D23/D2H

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D23/D2H

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BOARD OF COUNTY COMMISSIONERS
PATRICK J. BACA, CHAIRMAN
DISTRICT 1
JACQUELYN SCHAEFER, VICE CHAIR
DISTRICT 5
ALBERT "AL" VALDEZ, MEMBER
DISTRICT 2
EUGENE M. GILBERT, MEMBER
DISTRICT 3
PATRICIA "PAT" CASSIDY, MEMBER
DISTRICT 4
JUAN R. VIGIL, COUNTY MANAGER

County of Bernalillo

State of New Mexico

ONE CIVIC PLAZA, N.W.
ALBUQUERQUE, NEW MEXICO 87102
ADMINISTRATION (505) 768-4000
COMMISSION (505) 768-4217
FAX (505) 768-4329

RAY GALLAGHER, SHERIFF
PATRICK J. PADILLA, TREASURER
GLADYS M. DAVIS, CLERK
MARK J. CARRILLO, ASSESSOR
THOMAS J. MESCALL, PROBATE JUDGE

July 27, 1992

Tom Holtman, P.E.
Andrews, Asbury & Robert, Inc.
149 Jackson Street, NE
Albuquerque, New Mexico 87108

RE: DRAINAGE PLAN FOR LOT 1214A, SANDIA HEIGHTS UNIT 12
ENGINEER'S STAMP DATED MAY 27, 1992 (D-23/D2H)

Dear Mr. Holtman:

Based on the information provided, the plan is acceptable for Building Permit release.

Please be advised that prior to the County Building Department performing a final inpection, an approved Engineer's Certification must be accepted by this office. The Engineer also needs to certify the floodwall.

If you should have any questions, please do not hesitate to call me at 768-2650.

Cordially,

Gilbert Aldaz

Gilbert Aldaz, P.E. & P.S.
County Floodplain Administrator

xc: Bob Foglesong, Bernalillo County
Clifford E. Anderson, AMAFCA
Joe Gallegher, Owner

wp+3486

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ANDREWS ASBURY & ROBERT, C.
149 Jackson N.E.
ALBUQUERQUE, NEW MEXICO 87108

(505) 265-6631

LETTER OF TRANSMITTAL

DATE	JOB NO.
JULY 21, 1992	92-654

ATTENTION: GILBERT ALDEZ
RE: DRAINAGE REPORT - LOT 1214-1 SANDIA HEIGHTS. UNIT #2

TO GILBERT ALDEZ - FLOOD PLAIN ADM
CITY OF ALBUQUERQUE

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via HAND CARRIED the following items:

☐ Shop drawings ☒ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☑ WATER SURFACE PROFILE (HEC-2)

COPIES	DATE	NO.	DESCRIPTION
ONE	7-16 92	2 PGS	DRAINAGE REPORT LETTER OF JULY 16, 1992
ONE	4-30-92	2 PGS	WATER SURFACE PROFILE - HEC-2 PRINT-OUT
ONE	5/27/92	1 PAGE	DRAINAGE INFORMATION SHEET
ONE	5/26/92	2 SHTS	GRADING & DRAINAGE PLAN SHEET 1 OF 2 & 2 OF 2

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution
☒ As requested ☐ Returned for corrections ☐ Return ____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS THANKS FOR YOUR HELP GILBERT
TED ASBURY

COPY TO JOE GALLAGHER - C/O GALLAGHER CONSTR.

SIGNED: Thos. J Asbury

PRODUCT 240-3 NEBS Inc., Groton, Mass. 01471

If enclosures are not as noted, kindly notify us at once.

