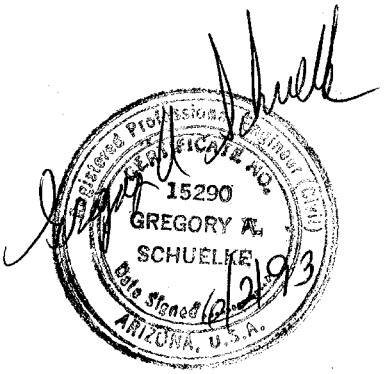
FLOOD INSURANCE STUDY
DAGGS WASH
UNINCORPORATED AREAS OF
MARICOPA COUNTY, ARIZONA

PREPARED FOR:

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

JUNE 2, 1993

FCDMC NO. 92-08
A-N WEST, INC. JOB NO. 7158-02



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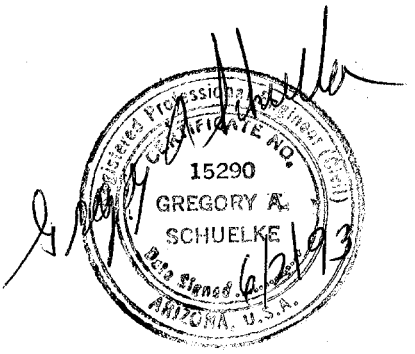

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1.0 INTRODUCTION:

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in 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 various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in their efforts to promote sound flood plain management.

1.2 Authority and Acknowledgements

The hydrologic and hydraulic analysis for this study were performed by A-N West, Inc. for the Flood Control District of Maricopa County, under contract No. FCD 92-08. This study was completed in June, 1993.

