 C.F.S.

MARICOPA--MOBILE--GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

CONCRETE FORD DESIGN SUMMARY

FORD STATION	CONTRIBUTING STRUCTURES	FORD LENGTH (FEET)	DESIGN "Q" (C.F.S.)	WATER DEPTH (FEET)
1224+00	#4	1160	600	2.2
1248+00	#5	800	1000	1.9
1294+00	#6,#7 & #8	1220	2500	2.2
1310+00	#9 & #10	1470	600	2.2
1350+00	#12	1100	1000	1.9
1366+00	#13	920	700	2.2
1382+00	#14 & #15	1280	300	1.4
1419+00	#16 & #17	1450	600	2.2
1464+00	#18,#19,#20 & #21	2000	600	2.2
1490+00	#22	1040	700	2.2
1512+00	#23 & #24	1320	600	1.4
1542+00	#25 & #26	1560	900	1.9
1576+00	#27	1060	800	1.9
1620+00	#28,#29,#31 & #32	2300	2500	4.0
1652+00	#33 & #34	1800	500	2.2
1684+00	#35,#36 & #37	2470	1500	4.0
1712+00	#38	960	600	2.2
1732+00	#39 & #40	1720	200	1.4
1750+00	#41 & #42	1180	200	1.4
1858+00	#43	1100	400	1.8

MARICOPA--MOBILE--GILA BEND HIGHWAY

STATE ROUTE 238 PROJECT # S-987-301

CONCRETE FORD DESIGN SUMMARY

FORD STATION	CONTRIBUTING STRUCTURES	FORD LENGTH (FEET)	DESIGN "Q" (C.F.S.)	WATER DEPTH (FEET)
1874+00	#44	830	100	1.4
1890+00	#45	1270	100	1.4
1912+00	#46	1360	600	2.5
1946+00	#47	1200	300	1.4
1978+00	#48	760	200	1.0
2004+00	#49	830	400	1.3
2056+00	#50	1340	200	1.2
2085+00	#51	1700	100	1.5
2126+00	#52 & #53	1100	500	1.2
2156+00	#54 THRU #59	4640	2500	4.0
2196+00 *	#60	940	1500	2.5
2215+00 *	#61	1290	700	2.2
2242+00 *	#62 & #63	1220	1500	1.5
2261+00 *	#64 & #65	1980	1500	1.4
2216+00 **	#61 & #62	2000	1500	5.0
2236+00 **	#63	1000	1500	4.0
2241+00 **	#64	600	1500	N.A.
2256+00 **	#65	1350	1000	1.9

* ALTERNATE B
** ALTERNATE A

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20
TITLE 610 STATE ROUTE 238 AREA 25 RAINFALL DRAINAGE HYD3REV4.DAT
TITLE
 5 RAINFL 1                0.041666667
 8             0.000       0.015       0.032       0.049       0.066
 8             0.085       0.105       0.139       0.176       0.215
 8             0.275       0.355       0.500       0.645       0.725
 8             0.785       0.824       0.861       0.895       0.915
 8             0.934       0.951       0.968       0.985       1.000
 9 ENDTBL
 6 RUNOFF 1    01     5    1.281       92.0        0.29     1 0 0 1 0 1
 6 REACH  3 102   5   6    14800.      0.8537      1.5235   1 0 0 1 0 1
 6 RUNOFF 1    02     4    2.225       90.0        0.66     1 0 0 1 0 1
 6 RUNOFF 1    03     5    1.109       91.0        0.49     1 0 0 1 0 1
 6 ADDHYD 4 103   4 5 3                                      1 0 0 1 0 1
 6 ADDHYD 4 103   3 6 7                                      1 0 0 1 0 1
 6 REACH  3 104   7   6    9000.       0.1668      1.6585   1 0 0 1 0 1
 6 RUNOFF 1    04     5    1.408       88.0        0.42     1 0 0 1 0 1
 6 REACH  3 121   5   7    3700.       0.0745      1.6640   1 0 0 1 0 1
 6 RUNOFF 1    05     1    2.525       91.0        0.67     1 0 0 1 0 1
 6 RUNOFF 1    06     2    1.248       89.0        0.44     1 0 0 1 0 1
 6 RUNOFF 1    07     3    1.126       86.0        0.52     1 0 0 1 0 1
 6 ADDHYD 4 105   1 2 4                                      1 0 0 1 0 1
 6 ADDHYD 4 105   4 3 2                                      1 0 0 1 0 1
 6 ADDHYD 4 105   2 6 5                                      1 0 0 1 0 1
 6 ADDHYD 4 105   5 7 6                                      1 0 0 1 0 1
 6 REACH  3 106   6   7    9000.       0.0592      1.6651   1 0 0 1 0 1
 6 RUNOFF 1    08     5    1.658       83.0        0.60     1 0 0 1 0 1
 6 RUNOFF 1    09     6    1.202       83.0        1.17     1 0 0 1 0 1
 6 ADDHYD 4 107   5 6 4                                      1 0 0 1 0 1
 6 ADDHYD 4 107   4 7 6                                      1 0 0 1 0 1
 6 REACH  3 108   6   7    15000.      0.0596      1.6649   1 0 0 1 0 1
 6 RUNOFF 1    10     5    1.445       83.0        1.50     1 0 0 1 0 1
 6 ADDHYD 4 109   5 7 6                                      1 0 0 1 0 1
 6 REACH  3 110   6   7    13100.      0.0381      1.6657   1 0 0 1 0 1
 6 RUNOFF 1    11     6    1.339       83.0        1.54     1 0 0 1 0 1
 6 ADDHYD 4 111   6 7 5                                      1 0 0 1 0 1
   ENDATA
 7 INCREM 6                0.10
 7 COMPUT 7    01 111                        2.42        1.001 2  01  01
   ENDCMP 1
   ENDJOB 2

*****************************END OF 80-80 LIST*******************************
```

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 1	RUNOFF	1.28	1	2	.10	.0	2.42	1.00	1.62	---	.72	3034.01	2368.5
XSECTION 102	REACH	1.28	1	2	.10	.0	2.42	1.00	1.62	---	.92	2168.30	1692.7
STRUCTURE 2	RUNOFF	2.22	1	2	.10	.0	2.42	1.00	1.46	---	1.01	2890.68	1299.2
STRUCTURE 3	RUNOFF	1.11	1	2	.10	.0	2.42	1.00	1.54	---	.87	1830.30	1650.4
XSECTION 103	ADDHYD	3.33	1	2	.10	.0	2.42	1.00	1.49	---	.95	4567.80	1370.1
XSECTION 103	ADDHYD	4.61	1	2	.10	.0	2.42	1.00	1.52	---	.93	6724.42	1457.1
XSECTION 104	REACH	4.61	1	2	.10	.0	2.42	1.00	1.52	---	1.12	6051.75	1311.3
STRUCTURE 4	RUNOFF	1.41	1	2	.10	.0	2.42	1.00	1.31	---	.83	2204.86	1566.0
XSECTION 121	REACH	1.41	1	2	.10	.0	2.42	1.00	1.31	---	1.01	1882.22	1336.8
STRUCTURE 5	RUNOFF	2.53	1	2	.10	.0	2.42	1.00	1.54	---	1.01	3406.84	1349.2
STRUCTURE 6	RUNOFF	1.25	1	2	.10	.0	2.42	1.00	1.38	---	.84	2003.82	1605.6
STRUCTURE 7	RUNOFF	1.13	1	2	.10	.0	2.42	1.00	1.18	---	.92	1380.56	1226.1
XSECTION 105	ADDHYD	3.77	1	2	.10	.0	2.42	1.00	1.49	---	.94	5104.61	1352.9
XSECTION 105	ADDHYD	4.90	1	2	.10	.0	2.42	1.00	1.42	---	.93	6481.88	1323.1
XSECTION 105	ADDHYD	9.51	1	2	.10	.0	2.42	1.00	1.47	---	1.03	11822.76	1242.7
XSECTION 105	ADDHYD	10.92	1	2	.10	.0	2.42	1.00	1.45	---	1.03	13696.72	1254.0
XSECTION 106	REACH	10.92	1	2	.10	.0	2.42	1.00	1.45	---	1.25	11901.12	1089.6
STRUCTURE 8	RUNOFF	1.66	1	2	.10	.0	2.42	1.00	1.00	---	.99	1572.77	948.6
STRUCTURE 9	RUNOFF	1.20	1	2	.10	.0	2.42	1.00	1.00	---	1.39	690.24	574.2
XSECTION 107	ADDHYD	2.86	1	2	.10	.0	2.42	1.00	1.00	---	1.05	1999.26	699.0
XSECTION 107	ADDHYD	13.78	1	2	.10	.0	2.42	1.00	1.35	---	1.23	13634.76	989.3
XSECTION 108	REACH	13.78	1	2	.10	.0	2.42	1.00	1.35	---	1.54	10855.98	787.7
STRUCTURE 10	RUNOFF	1.45	1	2	.10	.0	2.42	1.00	1.00	---	1.61	666.87	461.5
XSECTION 109	ADDHYD	15.23	1	2	.10	.0	2.42	1.00	1.32	---	1.54	11517.03	756.4
XSECTION 110	REACH	15.23	1	2	.10	.0	2.42	1.00	1.32	---	1.91	9230.73	606.2
STRUCTURE 11	RUNOFF	1.34	1	2	.10	.0	2.42	1.00	1.00	---	1.63	603.56	450.8
XSECTION 111	ADDHYD	16.57	1	2	.10	.0	2.42	1.00	1.29	---	1.89	9772.00	589.9

UMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA												TRAVEL TIME	
SEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	Q AND A EQUATION COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO O/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE	1	STORM	1																
102	14800	3014	.7	2163	.9	---	---	0	1.62	.10	1	.854	1.52	.525	.717	687	.42	.20	.20
04	9000	6656	.9	6033	1.1	---	---	0	1.52	.10	1	.167	1.66	.157	.906	485	.54	.20	.14
21	3700	2180	.8	1881	1.0	---	---	0	1.31	.10	1	.075	1.66	.232	.863	493	.54	.20	.14
106	9000	13625	1.0	11762	1.2	---	---	0	1.45	.10	1	.059	1.67	.224	.863	659	.43	.20	.19
08	15000	13576	1.2	10813	1.5	---	---	0	1.35	.10	1	.060	1.66	.394	.796	1096	.28	.30	.32
110	13100	11466	1.5	9230	1.9	---	---	0	1.32	.10	1	.038	1.67	.365	.805	1334	.24	.40	.39

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 11	1.34	
ALTERNATE 1		603.56
STRUCTURE 10	1.45	
ALTERNATE 1		666.87
STRUCTURE 9	1.20	
ALTERNATE 1		690.24
STRUCTURE 8	1.66	
ALTERNATE 1		1572.77
STRUCTURE 7	1.13	
ALTERNATE 1		1380.56
STRUCTURE 6	1.25	
ALTERNATE 1		2003.82
STRUCTURE 5	2.53	
ALTERNATE 1		3406.84
STRUCTURE 4	1.41	
ALTERNATE 1		2204.86
STRUCTURE 3	1.11	
ALTERNATE 1		1830.30
STRUCTURE 2	2.22	
ALTERNATE 1		2890.68
STRUCTURE 1	1.28	
ALTERNATE 1		3034.01
XSECTION 102	1.28	
ALTERNATE 1		2168.30
XSECTION 103	4.61	
ALTERNATE 1		6724.42
XSECTION 104	4.61	
ALTERNATE 1		6051.75

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 105	10.92	
ALTERNATE 1		13696.72
XSECTION 106	10.92	
ALTERNATE 1		11901.12
XSECTION 107	13.78	
ALTERNATE 1		13634.76
XSECTION 108	13.78	
ALTERNATE 1		10855.98
XSECTION 109	15.23	
ALTERNATE 1		11517.03
XSECTION 110	15.23	
ALTERNATE 1		9230.73
XSECTION 111	16.57	
ALTERNATE 1		9772.00
XSECTION 121	1.41	
ALTERNATE 1		1882.22

