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A FEASIBILITY STUDY REPORT FOR THE NEW RIVER CHANNEL CLEARING BETWEEN GLENDALE AND NORTHERN AVENUES

FOR

HOWARD PROPERTIES

Registered Professional Engineer (Civil)
CERTIFICATE NO.
10283
SAMUEL E.
KAO
Date Signed 1/15/87
ARIZONA, U.S.A.

ACK ENGINEERS, INC.

JANUARY 1987

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Existing & Modified Floodplain & Floodway Limits for the New River Between Glendale and Northern Avenue

AGK ENGINEERS, INC.

A FEASIBILITY STUDY REPORT FOR THE NEW RIVER CHANNEL CLEARING BETWEEN GLENDALE AND NORTHERN AVENUES

SUMMARY

The presently delineated floodway limits on the New River between Glendale and Northern Avenues can be reduced by means of channel clearing and minor excavation at an approximate cost of $327,917.

The resulting reduced floodway limits as well as the floodplain would be contained within the river banks. The reclaimed area of the Howard property between the existing and new floodway boundary is estimated to be 26 acres. There would be approximately 4 acres of land still remaining within the new floodway.

The total fronting length of the properties that would benefit from the channel clearing improvement is approximately 8,200 feet, of which approximately 1,250 feet is through the Howard property.

The time required for engineering design and construction are estimated to be five and six months, respectively.

INTRODUCTION

Purpose of Study

On October 16, 1986, AGK Engineers was retained by Howard Properties to determine the possibility for reducing the limits of the presently delineated floodway on the reach of the New River between Glendale and Northern Avenues.

The parcel of land owned by Howard Properties is located along the east bank of the New River, approximately midway from Glendale and Northern Avenues. The property comprises 48.4 acres, of which approximately 30 acres are situated within the current floodway limits of the New River. The current floodplain and floodway limits were delineated by the U.S. Army Corps of Engineers (COE) in 1986.

Design Parameters

A meeting was held on October 29, 1986 at the Flood Control District of Maricopa County (District) during which AGK Engineers presented scope of work. The design parameters agreed to by the District and AGK Engineers as a result of the meeting are summarized as follows:

1. As required by Federal Emergency Management Agency (FEMA) guidelines for flood insurability, the 100-year return frequency flood event should be used as the flow volume input for water surface computations. The 100-year flood was determined by the District to be 39,000 cfs for this river reach. ?

Taken out of

39,000 → .6 mile South of Northern
40,000 → Northern

explain

2. All cross sections which describe any modifications on the channel as a result of channel clearing should be collected with the existing channel cross sections developed by the most recent floodplain and floodway delineations.

3. Freeboard will not be required since this is neither a drainage channelization project nor involved in levee construction. ?

4. The open area requirement as imposed by the COE to FCDMC will not be transferred to the Howard property. ?

See JFR & other memorandum

5. The impact of bridge improvement at Glendale Avenue as planned by the District will not be considered in this study because the physical improvement will not materialize within a year. ?

what bridge?

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BASE DATA INFORMATION

Base Map

The base map used in this study was obtained from the District. It was prepared by the COE in the delineation of the floodplain and floodway along this river reach. The scale of the map is 1"=200' with a contour interval of 2 feet. The thalweg, locations of cross sections used in the delineation, and the floodplain and floodway limits have been shown on the map by the Corps of Engineers.

Digitized Cross Sections

A copy of the digitized cross sections developed by the COE was transmitted to AGK Engineers on November 7, 1986.

Water Surface Elevations

A copy of the HEC-2 computer output showing the water surface elevations resulting from the COE's floodplain and floodway delineation was transmitted on November 21, 1986 to AGK Engineers for use as a reference in this study.

HYDRAULIC ANALYSIS

Flow Rate

As agreed in the meeting with the District on October 29, 1986, the delineation of floodplain and floodway for the modified cross sections due to channel clearing would be performed on the basis of the flow with a 100-year return frequency. It was further agreed in the meeting that the 100-year flood in this river reach is 39,000 cfs. However, as shown on COE's HEC-2 computer input, the 100-year flood upstream of Sta. 149+60 (near the south end of Mr. Howard's Property) is equal to 40,000 cfs. In order to be consistent with the COE, a flow of 39,000 cfs was used for the river reach downstream of Sta. 149+60 and 40,000 cfs for river reach upstream of this station.

good

Proposed Modification on Grade and Cross Sections

Figure 1 shows an approximate profile along the bottom of the existing main river channel. The elevation data are taken from the aforementioned cross sections developed by the COE. The profile evidences a flat reach of the existing river bottom between Sta. 140+00 and Sta. 174+00. This flat reach causes the flood flow to slow down and thus spread or widen to the extent of the present floodplain and floodway

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boundaries. That condition is clearly illustrated on the attached map (Plate A).