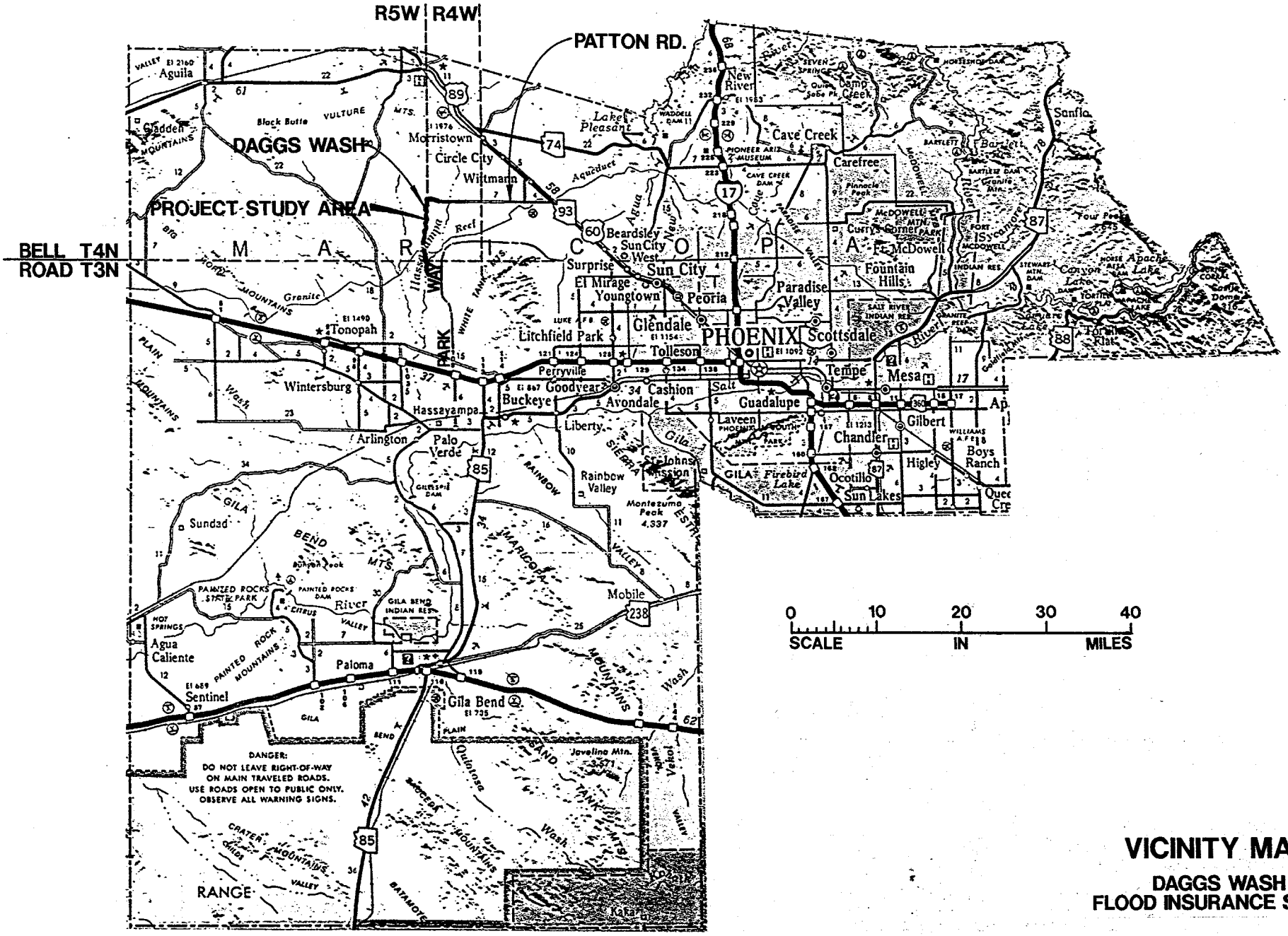
1.3 Coordination

The areas to be studied were provided by the Flood Control District of Maricopa County during contract negotiations in July, 1992.

A public notice was published in the Arizona Republic/Phoenix Gazette and Wickenburg Sun newspapers on October 14th and 21st, 1992 to notify all interested parties of the commencement of this study.

On October 29, 1992, a letter was sent to all property owners within the mapping limits of the study to notify of commencement of the study and to solicit any objections to property access for surveys.

The following agencies and companies were contacted to obtain information on the study; Flood Control District of Maricopa County, Taisei-Bechtel Joint Venture (Toyota Arizona Proving Grounds), Bureau of Reclamation, Sverdrup Engineering, Rick Engineering, Maricopa County Planning and Zoning Department, Arizona Department of Water Resources, Soil Conservation Service, Kewitt Western Contractors (Toyota Proving Grounds) and Maricopa County Department of Transportation.



VICINITY MAP

DAGGS WASH
FLOOD INSURANCE STUDY

FIGURE 1

2.0 AREA STUDIED

2.1 Scope of Study

The limits of detailed study in these areas of Maricopa County, Arizona were determined by the Flood Control District of Maricopa County and were forwarded to the study contractor during contract negotiations in July, 1992. The detailed study areas included Daggs Wash from its confluence with the Hassayampa River upstream to Peak View Road (the entrance to Toyota Arizona Proving Grounds) a distance of approximately 11 miles.

The general study area is shown on the Vicinity Map (Figure 1).

2.2 Community Description

The study area is currently in the Unincorporated Areas of Maricopa County. The study area is currently undeveloped desert. The ground cover consists primarily of creosote bush as well as a variety of cacti and scattered paloverde and mesquite trees with a cover density of approximately 35 percent.

The study area is located west and northwest of the White Tank Mountains, and west of the Hassayampa River. Daggs Wash crosses the Granite Reef Aquaduct (Central Arizona Project Canal) approximately three miles upstream of the confluence with the Hassayampa River.

The study area lies at an elevation between 1300 and 1650 feet.

The climate of the study area is typically desert in character with short, mild winters and long, hot summers. Wide diurnal temperature variations are also characteristic. Temperatures generally range between 35 degrees Fahrenheit (^{o}F) and 105^{o} F, with an annual average of 71^{o} F. The prevailing winds are from the east and are usually light, although severe windstorms occur occasionally during the summary thunderstorm season. The annual precipitation for the study area averages approximately 7.4 inches.

There are two separate rainfall seasons. The first occurs during the winter months from November to March, when the area is subject to storms from the Pacific Ocean. While this is classified as a rainfall season, there can be periods of a month or more, in this or any other season, when practically no precipitation falls. No significant snowfall occurs over the study area.

The second rainfall season occurs during July and August when Arizona is subject to widespread thunderstorm activity. These thunderstorms are extremely variable in intensity and location. The spring and fall months are generally dry, although precipitation in substantial amounts has fallen on occasion during every month of the year.

