FLOOD INSURANCE STUDY
FOR
TRILBY WASH

FROM THE CAP AQUEDUCT
TO GRAND AVENUE NEAR CIRCLE CITY
MARICOPA COUNTY, ARIZONA

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MARICOPA COUNTY, ARIZONA

SUBMITTED TO:

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY
2801 WEST DURANGO STREET
PHOENIX, ARIZONA 85009

CONTRACT FCD 90-24
P&D TECHNOLOGIES PROJECT NO. 10320.00

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Community Number 040037

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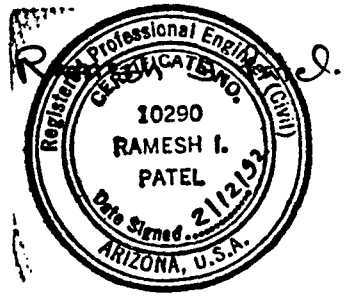

APPENDICES
(Bound Separately - 2 Books)

Appendix A:	A Hydrologic Analysis of Trilby Wash Watershed	Book 1 of 2
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FLOOD INSURANCE STUDY

FOR

TRILBY WASH

FROM CAP AQUEDUCT TO GRAND AVENUE NEAR CIRCLE CITY

MARICOPA COUNTY, ARIZONA

This is to certify that all work accomplished in the conduct of this study was done in accordance with the Statement of Work and General Provision of Contract FCD 90-24, and all amendments thereto, together with all such modifications, either written or oral, as the Project Officers and/or the Contracting Officer or their representatives have directed, as such modifications affect this contract, and that all such work has been accomplished in accordance with sound and accepted engineering practice with the contract provision or respective phases of the work.

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Project Manager
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Signed: FRED E. FLEET

Fred E. Fleet, P.E.
Associate Vice President
P&D Technologies

FLOOD INSURANCE STUDY
FOR
TRILBY WASH
From the Central Arizona Project Aqueduct to
Grand Avenue near Circle City
MARICOPA COUNTY, ARIZONA

1.0 INTRODUCTION

1.1 Purpose of Study

This Floodplain Delineation Study investigates the existence and severity of flood hazards for Trilby Wash from Central Arizona Project Aqueduct to Grand Avenue, Near Circle City, Maricopa County, Arizona, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for study area that will be used to establish actuarial flood insurance rates and assist the Maricopa County Flood Control District and local officials in their efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in Federal Regulations at 44 CFR, 60.3. In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements; in such cases, the more restrictive criteria take precedence, and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgements

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydraulic analysis for this study was prepared by P&D Technologies, the study contractor, for the Flood Control District of Maricopa County (FCD of MC), under Contract No. 90-24. The Coordination Officer at the Flood Control District is Besian Khatiblou, P.E. The Project Manager representing P&D Technologies is Ramesh I. Patel, P.E. This study was completed in February, 1992.

The hydrology data used in this study was supplied to P&D Technologies by the Flood Control District of Maricopa County. The hydrology information was taken, in part, from the Wittmann Area Drainage Master Study (ADMS) dated March, 1989. The Wittmann ADMS has been approved by FEMA and will become effective September 4, 1991.

1.3 Coordination

On June 5, 1990, an initial Consultation and Coordination Officer (CCO) meeting was held with representatives of the FCD of MC and the study contractor at the site. Coordination with the Flood Control District of Maricopa County produced a variety of information pertaining to floodplain regulations, available community maps, flood history and other data. This information is provided in report form, entitled: "Summary of Existing Data." A copy is included in Appendix 'F' of this report.

The following agencies were contacted for information and comments during the study:

- Arizona Department of Water Resources (ADWR);
- Arizona State Land Department (ASLD);
- Bureau of Land Management (BLM);
- Bureau of Reclamation (BOR);
- Central Arizona Water Conservation District (CAWCD);
- Cooper Aerial Mapping Company;
- Federal Emergency Management Agency (FEMA);
- Kenney Aerial Mapping Company;
- Luke Air Force Base, Engineering Division;
- Maricopa County Highway Department (MCHD);
- Soil Conservation Service (SCS);
- U.S. Army Corps of Engineers;
- U.S. Geological Survey (USGS); and finally,
- WLB Group (Private Consultant).

Vertical control data used to establish the network of elevation reference marks were provided by the WLB Group, Inc. and the Flood Control District of Maricopa County. P&D Technologies was also responsible for the field survey and aerial mapping.

The results of the study were submitted to the Flood Control District of Maricopa County for review on February 6, 1992. The study was acceptable to the county.

2.0 AREA STUDIED

2.1 Scope of Study

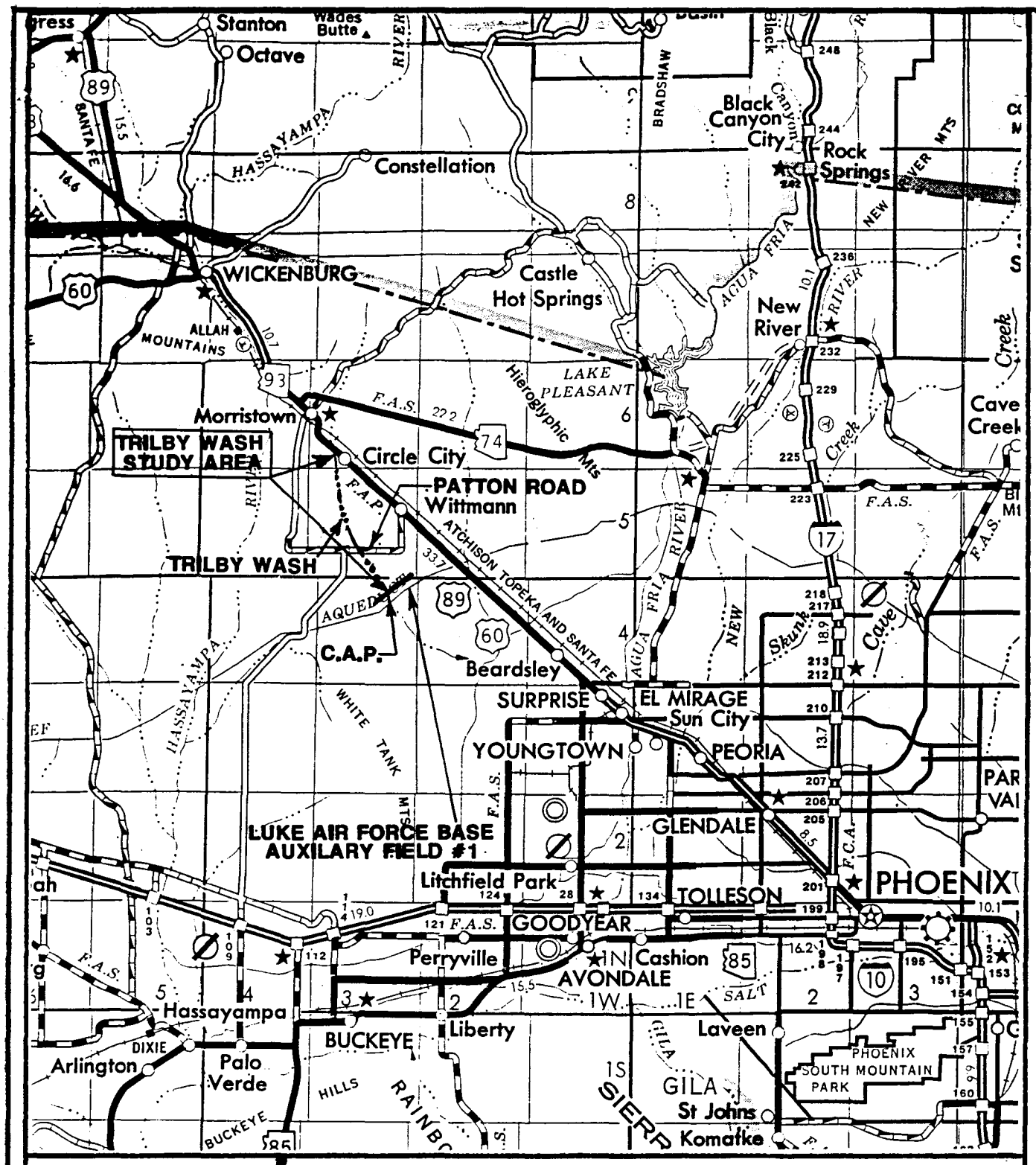
This Flood Insurance Study encompasses Trilby Wash in the unincorporated area of Maricopa County, Arizona. The project consists of topographic mapping and floodplain/floodway delineation for approximately 6.7 River Miles of Trilby Wash. The downstream study limits are the Central Arizona Project (CAP) Aqueduct, the upstream limits being Grand Avenue near Circle City. This project encompasses approximately 520 acres (0.81 sq. mile) area within the floodplain and approximate 230 acres (0.36 sq. miles) within the floodway. Riverine flooding of the Trilby Wash was studied by detailed methods for the entire reach. All of the reaches studied were delineated for the 100-year flood using detailed methods. There are a few prominent features in this study area, those of note are: Circle City, Patton Road and the CAP Aqueduct. Luke Air Force Base Auxiliary Field Number 1 is located to the southeast of this project boundary. The area of study is shown on the Vicinity Map as Figure 1.

P&D Technologies was responsible for the field survey as well as the establishment of ground control. All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the Flood Insurance Rate maps. A listing of the elevation reference marks (ERMS) for this study are included in Exhibit 3.

2.2 Study Area Description

The Trilby Wash is located in the central portion of Maricopa County in the Central Arizona Desert, approximately 30 miles northwest of Metropolitan Phoenix. It is situated approximately 2 miles west of the Wittmann. The watershed is characterized with broad slopes prone to sheet flow and with few small incised channels as tributaries. Trilby Wash carries flow southeasterly into the McMicken Dam Storage Basin. The slope of Trilby Wash is approximately 1% to the southeast. The flow line elevation ranges from 1543 at down stream to 1849 at upstream end. The only Community adjacent to the Trilby Wash is Circle City which consists of a small residential subdivision development. Circle City attracts predominantly a retired population due to its climate and peaceful setting. The city has an estimated population of less than 500 people. It is estimated that the population of the town will increase due to a proposed subdivision.

The climate of the study area is arid. The average annual precipitation is approximately 7.4 inches; with an average annual snowfall of 0 inches for this area (Harris-Toups, 1979). This area frequently experiences long periods of no rainfall. Rainfall normally occurs in two seasons. One season, primarily results from local convective storms, lasts from July to Mid-September, the other season mainly formed by cyclonic (frontal) storms extends from December through March.



TRLIBY WASH STUDY AREA
MARICOPA COUNTY ARIZONA

APPROXIMATE SCALE
10 0 10 20 30 40
SCALE 1"=500'

VICINITY MAP

FIGURE 1

The land within the watershed is virtually in its natural state. Natural vegetation is sparse with plant species being typical to desert areas. Cacti, along with other desert shrubs, grow throughout the watershed. Scattered trees, such as palo verde and mesquite, exist among the shrubs. The vegetation tends to be thicker along and adjacent to the stream courses.

Trilby Wash and its tributaries drain most of the unincorporated Circle City. The river has its headwaters in the Wickenburg Mountains to the north of Circle City. For more detailed hydrology information, the reader is urged to refer to the previous report entitled: "Wittmann Area Drainage Master Study", dated 3/89 (References 15 and 16).

2.3 Principal Flood Problems

Riverine flooding is the major hazard in this area. The flooding is characterized by: unconfined flow over broad, relatively low relief areas that have developed a system of branching channels; overbank flows that spread laterally, and flows collecting in depressions to form ponding areas.

Ponding is the result of runoff or flows collecting in a depression that may have no outlet. Impoundments behind manmade obstructions such as: levees, road fills, railroad grades, canal banks, and other similar structures are included in this type of flooding as long as they are not backwater from a defined channel, or do not exceed 3.0 feet in depth (FEMA 37).

Sheet runoff is the broad, relatively unconfined downslope movement of water across sloping terrain that results from many sources, including intense rainfall, overflow from a channel that crosses a drainage divide, and/or overflow from a perched channel onto lower elevations. Generally, it enters a channel or drainage system that intersects its flow, but occasionally it dissipates before reaching a channel (FEMA, 37).

The C.A.P. overchute and Patton Road Crossing are the two major man-made obstructions to the floodwater from the natural water courses.

The Patton Road Crossing has 8 - 68 inch corrugated metal pipe culverts under the roadway and will cause backwater effects to the area immediately north of the Patton Road Crossing during the 100 year event.

Some small areas of sheet flow and ponding were identified through examination of topographic maps, field survey and field reconnaissance. They occur predominantly in adjacent tributary areas as well as behind Patton Road and the CAP aqueduct.

There are several areas of lateral flooding which occurs in this reach of Trilby Wash. In these areas the flow is not contained in the banks and under current conditions physically leaves the watershed reach.

Flood damage has not been repeated in the study area because the study area is presently undeveloped.

2.4 Flood Protection Measures

Future demands associated with development will intensify the need for flood protection measures. No major structural flood protection measures exist or are planned for the study area. A small water stock pond is located on a tributary to the Trilby Wash approximately 2 miles upstream of the CAP. It should not be considered as a flood control structure because it provides no significant protection from flooding. The adoption of this study by Maricopa County will provide a tool to manage future development encroachments into the 100-year floodway and to assure that approved encroachments into the flood fringe wil be adequately protected from flood damage.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the study area, standard hydraulic study methods were used to determine the flood hazard data required for this study. The 100-year flood event is selected for the basis of this study. This event has a 1 percent chance of being equaled or exceeded during any one year. The analysis reported herein reflects flooding potentials based on existing conditions in the community at this time.

In the areas of lateral flooding where flow is not contained within the banks under natural conditions, Encroachment Method 1, which specifies the location of encroachment for a given cross-section, is used to calculate the flood profile under natural condition. This methodology allows for future development and result in the most conservative water surface elevation profile.

3.1 Hydrologic Analyses

Hydrologic analysis were conducted to establish the 100 year discharges at critical points along the main branch of Trilby Wash. The U.S. Army Corps of Engineers (COE) HEC-1 Computer Program was the basis of model. The peak discharge values were provided by the Flood Control District of Maricopa County and are based on the Wittmann Area Drainage Master Study (ADMS) (References 15 and 16). Peak discharge values for the Trilby Wash as shown in Table 1 were received from the Flood Control District of Maricopa County. Drainage Map Exhibit 4 located in the map pocket at the end of this report shows the location of the critical points. The detailed Hydrologic Analysis of Trilby Wash prepared by Flood Control District of Maricopa County's Hydrology Division (Dated Aug. 1991) is included in Appendix 'A' (bound separately) of this report.

TABLE 1
SUMMARY OF DISCHARGES
TRILBY WASH
(GRAND AVENUE TO CAP AQUEDUCT)

CONCENTRATION POINT	WITTMANN ADMS DISCHARGE-CFS	FCD DETAIL DISCHARGE-CFS
Sta. 17.262	2,785	2,785
63B2	* -----	2,995
63B3	* -----	3,020
63B	3,035	3,035
63C	3,322	3,322
C631	* -----	3,706
C632	* -----	3,756
C633	* -----	3,805
63	3,851	3,851
Sta. 10.444	3,845	3,845
Sta. 10.382	3,780	3,780

* Concentration Points of the Trilby Wash FIS Concerns.