In an effort to improve the hydraulic conveyance and subsequently lower the water surface elevations in the river reach, a slope of 0.00177 ft/ft was proposed for the New River between Sta. 140+00 and Sta. 170+00, as illustrated in Figure 1. This slope is compatible with the existing general grade of the river reach between Glendale and Northern Avenues.

In addition to lowering the river bottom by excavation between Sta. 140+00 and Sta. 170+00, the existing river cross sections between Sta. 125+00 and Sta. 170+00 are proposed to be widened to provide more area for floodwater to flow through. As shown on Figure 2, the cross sections were widened in general accordance with the existing cross section at Sta. 120+00. The bottom widths of the widened sections range between 300 and 340 feet. The side slopes are generally 4 horizontal and 1 vertical. No levees nor raised dikes were required in the proposed channel clearing. Minor compacted fills would be required along the west bank at Sta. 140+00 and Sta. 149+60 to stabilize the existing bank, as shown in Figure 2.

Determination of Hydraulic Parameters

The Manning's roughness coefficients for the reach of the New River between Glendale and Northern Avenues were determined by visual observation during a field reconnaissance on November 12, 1986. A value of 0.035 was used as the roughness coefficient for the channel section and 0.045 for the left and right overbanks. These values coincide with what were used by the COE in their delineations.

The coefficient of contraction and expansion were respectively assumed to be 0.1 and 0.3 for ordinary channel sections. For sections near the Glendale Avenue bridge, the coefficients of contraction and expansion were assumed to be 0.3 and 0.5. Furthermore, near the dip crossing of Northern Avenue, the coefficients were respectively assumed to be 0.5 and 0.7. Again, these assumed values are identical to what were used in COE's study.

FLOODPLAIN AND FLOODWAY DELINEATION

Water surface profiles for the floodplain and floodway based on the modified cross sections were computed using the HEC-2 computer program. The computation for determining water surface elevations began at from Sta. 100+70, approximately 1,700 feet downstream of the Glendale Avenue

bridge, and proceeded upstream to Sta. 229+00; located approximately one mile upstream from Northern Avenue. The initial water surface elevation is based on the results of the COE's delineation.

Whenever possible, the same encroachment widths as developed by the COE for floodway delineation were used in this study. The boundaries of the 100-year floodplain and floodway were delineated by use of the computed water surface elevations at each cross section. Between cross sections, flood boundaries were interpolated with the aid of the contour lines. The delineated floodplain and floodway boundaries for the modified cross sections were shown on the accompanying Plate A.

The study indicates that the estimated reclaimed area of the Howard property between the existing and new floodway boundary is 26 acres. There would be approximately 4 acres of land still remaining within the new floodway.

The total fronting length of the properties that would benefit from this proposed channel clearing improvement is approximately 8,200 feet, of which approximately 1,250 feet is fronting the Howard property.

Comparison of Water Surface Elevations

The water surface elevations for floodplain and floodway before and after the proposed channel clearing are tabulated respectively in Tables 1 and 2, and also plotted in Figure 1.

As indicated, water surface elevations throughout the modified river reach are lowered by a range of two to four feet as a result of the channel clearing. As further indicated on Plate A and Figure 2, the new floodplain and floodway boundaries through the Howard property are confined within the modified channel sections instead of spreading over the east bank of the river.

Comparison of Flow Velocities

The velocities of the flow before and after the proposed channel clearing are also tabulated respectively in Tables 1 and 2. A velocity profile for floodway delineation before and after the clearing is plotted in Figure 1. As indicated, the fluctuations of flow velocities in the river reach are much reduced after the proposed clearing. This attenuation of velocity variation would improve the stability of the river banks and reduce the potential for aggredation/degradation in the river reach.