2.3 Principal Flood Problems

The current Daggs Wash floodplain is essentially undeveloped, with approximately, 3 permanent inhabited residential structures within the floodplain near the north study limits. The only paved road crossing of Daggs Wash is Peak View Road at the north study limits.

No significant flood problems have been noted in Daggs Wash due to this lack of development to date.

2.4 Flood Protection Measures

The Granite Reef Aqueduct (Central Arizona Project Canal) crossing of Daggs Wash provides attenuation of the peak discharges in Daggs Wash as storage routing is created at this overchute crossing of the canal. The 100-year 24-hour storm event peak discharge inflow of 4957 cfs is reduced to 3277 cfs after storage routing at this overchute. The CAP Canal was built by and is owned, operated and maintained by the U.S. Bureau of Reclamation.

The Daggs Wash overchute crossing includes levees upstream of the CAP Canal to train flows through the concrete overchute crossing. The levees, exposed to potentially scouring velocities, which involve both sides where the levees transition upstream from the concrete flume with radius of 135 feet and central angle of 90° are armored with rock rip-rap. The rock rip-rap is 24-inches thick with a 12-inch thick sand and gravel filter blanket which extends to the top of levee elevation of 1383.0.

The freeboard for the peak 100-year 24-hour storm event discharge at these levees was computed to be 0.9 feet, which is less than the FEMA requirement of 3.0 feet.

The Jackrabbit Wash Study (Reference 1) included a special problem and recommended solution report for the above levee problem as part of the technical data prepared for the report.

The routed outflow hydrograph was evaluated to determine the duration that ponding exceeded elevation 1380.0 (the elevation at which 3.0 feet freeboard is available). The duration of ponding above 1380.0 for the 100-year 24-hour storm event was 3 hours.

The Jackrabbit Wash FIS study made the following conclusions after examining the available data:

1. The peak stage of 1382.1 will be used for delineating the 100-year ponding limits against the CAP canal at this crossing. In the event the dikes fail, this will still be the most conservative assumption, for upstream ponding.

2. The peak outflow of 3277 cfs will be used for floodplain administration downstream of the CAP canal. The reasons for this conclusion are:

   a. In the event that the dikes fail, the peak stage will not be reached, so the peak flow through the box flume will not exceed 3277 cfs.

   b. Flow which may breach the dikes will be trapped and conveyed by the CAP Canal.

   c. Flow which may top the concrete box flume walls will spill into the CAP Canal and will not contribute to the peak discharge downstream in Daggs Wash.

   d. The areas of high velocity are protected by the rock rip-rap lined transition dikes. There will not be scourable flow velocities against the unarmored sections of dikes. The danger of failure of the dikes is due to the potential for wave action and piping. Failure due to wave action is slight because the exposure of the levee to wave action is less than 3 hours. The possibility of failure due to piping is also slight since the dikes were constructed under USBR specifications and inspection. Cutoff trenches were also constructed under the dikes where areas of clean sand and gravels were encountered.

The ponding elevation and flooding limits established by the Jackrabbit Wash FIS (Reference 1) which was based on the above conclusions was accepted by

FEMA as part of that study. This FIS study concurred with the ponding limits from the Jackrabbit Wash FIS and the above conclusions and performed the hydraulic analysis downstream of the CAP overchute using the discharge referred to above.

This flood insurance study is intended to be utilized in the planning and regulation of future development within the study area to provide for adequate drainage and flood proofing of development.

3.0 ENGINEERING METHODS

3.1 Hydrologic Analysis

The hydrology for Daggs Wash was performed as part of a previous study of Jackrabbit Wash which included delineating ponding along the Central Arizona Canal at Daggs Wash (Reference 1). The peak discharges were computed for the 100-year 24-hour storm event. Attenuation of peak discharges due to storage routing upstream of the CAP canal overchute crossing of Daggs Wash was also computed.

A summary of drainage area - peak discharge relationships for Daggs Wash at several locations along the study reach from Reference 1 is shown in Table 1.

At some locations, it is noted that peak discharges decrease proceeding downstream. This is attributed to attenuation of peak discharges by channel routing, which exceeds additional runoff to the water shed by intermediate drainage subareas.