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IN[illegible] INFORMATION SHEET

PROJECT TITLE: Sandia Heights Lot 1214A ZONE ATLAS/DRNG. FILE #: D-23-Z/D2H

DRB #: _____ EPC #: _____ WORK ORDER #: 92-634

LEGAL DESCRIPTION: Sandia Heights Unit 12 Lot 1214A

CITY ADDRESS: _____

ENGINEERING FIRM: Andrews, Asbury & Robert, Inc. CONTACT: Tom Holtman

ADDRESS: 149 Jackson St., N.E. PHONE: (505) 265-6631

OWNER: Gallegher Construction, Inc. CONTACT: Joe Gallegher

ADDRESS: P.O. Box 20232, Albuquerque, NM PHONE: 263-0782

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- X DRAINAGE REPORT
- X DRAINAGE PLAN
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- X EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION
- ____ OTHER

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUB'D. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- X DRAINAGE REQUIREMENTS
- ____ OTHER _____ (SPECIFY)

RECEIVED
JUL 22 1992
HYDROLOGY DIVISION

DATE SUBMITTED: May 27, 1992

BY: Tom Holtman

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ANDREWS, ASBURY & ROBERT, INC.
Consulting Engineers
149 Jackson, NE, Albuquerque, New Mexico 87108
(505) 265-6631

John A. Andrews, P.E.
Charles T. Asbury, P.E.
John B. Robert, P.E. & L.S. (1915-1984)
James E. Millington, P.E. - V.P.
Gayle D. Jewell, L.S. - V.P.

JUL 22 1992
HYDROLOGY DIVISION

July 16, 1992

Mr. Gilbert Aldaz
Flood Plain Administrator
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

RE: DRAINAGE REPORT FOR LOT 1214-1
SANDIA HEIGHTS UNIT 12 (D-23)

Dear Gilbert:

This letter is in response to AMAFCA's comments on the subject project in their letter dated June 30, 1992. I spoke with the Bernallilo County Drainage Administrator on the telephone and it was my understanding that he had no additional comments.

a. A copy of the HEC-2 input file is enclosed.

b. As additional clarification regarding Item C in AMAFCA's letter which involved the top of wall elevation, the energy grade line, and possible debris plugging, the following qualitative reasoning is presented:

In the analyses, all of the 100 year discharge was confined to the north arroyo channel and the top of flood wall elevation was based upon this modeling restriction. This assumption can be considered a very conservative approach and should account for possible debris and sediment accumulation. The existing hill that divides the north and south channels is approximately 2 to 3 feet below the top of the flood wall. This means that if the water surface elevation in the north channel approaches the freeboard limit on the flood wall, flow will actually escape the confines of the north channel and enter the south channel prior to possible overtopping of the floodwall. At several locations in the HEC2 model, X3 cards were required at the hill between the north and south channels to confine flow to the north channel. Furthermore, in all likelihood, a large percentage of the 100 year discharge will enter the south channel well upstream of the property.

The capacity of the entire arroyo using the entire available area from both the north and south channel is well over the discharge that could be expected from approximately a 500 year event. Therefore, more than adequate factor of safety has been included in the analyses and design to account for possible debris accumulation based upon the proposed height of the floodwall.

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c. The suggested horizontal depth of bury of the upstream end of the floodwall was based upon engineering judgement. The effects of the upstream structure were not considered, although this structure will help direct flow away from the flood wall and therefore reduce possible scouring effects at the upstream end of the flood wall. To relieve concern the horizontal depth of bury will be increased at the upstream end to an approximate value of 30 feet. Sheets 1 and 2 of the original submittal have been revised to reflect this change and the revised drawings are enclosed.

d. The property owner is aware, and has been advised of the visual impact of the concrete slope paving. A colored concrete will most likely be used for the project. The property owner has also been advised and has the responsibility of obtaining any further approvals from other agencies (beyond those required for drainage alone) prior to construction of the floodwall.

I hope this amended supplemental submittal will clarify and address all remaining concerns on the project.

Sincerely

Thomas L. Holtman, P.E.

cc: Cliff Anderson (w/encl.)
Bob Fogelsong (w/encl.)
Joe Gallegher (w/encl.)