TABLE 1

WATER SURFACE ELEVATIONS AND VELOCITIES FOR FLOODPLAIN

BEFORE AND AFTER CHANNEL CLEARING

Section No.	Water Surface Elevation		Flow Velocity (fps)	
	Before	After	Before	After
100.700	1051.83	1051.83	10.24	10.25
107.000	1053.83	1053.83	5.74	5.74
110.700	1053.33	1053.30	14.21	14.27
117.200	1058.44	1058.46	11.56	11.54
118.000	1058.86	1058.88	11.69	11.67
120.000	1061.02	1061.03	6.91	6.90
125.000	1061.53	1061.58	6.62	6.11
131.400	1062.21	1061.84	11.95	8.77
135.000	1064.75	1062.41	9.98	11.07
140.000	1066.47	1064.58	7.06	8.02
143.000	1066.89	1065.16	8.07	8.10
146.000	1068.64	1065.36	11.01	10.99
149.600	1070.49	1066.94	8.55	9.34
158.000	1072.76	1068.84	7.59	8.73
167.000	1074.11	1070.51	10.99	8.94
170.000	1074.43	1070.90	12.79	10.31
174.100	1077.21	1077.16	11.89	12.02
178.000	1079.13	1079.17	7.36	7.32
178.500	1079.29	1079.34	7.15	7.07
181.600	1079.36	1079.41	11.29	11.19
185.200	1080.90	1080.88	9.88	10.09
190.000	1082.40	1082.50	8.31	8.18
193.600	1082.90	1082.96	11.32	11.23
198.400	1085.07	1085.08	9.30	9.30
202.400	1085.67	1085.68	12.01	12.00
206.000	1087.37	1087.38	11.72	11.72
210.500	1089.63	1089.63	7.14	7.14
216.000	1090.18	1090.18	6.49	6.49
218.000	1090.54	1090.54	5.32	5.32
220.800	1090.63	1090.63	5.88	5.88
223.000	1090.68	1090.68	6.69	6.69
229.000	1091.34	1091.34	6.44	6.44

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TABLE 2

WATER SURFACE ELEVATIONS AND VELOCITIES FOR FLOODWAY

BEFORE AND AFTER CHANNEL CLEARING

Section No.	Water Surface Elevation Before	Water Surface Elevation After	Flow Velocity (fps) Before	Flow Velocity (fps) After
100.700	1052.19	1052.19	9.79	9.79
107.000	1054.04	1054.04	5.64	5.64
110.700	1053.53	1053.53	13.76	13.76
117.200	1058.27	1058.27	11.78	11.78
118.000	1058.73	1058.73	11.86	11.86
120.000	1060.82	1060.82	7.39	7.39
125.000	1061.38	1061.46	7.19	6.58
131.400	1061.47	1061.89	13.57	8.73
135.000	1064.55	1062.40	11.94	11.22
140.000	1067.18	1064.65	7.69	8.09
143.000	1067.67	1065.26	8.26	8.01
146.000	1068.64	1065.44	12.53	10.89
149.600	1071.28	1066.98	7.85	9.30
158.000	1073.06	1068.86	8.29	8.71
167.000	1074.64	1070.52	10.59	8.93
170.000	1075.11	1070.91	11.51	10.30
174.100	1077.10	1077.08	12.47	12.51
178.000	1079.43	1079.44	7.21	7.21
178.500	1079.65	1079.66	6.75	6.73
181.600	1079.66	1079.67	10.82	10.80
185.200	1080.62	1080.61	11.44	11.76
190.000	1082.99	1083.14	7.89	7.74
193.600	1083.37	1083.47	10.77	10.66
198.400	1085.27	1085.31	9.12	9.08
202.400	1085.82	1085.85	11.80	11.76
206.000	1087.40	1087.41	11.69	11.69
210.500	1089.51	1089.52	7.83	7.83
216.000	1090.28	1090.29	6.74	6.74
218.000	1090.68	1090.69	5.51	5.50
220.800	1090.77	1090.77	6.11	6.11
223.000	1090.84	1090.85	6.80	6.80
229.000	1091.55	1091.56	6.40	6.40

ESTIMATION OF COSTS

The estimated project cost is the sum of the expected expenditures for construction, engineering, and contingency. The estimated dollar amount of each component is listed in Table 3.

The construction cost was estimated by applying a unit cost to required quantities of excavation and backfill resulting from channel clearing. Unit costs were derived from recent construc-tion bid prices on similar projects supplemented by discussions with construction contractors familiar with the site specific issues.

The engineering cost which is composed of surveying, design, soil boring and testing, and inspection was assumed to be four-teen (14) percent of the construction cost.