TABLE 1
Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	100-Year 24-Hour Storm Peak Discharge (Cubic Feet per Second)
Daggs Wash		
At Hassayampa River	28.1	3041
Below CAP Canal	26.1	3277
Above CAP Canal	26.1	4957
At Middle Section 11,T4N,R5W	18.6	2943
At Peak View Road (Entrance to Toyota Proving Grounds)	13.3	3297

3.2 Hydraulic Analysis

Cross-sections were digitized from topographic mapping (Reference 2) that was compiled photogrammetrically from aerial photos. Drainage culvert and overchute elevation data and structure geometry were obtained from as-built plans of the Peak View Road (Reference 3) and Central Arizona Canal (Reference 4). The Peak View Road is the only road crossing with culverts across Daggs Wash. Field survey was conducted to verify as-built plan dimensions of structures and that the culverts and overchute structure elevations were on the same elevation datumn as the mapping (NGVD,1929).

Water-surface elevations for floods for the 100-year recurrence interval were computed using the COE HEC-2 step-backwater computer program (Reference 5). Starting water surface elevations were determined using the slope-area method.

Locations of selected cross-sections used in the hydraulic analysis are shown on the Flood Profiles (Exhibit 1) and Flood Insurance Rate Maps (Exhibit 3). For stream segments for which a floodway was computed (Sections 4.2) selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 3).

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen using procedures from Reference 6 and based on field observations of the stream and floodplain areas. A summary of the Manning's "n" values used in the floodplain modelling of the study washes follows:

Roughness Coefficients		
Stream	Wtd. Channel	Wtd. Overbank
Daggs Wash	.028 - 0.068 (Note 1)	0.035 - 0.09

Note 1. The horizontal 'n' value variation option of HEC-2 was used to model the wide variation in 'n' values at defined channels. The heavy vegetation on the channel banks (n = 0.09) and the sand and gravel bed (n = 0.028) were modelled separately by this option. The weighed channel 'n' value range, resulting from this modelling approach is presented. In some locations,

where defined channels with heavy bank vegetation and sand/gravel beds were noted, this option was also applied on overbanks.

A Manning's 'n' of 0.013 was used for the concrete spillway overchute at the CAP Canal and for the concrete box culverts at Peakview Road.

The hydraulic analyses for this study were based on unobstructed flow. Flow profiles were not compared to historical events. No information exists on flood elevations and historical discharges for the study streams with which to make this comparison.

All elevations are referenced to the National Geodetic Vertical Datumn of 1929 (NGVD). Elevation reference marks and descriptions used in this study are shown on the maps (Exhibit 3) and summarized in this report (Exhibit 2).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

4.1 Floodplain Boundaries

For the streams studied in detail 100-year flood boundaries were delineated using the topographic maps at a scale of 1:4,800 and with contour interval of 2 feet (Reference 2).

The 100-year floodplain boundaries are shown on the Flood Insurance Rate Map, (Exhibit 3). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones AE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topograhic data.

4.2 Floodways

Encroachment of floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and 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. For purposes of the NFIP, 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 a floodway and a 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 floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each of the floodplain. Floodway widths were computed at cross sections Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross-sections (Table 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The floodway upstream of the CAP Canal overchute was based on computed water surface elevation and coincides with the floodplain delineation. Since the detention provided by this overchute structure requires preservation to maintain the attenuation of peak discharges no filling in of the flood pool should be allowed and, therefore, no encroachment by the floodway was shown.

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

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding with a constant water-surface elevation (usually areas of ponding) where average depths are between 1 and 3 feet. The BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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 100-year floodplain, and areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding, where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

5.0 OTHER STUDIES

The Jackrabbit Wash Floodplain Delineation Study (Reference 1) was performed for the Flood Control District of Maricopa County in February, 1991. This study included a hydrologic analysis of the Daggs Wash Watershed and detailed floodplain ponding analysis of the 100-year 24-hour storm event upstream of the CAP Canal. The water surface ponding elevation determined upstream of the overchute by the Jackrabbit Wash Study (Reference 1) was 1382.1 and this Daggs Wash Flood Insurance Study also computed a water surface elevation of 1382.1 at the same location upstream of the overchute.

6.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Presidio of San Francisco, Building 105, San Francisco, California 94129.