3.2 Hydraulic Analyses

Using the hydrology information obtained from the FCD of MC, an analyses of the hydraulic characteristics of flooding were carried out. Computation of the water surface elevations were calculated only for the 100 year storm, per contract. Water-surface elevations were computed using the new version, 4.6.0 of the HEC-2 computer program dated February, 1991 (Reference 22).

The starting water-surface elevation for the HEC-2 Model was assumed at a critical depth. This is due to the fact that the starting cross section is located in the concrete CAP overchute structure. Channel and overbank roughness coefficients (Manning's "n" values) used in the hydraulic computations were chosen by engineering judgment and were based on field observations of the stream and floodplain areas. The channel "n" values for Trilby Wash ranged from 0.045 to 0.075, and the overbank "n" values

ranged from 0.065 to 0.10. The Manning's "n" values are discussed in a detailed in Manning's 'n' Value Determination Report. Manning's 'n' Value Determination Report is included in APPENDIX 'E' of this study.

Cross section data for the analyses were determined by obtaining digitized cross sections from topographic maps, at a scale of 1" = 200 feet and 2-foot contour intervals, prepared specifically for this project by Cooper Aerial Mapping of Phoenix, Inc. The Patton Road Culvert Crossing and C.A.P. overchute were surveyed to obtain elevation data and structural geometry. Copies of these two (2) "as-built" drawings are included as a part of Exhibit 2 and 3 of Appendix 'E' - Manning's 'n' Value Determination Report. Locations of selected cross-sections used in the hydraulic analysis are shown on the flood profiles (Exhibit 1) and on the Flood Insurance Rate Maps (Exhibit 2).

Contraction and expansion coefficient values of 0.1 and 0.3, respectively, were used for gradual transitions.

The hydraulic analysis for this study was based on unobstructed flow. The flood elevations shown are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Test run for Encroachment Method 4, which is based on equal conveyance reduction from each side of the floodplain, was run to begin encroachment. Final encroachment was done with the use of Encroachment Method 1. Encroachment was set such that the maximum increase in flood height was limited to 1 foot, provided that the severe flow velocity distributions; unwarranted water depths in the floodway fringe and undulating flow boundaries were not produced.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

This Flood Insurance Study provides 100-year water surface elevations as well as delineations of the 100-year floodplain and floodway boundaries in order to assist communities and regulatory agencies in developing floodplain management regulations. The goal of floodplain management is to reduce the loss of life, property and damage resulting from flooding.

4.1 Floodplain Boundaries

The term floodplain is defined by FEMA "as the lowland and relatively flat area adjoining inland and coastal waters, and those other areas subject to flooding" (Reference 7). The purpose of this study and the resulting maps is to delineate topographic areas that are at risk of being flooded during the 100-year storm event, under existing conditions. For Trilby Wash, the 100-year Floodplain boundaries have been determined using the flood elevations determined at each cross section.

Between cross sections, the boundaries were interpolated with the topographic maps. The 100-year floodplain boundaries are shown on the Flood Insurance Rate Maps (Exhibit 2).

4.2 Floodways

The following excerpt is taken, in part, from FEMA 37, Reference 6:

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities. As a result, it also increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. Therefore, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into two parts: a floodway and floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodway delineation for this study was computed with the use of Encroachment Method 1 for the entire 6.7 River Mile Reach of Trilby Wash. Floodway widths were computed at cross sections; thus between cross sections, the floodway boundaries were interpolated. In cases where the floodway and 100-year floodplain boundaries are either very close together or collinear, only the floodway boundary is shown. The results of the floodway computations are tabulated in (Table 2).

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. The typical relationships between the floodway and the floodplain development are shown in Figure 2.

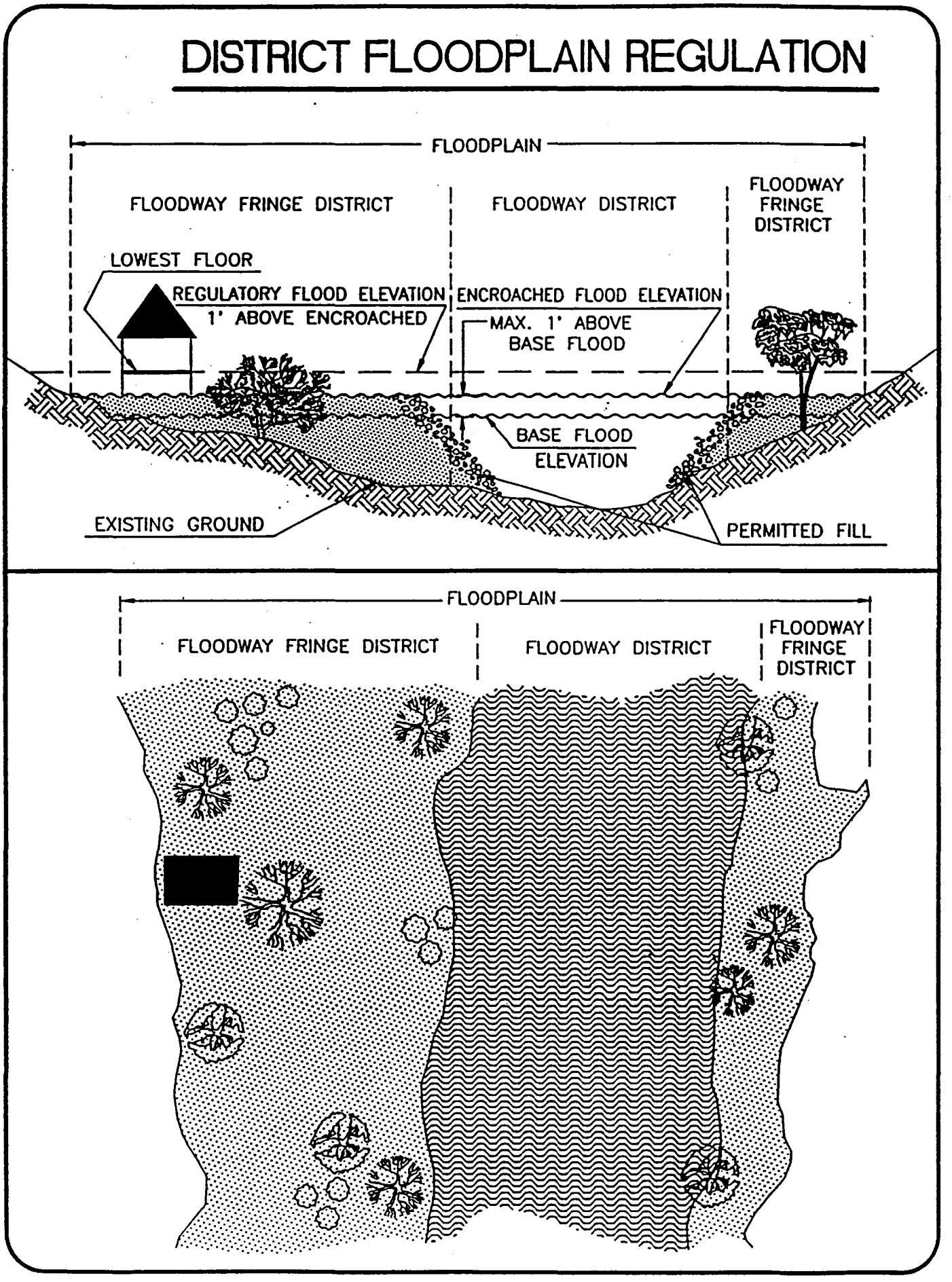


FIGURE 2. FLOODWAY SCHEMATIC

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	55,150	136	396	9.7	1545.5	1545.5	1545.5	.0
B	55,177	136	396	9.7	1547.7	1547.7	1547.7	.0
C	55,273	136	476	8.1	1548.4	1548.4	1548.4	.0
D	55,299	159	662	5.8	1549.0	1549.0	1549.0	.0
E	55,304	179	622	6.2	1549.0	1549.0	1549.0	.0
F	55,330	215	788	4.9	1549.5	1549.5	1549.5	.0
G	55,590	170	649	5.9	1551.0	1551.0	1551.1	.1
H	55,930	188	892	4.3	1552.7	1552.7	1553.6	.9
I	56,410	179	816	4.7	1555.1	1555.1	1556.0	.9
J	56,820	179	716	5.4	1558.0	1558.0	1558.2	.2
K	57,105	136	705	5.5	1559.7	1559.7	1559.7	.0
L	57,425	136	536	7.1	1561.1	1561.1	1561.3	.2
M	57,790	256	1096	3.5	1564.4	1564.4	1564.4	.0
N	58,115	157	636	6.0	1565.4	1565.4	1565.5	.1
O	58,410	194	880	4.3	1566.7	1566.7	1567.7	1.0
P	58,705	175	835	4.6	1567.9	1567.9	1568.9	1.0
Q	59,085	131	633	6.0	1570.1	1570.1	1570.8	.7

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
R	59,450	173	775	4.9	1573.0	1573.0	1573.3	.3
S	59,935	157	743	5.1	1575.4	1575.4	1575.9	.5
T	60,330	228	912	4.2	1577.2	1577.2	1577.9	.7
U	60,800	183	771	4.9	1579.1	1579.1	1580.1	1.0
V	61,005	156	611	6.2	1581.2	1581.2	1581.3	.1
W	61,385	140	657	5.8	1583.3	1583.3	1584.0	.7
X	61,715	144	655	5.8	1585.6	1585.6	1586.2	.6
Y	61,895	191	1145	3.3	1586.5	1586.5	1587.2	.7
Z	61,955	210	1415	2.7	1587.6	1587.6	1588.6	1.0
AA	62,365	180	480	7.8	1589.3	1589.3	1589.3	.0
AB	62,705	183	763	4.9	1593.1	1593.1	1593.4	.3
AC	63,150	234	889	4.2	1595.1	1595.1	1595.7	.6
AD	63,580	132	484	7.8	1597.6	1597.6	1597.9	.3
AE	64,040	140	753	5.0	1600.9	1600.9	1601.8	.9
AF	64,280	220	882	4.3	1602.6	1602.6	1603.0	.4
AG	64,675	176	631	5.9	1604.8	1604.8	1605.2	.4
AH	65,080	162	726	5.2	1608.3	1608.3	1608.6	.3

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AI	65,450	193	765	4.9	1610.0	1610.0	1610.6	.6
AJ	65,915	164	466	8.0	1613.7	1613.7	1613.9	.2
AK	66,360	131	634	5.8	1618.4	1618.4	1618.7	.3
AL	66,795	138	606	6.1	1621.6	1621.6	1621.9	.3
AM	67,240	168	480	7.7	1624.4	1624.4	1624.8	.4
AN	67,700	120	501	7.4	1628.5	1628.5	1629.0	.5
AO	68,160	137	724	5.1	1631.4	1631.4	1632.1	.7
AP	68,640	126	431	8.6	1634.6	1634.6	1634.5	-.1
AQ	69,060	221	755	4.9	1638.6	1638.6	1638.8	.2
AR	69,385	498	842	4.4	1641.2	1641.2	1641.2	.0
AS	69,820	701	1220	3.0	1644.9	1644.9	1645.1	.2
AT	70,150	721	1413	2.6	1646.6	1646.6	1647.0	.4
AU	70,510	446	492	7.5	1650.4	1650.4	1650.5	.1
AV	70,940	420	1149	3.2	1654.8	1654.8	1655.1	.3
AW	71,380	384	855	4.3	1657.1	1657.1	1657.4	.3
AX	71,825	303	803	4.6	1660.3	1660.3	1660.4	.1
AY	72,290	426	773	4.8	1663.3	1663.3	1663.4	.1

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
AZ	72,660	449	824	4.5	1666.0	1666.0	1666.2	.2
BA	73,080	565	935	4.0	1668.7	1668.7	1669.3	.6
BB	73,455	539	1214	3.1	1671.2	1671.2	1671.8	.6
BC	73,855	413	713	5.2	1674.2	1674.2	1674.4	.2
BD	74,325	459	1073	3.5	1677.8	1677.8	1678.3	.5
BE	74,585	452	899	4.1	1679.5	1679.5	1679.7	.2
BF	74,960	339	628	5.9	1682.4	1682.4	1682.7	.3
BG	75,560	384	890	3.7	1688.0	1688.0	1688.3	.3
BH	76,015	301	675	4.9	1691.5	1691.5	1691.5	.0
BI	76,460	160	509	6.5	1694.6	1694.6	1695.3	.7
BJ	76,925	160	593	5.6	1698.2	1698.2	1699.0	.8
BK	77,385	156	557	6.0	1701.9	1701.9	1702.3	.4
BL	77,675	149	615	5.4	1704.0	1704.0	1704.4	.4
BM	77,905	164	458	7.3	1705.4	1705.4	1705.9	.5
BN	78,385	232	800	4.2	1709.7	1709.7	1710.3	.6
BO	78,870	193	563	5.9	1713.0	1713.0	1713.3	.3
BP	79,075	228	615	5.4	1715.1	1715.1	1715.3	.2

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BQ	79,435	252	711	4.3	1718.1	1718.1	1718.7	.6
BR	79,825	222	638	4.8	1721.1	1721.1	1721.9	.8
BS	80,300	213	610	5.0	1725.4	1725.4	1726.0	.6
BT	80,775	167	528	5.7	1730.0	1730.0	1730.3	.3
BU	81,205	294	858	3.5	1733.1	1733.1	1733.7	.6
BV	81,540	351	725	4.2	1735.9	1735.9	1736.0	.1
BW	81,840	335	770	3.9	1738.7	1738.7	1739.0	.3
BX	82,270	414	919	3.3	1742.1	1742.1	1742.8	.7
BY	82,565	341	603	5.0	1744.6	1744.6	1745.4	.8
BZ	82,810	459	662	4.6	1746.9	1746.9	1747.6	.7
CA	83,155	364	217	5.3	1751.7	1751.7	1751.3	-.4
CB	83,650	432	472	2.4	1757.3	1757.3	1757.6	.3
CC	83,900	387	299	3.8	1760.6	1760.6	1760.4	-.2
CD	83,945	418	471	2.4	1761.1	1761.1	1761.3	.2
CE	84,125	445	413	2.8	1763.0	1763.0	1763.1	.1
CF	84,595	270	304	3.8	1769.0	1769.0	1769.0	.0
CG	85,075	319	535	3.3	1774.5	1774.5	1774.7	.2

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CH	85,350	326	523	5.7	1777.7	1777.7	1778.3	.6
CI	85,825	154	535	5.6	1783.4	1783.4	1783.8	.4
CJ	86,305	120	444	6.7	1788.1	1788.1	1788.0	-.1
CK	86,705	118	348	8.6	1793.4	1793.4	1793.5	.1
CL	87,020	210	775	3.9	1797.2	1797.2	1798.0	.8
CM	87,390	110	327	9.2	1800.9	1800.9	1801.1	.2
CN	87,800	260	714	4.2	1805.7	1805.7	1806.7	1.0
CO	88,250	124	402	7.4	1810.7	1810.7	1810.2	-.5
CP	88,640	146	487	6.1	1814.8	1814.8	1815.2	.4
CQ	89,030	125	419	7.1	1819.0	1819.0	1818.9	-.1
CR	89,425	66	275	10.9	1823.3	1823.3	1823.2	-.1
CS	89,820	170	520	5.8	1827.6	1827.6	1828.0	.4
CT	90,005	102	407	7.4	1829.0	1829.0	1829.1	.1
CU	90,475	91	324	9.2	1835.4	1835.4	1835.2	-.2
CV	90,820	168	572	5.2	1839.5	1839.5	1840.0	.5
CW	91,145	88	305	9.1	1842.7	1842.7	1842.9	.2
CX	91,445	95	414	6.7	1846.4	1846.4	1846.9	.5