The contingency cost consists of legal, administration and other miscellaneous expenses as well as the allowance for cost overruns as a result of unforeseen circumstances or unit price fluctuations that may occur during the period of con-struction. In this study, the contingency cost was assumed to be ten (10) percent of the construction cost.

ESTIMATED CONSTRUCTION SCHEDULE

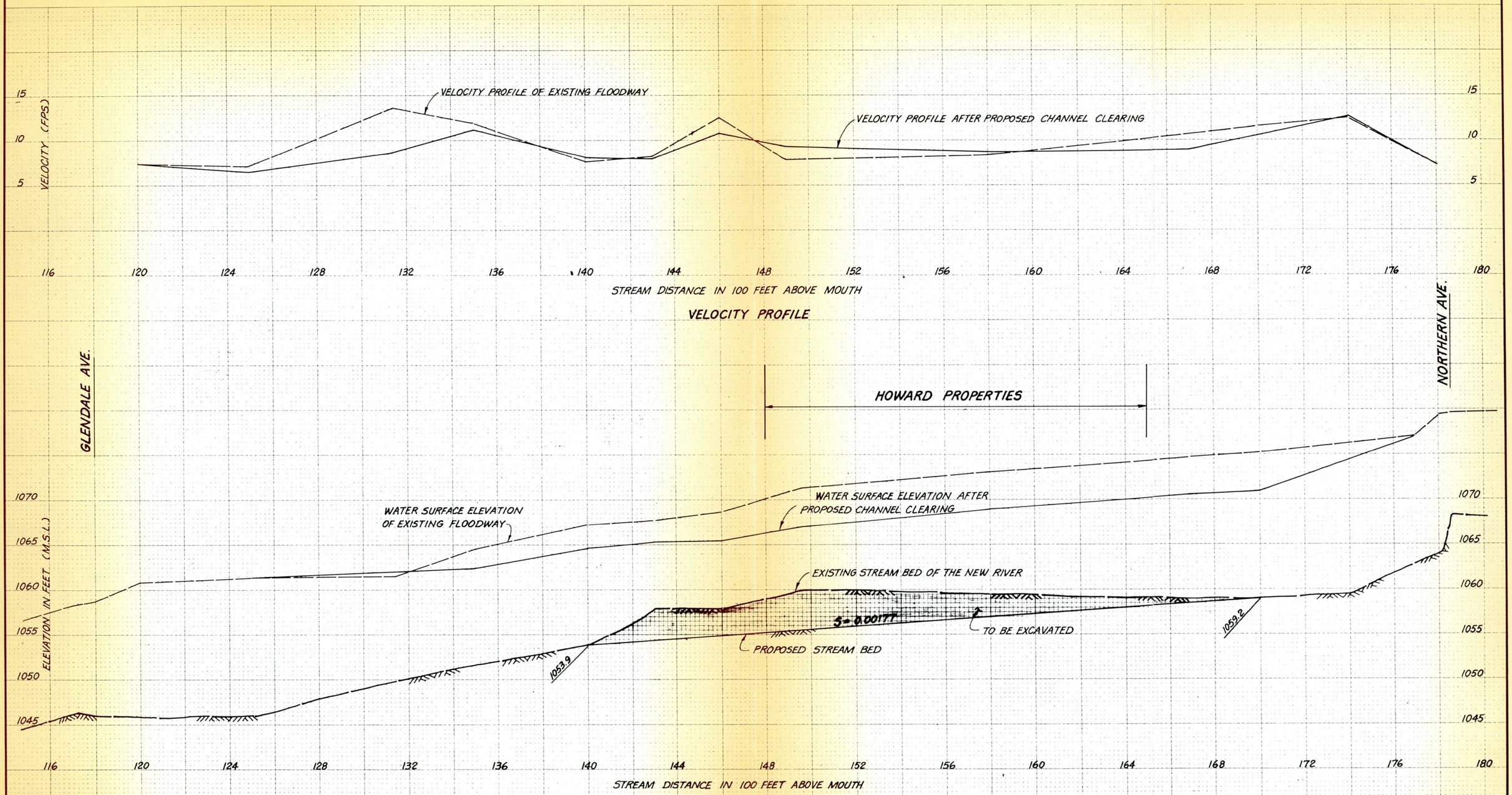
The length of time required for surveying, soil testing and preparation of engineering plans and specifications for the proposed channel clearing is estimated to be five months after the notice to proceed.