7.0 BIBLIOGRAPHY AND REFERENCES

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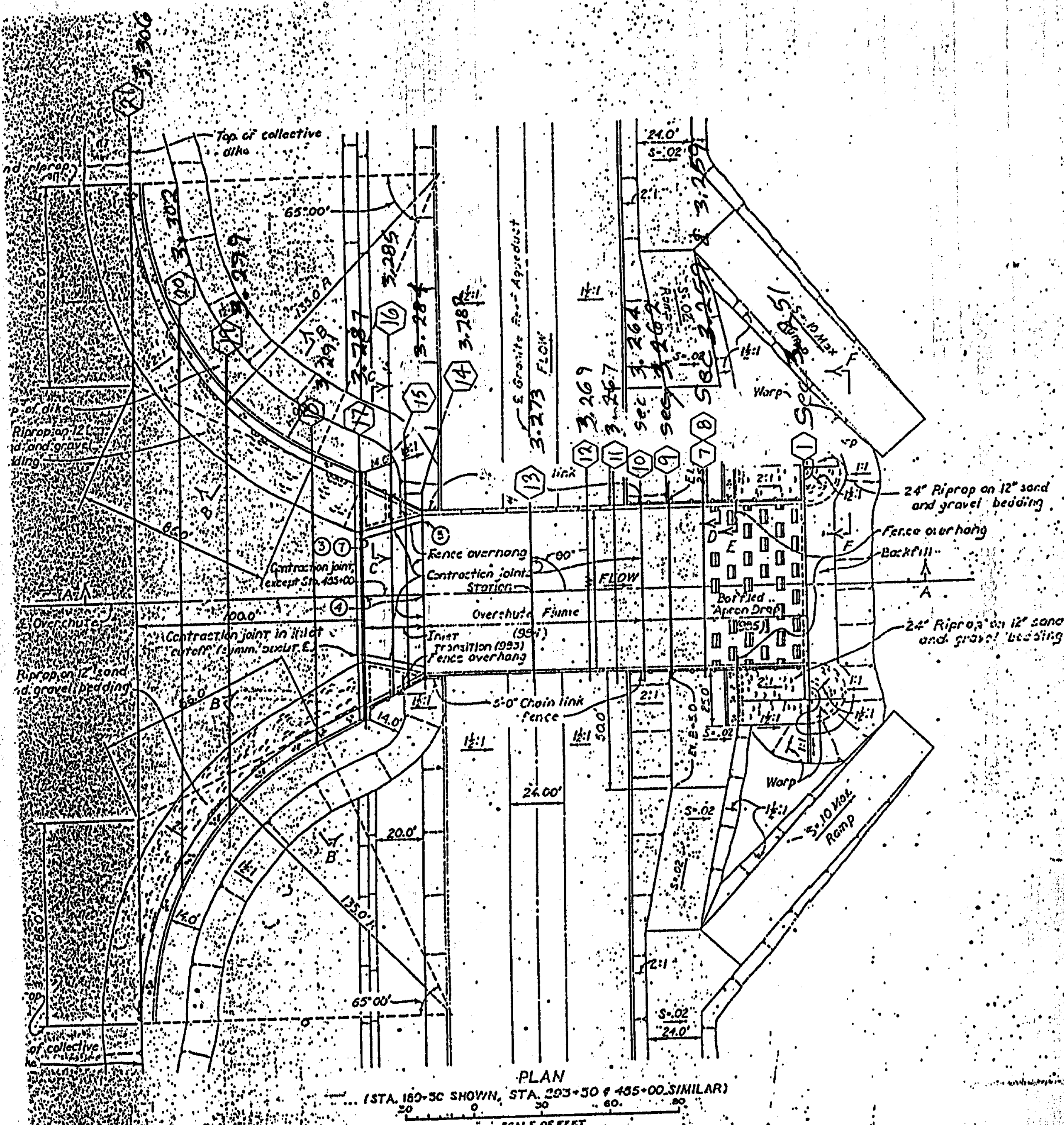
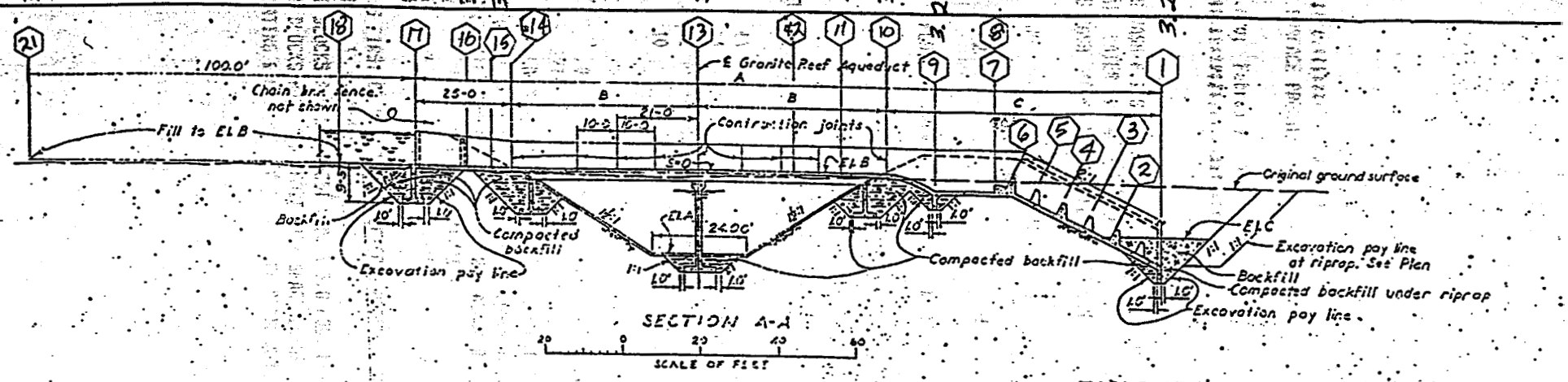
DAGGS WASH OVERCHUTE R.M.3.1
C.A.P. STA.485+00
HEC-2 MODEL CROSS-SECTION LOCATION EXHIBIT