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CY	91,685	96	323	8.6	1849.2	1849.2	1849.2	.0
CZ	92,005	122	455	6.1	1853.1	1853.1	1853.5	.4
DA	92,275	147	670	4.2	1855.0	1855.0	1855.3	.3

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA TRILBY WASH - MAIN CHANNEL

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
CB	83,560	294	527	3.5	1753.9	1753.9	1754.4	.5
CC	83,850	359	428	4.4	1757.6	1757.6	1757.4	-.2
CD	84,030	152	183	3.3	1760.0	1760.0	1760.4	.4
CE	84,220	146	231	2.6	1763.5	1763.5	1763.3	-.2
CF	84,750	168	210	2.9	1769.6	1769.6	1769.8	.2
CG	85,115	319	513	3.4	1774.5	1774.5	1774.6	.1

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA MIDDLE CHANNEL AT SPLIT - TRILBY WASH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION (FEET NGVD)			
CROSS SECTION	DISTANCE (1)	WIDTH (FEET)	SECTION AREA (SQ.FT.)	MEAN VELOCITY (FT/S)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
BX	82,270	414	915	3.3	1742.1	1742.1	1742.8	.7
BY	82,565	341	619	4.9	1744.6	1744.6	1745.4	.8
BZ	82,810	459	656	4.6	1747.0	1747.0	1747.6	.6
CA	83,180	209	449	4.2	1750.5	1750.5	1750.5	.0
CB	83,630	294	527	3.5	1753.9	1753.9	1754.4	.5
CC	83,950	364	490	3.8	1757.7	1757.7	1757.6	-.1
CD	84,250	240	418	3.0	1760.1	1760.1	1760.4	.3
CE	84,510	145	178	7.0	1763.7	1763.7	1763.8	.1
CF	85,000	279	453	2.7	1771.1	1771.1	1771.2	.1
CG	85,210	118	229	5.4	1773.1	1773.1	1773.4	.3
CH	85,610	326	595	5.0	1778.1	1778.1	1778.6	.5
CI	86,095	154	500	6.0	1783.4	1783.4	1783.6	.2

TABLE 2	FEDERAL EMERGENCY MANAGEMENT AGENCY MARICOPA COUNTY (UNINCORPORATED) MARICOPA COUNTY, ARIZONA	FLOODWAY DATA WEST CHANNEL AT SPLIT - TRILBY WASH

5.0 INSURANCE APPLICATION

The 100-year floodplain and floodway boundaries are shown on the Flood Insurance Rate Maps (Exhibit 2). On these maps, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards zones. Small areas within the floodplain boundaries may lie above the flood elevations but are not shown.

The following information included in both this Section (5.0) and Section 6.0 was defined in FEMA 37, Reference 6. For flood insurance rating purposes, the flood insurance zone designations were assigned based on the results and interpretation of this engineering analyses. There are a total of nine (9) zones listed in the FEMA publication, of which five (5) apply to this study reach of the Trilby Wash. These zones are as follows:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone B

Zone B is the flood insurance rate zone that corresponds to areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed as a convenient reference when obtaining flood insurance and floodplain management information. For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies. For floodplain management applications, the map shows by tints, screens, and symbols, the 100-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

The number of other hydrologic/hydraulic studies that have been done in this area is limited to three. The other studies that have been completed include:

1) Flood Insurance Study, Approximate Study for the Unincorporated Area of Maricopa County, Arizona, 1979, prepared by Harris - Toups, Associates;

2) Work done by the Bureau of Reclamation (BOR) for sizing the Trilby Wash/CAP Flume Crossing. This work is unpublished and was obtained via phone conversations and FAX transmittals; and finally,

3) The Wittmann area Drainage Master Study, 1989, prepared by The WLB Group, Inc. under contract with the FCD of Maricopa County.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting either:

1) The Flood Control District of Maricopa County
   c/o Mr. Besian Khatiblou, P.E.
   2801 W. Durango Street
   Phoenix, Arizona 85009
   (602) 506-1501

   and/or

2) The Department of Water Resources (DWR)
   Archive File Department
   15 South 15th Avenue
   Phoenix, Arizona 85007
   (602) 542-1541

9.0 BIBLIOGRAPHY AND REFERENCES

1) Aldridge, B.N. and Garrett, J.M.; 1973; Roughness Coefficients for Stream Channels in Arizona: U.S. Geological Survey, Open File Report (Prepared in cooperation with the Arizona Highway Department); 87 p., unpublished.

2) Arizona Department of Water Resources (A.D.W.R.); 8/90; Instructions for Organizing and Submitting Technical Documentation for Flood Studies (TR 90-3): Engineering Division, Flood Management Section; unpublished; 13 p.

3) Barnes, H.H. Jr.; 1967; Roughness Characteristics of Natural Channels: U.S. Geological Survey, Water Supply Paper 1849; U.S. Government Printing Office; Washington, D.C.; 213 p.

4) Chow, Ven, T.; 1959; Open-Channel Hydraulics: McGraw-Hill (Publishing Company) Civil Engineering Series; New York; 680 p.

5) Bonner, Vernon, R.; 1/88; Floodway Determination Using Computer Program HEC-2, Training Document No. 5: The Hydrologic Engineering Center, Water Resources Support Center, U.S. Army, Corps of Engineers; Davis, CA; 82 p.

6) Federal Emergency Management Agency (FEMA); 9/85; Flood Insurance Study Guidelines and Specifications for Study Contractors, FEMA 37: Federal Insurance Administration; Washington, D.C.

7) FEMA; 3/86; A Unified National Program for Floodplain Management, FEMA 100: Interagency Task Force on Floodplain Management; Washington, D.C.

8) Harris-Toups, Associates; 1/79; Flood Insurance Study Approximate Study Unincorporated Area of Maricopa County, Arizona: Prepared for the U.S. Department of Housing and Urban Development, Federal Insurance Administration; unpublished.

9) Hoggan, Daniel, H.; 1989; Computer Assisted Floodplain Hydrology and Hydraulics, Featuring the U.S. Army Corps of Engineers' HEC-1 and HEC-2 Software Systems: McGraw-Hill Publishing Company; New York; 518 p.

10) Hoggan, Daniel, H.; 1989; Computer Assisted Floodplain Hydrology and Hydraulics, Featuring the U.S. Army Corps of Engineers' HEC-1 and HEC-2 Software Systems, Authors's Appendix B - Workshop Problem Solutions: McGraw-Hill Publishing Company; New York; 54 p.

11) National Flood Insurance Program; 4/15/88; Flood Insurance Rate Maps (FIRM), all or portions of the following: Map Numbers 04013C1125 D and 04013C0695 D; corresponding to Panel Numbers 1125 and 695 of 4350, respectively; Maricopa County, Arizona and Incorporated Areas: Federal Emergency Management Agency (FEMA).

12) National Flood Insurance Program; 5/11/90 (Rev.); Flood Insurance Rate Maps (FIRM), all or portions of the following: Map Numbers 04013C0679 E, 04013C0687 E, and 04013C1110 E; corresponding to Panel Numbers 679, 687 and 1110 of 4350, respectively; Maricopa County, Arizona and Incorporated Areas: Federal Emergency Management Agency (FEMA).

13) National Oceanic and Atmospheric Administration (NOAA); 1973; Precipitation-Frequency Atlas of the Western United States, Volume VIII-Arizona: U.S. Department of Commerce; Silver Springs, MD;41 p.

14) Soil Conservation Service; 1985; Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona: U.S. Department of Agriculture; U.S. Government Printing Office; No. 1985-167-S/20007.

15) The WLB Group, Inc.; 4/21/88; 50- and 100- Year HEC-1 Computer Models for the Wittmann Area Drainage Master Study (ADMS): Prepared for The Flood Control District of Maricopa County; Phoenix, AZ; unpublished.

16) The WLB Group, Inc.; 3/89; Wittmann Area Drainage Master Study Part A: Hydrology and Hydraulics: Prepared for The Flood Control District of Maricopa County; Phoenix, AZ; unpublished.

17) The WLB Group, Inc.; 3/89; Wittmann Area Drainage Master Study Part B: Stormwater Management Plans: Prepared for The Flood Control District of Maricopa County; Phoenix, AZ; unpublished.

18) The WLB Group, Inc.; 3/89; Addendum to the Wittmann ADMS, Effects of Floodplain Encroachment and Channelization on Stormwater Runoff: Prepared for The Flood Control District of Maricopa County; Phoenix, AZ; unpublished.

19) U.S. Army, Corps of Engineers, Los Angles District; 11/53; Design Memorandum No. 1 Hydrology and Hydraulic Design for Trilby Wash Detention Basin and Outlet Channel: Department of the Army; Los Angeles, CA; unpublished

20) U.S. Army, Corps of Engineers, Los Angles District; 1/73; Trilby Wash Detention Basin Lower Agua Fria River, Maricopa County, Arizona: Department of the Army; Los Angeles, CA; unpublished

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25) U.S.G.S. Quadrangle Maps of Arizona: Wittmann (1981) and White Tank Mountains, N.E. (1978); Denver, Colorado.