The construction period of this project is estimated to be six months after the engineering plans and specifications are reviewed and approved by all the regulating agencies.

TABLE 3

ESTIMATED PROJECT COST

Description	Estimated Quantity	Unit	Unit Cost	Amount
CONSTRUCTION COST				
Excavation	331,040	C.Y.	0.75	$248,280
Compacted Backfill	1,490	C.Y.	10.50	15,700
	Total Construction Cost		=	$263,980
ENGINEERING COST				
	$263,980 x 14%		=	$ 36,957
CONTINGENCY COST				
	$263,980 x 10%		=	$ 26,980
TOTAL PROJECT COST				$327,917



SCALE
HORIZ. 1" = 400'
VERT. 1" = 10'

FIGURE 1

WATER SURFACE AND VELOCITY PROFILE

TO ACCOMPANY REPORT BY AGK ENGINEERS, INC., JANUARY, 1987

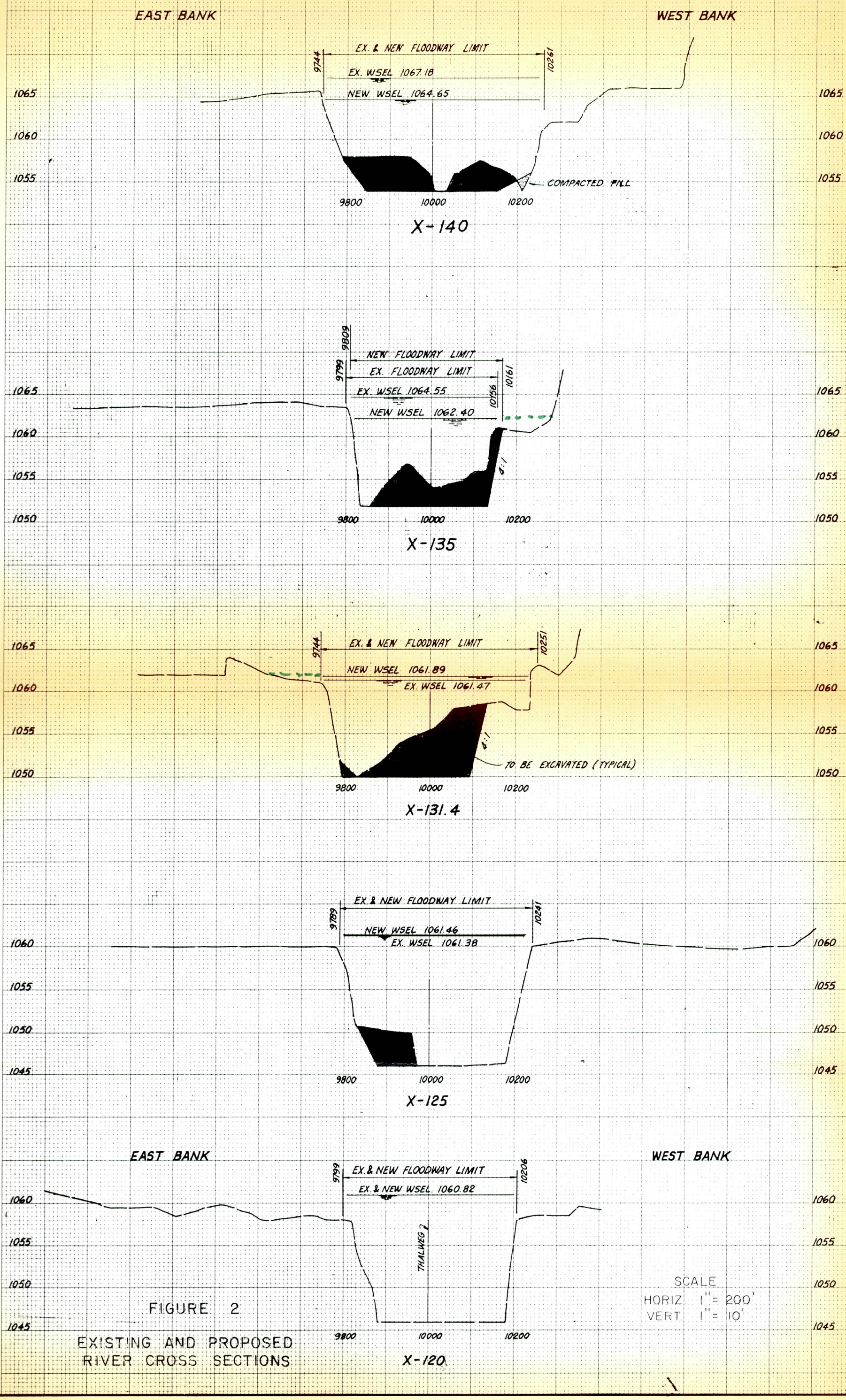


FIGURE 2

EXISTING AND PROPOSED RIVER CROSS SECTIONS

TO ACCOMPANY REPORT BY R&K ENGINEERS, INC. JANUARY, 1967

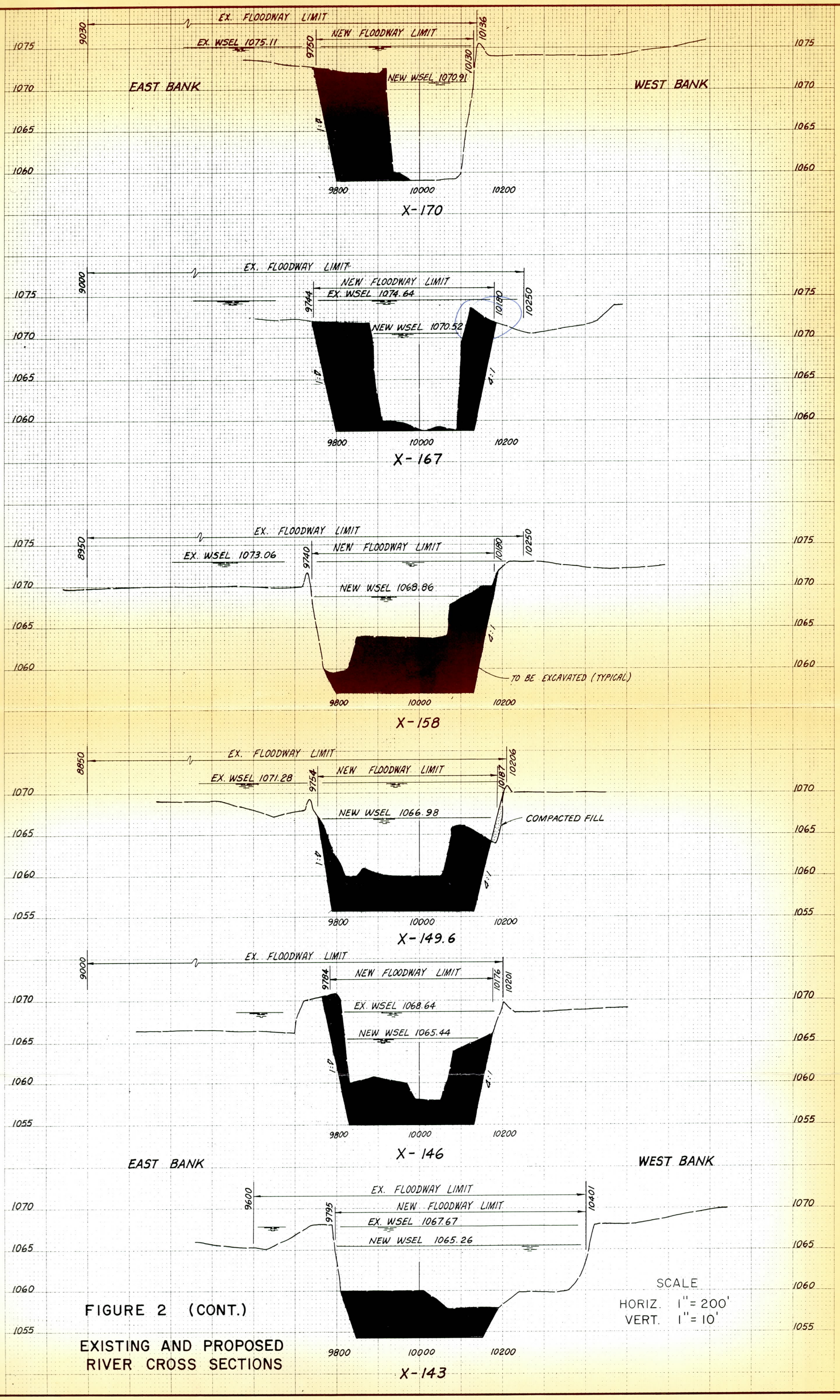


FIGURE 2 (CONT.)