PLAN
(STA. 180+50 SHOWN, STA. 293+50 & 485+00 SIMILAR)

SCALE OF FEET



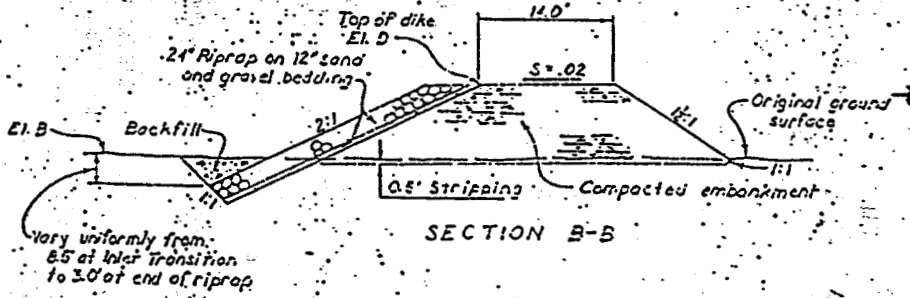


TABLE OF DIMENSIONS AND ELEVATIONS

STATION	W	El. A	El. B	El. C	El. D	A	B
180+50	67-6	1355.33	1377.16	1362.0	1385.7	191-1 3/8	47-7 3/4
293+50	67-6	1354.42	1376.67	1357.0	1385.7	199-2 1/4	45-3
485-00	47-4	1351.46	1373.31	1358.0	1353.0	191-1 3/8	47-7 3/4

NOTES

For general notes, see 344-D-978
For chain link fencing details, see 40-D-6265; EXCEPT barbed wire supporting arms shall be oriented vertically.
① Indicates type of waterstop intersection. For details, see 344-D-992

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL ARIZONA PROJECT
GRANITE REEF DIVISION-ARIZONA

GRANITE REEF AQUEDUCT
REACH 7
STATIONS 180+50, 293+50 AND 485+00
OVERCHUTES

DESIGNED O.J. Vidal — SUBMITTED O.J. Vidal
DRAWN T.C.S. — DMT — RECOMMENDED
CHECKED P.C. Hagman — APPROVED
CHIEF, WATER CONVEYANCE BRANCH

DENVER, COLORADO — JULY 27, 1977 — 344-D-982

O, LTR'S. 4-15-81 AND 11-23-81.

DAGGS WASH OVERCHUTE R.M.3.1
C.A.P. STA.485+00

HEC-2 MODEL CROSS-SECTION LOCATION EXHIBIT

B-23