```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR-20
TITLE 612 STATE ROUTE 238 AREA 28 RAINFALL DRAINAGE HYD2REV3.DAT
TITLE
5 RAINFL 1                0.041666667
8             0.000       0.015       0.032       0.049       0.066
8             0.085       0.105       0.139       0.176       0.215
8             0.275       0.355       0.500       0.645       0.725
8             0.785       0.824       0.861       0.895       0.915
8             0.934       0.951       0.968       0.985       1.000
9 ENDTBL
5 RUNOFF 1    01     5    1.441       83.0        0.86     1 0 0 1 0 1
6 RUNOFF 1    02     6    3.596       83.0        1.24     1 0 0 1 0 1
6 ADDHYD 4 101   5 6 7                                      1 0 0 1 0 1
6 REACH  3 102   7   6    6000.       0.0683      1.6652   1 0 0 1 0 1
6 RUNOFF 1    03     4    2.329       83.0        1.56     1 0 0 1 0 1
6 RUNOFF 1    04     5    1.191       83.0        0.87     1 0 0 1 0 1
6 ADDHYD 4 103   4 5 7                                      1 0 0 1 0 1
6 ADDHYD 4 103   7 6 5                                      1 0 0 1 0 1
6 REACH  3 104   5   6    6000.       0.0507      1.6655   1 0 0 1 0 1
6 RUNOFF 1    05     4    1.672       83.0        1.08     1 0 0 1 0 1
6 RUNOFF 1    06     5    1.234       83.0        0.76     1 0 0 1 0 1
6 ADDHYD 4 105   4 5 7                                      1 0 0 1 0 1
6 ADDHYD 4 105   7 6 5                                      1 0 0 1 0 1
6 REACH  3 106   5   6    6800.       0.0439      1.6656   1 0 0 1 0 1
6 RUNOFF 1    07     5    1.482       83.0        1.76     1 0 0 1 0 1
6 ADDHYD 4 107   5 6 7                                      1 0 0 1 0 1
6 REACH  3 108   7   6    14500.      0.0332      1.6658   1 0 0 1 0 1
6 RUNOFF 1    08     5    0.865       83.0        1.56     1 0 0 1 0 1
6 ADDHYD 4 109   5 6 7                                      1 0 0 1 0 1
ENDATA
7 INCREM 6                0.10
7 COMPUT 7    01 109                        2.42        1.001 2  01  01
ENDCMP 1
ENDJOB 2

*****************************END OF 80-80 LIST******************************
```

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 1	RUNOFF	1.44	1	2	.10	.0	2.42	1.00	1.00	---	1.18	1058.19	734.3
STRUCTURE 2	RUNOFF	3.60	1	2	.10	.0	2.42	1.00	1.00	---	1.44	1967.17	547.0
XSECTION 101	ADDHYD	5.04	1	2	.10	.0	2.42	1.00	1.00	---	1.33	2873.49	570.5
XSECTION 102	REACH	5.04	1	2	.10	.0	2.42	1.00	1.00	---	1.58	2598.74	515.9
STRUCTURE 3	RUNOFF	2.33	1	2	.10	.0	2.42	1.00	1.00	---	1.65	1037.03	445.3
STRUCTURE 4	RUNOFF	1.19	1	2	.10	.0	2.42	1.00	1.00	---	1.19	868.26	729.0
XSECTION 103	ADDHYD	3.52	1	2	.10	.0	2.42	1.00	1.00	---	1.36	1650.61	468.9
XSECTION 103	ADDHYD	8.56	1	2	.10	.0	2.42	1.00	1.00	---	1.52	4152.56	485.3
XSECTION 104	REACH	8.56	1	2	.10	.0	2.42	1.00	1.00	---	1.79	3840.85	448.9
STRUCTURE 5	RUNOFF	1.67	1	2	.10	.0	2.42	1.00	1.00	---	1.33	1026.60	614.0
STRUCTURE 6	RUNOFF	1.23	1	2	.10	.0	2.42	1.00	1.00	---	1.11	994.61	806.0
XSECTION 105	ADDHYD	2.91	1	2	.10	.0	2.42	1.00	1.00	---	1.20	1922.97	661.7
XSECTION 105	ADDHYD	11.46	1	2	.10	.0	2.42	1.00	1.00	---	1.61	4832.26	421.6
XSECTION 106	REACH	11.46	1	2	.10	.0	2.42	1.00	1.00	---	1.92	4478.03	390.7
STRUCTURE 7	RUNOFF	1.48	1	2	.10	.0	2.42	1.00	1.00	---	1.78	590.54	398.5
XSECTION 107	ADDHYD	12.94	1	2	.10	.0	2.42	1.00	1.00	---	1.90	5054.82	390.5
XSECTION 108	REACH	12.94	1	2	.10	.0	2.42	1.00	1.00	---	2.55	3918.32	302.7
STRUCTURE 8	RUNOFF	.87	1	2	.10	.0	2.42	1.00	1.00	---	1.65	385.16	445.3
XSECTION 109	ADDHYD	13.81	1	2	.10	.0	2.42	1.00	1.00	---	2.51	4064.93	294.3

UMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA												TRAVEL TIME	
SEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	Q AND A EQUATION COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO O/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE 1 STORM 1																			
102	6000	2867	1.3	2597	1.6	---	---	0	1.00	.10	1	.068	1.67	.140	.906	751	.39	.30	.21
104	6000	4150	1.5	3840	1.8	---	---	0	1.00	.10	1	.051	1.67	.113	.925	773	.38	.30	.22
106	6800	4832	1.6	4477	1.9	---	---	0	1.00	.10	1	.044	1.67	.115	.927	899	.33	.30	.25
108	14500	5055	1.9	3910	2.5	---	---	0	1.00	.10	1	.033	1.67	.458	.774	2224	.15	.50	.65

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 8	.87	
ALTERNATE 1		385.16
STRUCTURE 7	1.48	
ALTERNATE 1		590.54
STRUCTURE 6	1.23	
ALTERNATE 1		994.61
STRUCTURE 5	1.67	
ALTERNATE 1		1026.60
STRUCTURE 4	1.19	
ALTERNATE 1		868.26
STRUCTURE 3	2.33	
ALTERNATE 1		1037.03
STRUCTURE 2	3.60	
ALTERNATE 1		1967.17
STRUCTURE 1	1.44	
ALTERNATE 1		1058.19
XSECTION 101	5.04	
ALTERNATE 1		2873.49
XSECTION 102	5.04	
ALTERNATE 1		2598.74
XSECTION 103	8.56	
ALTERNATE 1		4152.56
XSECTION 104	8.56	
ALTERNATE 1		3840.85
XSECTION 105	11.46	
ALTERNATE 1		4832.26
XSECTION 106	11.46	
ALTERNATE 1		4478.03

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 107	12.94	
ALTERNATE 1		5054.82
XSECTION 108	12.94	
ALTERNATE 1		3918.32
XSECTION 109	13.81	
ALTERNATE 1		4064.93

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*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR-20
TITLE 610 STATE ROUTE 238 AREA 38 RAINFALL DRAINAGE HYD4REV4.DAT
TLE
5 RAINFL 1                0.041666667
 8            0.000       0.015       0.032       0.049       0.066
 8            0.085       0.105       0.139       0.176       0.215
 8            0.275       0.355       0.500       0.645       0.725
 8            0.785       0.824       0.861       0.895       0.915
 8            0.934       0.951       0.968       0.985       1.000
 9 ENDTBL
 6 RUNOFF 1    01     5    1.872       83.0        1.36     1 0 0 1 0 1
 6 REACH  3 102   5   6    4800.       0.0227      1.6659   1 0 0 1 0 1
 6 RUNOFF 1    02     4    1.610       83.0        1.08     1 0 0 1 0 1
 6 ADDHYD 4 103   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 104   5   6    3500.       0.0748      1.6653   1 0 0 1 0 1
 6 RUNOFF 1    03     4    2.065       83.0        2.00     1 0 0 1 0 1
 6 ADDHYD 4 105   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 106   5   6    7300.       0.0744      1.6651   1 0 0 1 0 1
 6 RUNOFF 1    04     4    2.191       92.0        1.10     1 0 0 1 0 1
 6 ADDHYD 4 107   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 108   5   6    2600.       0.0585      1.6654   1 0 0 1 0 1
 6 RUNOFF 1    05     4    1.418       83.0        1.28     1 0 0 1 0 1
 6 ADDHYD 4 109   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 110   5   6    6300.       0.0540      1.6653   1 0 0 1 0 1
 6 RUNOFF 1    06     4    1.954       83.0        1.06     1 0 0 1 0 1
 6 ADDHYD 4 111   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 112   5   6    8500.       0.0524      1.6652   1 0 0 1 0 1
 6 RUNOFF 1    07     4    1.463       83.0        1.93     1 0 0 1 0 1
 6 ADDHYD 4 113   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 114   5   6    9800.       0.0355      1.6657   1 0 0 1 0 1
 6 RUNOFF 1    08     4    1.170       83.0        1.90     1 0 0 1 0 1
 6 ADDHYD 4 115   6 4 5                                      1 0 0 1 0 1
   ENDATA
 7 INCREM 6                0.10
 7 COMPUT 7    01 115                        2.42        1.001 2  01  01
   ENDCMP 1
   ENDJOB 2

*****************************END OF 80-80 LIST******************************
```

UMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 1	RUNOFF	1.87	1	2	.10	.0	2.42	1.00	1.00	---	1.52	943.14	503.8
SECTION 102	REACH	1.87	1	2	.10	.0	2.42	1.00	1.00	---	1.95	713.00	380.9
TRUCTURE 2	RUNOFF	1.61	1	2	.10	.0	2.42	1.00	1.00	---	1.33	988.53	614.0
XSECTION 103	ADDHYD	3.48	1	2	.10	.0	2.42	1.00	1.00	---	1.50	1413.12	405.8
XSECTION 104	REACH	3.48	1	2	.10	.0	2.42	1.00	1.00	---	1.71	1357.92	390.0
TRUCTURE 3	RUNOFF	2.07	1	2	.10	.0	2.42	1.00	1.00	---	1.94	729.28	353.2
XSECTION 105	ADDHYD	5.55	1	2	.10	.0	2.42	1.00	1.00	---	1.77	2053.54	370.2
SECTION 106	REACH	5.55	1	2	.10	.0	2.42	1.00	1.00	---	2.12	1886.58	340.1
TRUCTURE 4	RUNOFF	2.19	1	2	.10	.0	2.42	1.00	1.62	---	1.31	2140.03	976.7
XSECTION 107	ADDHYD	7.74	1	2	.10	.0	2.42	1.00	1.17	---	1.54	3003.50	388.1
SECTION 108	REACH	7.74	1	2	.10	.0	2.42	1.00	1.17	---	1.70	2970.99	383.9
STRUCTURE 5	RUNOFF	1.42	1	2	.10	.0	2.42	1.00	1.00	---	1.46	753.42	531.3
XSECTION 109	ADDHYD	9.16	1	2	.10	.0	2.42	1.00	1.14	---	1.63	3665.14	400.3
SECTION 110	REACH	9.16	1	2	.10	.0	2.42	1.00	1.14	---	1.93	3416.24	373.1
TRUCTURE 6	RUNOFF	1.95	1	2	.10	.0	2.42	1.00	1.00	---	1.32	1218.57	623.6
XSECTION 111	ADDHYD	11.11	1	2	.10	.0	2.42	1.00	1.12	---	1.77	4001.88	360.2
SECTION 112	REACH	11.11	1	2	.10	.0	2.42	1.00	1.12	---	2.14	3666.95	330.1
STRUCTURE 7	RUNOFF	1.46	1	2	.10	.0	2.42	1.00	1.00	---	1.89	534.61	365.4
XSECTION 113	ADDHYD	12.57	1	2	.10	.0	2.42	1.00	1.10	---	2.11	4170.65	331.7
SECTION 114	REACH	12.57	1	2	.10	.0	2.42	1.00	1.10	---	2.60	3676.27	292.4
STRUCTURE 8	RUNOFF	1.17	1	2	.10	.0	2.42	1.00	1.00	---	1.87	434.04	371.0
SECTION 115	ADDHYD	13.74	1	2	.10	.0	2.42	1.00	1.10	---	2.52	3948.98	287.3

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA						Q AND A EQUATION						TRAVEL TIME	
SEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO O/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE 1 STORM 1																			
102	4800	943	1.5	711	2.0	---	---	0	1.00	.10	1	.023	1.67	.496	.754	1809	.18	.50	.53
104	3500	1413	1.5	1358	1.7	---	---	0	1.00	.10	1	.075	1.67	.048	.961	550	.49	.20	.15
106	7300	2052	1.8	1886	2.1	---	---	0	1.00	.10	1	.074	1.67	.109	.919	992	.31	.30	.28
108	2600	2996	1.5	2971	1.7	---	---	0	1.17	.10	1	.058	1.67	.016	.992	351	.68?	.20	.10
110	6300	3659	1.6	3413	1.9	---	---	0	1.14	.10	1	.054	1.67	.072	.933	823	.36	.30	.23
112	8500	3998	1.8	3661	2.1	---	---	0	1.12	.10	1	.052	1.67	.101	.916	1092	.28	.30	.31
114	9800	4170	2.1	3676	2.6	---	---	0	1.10	.10	1	.035	1.67	.163	.882	1560	.21	.50	.44

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID		DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 8		1.17	
ALTERNATE	1		434.04
STRUCTURE 7		1.46	
ALTERNATE	1		534.61
STRUCTURE 6		1.95	
ALTERNATE	1		1218.57
STRUCTURE 5		1.42	
ALTERNATE	1		753.42
STRUCTURE 4		2.19	
ALTERNATE	1		2140.03
STRUCTURE 3		2.07	
ALTERNATE	1		729.28
STRUCTURE 2		1.61	
ALTERNATE	1		988.53
STRUCTURE 1		1.87	
ALTERNATE	1		943.14
XSECTION 102		1.87	
ALTERNATE	1		713.00
XSECTION 103		3.48	
ALTERNATE	1		1413.12
XSECTION 104		3.48	
ALTERNATE	1		1357.92
XSECTION 105		5.55	
ALTERNATE	1		2053.54
XSECTION 106		5.55	
ALTERNATE	1		1886.58
XSECTION 107		7.74	
ALTERNATE	1		3003.50

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 108	7.74	
ALTERNATE 1		2970.99
XSECTION 109	9.16	
ALTERNATE 1		3665.14
XSECTION 110	9.16	
ALTERNATE 1		3416.24
XSECTION 111	11.11	
ALTERNATE 1		4001.88
XSECTION 112	11.11	
ALTERNATE 1		3666.95
XSECTION 113	12.57	
ALTERNATE 1		4170.65
XSECTION 114	12.57	
ALTERNATE 1		3676.27
XSECTION 115	13.74	
ALTERNATE 1		3948.98