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**********************************************
*  WATER SURFACE PROFILES                    *
*  VERSION OF NOVEMBER 1976                  *
*  UPDATED MAY 1984                          *
*  IBM-PC-XT VERSION AUGUST 1985             *
*  RUN DATE  04-30-92   TIME  10:55:36       *
**********************************************
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**************************************
*  U.  ARMY CORPS OF ENGINEERS       *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D        *
*  DAVIS, CALIFORNIA 95616           *
*  (916) 440-2105 (FTS) 448-2105     *
**************************************
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X     X  XXXXXXX   XXXXX            XXXXX
X     X  X        X     X          X     X
X     X  X        X                      X
XXXXXXX  XXXX     X          XXXXX   XXXXX
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX            XXXXXXX
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THIS RUN EXECUTED 04-30-92

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**************************************************
 HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
 ERROR CORR -  01,02,03,04,05,06
 MODIFICATION -  50,51,52,53,54,55,56
 IBM-PC-XT VERSION AUGUST 1985
**************************************************
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T1     Gallagher Site - Flow confined to north channel
T2     Supercritical 100 year - multiple flows Input File: Gall4.in
T3     Q=1000 CFS          TLH 4-30-92

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

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J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     1.000     .000     .000     .000     .000     .000    -1.000     .000     .000     .000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

     .000   38.000   42.000    1.000    2.000    8.000   26.000    3.000   53.000   54.000

NC     .035     .035     .035     .300     .500     .000     .000     .000     .000     .000
NT    4.000 1000.000 3000.000 4600.000 5520.000     .000     .000     .000     .000     .000
X1   90.000   12.000  100.000  730.000  310.000  310.000  310.000     .000     .000     .000
X3    .000     .000     .000  410.000     .000     .000     .000     .000     .000     .000
GR 6150.000  100.000 6140.000  120.000 6140.000  200.000 6141.000  230.000 6142.000  320.000
GR 6144.700  410.000 6144.000  440.000 6142.000  490.000 6140.000  530.000 6140.000  560.000
GR 6141.000  610.000 6150.000  730.000     .000     .000     .000     .000     .000     .000

X1   80.000   15.000  100.000  650.000  115.000  115.000  115.000     .000     .000     .000
X3    .000     .000     .000  400.000     .000     .000     .000     .000     .000     .000
GR 6134.000  100.000 6130.000  120.000 6128.000  160.000 6125.000  200.000 6125.000  230.000
GR [illegible]
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GR	6134.000	100.000	6130.000	120.000	[illegible]	160.000	6125.000	200.000	[illegible]	[illegible]
GR	6128.000	250.000	6130.600	300.000	6130.600	400.000	6129.000	430.000	6128.400	465.000
GR	6126.800	480.000	6126.800	500.000	6128.300	510.000	6130.000	530.000	6134.000	650.000
X1	70.000	21.000	100.000	565.000	120.000	120.000	120.000	.000	.000	.000
X3	.000	.000	.000	356.000	.000	.000	.000	.000	.000	.000
GR	6124.000	100.000	6120.000	112.000	6119.000	128.000	6120.000	141.000	6123.500	152.000
GR	6122.300	190.000	6123.000	208.000	6125.000	254.000	6127.700	356.000	6127.000	357.000
GR	6127.700	358.000	6126.300	400.000	6123.500	415.000	6122.900	443.000	6122.900	460.000
GR	6123.500	493.000	6125.000	515.000	6121.600	527.000	6121.300	540.000	6121.600	550.000
GR	6125.200	565.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	60.000	19.000	100.000	565.000	100.000	100.000	100.000	.000	.000	.000
X3	.000	.000	.000	345.000	.000	.000	.000	.000	.000	.000
GR	6121.000	100.000	6119.300	113.000	6117.200	118.000	6117.000	126.000	6117.100	137.000
GR	6118.900	143.000	6120.200	180.000	6121.500	230.000	6121.000	283.000	6122.200	325.000
GR	6122.500	345.000	6121.700	407.000	6120.200	427.000	6119.700	433.000	6119.500	468.000
GR	6119.300	502.000	6118.900	528.000	6119.800	548.000	6123.000	565.000	.000	.000