EXHIBIT 1

FLOOD PROFILES

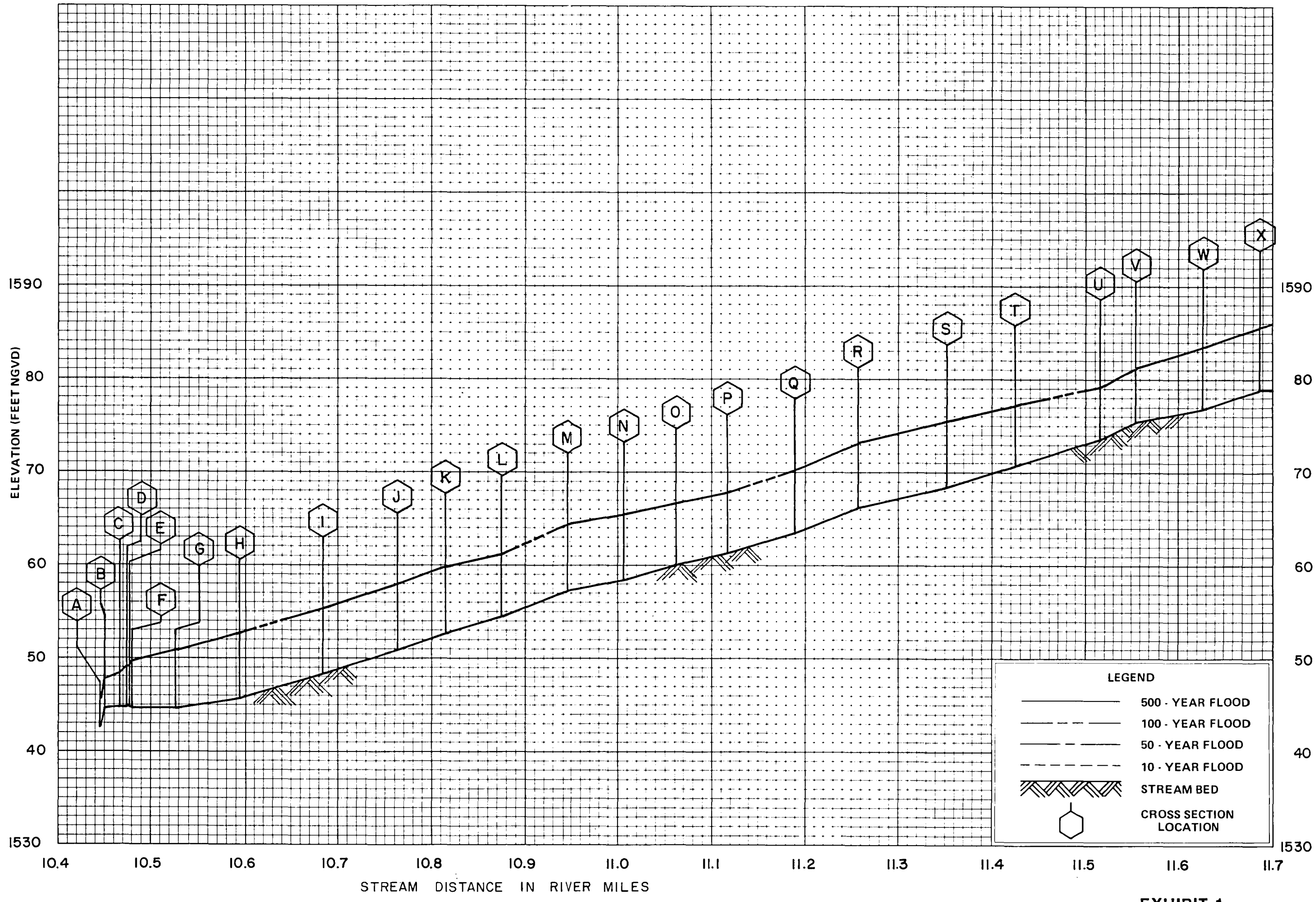


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 1 OF 8

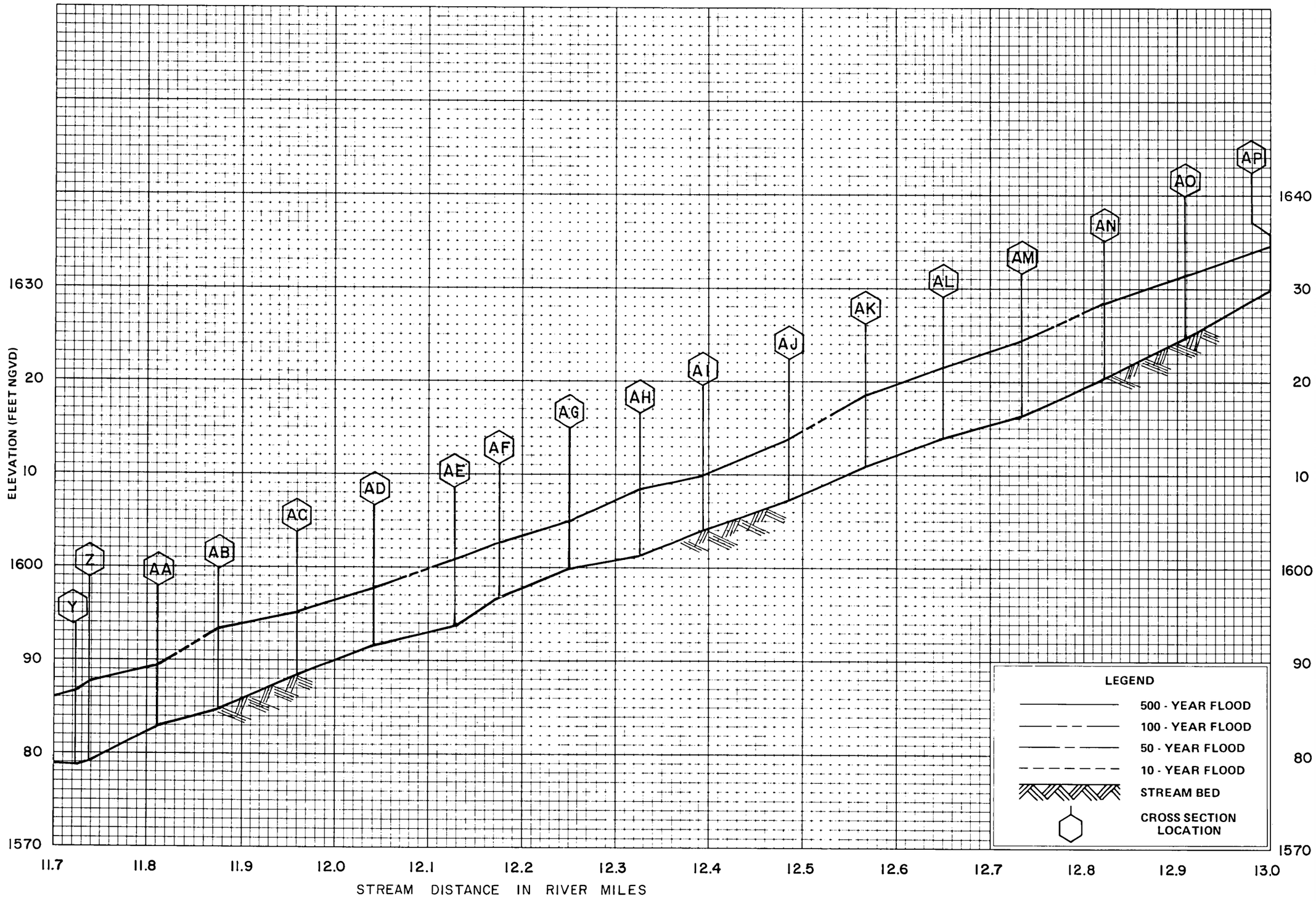


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 2 OF 8

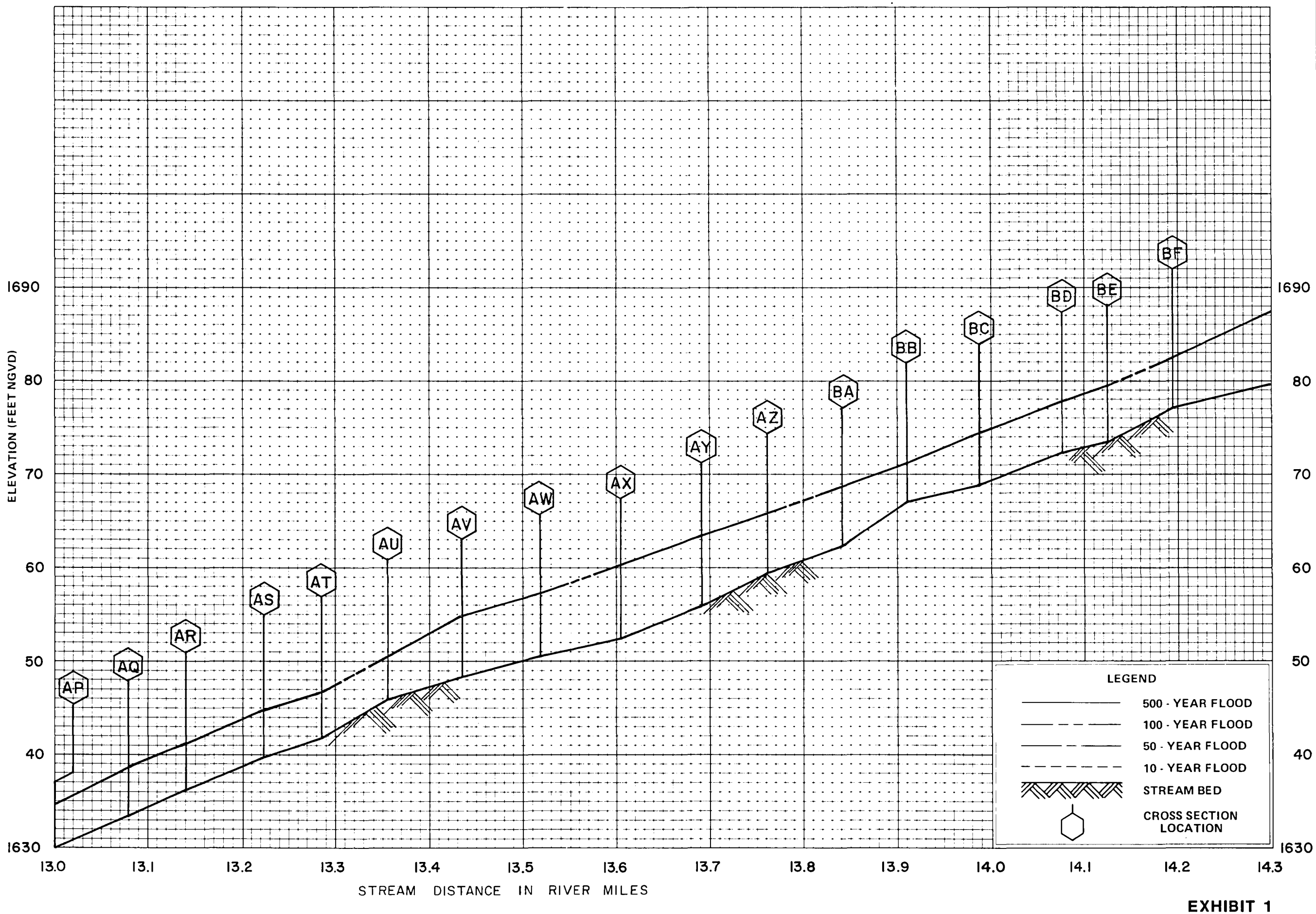


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 3 OF 8

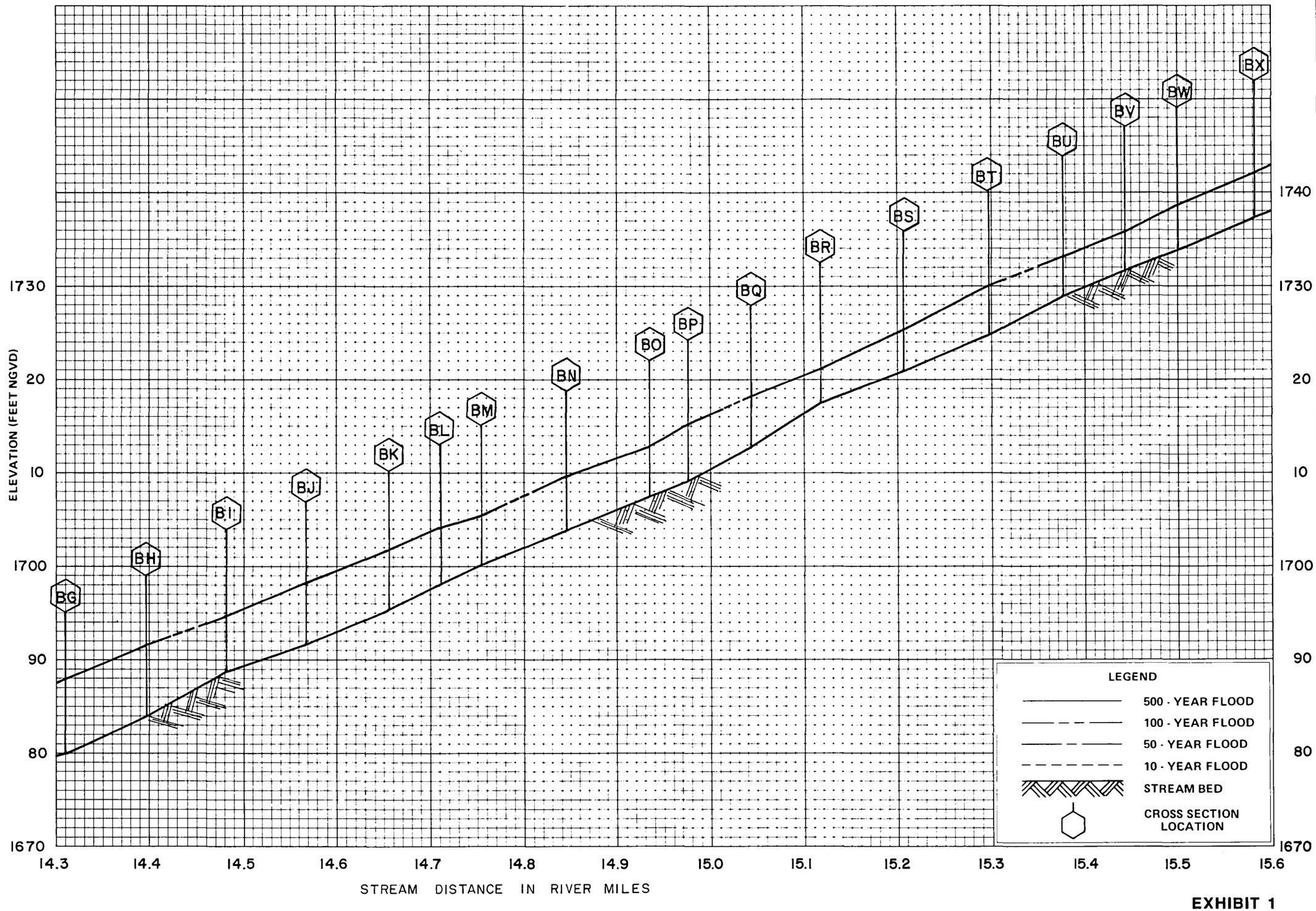


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 4 OF 8

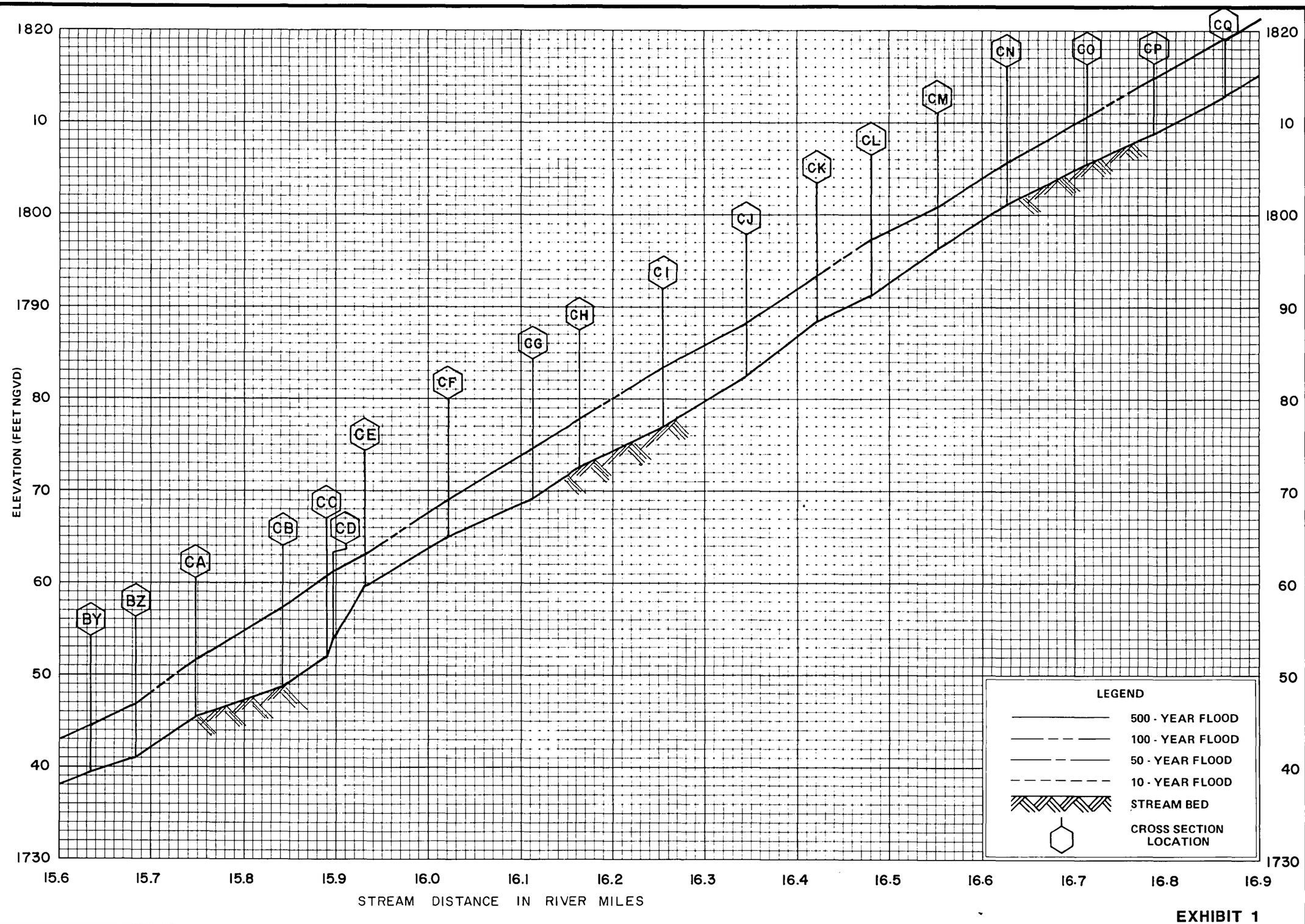


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 5 OF 8

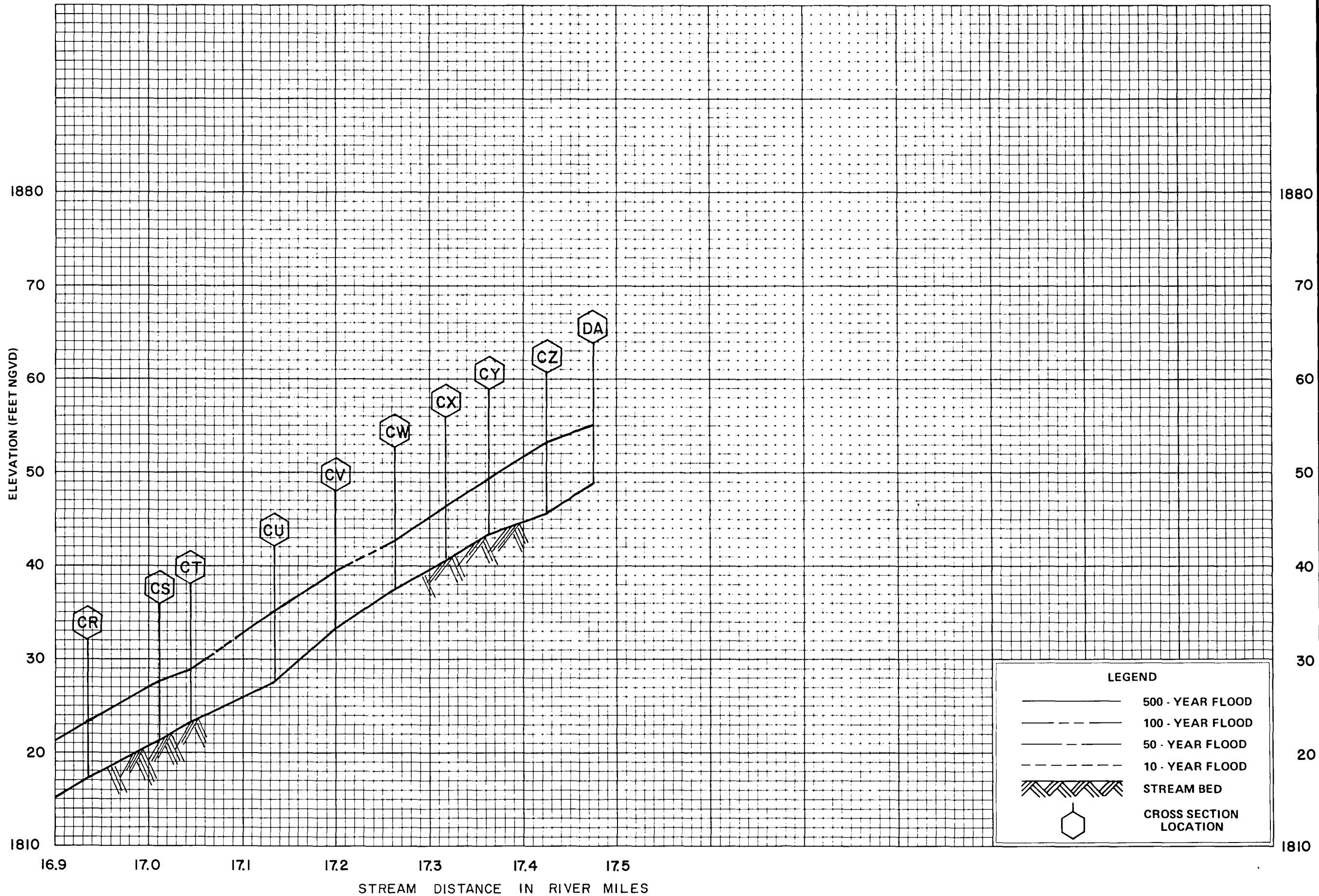


EXHIBIT 1

FLOOD PROFILES

TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

SHT 6 OF 8

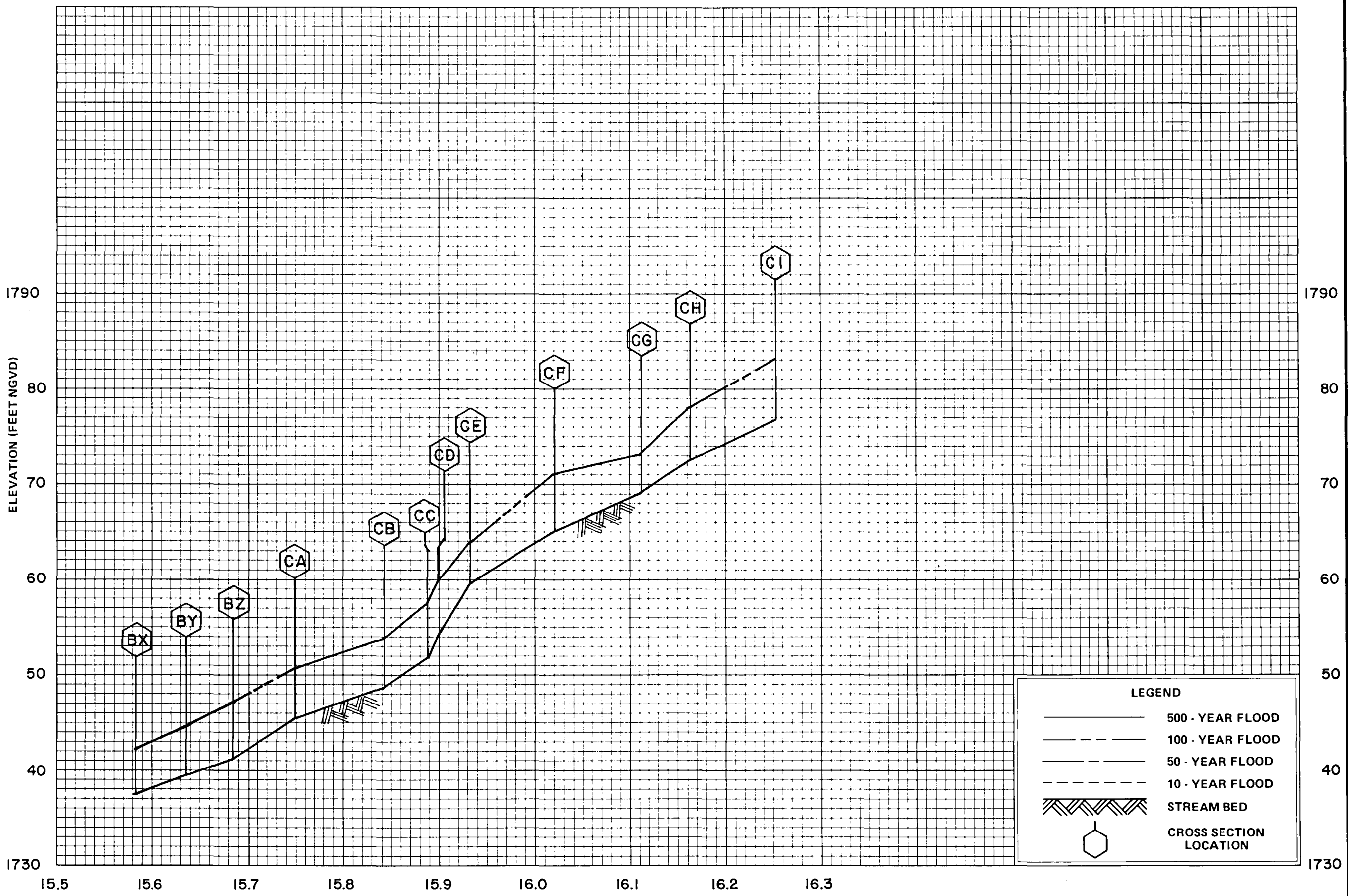


EXHIBIT 1

FLOOD PROFILES