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

0B TR-20
TITLE 612  STATE ROUTE 238  AREA 40  RAINFALL DRAINAGE HYD1REV4.DAT
TITLE
5 RAINFL 1                0.041666667
8            0.000        0.015        0.032        0.049        0.066
8            0.085        0.105        0.139        0.176        0.215
8            0.275        0.355        0.500        0.645        0.725
8            0.785        0.824        0.861        0.895        0.915
8            0.934        0.951        0.968        0.985        1.000
9 ENDTBL
6 RUNOFF 1    01     5        0.456        90.        0.281 0 0 1 0 1
6 RUNOFF 1    05     6        0.361        90.        0.231 0 0 1 0 1
6 ADDHYD 4 101   5 6 7                                    1 0 0 1 0 1
6 REACH  3 102   7   6        2300.      0.4860      1.63961 0 0 1 0 1
6 RUNOFF 1    02     4        0.500        90.        0.321 0 0 1 0 1
6 RUNOFF 1    06     5        0.256        90.        0.221 0 0 1 0 1
6 ADDHYD 4 103   4 5 3                                    1 0 0 1 0 1
6 ADDHYD 4 103   3 6 7                                    1 0 0 1 0 1
6 REACH  3 104   7   6        2200.      0.3227      1.64501 0 0 1 0 1
6 RUNOFF 1    03     4        0.442        90.        0.301 0 0 1 0 1
6 RUNOFF 1    07     5        0.495        90.        0.451 0 0 1 0 1
6 ADDHYD 4 105   4 5 3                                    1 0 0 1 0 1
6 ADDHYD 4 105   3 6 7                                    1 0 0 1 0 1
6 REACH  3 106   7   6        2500.      0.2164      1.65741 0 0 1 0 1
6 RUNOFF 1    04     4        0.758        90.        0.481 0 0 1 0 1
6 RUNOFF 1    08     5        0.279        90.        0.231 0 0 1 0 1
6 ADDHYD 4 107   4 5 3                                    1 0 0 1 0 1
6 ADDHYD 4 107   3 6 7                                    1 0 0 1 0 1
6 REACH  3 108   7   6        5400.      0.2061      1.65951 0 0 1 0 1
6 RUNOFF 1    09     5        0.420        90.        0.351 0 0 1 0 1
6 ADDHYD 4 109   5 6 7                                    1 0 0 1 0 1
6 REACH  3 110   7   6       11100.      0.2085      1.65871 0 0 1 0 1
6 RUNOFF 1    10     1        0.874        82.        0.651 0 0 1 0 1
6 REACH  3 112   1   2        4300.      0.2508      1.65491 0 0 1 0 1
6 RUNOFF 1    11     1        0.679        82.        0.481 0 0 1 0 1
6 ADDHYD 4 113   1 2 3                                    1 0 0 1 0 1
6 REACH  3 114   3   4        4700.      0.2117      1.64591 0 0 1 0 1
6 RUNOFF 1    13     1        0.476        82.        0.661 0 0 1 0 1
6 REACH  3 116   1   2        4500.      0.4611      1.62491 0 0 1 0 1
6 RUNOFF 1    12     1        0.957        82.        1.131 0 0 1 0 1
6 ADDHYD 4 117   1 2 3                                    1 0 0 1 0 1
6 ADDHYD 4 117   3 4 5                                    1 0 0 1 0 1
6 REACH  3 118   5   7        2200.      0.2222      1.63381 0 0 1 0 1
6 RUNOFF 1    14     1        0.566        82.        0.791 0 0 1 0 1
6 RUNOFF 1    15     2        0.647        82.        0.731 0 0 1 0 1
6 ADDHYD 4 119   1 2 3                                    1 0 0 1 0 1
```

UMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 1	RUNOFF	.46	1	2	.05	.0	2.42	1.00	1.46	---	.71	986.80	2164.0
STRUCTURE 5	RUNOFF	.36	1	2	.05	.0	2.42	1.00	1.46	---	.67	866.86	2401.3
SECTION 101	ADDHYD	.82	1	2	.05	.0	2.42	1.00	1.46	---	.69	1827.20	2236.5
SECTION 102	REACH	.82	1	2	.05	.0	2.42	1.00	1.46	---	.75	1807.49	2212.4
STRUCTURE 2	RUNOFF	.50	1	2	.05	.0	2.42	1.00	1.46	---	.74	1001.67	2003.3
TRUCTURE 6	RUNOFF	.26	1	2	.05	.0	2.42	1.00	1.46	---	.67	627.57	2451.4
XSECTION 103	ADDHYD	.76	1	2	.05	.0	2.42	1.00	1.46	---	.71	1574.28	2082.4
XSECTION 103	ADDHYD	1.57	1	2	.05	.0	2.42	1.00	1.46	---	.73	3334.84	2120.0
SECTION 104	REACH	1.57	1	2	.05	.0	2.42	1.00	1.46	---	.79	3311.39	2105.1
TRUCTURE 3	RUNOFF	.44	1	2	.05	.0	2.42	1.00	1.46	---	.72	918.59	2078.2