EXISTING AND PROPOSED RIVER CROSS SECTIONS

TO ACCOMPANY REPORT BY R&K ENGINEERS, INC., JANUARY, 1987

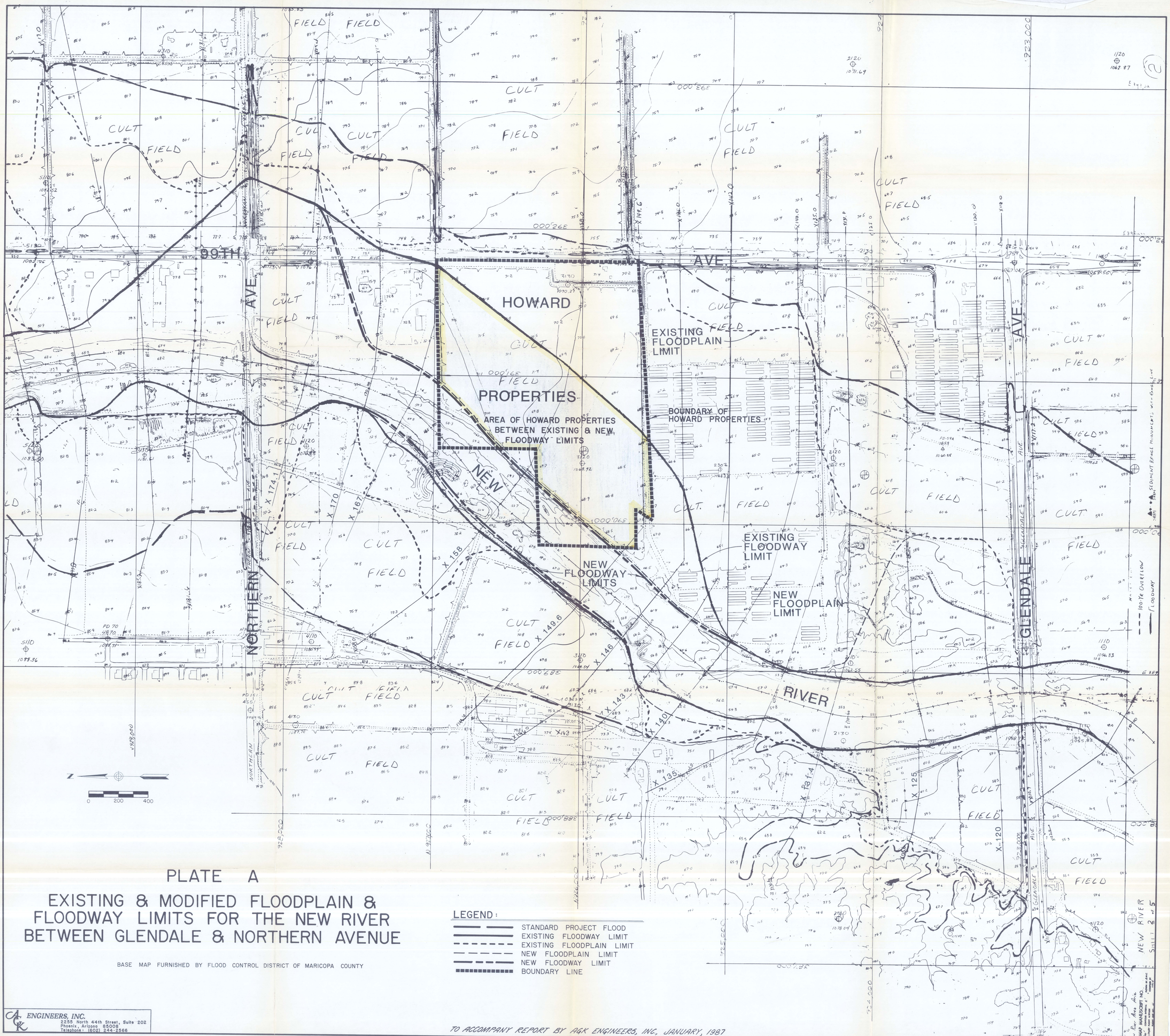


PLATE A

EXISTING & MODIFIED FLOODPLAIN & FLOODWAY LIMITS FOR THE NEW RIVER BETWEEN GLENDALE & NORTHERN AVENUE

BASE MAP FURNISHED BY FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

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