WEST CHANNEL AT SPLIT-TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY

FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

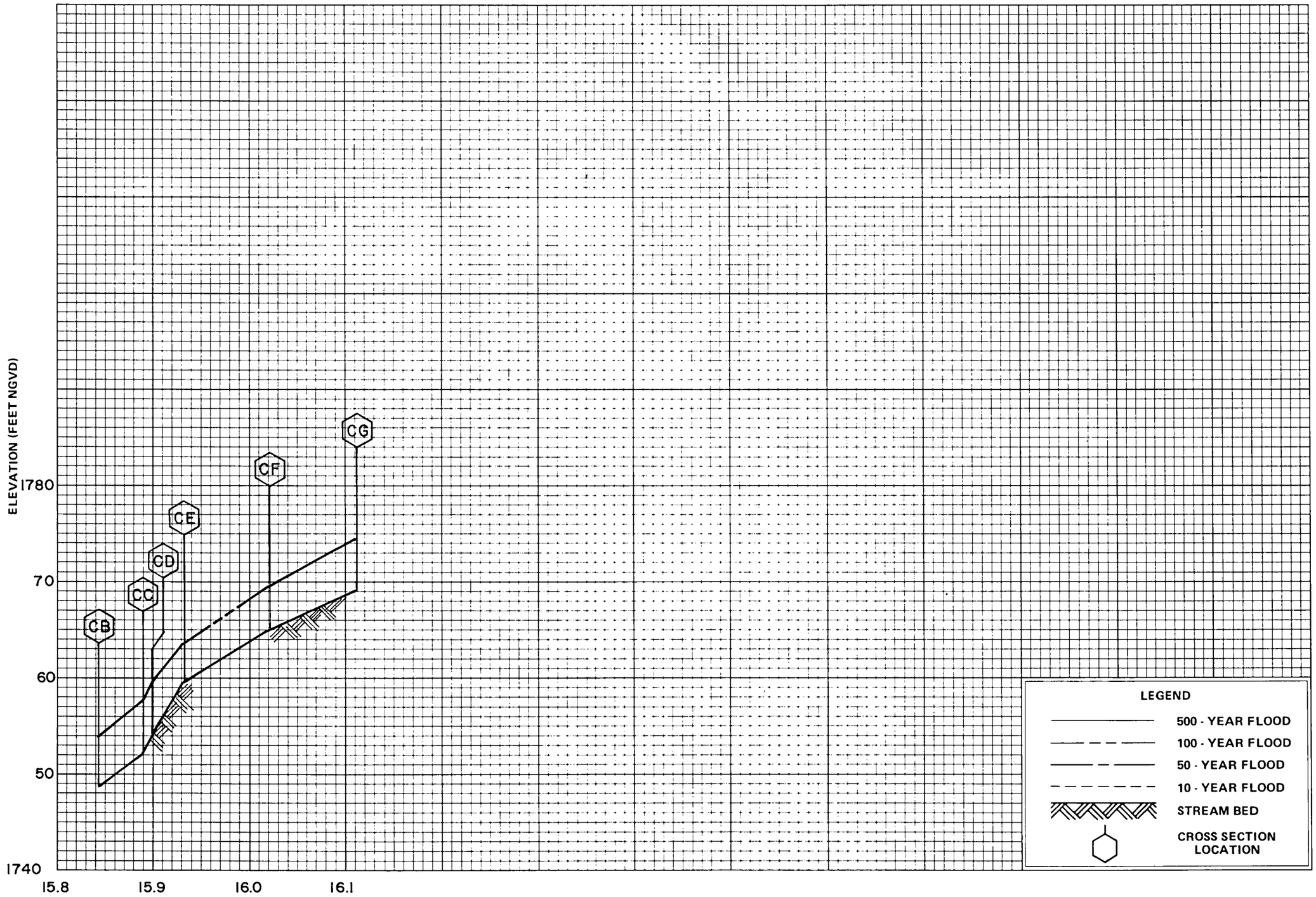


EXHIBIT 1

FLOOD PROFILES

MIDDLE CHANNEL AT SPLIT-TRILBY WASH

FEDERAL EMERGENCY MANAGEMENT AGENCY
FLOOD CONTROL DISTRICT
MARICOPA COUNTY, ARIZONA

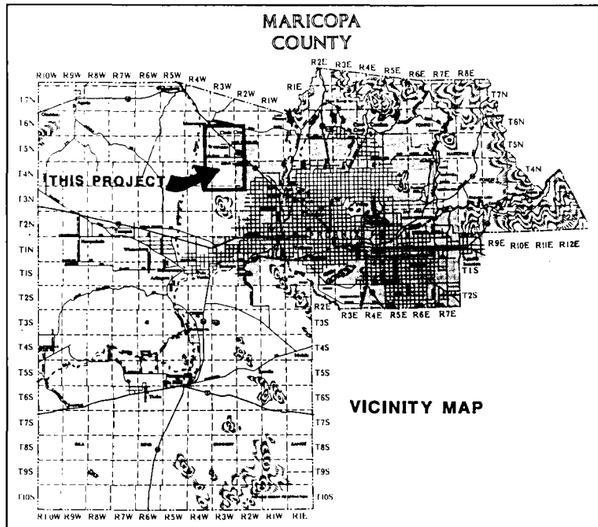
SHT 8 OF8

EXHIBIT 2

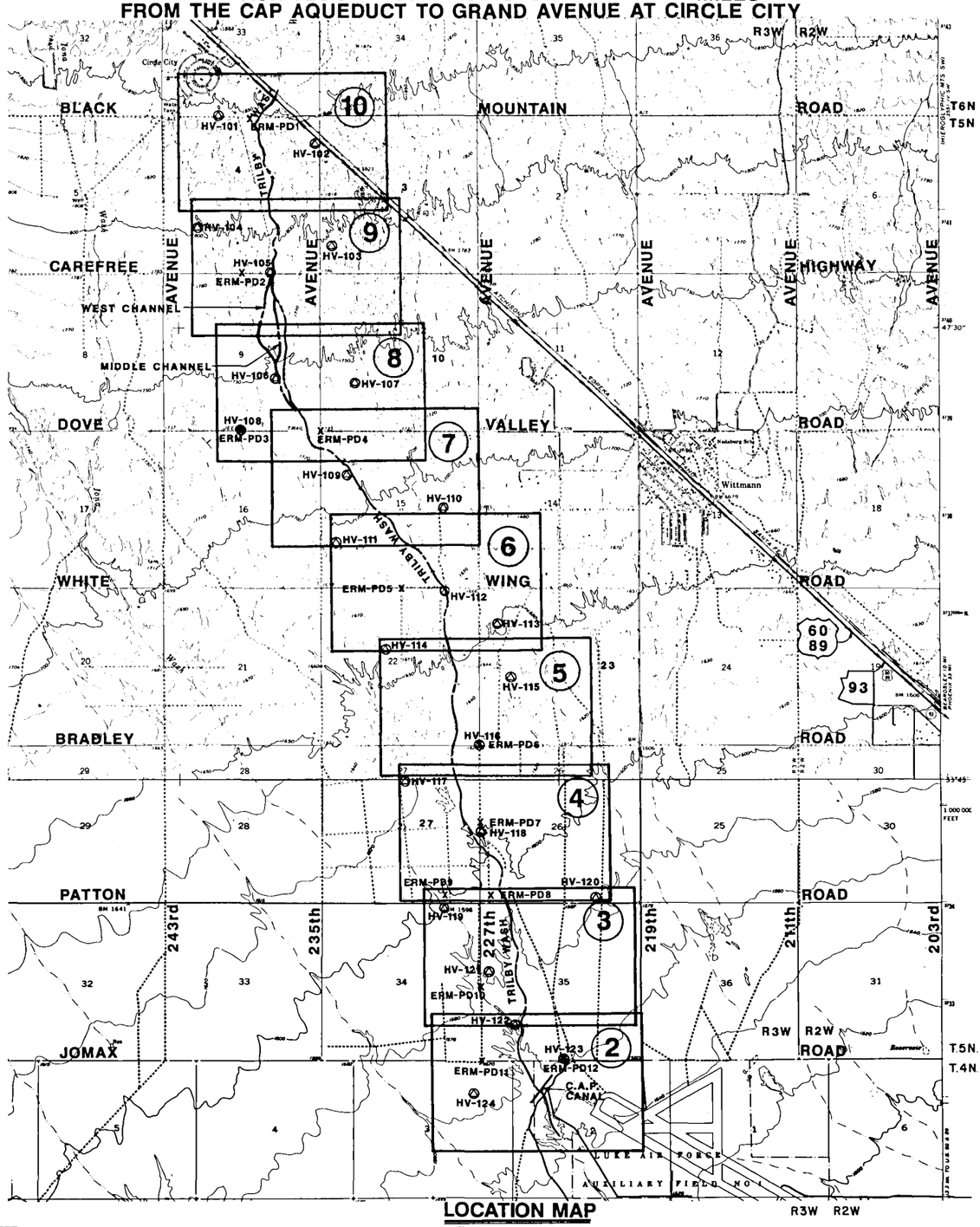
FLOOD INSURANCE RATE MAPS

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
D.E. SAGRAMOSO, CHIEF ENGINEER AND GENERAL MANAGER

TRILBY WASH FLOOD INSURANCE STUDY 6.7 RIVER MILES FROM THE CAP AQUEDUCT TO GRAND AVENUE AT CIRCLE CITY



VICINITY MAP



LOCATION MAP

MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE
SURVEY: P & D TECHNOLOGIES
DATE: 9-13-90