TRUCTURE 7	RUNOFF	.50	1	2	.05	.0	2.42	1.00	1.46	---	.84	819.44	1655.4
SECTION 105	ADDHYD	.94	1	2	.05	.0	2.42	1.00	1.46	---	.77	1650.14	1761.1
XSECTION 105	ADDHYD	2.51	1	2	.05	.0	2.42	1.00	1.46	---	.79	4949.30	1971.8
XSECTION 106	REACH	2.51	1	2	.05	.0	2.42	1.00	1.46	---	.85	4886.48	1946.8
TRUCTURE 4	RUNOFF	.76	1	2	.05	.0	2.42	1.00	1.46	---	.86	1206.99	1592.3
STRUCTURE 8	RUNOFF	.28	1	2	.05	.0	2.42	1.00	1.46	---	.67	669.96	2401.3
SECTION 107	ADDHYD	1.04	1	2	.05	.0	2.42	1.00	1.46	---	.80	1625.26	1567.3
SECTION 107	ADDHYD	3.55	1	2	.05	.0	2.42	1.00	1.46	---	.84	6479.93	1826.9
XSECTION 108	REACH	3.55	1	2	.05	.0	2.42	1.00	1.46	---	.94	6072.86	1712.1
TRUCTURE 9	RUNOFF	.42	1	2	.05	.0	2.42	1.00	1.46	---	.76	805.69	1918.3
XSECTION 109	ADDHYD	3.97	1	2	.05	.0	2.42	1.00	1.46	---	.93	6637.79	1673.3
XSECTION 110	REACH	3.97	1	2	.05	.0	2.42	1.00	1.46	---	1.08	5629.96	1419.2
TRUCTURE 10	RUNOFF	.87	1	2	.05	.0	2.42	1.00	.94	---	1.03	741.39	848.3
SECTION 112	REACH	.87	1	2	.05	.0	2.42	1.00	.94	---	1.17	683.36	781.9
STRUCTURE 11	RUNOFF	.68	1	2	.05	.0	2.42	1.00	.94	---	.90	695.04	1023.6
SECTION 113	ADDHYD	1.55	1	2	.05	.0	2.42	1.00	.94	---	1.03	1196.27	770.3
XSECTION 114	REACH	1.55	1	2	.05	.0	2.42	1.00	.94	---	1.19	1117.41	719.5
TRUCTURE 13	RUNOFF	.48	1	2	.05	.0	2.42	1.00	.94	---	1.04	399.26	838.8
SECTION 116	REACH	.48	1	2	.05	.0	2.42	1.00	.94	---	1.19	367.76	772.6
STRUCTURE 12	RUNOFF	.96	1	2	.05	.0	2.42	1.00	.94	---	1.37	534.13	558.1
SECTION 117	ADDHYD	1.43	1	2	.05	.0	2.42	1.00	.94	---	1.27	872.90	609.1
SECTION 117	ADDHYD	2.99	1	2	.05	.0	2.42	1.00	.94	---	1.23	1977.69	662.3

UMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

ECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 118	REACH	2.99	1	2	.05	.0	2.42	1.00	.94	---	1.30	1963.03	657.4
STRUCTURE 14	RUNOFF	.57	1	2	.05	.0	2.42	1.00	.94	---	1.14	418.06	738.6
TRUCTURE 15	RUNOFF	.65	1	2	.05	.0	2.42	1.00	.94	---	1.09	506.08	782.2
SECTION 119	ADDHYD	1.21	1	2	.05	.0	2.42	1.00	.94	---	1.11	922.24	760.3
XSECTION 119	ADDHYD	4.20	1	2	.05	.0	2.42	1.00	.94	---	1.24	2783.38	662.9
SECTION 120	REACH	4.20	1	2	.05	.0	2.42	1.00	.94	---	1.29	2780.83	662.3
STRUCTURE 16	RUNOFF	1.22	1	2	.05	.0	2.42	1.00	.94	---	1.37	678.04	554.4
XSECTION 121	ADDHYD	5.42	1	2	.05	.0	2.42	1.00	.94	---	1.30	3446.56	635.7
SECTION 121	ADDHYD	9.39	1	2	.05	.0	2.42	1.00	1.16	---	1.15	8564.73	912.2
SECTION 122	REACH	9.39	1	2	.05	.0	2.42	1.00	1.16	---	1.30	7955.46	847.3
TRUCTURE 17	RUNOFF	.92	1	2	.05	.0	2.42	1.00	.94	---	1.39	497.75	542.2
SECTION 123	ADDHYD	10.31	1	2	.05	.0	2.42	1.00	1.14	---	1.31	8440.97	819.0
XSECTION 124	REACH	10.31	1	2	.05	.0	2.42	1.00	1.14	---	1.37	8399.53	814.9

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS									PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV.AREA						Q AND A EQUATION						TRAVEL TIME	
SEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO Q/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE 1 STORM 1																			
102	2300	1825	.7	1807	.8	---	---	0	1.46	.05	1	.486	1.64	.033	.990	116	.87?	.05	.03
104	2200	3320	.8	3307	.8	---	---	0	1.46	.05	1	.323	1.64	.028	.996	111	.90?	.05	.03
106	2500	4935	.8	4886	.9	---	---	0	1.46	.05	1	.216	1.66	.032	.990	130	.82?	.05	.04
108	5400	6476	.9	6065	.9	---	---	0	1.46	.05	1	.206	1.66	.088	.937	258	.52	.10	.07
110	11100	6603	.9	5620	1.1	---	---	0	1.46	.05	1	.208	1.66	.244	.851	524	.29	.15	.15
112	4300	740	1.1	681	1.1	---	---	0	.94	.05	1	.251	1.65	.123	.921	439	.34	.10	.12
114	4700	1194	1.1	1117	1.2	---	---	0	.94	.05	1	.212	1.65	.112	.935	455	.33	.15	.13
116	4500	399	1.1	367	1.2	---	---	0	.94	.05	1	.461	1.62	.125	.921	446	.34	.15	.13
118	2200	1973	1.3	1963	1.3	---	---	0	.94	.05	1	.222	1.63	.019	.995	178	.67?	.05	.05
120	1600	2782	1.3	2780	1.3	---	---	0	.94	.05	1	.293	1.61	.008	.999	104	.93?	.05	.03
122	7200	8564	1.1	7955	1.3	---	---	0	1.16	.05	1	.119	1.65	.101	.929	446	.34	.15	.13
124	2400	8440	1.3	8379	1.4	---	---	0	1.14	.05	1	.118	1.65	.014	.993	150	.75?	.05	.04