THIS MAP WAS PREPARED BY

P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section — q_{100} = 3,000 cfs — 1.00 — FD = 100yr. WSE — FW = Floodway WSE — 1.00
- Elevation Reference Marks — ERM-7 X
- Horizontal And Vertical Control Points — HV-1
- Zone Cutters (Boundary)
- Base Flood Elevations — 580
- Zone Designations — ZONE AE
- Dirt Roads
- Paved Road
- Section Corner
- Section Line
- Fence Lines

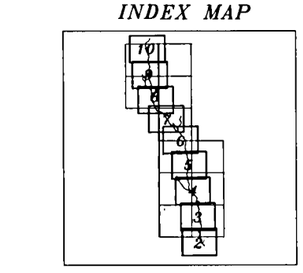
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION

NOTE: CROSS SECTION STATION

INDEX MAP



N

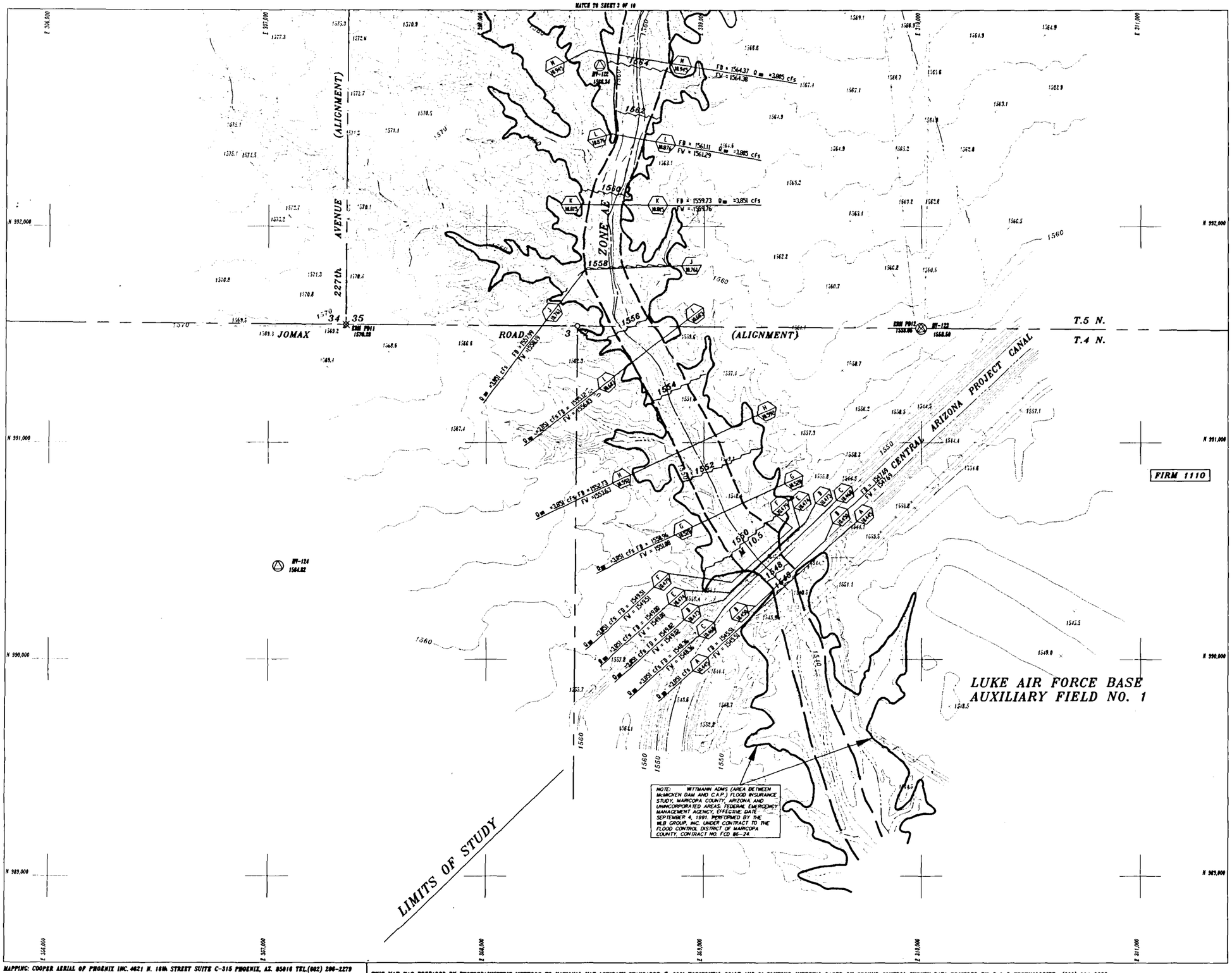
200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P & D TECHNOLOGIES
1702 E. HIGHLAND, SUITE 410
PHOENIX, AZ 85016
Tel. (602) 264-3335

DESIGN:	By: L.M. Venero	Date:	Submitted By: Date:	SHEET:
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By: Date:	1
PLANS:	By: Richard Murillo	Date:	Approved By: Date:	OF:
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER:	10

FLOOD INSURANCE RATE MAP 24" X 36"
9 SHEETS (SHEET 2 TO 10)



MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E.HIGHLAND AVE. SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section Q_m = 3,000 cfs — FB = 100yr. WSE (1.00) — FW = Floodway WSE (1.00)
- Elevation Reference Marks — ERM PD7
- Horizontal And Vertical Control Points — HV-1
- Zone Gutters (Boundary)
- Base Flood Elevations — 580
- Zone Designations — ZONE AE
- Dirt Roads
- Paved Road
- Section Corner
- Section Line
- Fence Lines

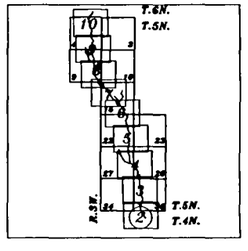
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD11	1570.20	CLO B.C. SW COR SEC 36 T5N R3W
ERM PD12	1558.05	CLO B.C. S1/4 SEC 35 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



N

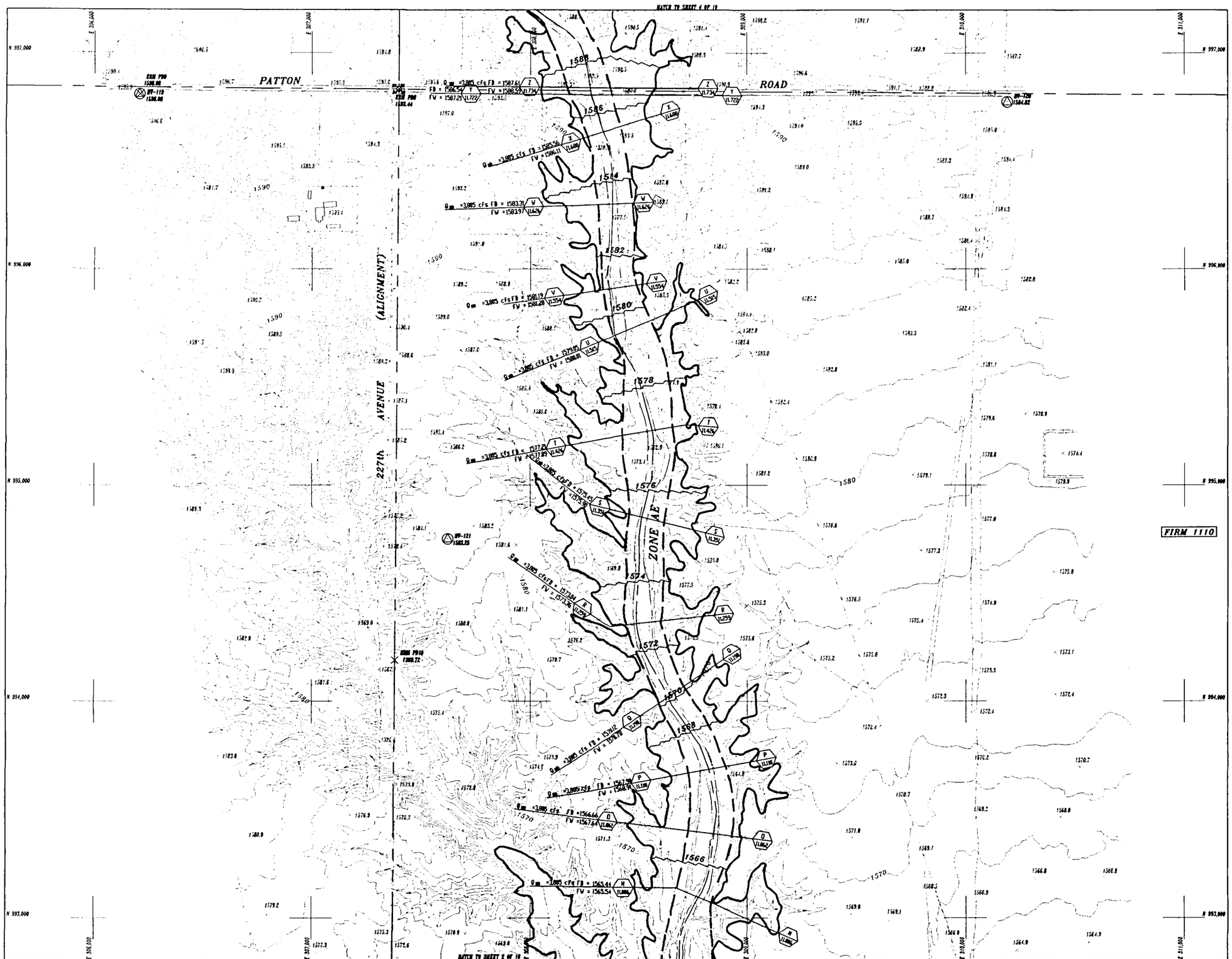
200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.H. Vomero	Date:	Submitted By:	Date:
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER	

SHEET: 2 OF: 10



FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section — Q_{100} = 3,000 cfs — FB = 100yr. WSE — FW = Floodway WSE
- Elevation Reference Marks — ERM PD7
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- Dirt Roads
- Paved Road
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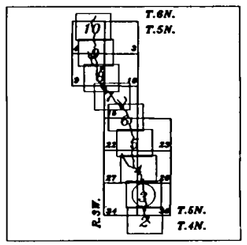
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD8	1583.44	MCDD B.C. FLUSH NW COR SEC 36 T5N R3W
ERM PD9	1588.08	USCGS B.C. IN CONC 1100' W OF PD8
ERM PD10	1569.72	GLO B.C. W1/4 SEC 36 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



N

200 100 0 200 400 600

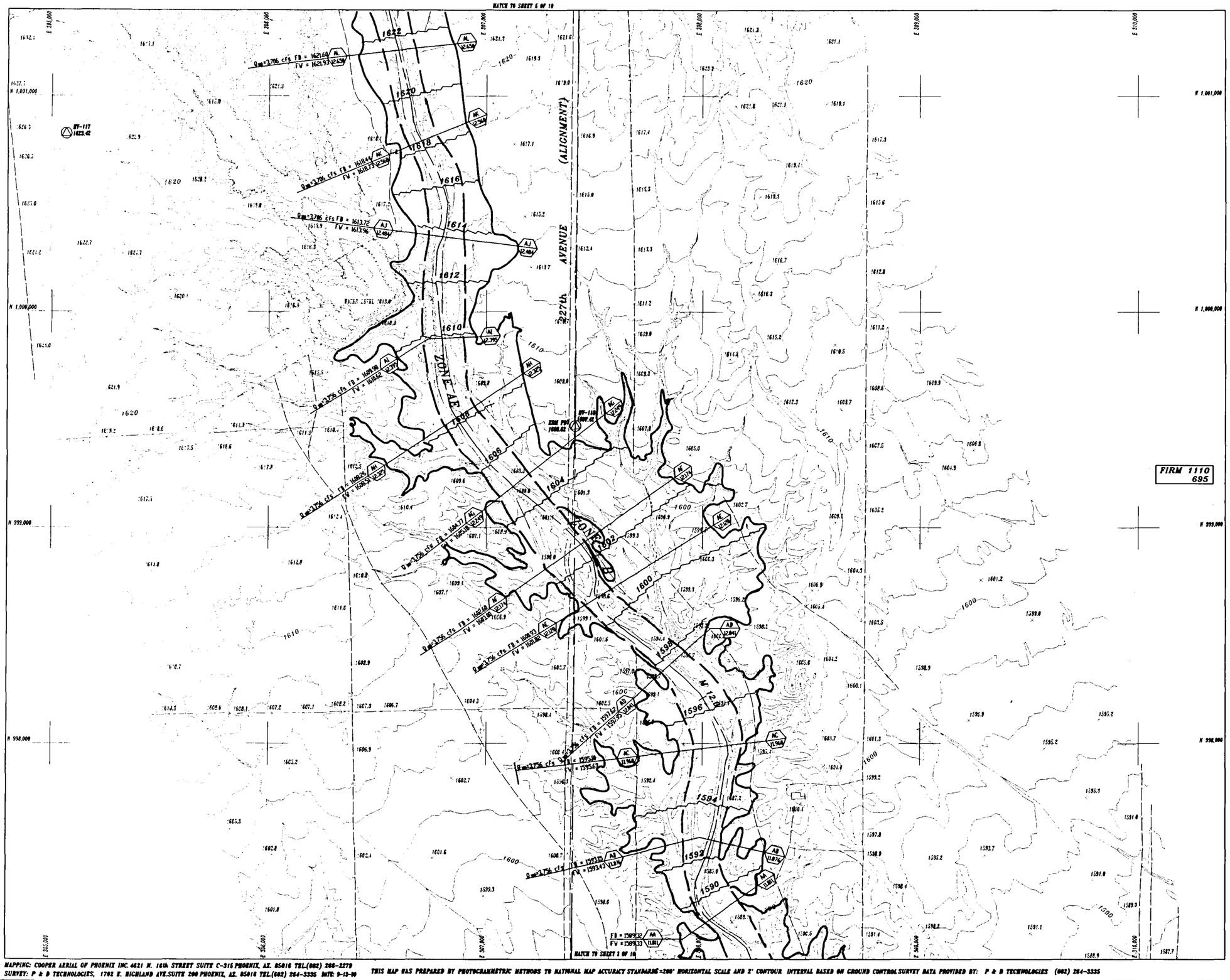
2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Vomero	Date:	Submitted By:	Date:	SHEET: 3
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:	
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:	OF: 10
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER		

MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-31 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE. SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335



MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE.SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section — FD = 100yr. WSE; FW = Floodway WSE
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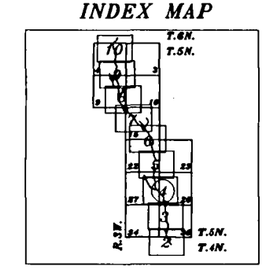
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ONNATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/
ERM PD7	1008.62	GLD B.C. W1/4 SEC 26 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