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 17	.92	
ALTERNATE 1		497.75
STRUCTURE 16	1.22	
ALTERNATE 1		678.04
STRUCTURE 15	.65	
ALTERNATE 1		506.08
STRUCTURE 14	.57	
ALTERNATE 1		418.06
STRUCTURE 13	.48	
ALTERNATE 1		399.26
STRUCTURE 12	.96	
ALTERNATE 1		534.13
STRUCTURE 11	.68	
ALTERNATE 1		695.04
STRUCTURE 10	.87	
ALTERNATE 1		741.39
STRUCTURE 9	.42	
ALTERNATE 1		805.69
STRUCTURE 8	.28	
ALTERNATE 1		669.96
STRUCTURE 7	.50	
ALTERNATE 1		819.44
STRUCTURE 6	.26	
ALTERNATE 1		627.57
STRUCTURE 5	.36	
ALTERNATE 1		866.86
STRUCTURE 4	.76	
ALTERNATE 1		1206.99

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ TRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 3	.44	
ALTERNATE 1		918.59
STRUCTURE 2	.50	
ALTERNATE 1		1001.67
STRUCTURE 1	.46	
ALTERNATE 1		986.80
XSECTION 101	.82	
ALTERNATE 1		1827.20
XSECTION 102	.82	
ALTERNATE 1		1807.49
XSECTION 103	1.57	
ALTERNATE 1		3334.84
XSECTION 104	1.57	
ALTERNATE 1		3311.39
XSECTION 105	2.51	
ALTERNATE 1		4949.30
XSECTION 106	2.51	
ALTERNATE 1		4886.48
XSECTION 107	3.55	
ALTERNATE 1		6479.93
XSECTION 108	3.55	
ALTERNATE 1		6072.86
XSECTION 109	3.97	
ALTERNATE 1		6637.79
XSECTION 110	3.97	
ALTERNATE 1		5629.96
XSECTION 112	.87	
ALTERNATE 1		683.36

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 113	1.55	
ALTERNATE 1		1196.27
XSECTION 114	1.55	
ALTERNATE 1		1117.41
XSECTION 116	.48	
ALTERNATE 1		367.76
XSECTION 117	2.99	
ALTERNATE 1		1977.69
XSECTION 118	2.99	
ALTERNATE 1		1963.03
XSECTION 119	4.20	
ALTERNATE 1		2783.38
XSECTION 120	4.20	
ALTERNATE 1		2780.83
XSECTION 121	9.39	
ALTERNATE 1		8564.73
XSECTION 122	9.39	
ALTERNATE 1		7955.46
XSECTION 123	10.31	
ALTERNATE 1		8440.97
XSECTION 124	10.31	
ALTERNATE 1		8399.53

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

 0B TR-20
 TITLE 610 STATE ROUTE 238 AREA 41 RAINFALL DRAINAGE HYD5REV5.DAT
 ITLE
 5 RAINFL 1                0.041666667
 8             0.000       0.015       0.032       0.049       0.066
 8             0.085       0.105       0.139       0.176       0.215
 8             0.275       0.355       0.500       0.645       0.725
 8             0.785       0.824       0.861       0.895       0.915
 8             0.934       0.951       0.968       0.985       1.000
 9 ENDTBL
 6 RUNOFF 1    01     5    56.8        83.0        4.01     1 0 0 1 0 1
 6 REACH  3 102   5   6    21200.      0.0919      1.6607   1 0 0 1 0 1
 6 RUNOFF 1    02     4     9.5        83.0        2.56     1 0 0 1 0 1
 6 ADDHYD 4 103   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 104   5   6    15850.      0.0746      1.6624   1 0 0 1 0 1
 6 RUNOFF 1    03     4    11.5        83.0        2.22     1 0 0 1 0 1
 6 ADDHYD 4 105   6 4 5                                      1 0 0 1 0 1
 6 REACH  3 106   5   6    38000.      0.0600      1.6616   1 0 0 1 0 1
 6 RUNOFF 1    04     4    23.2        83.0        2.74     1 0 0 1 0 1
 6 ADDHYD 4 106   6 4 1                                      1 0 0 1 0 1
 6 RUNOFF 1    06     5    120.0       75.0        4.28     1 0 0 1 0 1
 6 REACH  3 108   5   6    20600.      0.0262      1.6654   1 0 0 1 0 1
 6 RUNOFF 1    07     5    10.3        83.0        2.13     1 0 0 1 0 1
 6 ADDHYD 4 108   6 5 2                                      1 0 0 1 0 1
 6 RUNOFF 1    05     3    16.9        83.0        4.38     1 0 0 1 0 1
 6 ADDHYD 4 110   1 2 4                                      1 0 0 1 0 1
 6 ADDHYD 4 110   4 3 5                                      1 0 0 1 0 1
   ENDATA
 7 INCREM 6                0.10
 7 COMPUT 7    01 110                      2.42        1.001 2  01  01
   ENDCMP 1
   ENDJOB 2

*****************************END OF 80-80 LIST******************************
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UMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

ECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
STRUCTURE 1	RUNOFF	56.80	1	2	.10	.0	2.42	1.00	1.00	---	3.28	10174.45	179.1
XSECTION 102	REACH	56.80	1	2	.10	.0	2.42	1.00	1.00	---	3.71	9805.73	172.6
TRUCTURE 2	RUNOFF	9.50	1	2	.10	.0	2.42	1.00	1.00	---	2.31	2645.95	278.5
SECTION 103	ADDHYD	66.30	1	2	.10	.0	2.42	1.00	1.00	---	3.45	10957.18	165.3
XSECTION 104	REACH	66.30	1	2	.10	.0	2.42	1.00	1.00	---	3.83	10744.55	162.1
TRUCTURE 3	RUNOFF	11.50	1	2	.10	.0	2.42	1.00	1.00	---	2.09	3676.75	319.7
XSECTION 105	ADDHYD	77.80	1	2	.10	.0	2.42	1.00	1.00	---	3.58	11650.10	149.7
XSECTION 106	REACH	77.80	1	2	.10	.0	2.42	1.00	1.00	---	4.42	10634.85	136.7
TRUCTURE 4	RUNOFF	23.20	1	2	.10	.0	2.42	1.00	1.00	---	2.44	6046.82	260.6
SECTION 106	ADDHYD	101.00	1	2	.10	.0	2.42	1.00	1.00	---	3.25	13013.33	128.8
TRUCTURE 6	RUNOFF	120.00	1	2	.10	.0	2.42	1.00	.61	---	3.49	12230.83	101.9
SECTION 108	REACH	120.00	1	2	.10	.0	2.42	1.00	.61	---	4.22	11054.13	92.1
STRUCTURE 7	RUNOFF	10.30	1	2	.10	.0	2.42	1.00	1.00	---	2.02	3425.78	332.6
XSECTION 108	ADDHYD	130.30	1	2	.10	.0	2.42	1.00	.64	---	4.10	11492.48	88.2
TRUCTURE 5	RUNOFF	16.90	1	2	.10	.0	2.42	1.00	1.00	---	3.53	2773.58	164.1
XSECTION 110	ADDHYD	231.30	1	2	.10	.0	2.42	1.00	.79	---	3.93	24025.29	103.9
SECTION 110	ADDHYD	248.20	1	2	.10	.0	2.42	1.00	.81	---	3.84	26722.96	107.7

UMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

		HYDROGRAPH INFORMATION							ROUTING PARAMETERS										PEAK	
		INFLOW		OUTFLOW		OUTFLOW+ INTERV. AREA													TRAVEL TIME	
SEC ID	REACH LENGTH (FT)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	PEAK (CFS)	TIME (HR)	BASE-FLOW (CFS)	VOLUME ABOVE BASE (IN)	MAIN TIME INCR (HR)	ITER-ATION #	Q AND A EQUATION COEFF (X)	POWER (M)	LENGTH FACTOR (K*)	PEAK RATIO O/I (Q*)	S/Q *PEAK (K) (SEC)	ATT-KIN COEFF (C)	STOR-AGE (HR)	KINE-MATIC (HR)
ALTERNATE 1 STORM 1																				
102	21200	10174	3.3	9806	3.7	---	---	0	1.00	.10	1	.092	1.66	.056	.964	1368	.23	.40	.38
104	15850	10953	3.4	10743	3.8	---	---	0	1.00	.10	1	.075	1.66	.035	.981	1116	.28	.40	.31
106	38000	11649	3.6	10634	4.4	13007	3.2	0	1.00	.10	1	.060	1.66	.151	.913	2989	.11	.80	.85
108	20600	12231	3.5	11053	4.2	11492	4.1	0	.61	.10	1	.026	1.67	.141	.904	2564	.13	.70	.73

UMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
STRUCTURE 7	10.30	
ALTERNATE 1		3425.78
STRUCTURE 6	120.00	
ALTERNATE 1		12230.83
STRUCTURE 5	16.90	
ALTERNATE 1		2773.58
STRUCTURE 4	23.20	
ALTERNATE 1		6046.82
STRUCTURE 3	11.50	
ALTERNATE 1		3676.75
STRUCTURE 2	9.50	
ALTERNATE 1		2645.95
STRUCTURE 1	56.80	
ALTERNATE 1		10174.45
XSECTION 102	56.80	
ALTERNATE 1		9805.73
XSECTION 103	66.30	
ALTERNATE 1		10957.18
XSECTION 104	66.30	
ALTERNATE 1		10744.55
XSECTION 105	77.80	
ALTERNATE 1		11650.10
XSECTION 106	101.00	
ALTERNATE 1		13013.33
XSECTION 108	130.30	
ALTERNATE 1		11492.48
XSECTION 110	248.20	
ALTERNATE 1		26722.96

Sverdrup
CORPORATION

Statewide Management Consultant
Arizona Department of Transportation
432 North 44th Street, Suite 300
Phoenix, Arizona 85008

602 273-2762

FLOOD CONTROL DISTRICT
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	CH ENG		HYDRO
	ASST		LMgt
	ADMIN		SUSP
	C & O		FILE
	ENGR		DESTROY
	FINANCE		TAD
REMARKS			

October 13, 1986

Ms. Teresa Dominquez
Maricopa County Flood Control District
3335 West Durango Street
Phoenix, Arizona 85009

RE: Contract No. 85-40
Maricopa - Mobile
State Route 238
Project No. S-987-301PE,-501C

Dear Ms. Dominquez:

Transmitted for your information is a preliminary plan and profile of the Maricopa-Mobile-Gila Bend Highway project prepared by Dibble & Associates, Consulting Engineers, working with us for the Arizona Department of Transportation. Also transmitted is the preliminary hydraulic report, the typical roadway section and a preliminary cost estimate.

As Management Consultant for ADOT, SVERDRUP CORPORATION will be reviewing and commenting on these documents. If you have any comments you wish to make please forward them to or call the undersigned by October 21 for consideration in our review.