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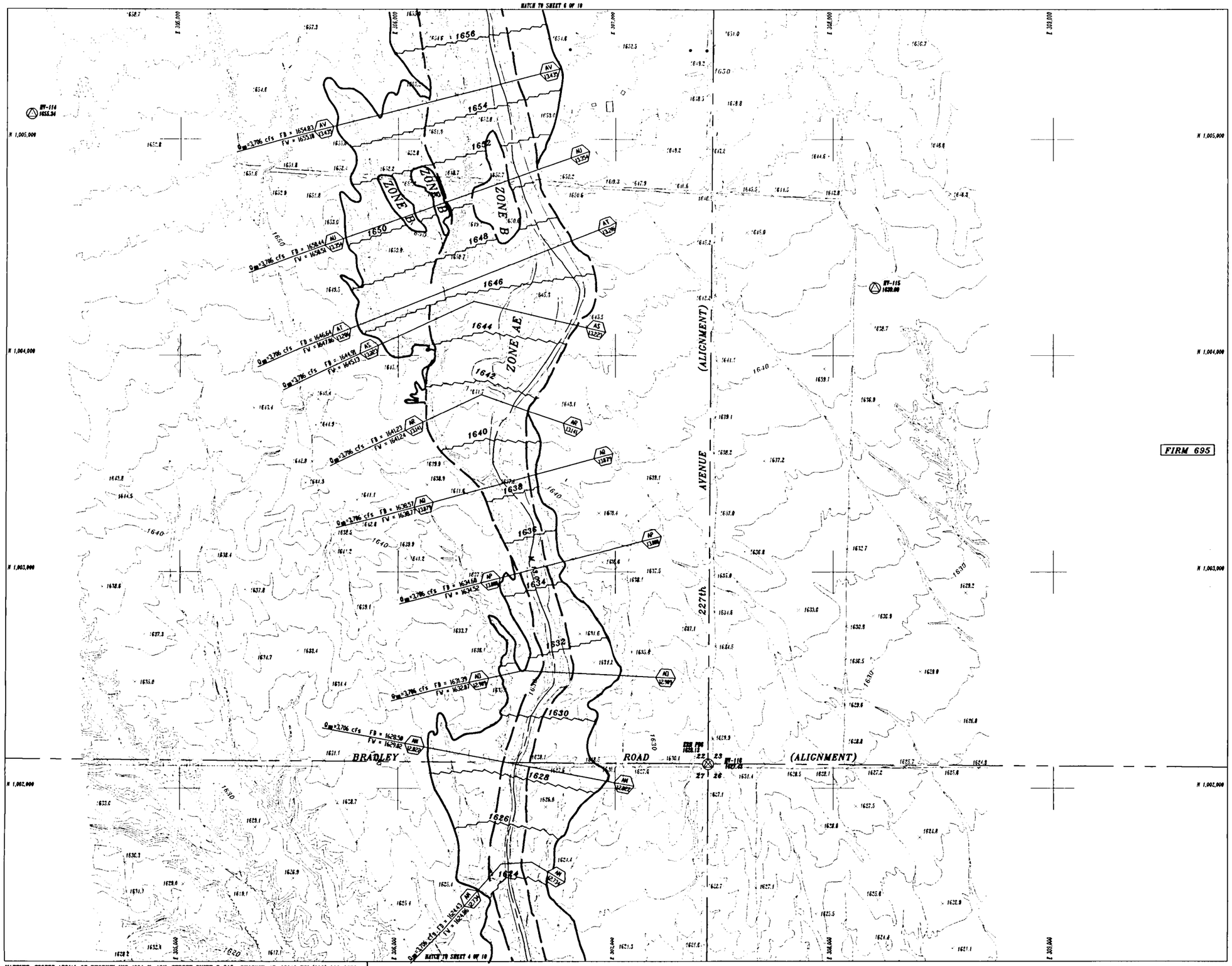
200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Vomero	Date:	Submitted By: Date:	SHEET: 4
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By: Date:	
PLANS:	By: Richard Murillo	Date:	Approved By: Date:	OF: 10
PLANS CHECK:	By: Ramesh Patel, PE	Date:	[illegible]	



MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE. SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
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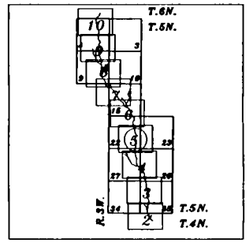
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD6	1628.13	GLO B.C. SE COR SEC 22 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



N

200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Vomero	Date:	Submitted By: Date:	SHEET: 5
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By: Date:	
PLANS:	By: Richard Murillo	Date:	Approved By: Date:	OF: 10
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER:	

MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 208-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
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- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
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ELEVATION REFERENCE MARKS

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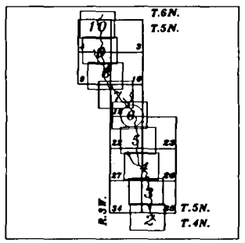
I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD6	1672.13	GLO B.C. N1/4 SEC 22 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



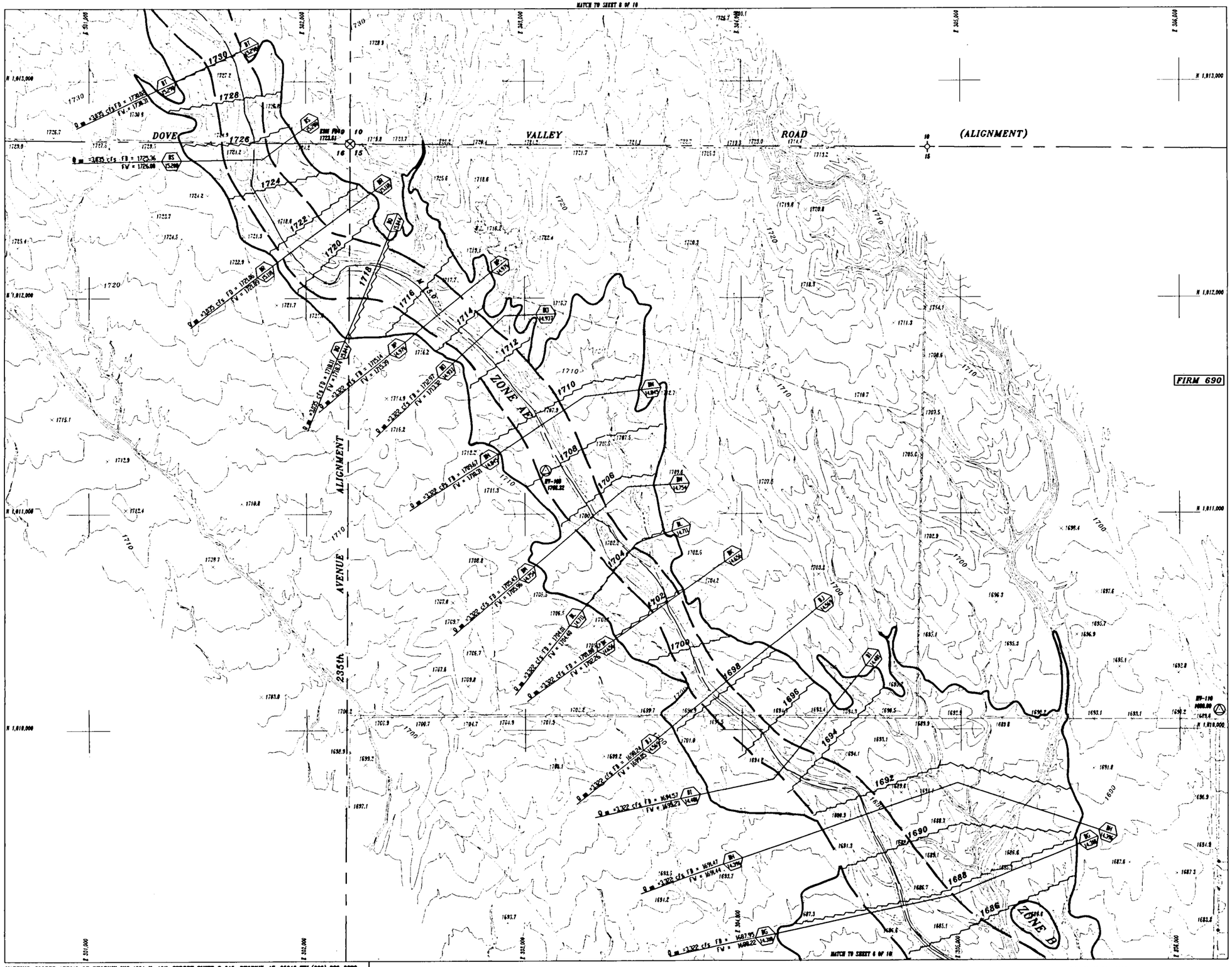
N

200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Tomero	Date:	Submitted By:	Date:	SHEET:	
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:	6	
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:	OF:	
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER		10	


MATCH TO SHEET 6 OF 10
DOVE VALLEY ROAD (ALIGNMENT)
235th AVENUE ALIGNMENT
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ZONE B
FIRM 690
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Q = 3835 cfs FB = 1726.36 FV = 1726.00
Q = 3322 cfs FB = 1709.47 FV = 1708.43
Q = 3322 cfs FB = 1694.47 FV = 1694.44
Q = 3322 cfs FB = 1687.95 FV = 1688.22
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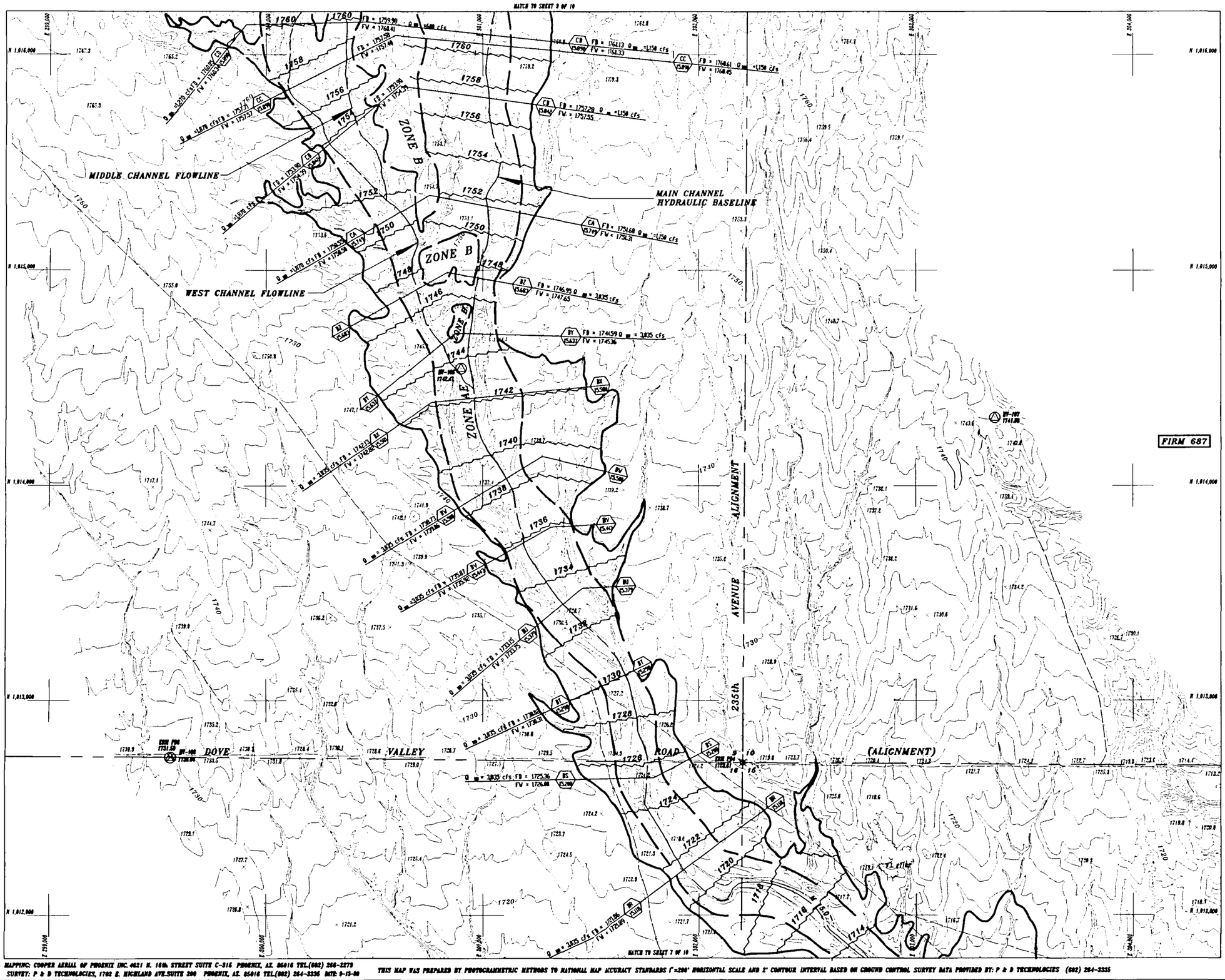


MAPPING: COOPER AERIAL OF PHOENIX INC. 4021 N. 16th STREET SUITE C-516 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE.SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-00

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS (1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section — Q = 3,000 cfs — 1.00 — FB = 100yr. WSE — FV = Floodway WSE — 1.00
- Elevation Reference Marks — ERM PD7
- Horizontal And Vertical Control Points — BV-1
- Zone Gutters (Boundary)
- Base Flood Elevations — 580
- Zone Designations — ZONE AE
- Dirt Roads
- Paved Road
- Section Corner
- Section Line
- Fence Lines

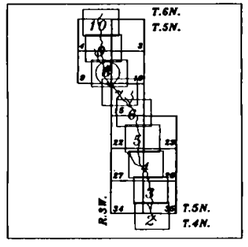
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD6	1731.50	CLB B.C. W1/4 SEC 16 T5N R3W
ERM PD4	1722.61	CLB B.C. NE COR SEC 16 T5N R3W

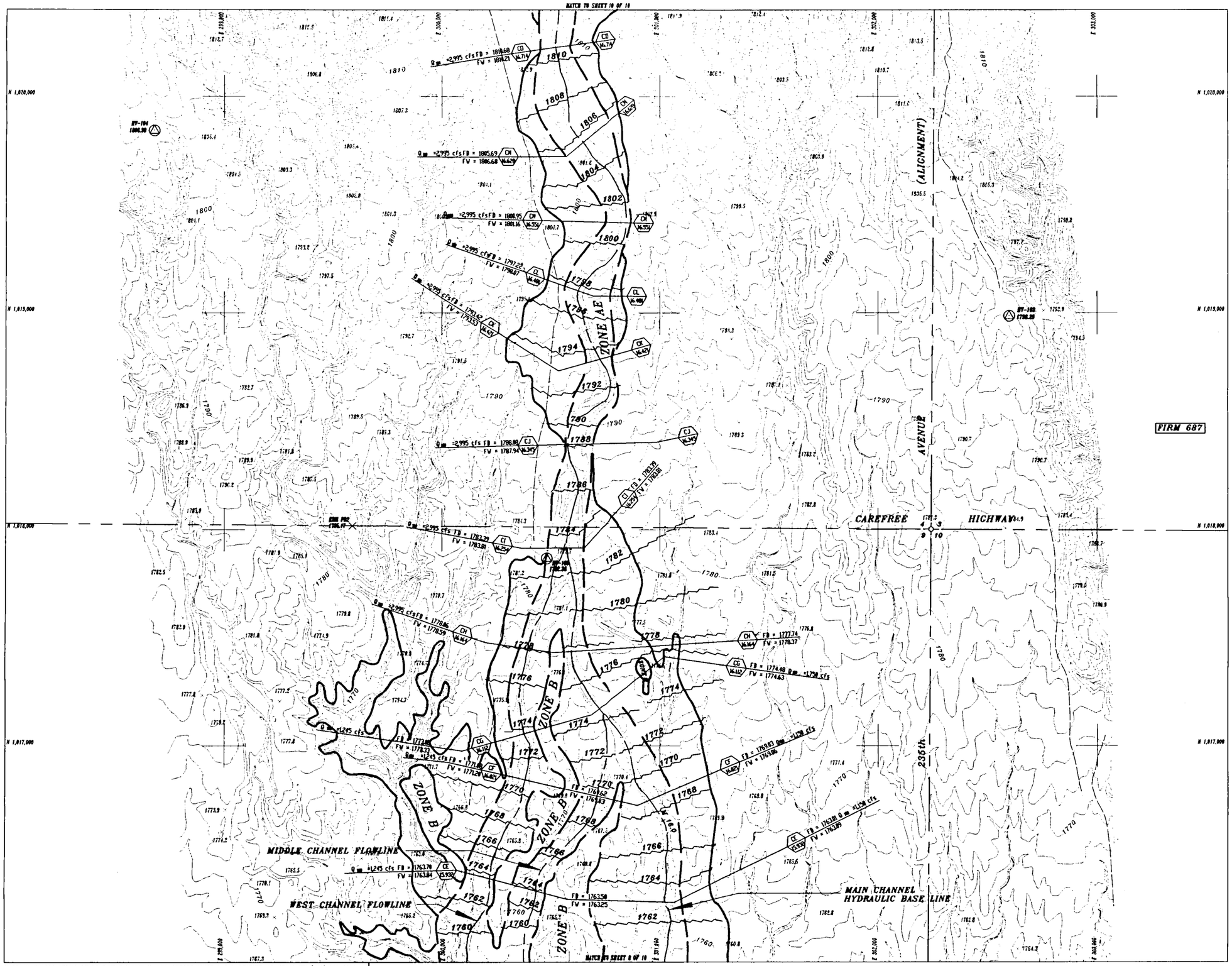
NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Venero	Date:	Submitted By:	Date:	SHEET:	
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:	8	
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:	OF:	
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER		10	



MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE. SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3335 DATE: 9-13-90

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS 1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3335

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section Q_{100} = 3,000 cfs — 1.00 FB = 100yr. WSE — 1.00 FV = Floodway WSE
- Elevation Reference Marks — ERM PD7
- Horizontal And Vertical Control Points — HV-1
- Zone Gutters (Boundary)
- Base Flood Elevations — 580
- Zone Designations — ZONE AE
- Dirt Roads
- Paved Road
- Section Corner
- Section Line
- Fence Lines

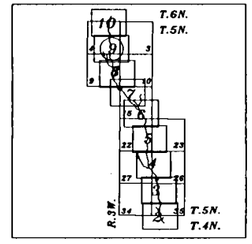
ELEVATION REFERENCE MARKS

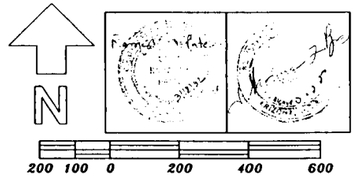
NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD2	1785.17	GLO B.C. S1/4 SEC 4 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP





2 FOOT CONTOUR INTERVAL

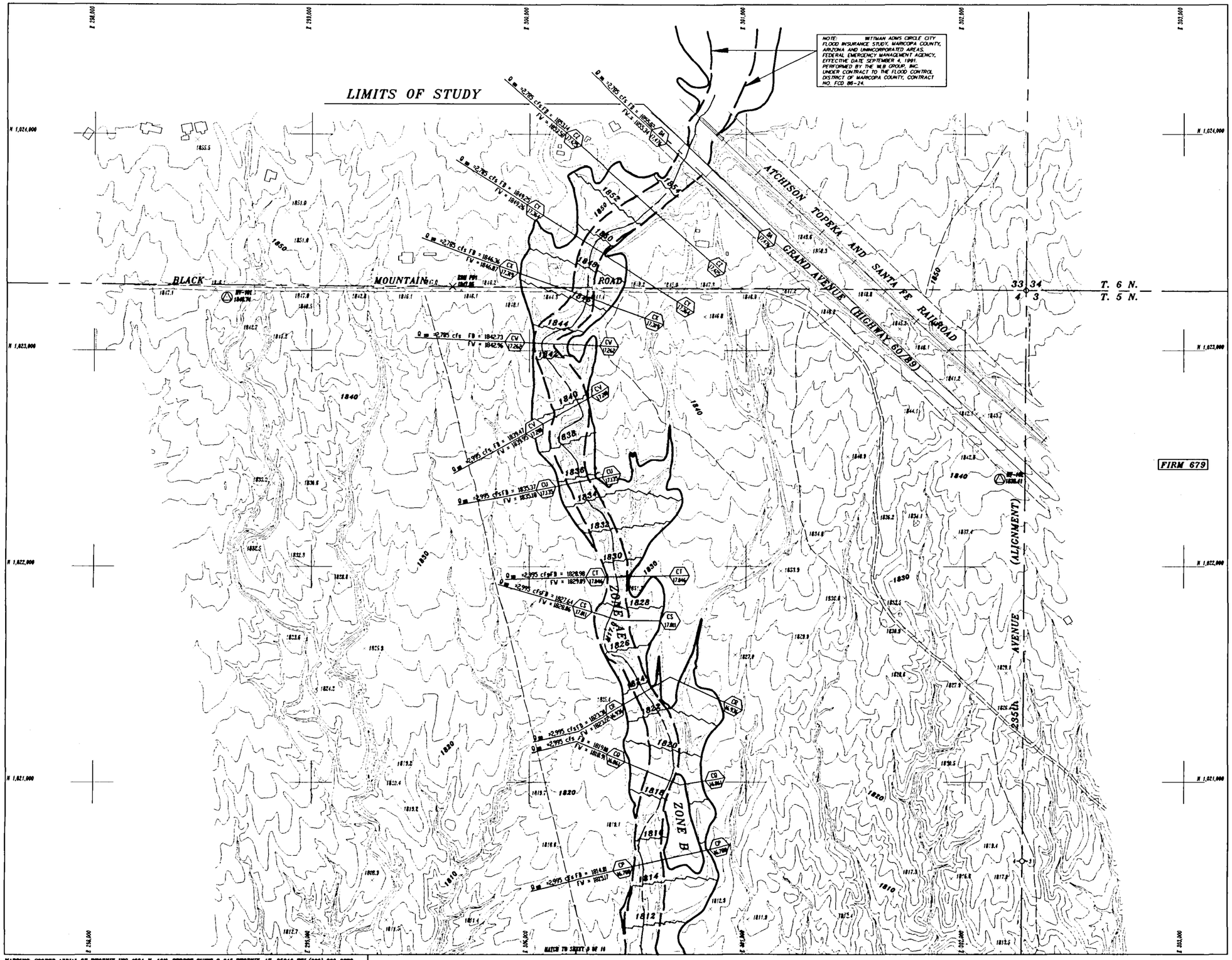
P&D Technologies
An Employee Owned Company
1702 E. Highland #200, Phoenix, Arizona 85016
Telephone (602) 264-3335

DESIGN:	By: L.M. Yamero	Date:	Submitted By:	Date:
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER	

SHEET: 9 OF: 10

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

TRILBY WASH FLOODPLAIN DELINEATION STUDY



MAPPING: COOPER AERIAL OF PHOENIX INC. 4621 N. 16th STREET SUITE C-315 PHOENIX, AZ. 85016 TEL.(602) 266-2279
SURVEY: P & D TECHNOLOGIES, 1702 E. HIGHLAND AVE. SUITE 200 PHOENIX, AZ. 85016 TEL.(602) 264-3336 DATE: 9-13-00

THIS MAP WAS PREPARED BY PHOTOGRAMMETRIC METHODS TO NATIONAL MAP ACCURACY STANDARDS (1"=200' HORIZONTAL SCALE AND 2' CONTOUR INTERVAL BASED ON GROUND CONTROL SURVEY DATA PROVIDED BY: P & D TECHNOLOGIES (602) 264-3336

LEGEND

- Excluded Areas
- 100-Yr Floodplain Boundary
- Floodway Boundary
- Hydraulic Base Line With River Mile — M 75.0 — M 76.0
- Cross Section Q_{100} = 3,000 cfs — FB = 100yr. WSE (1.00) — FW = Floodway WSE (1.00)
- Elevation Reference Marks — ERM PD7
- Horizontal And Vertical Control Points — BV-1
- Zone Cutters (Boundary)
- Base Flood Elevations — 580
- Zone Designations — ZONE AE
- Dirt Roads
- Paved Road
- Section Corner
- Section Line
- Fence Lines

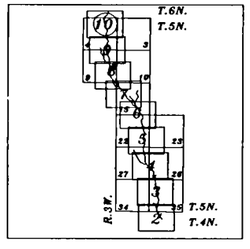
ELEVATION REFERENCE MARKS

NOTE: ALL ELEVATIONS ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929.

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION / LOCATION
ERM PD1	1047.86	GLO B.C. N 1/4 SEC 4 T5N R3W

NOTE: CROSS SECTION STATION 10,000.0 IS HYDRAULIC BASE LINE EXCEPT AS NOTED.

INDEX MAP



N

200 100 0 200 400 600

2 FOOT CONTOUR INTERVAL

P&D Technologies
An Employee Owned Company
1702 E. Highland §200, Phoenix, Arizona 85016
Telephone (602) 264-3336

DESIGN:	By: L.M. Venero	Date:	Submitted By:	Date:	SHEET:	
DESIGN CHECK:	By: Ramesh Patel, PE	Date:	Recommended By:	Date:	10	
PLANS:	By: Richard Murillo	Date:	Approved By:	Date:	OF:	
PLANS CHECK:	By: Ramesh Patel, PE	Date:	CHIEF ENGINEER AND GENERAL MANAGER		10	

EXHIBIT 3

ELEVATION REFERENCE MARKS

TRILBY WASH
ELEVATION REFERENCE MARKS

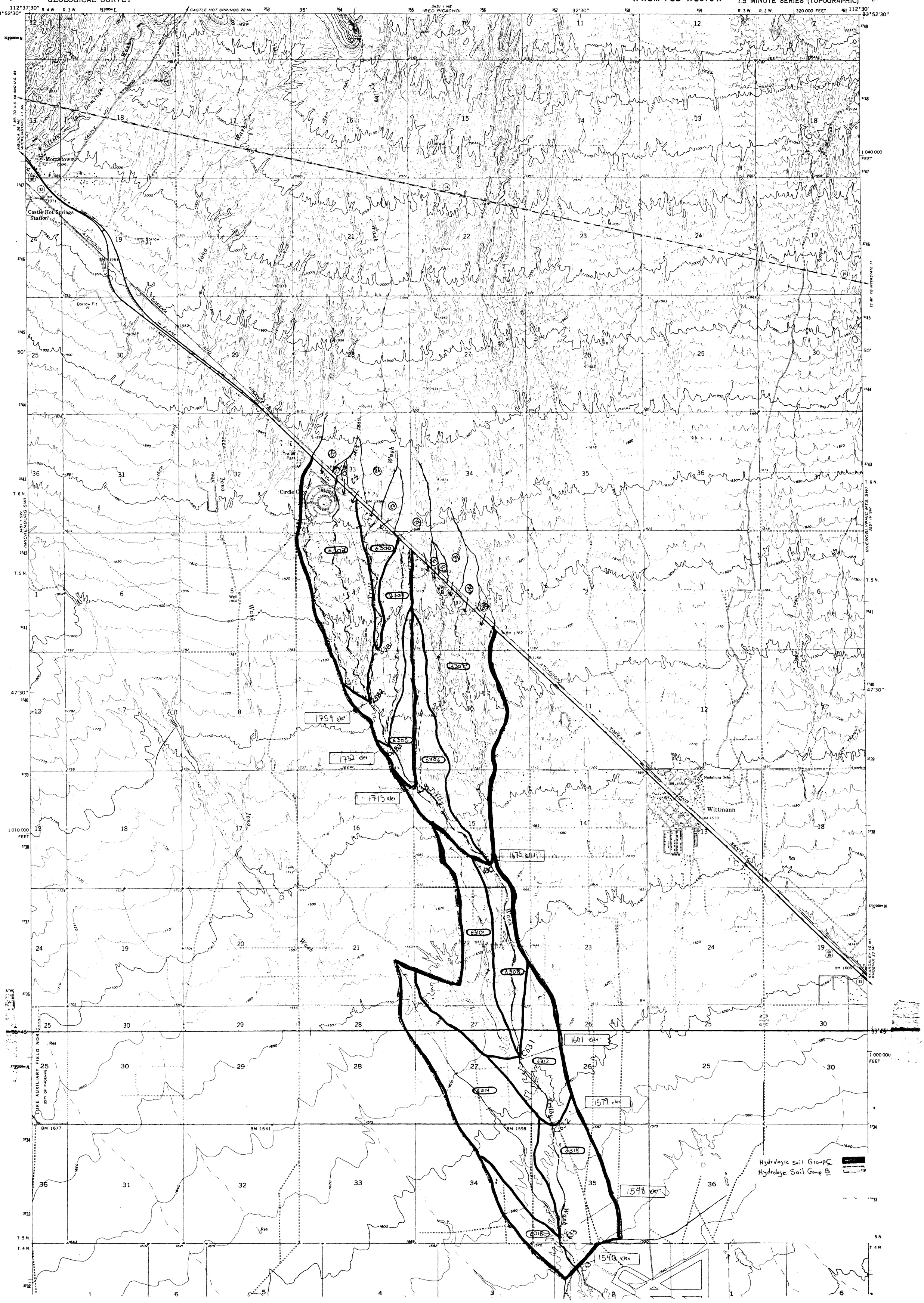
ERM#	NORTHING	EASTING	ELEVATION (FT. HGVD)	DESCRIPTION		
PD1	1023297.03	299643.65	1847.05	GLO	B.C	N1/4 SEC 4 T5N R3W
PD2	1018018.10	299588.05	1785.17	GLO	B.C.	S1/4 SEC 4 T5N R3W
PD3	1012737.52	299556.06	1731.59	GLO	B.C.	N1/4 SEC 16 T5N R3W
PD4	1012711.34	302202.58	1723.61	GLO	B.C.	NE COR SEC 16 T5NR3W
PD5	1007410.76	304815.23	1672.13	GLO	B.C.	N1/4 SEC 22 T5N R3W
PD6	1002114.06	307427.61	1628.13	GLO	B.C.	SE COR SEC 22 T5N R3W
PD7	999473.22	307410.54	1608.62	GLO	B.C.	W1/4 SEC 26 T5N R3W
PD8	996832.52	307395.01	1593.44	MCHD	B.C.	FLUSH NW COR SEC 35 T5N R3W
PD9	996810.27	306207.17	1598.08	USCGS	B.C.	IN CONC 1188 W OF PD8
PD10	994188.80	307377.19	1569.72	GLO	B.C.	W1/4 SEC 35 T5N R3W
PD11	991547.40	307357.96	1570.28	GLO	B.C.	SW COR SEC 35 T5N R3W
PD12	991530.54	309997.61	1559.65	GLO	B.C.	S1/4 SEC 35 T5N R3W

EXHIBIT 4

DRAINAGE MAP

EXHIBIT 4 - DRAINAGE MAP

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

(FROM FCD 1/29/91)

WITTMANN QUADRANGLE
ARIZONA-MARICOPA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)