Sincerely,

SVERDRUP CORPORATION

Virginia L Powell

for William A. Ross
Project Coordinator

WAR/tlp

Enclosure

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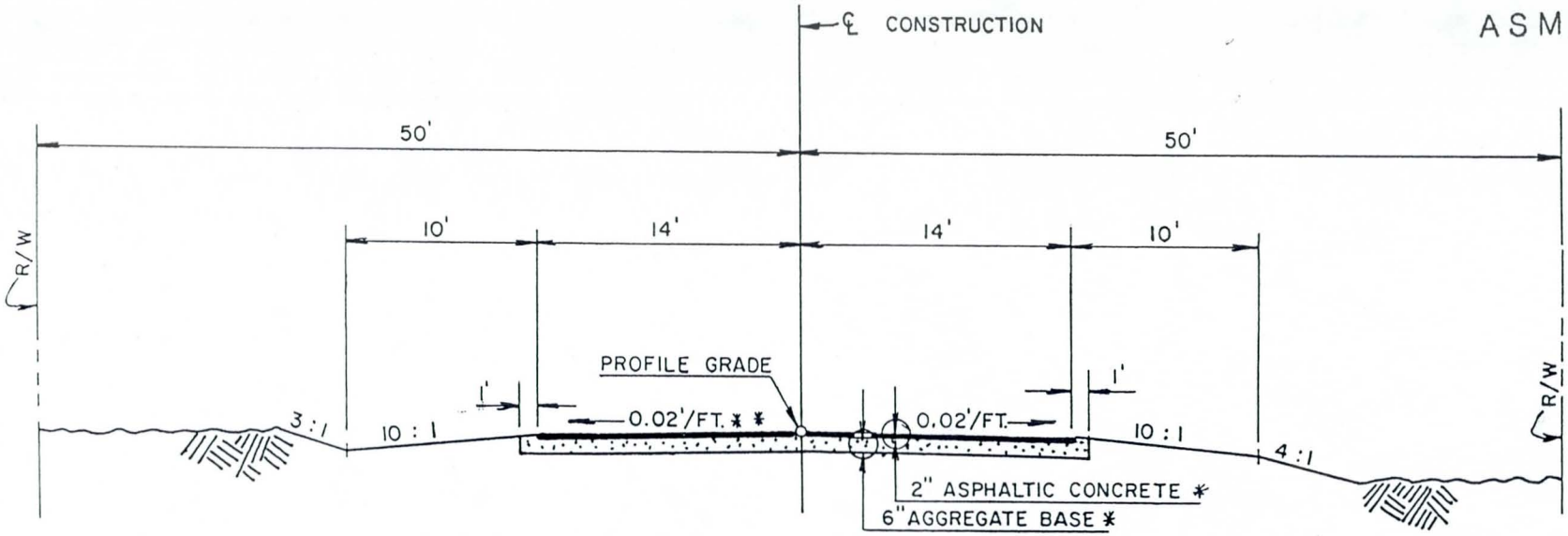

TYPICAL SECTION

* THICKNESS USED ONLY FOR COST ESTIMATE PURPOSES ONLY-ACTUAL PAVEMENT SECTION TO BE DETERMINED DURING DESIGN.

** CROSS SLOPE THRU DIP SECTIONS TO BE ADJUSTED TO ELIMATE PONDING

MARICOPA-MOBILE-GILA BEND HIGHWAY
STATE ROUTE 238
PROJECT NO. S-987-301

OCT 8 1986

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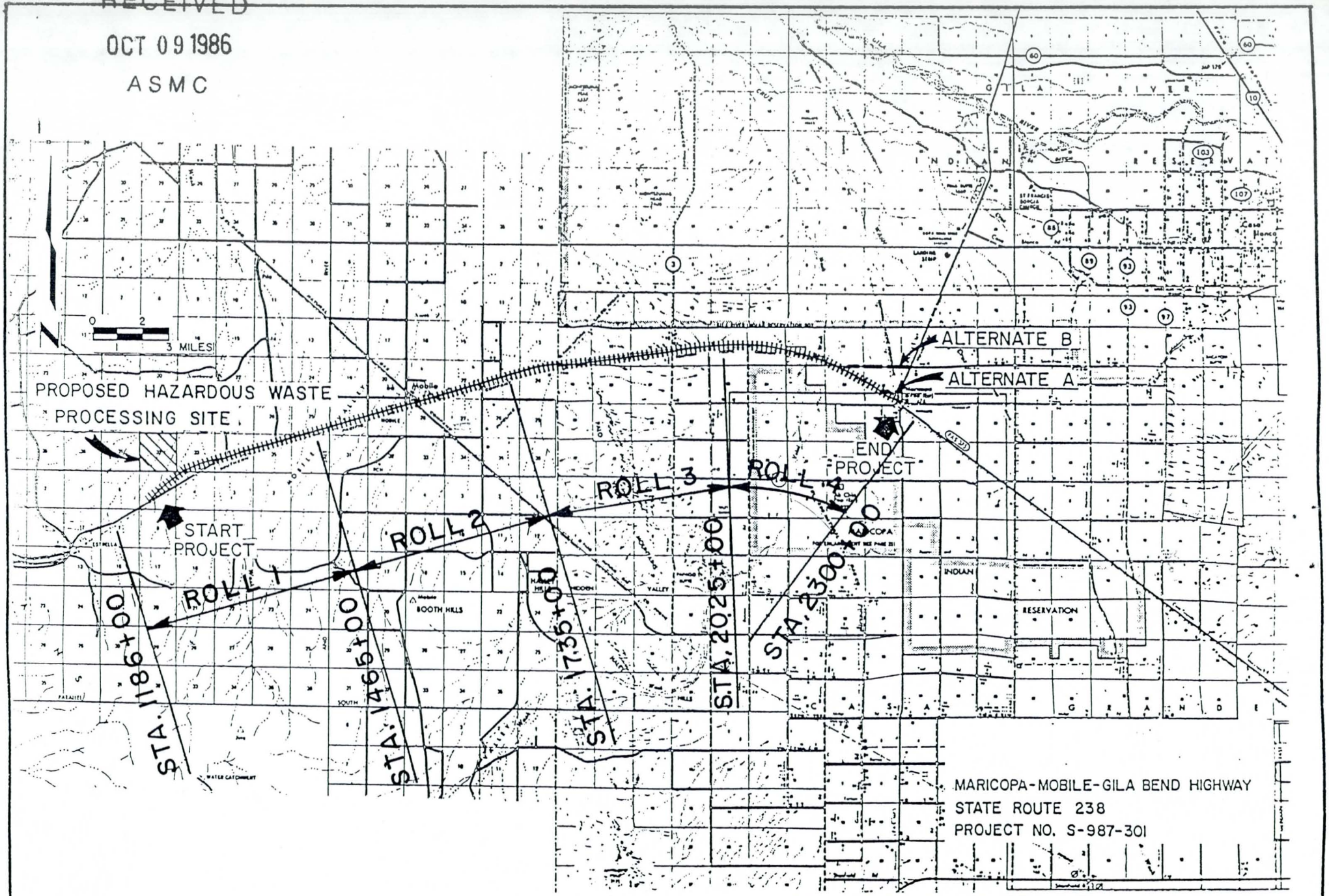

PLAN & PROFILE ROLLS
KEY MAP

OCT. 8 1986

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PRELIMINARY COST ESTIMATE

ARIZONA DEPARTMENT OF TRANSPORTATION
S.R. 238 - HAZARDOUS WASTE ROADWAY
PROJECT NO. S-987-301-PE

OCTOBER 3, 1986

BASE ROADWAY

Item No.	Item	Approx. Quantity	Unit	Unit Price	Cost
1	MOBILIZATION	1	L.SUM	$180,000.00	$180,000
2	CLEAR & GRUB	134	ACRES	200.00	26,800
3	ROADWAY EXCAVATION	250,000	C.Y.	3.00	750,000
4	SPOIL	50,000	C.Y.	2.00	100,000
5	STRUCTURES @ WATERMAN WASH	1	L.SUM	147,400.00	147,400
6	FURNISH WATER SUPPLY	2430	M.GAL	35.00	85,050
7	CONCRETE FORD WALLS	41,830	L.FT.	47.00	1,966,010
8	SUBGRADE PREP	324,670	S.Y.	2.30	746,741
9	AGGREGATE BASE COURSE	87,660	TON	8.50	745,110
10	ASPHALTIC CONCRETE PAVING	32,960	TON	35.50	1,170,080
11	SIGN & STRIPE	1	L.SUM	40,900.00	40,900
12	MISC. & CONTINGENCY	1	L.SUM	136,000.00	136,000

TOTAL ESTIMATED COST, BASE ROAD: $6,094,091

USE: $6,094,000

ALTERNATE "A"

Item No.	Item	Approx. Quantity	Unit	Unit Price	Cost
1	MOBILIZATION	1	L.SUM	$19,600.00	$19,600
2	CLEAR & GRUB	5	ACRES	200.00	1,000
3	ROADWAY EXCAVATION	94,500	C.Y.	3.00	283,500
4	SPOIL	53,400	C.Y.	2.00	106,800
5	FURNISH WATER SUPPLY	270	M.GAL	35.00	9,450
6	CONCRETE FORD WALLS	4,950	L.FT.	47.00	232,650
7	SUBGRADE PREP	35,270	S.Y.	2.30	81,121
8	AGGREGATE BASE COURSE	9,520	TON	8.50	80,920
9	ASPHALTIC CONCRETE PAVING	3,580	TON	35.50	127,090
10	SIGN & STRIPE	1	L.SUM	4,440.00	4,440
11	MISC. & CONTINGENCY	1	L.SUM	30,000.00	30,000

ESTIMATED COST, ALTERNATE "A": $976,571

TOTAL ESTIMATED COST, BASE ROAD WITH ALTERNATE "A": $7,070,662

USE: $7,070,000

PRELIMINARY COST ESTIMATE

ARIZONA DEPARTMENT OF TRANSPORTATION
S.R. 238 - HAZARDOUS WASTE ROADWAY
PROJECT NO. S-987-301-PE

OCTOBER 3, 1986

ALTERNATE "B"

Item No.	Item	Approx. Quantity	Unit	Unit Price	Cost
1	MOBILIZATION	1	L.SUM	$20,200.00	$20,200
2	CLEAR & GRUB	15	ACRES	200.00	3,000
3	ROADWAY EXCAVATION	75,300	C.Y.	3.00	225,900
4	SPOIL	32,000	C.Y.	2.00	64,000
5	FURNISH WATER SUPPLY	280	M.GAL	35.00	9,800
6	CONCRETE FORD WALLS	5,430	L.FT.	47.00	255,210
7	SUBGRADE PREP	36,600	S.Y.	2.30	84,180
8	AGGREGATE BASE COURSE	9,900	TON	8.50	84,150
9	ASPHALTIC CONCRETE PAVING	3,700	TON	35.50	131,350
10	SIGN & STRIPE	1	L.SUM	4,610.00	4,610
11	MISC. & CONTINGENCY	1	L.SUM	34,800.00	34,800

ESTIMATED COST, ALTERNATE "B": $917,200

TOTAL ESTIMATED COST, BASE ROAD WITH ALTERNATE "B": $7,011,291

USE: $7,011,000

STATE ROUTE 238
MARICOPA-MOBILE-GILA BEND
PINAL-MARICOPA COUNTIES

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	S-987-301			

DIBBLE & ASSOCIATES, CONSULTING ENGINEERS

DATE _____ FOR THE CONSULTING ENGINEER

DESIGN | DRAWN | CHECKED

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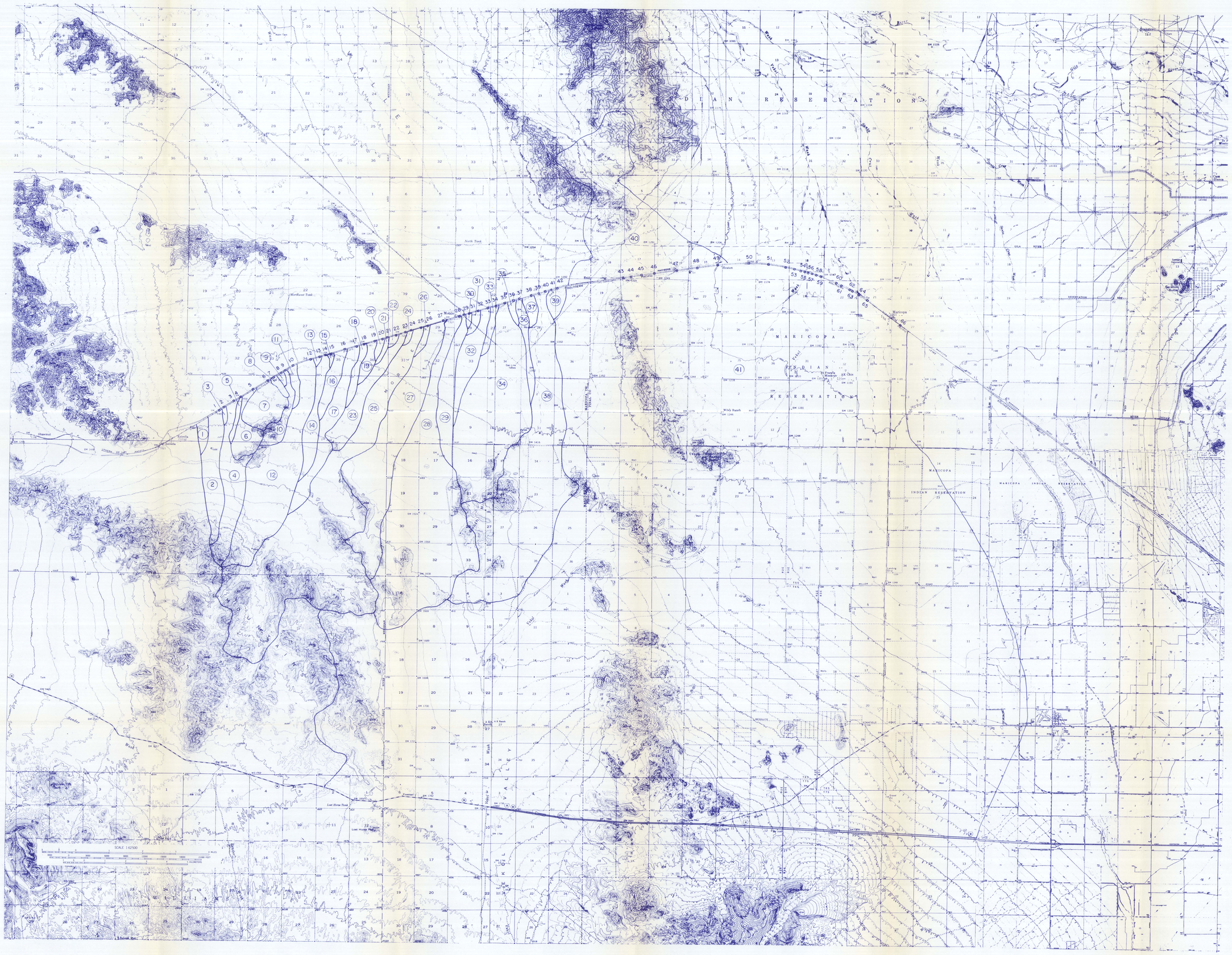

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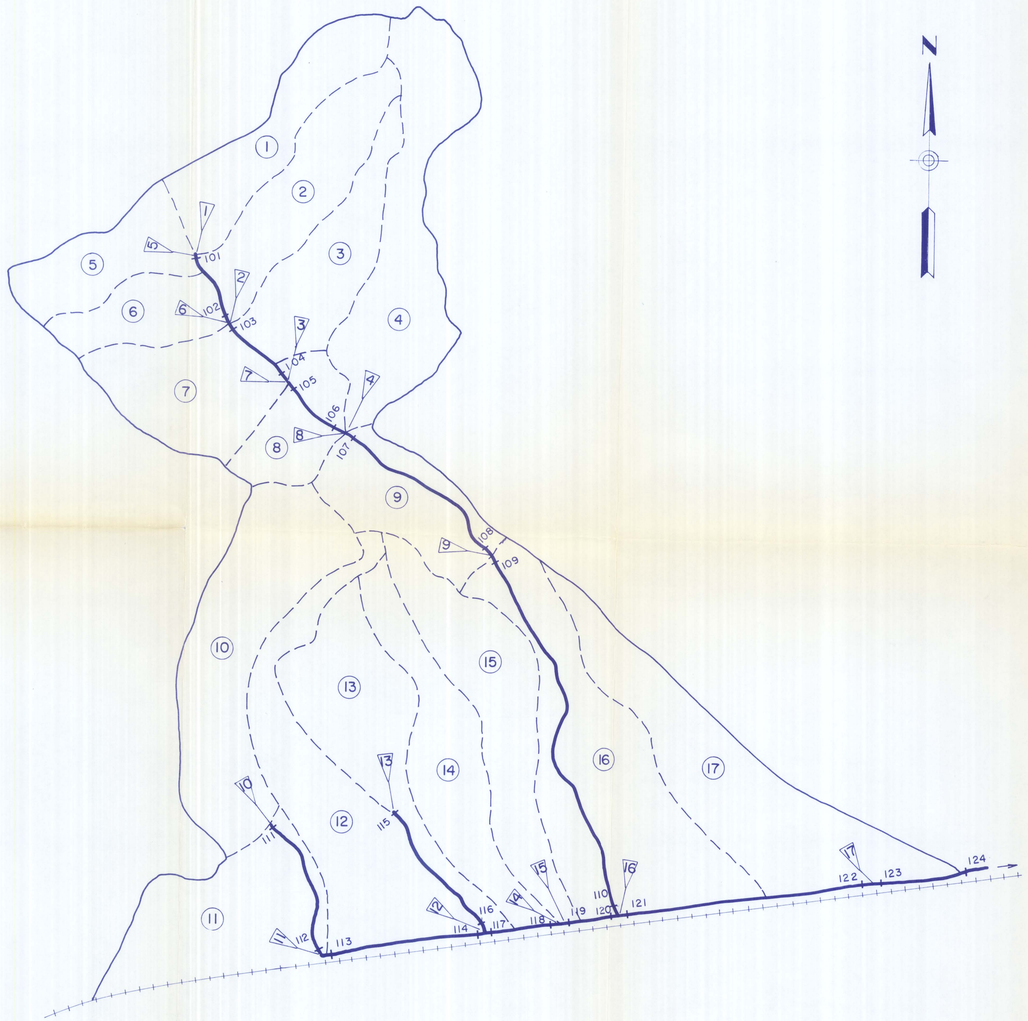

AREA 40

2000 0 2000 4000

SCALE IN FEET

AREA 41

6000 0 6000 1200

SCALE IN FEET

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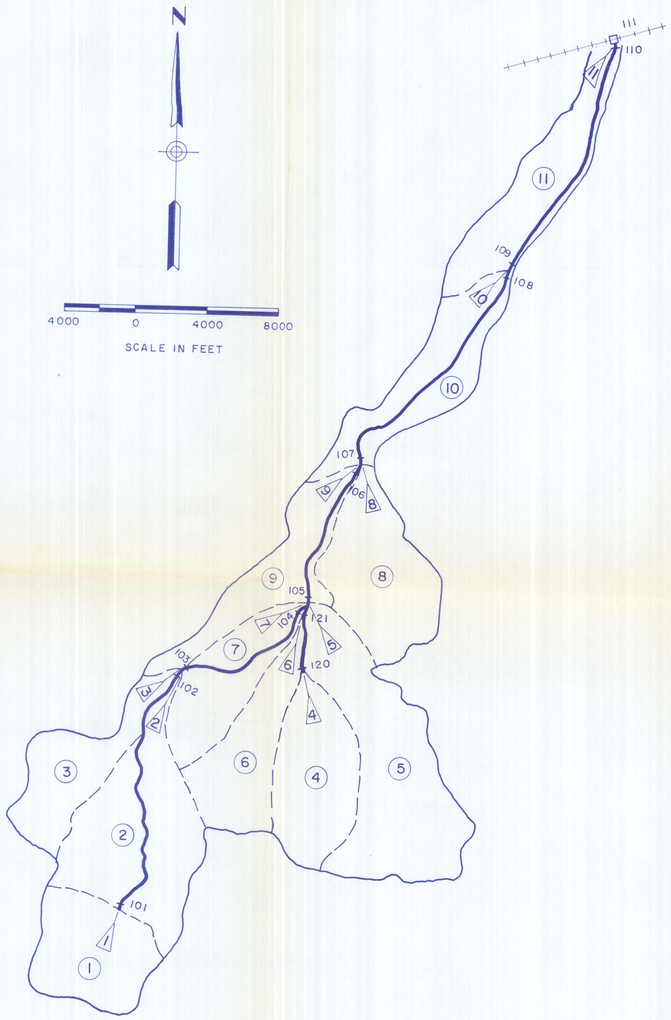
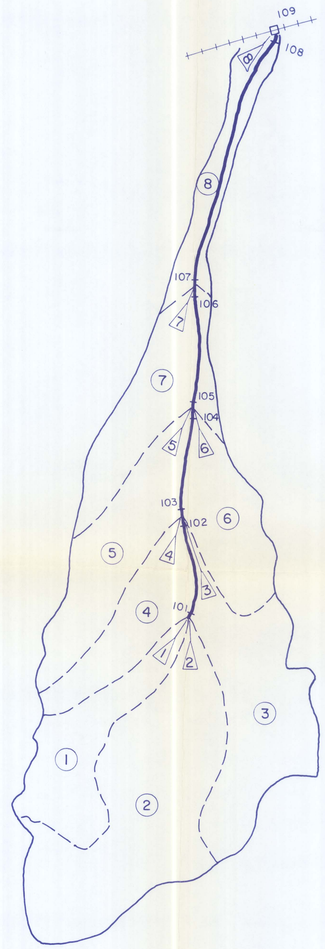


AREA 25



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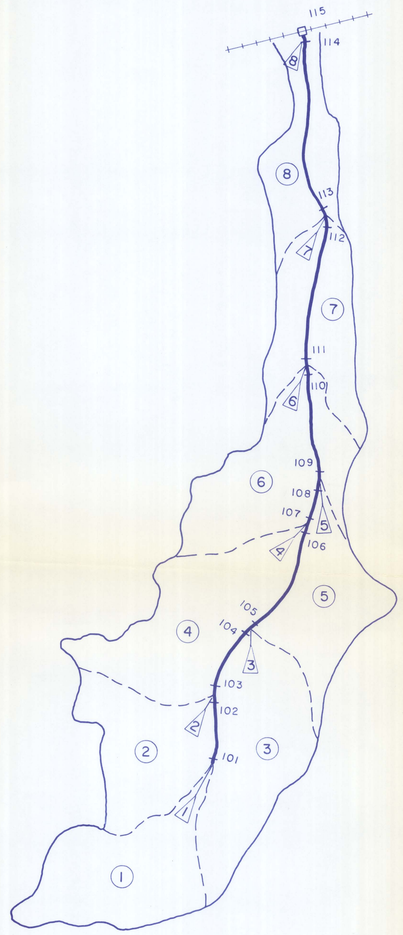

AREA 38