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X1	50.000	21.000	108.000	598.000	60.000	60.000	85.000	.000	.000	.000
X3	.000	.000	.000	360.000	.000	.000	.000	.000	.000	.000
GR	6120.000	108.000	6117.000	142.000	6116.000	146.000	6115.000	155.000	6115.000	158.000
GR	6115.500	172.000	6117.500	178.000	6118.000	213.000	6118.700	250.000	6119.000	306.000
GR	6119.700	325.000	6120.200	360.000	6119.000	410.000	6116.200	435.000	6116.500	450.000
GR	6116.700	495.000	6116.600	528.000	6115.800	572.000	6117.000	584.000	6119.000	593.000
GR	6120.000	598.000	.000	.000	.000	.000	.000	.000	.000	.000
X1	45.000	23.000	100.000	610.000	60.000	60.000	25.000	.000	.000	.000
X3	.000	.000	.000	360.000	.000	.000	.000	.000	.000	.000
GR	6117.000	100.000	6116.000	114.000	6115.000	128.000	6114.200	155.000	6113.900	160.000
GR	6114.000	164.000	6114.700	185.000	6115.300	210.000	6116.000	242.000	6117.000	300.000
GR	6117.600	315.000	6118.400	360.000	6117.000	400.000	6116.000	411.000	6115.000	419.000
GR	6114.000	429.000	6114.000	500.000	6114.600	542.000	6114.000	550.000	6114.000	570.000
GR	6116.500	576.000	6117.000	585.000	6118.000	610.000	.000	.000	.000	.000
NC	.020	.020	.020	.100	.300	.000	.000	.000	.000	.000
X1	40.000	16.000	100.000	617.000	50.000	50.000	50.000	.000	.000	.000
X3	.000	.000	.000	300.000	.000	.000	.000	.000	.000	.000
GR	6117.000	100.000	6115.000	127.000	6114.000	159.000	6113.800	169.000	6114.000	180.000
GR	6115.000	229.000	6115.700	260.000	6115.800	300.000	6115.400	342.000	6115.000	363.000
GR	6114.000	427.000	6113.300	452.000	6113.000	488.000	6113.100	532.000	6114.000	571.000
GR	6118.000	617.000	.000	.000	.000	.000	.000	.000	.000	.000
NC	.035	.035	.035	.300	.500	.000	.000	.000	.000	.000
X1	30.000	14.000	100.000	717.000	130.000	130.000	130.000	.000	.000	.000
X3	.000	.000	.000	282.000	.000	.000	.000	.000	.000	.000
GR	6117.000	100.000	6114.000	160.000	6113.400	168.000	6113.500	196.000	6114.000	208.000
GR	6115.100	282.000	6114.000	353.000	6113.000	389.000	6112.000	445.000	6111.600	482.000
GR	6111.500	499.000	6112.000	533.000	6113.000	561.000	6118.000	717.000	.000	.000
X1	20.000	10.000	100.000	680.000	190.000	190.000	190.000	.000	.000	.000
X3	.000	.000	.000	280.000	.000	.000	.000	.000	.000	.000
GR	6112.000	130.000	6110.000	190.000	6106.500	230.000	6106.300	240.000	6110.700	280.000
GR	6110.000	340.000	6105.000	380.000	6106.000	410.000	6106.000	590.000	6112.000	680.000
X1	10.000	12.000	100.000	710.000	.000	.000	.000	.000	.000	.000
X3	.000	.000	.000	220.000	.000	.000	.000	.000	.000	.000
GR	6106.000	100.000	6104.000	120.000	6102.000	145.000	6100.000	180.000	6100.000	200.000
GR	6102.000	220.000	6102.300	240.000	6102.000	300.000	6100.000	340.000	6098.000	360.000
GR	6104.000	680.000	6106.000	710.000	.000	.000	.000	.000	.000	.000
EJ	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

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MEMORANDUM

To: D-23 / D2H (Lot 1214A, Unit 12, S.H.S.)
(Submittal received May 28, 1992)

FROM: GILBERT

DATE: 7/09/92

Called Tom @ A.A.R. told him to Address AMAFCA's comments & resubmit. I had no additional comments.

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R. WARD HUNNICUTT, CHAIRMAN
PAT D. HIGDON, VICE-CHAIRMAN
DANIEL W. COOK, SECRETARY-TREASURER
GENEIVA MEEKER, DIRECTOR
RONALD D. BROWN, DIRECTOR

LARRY A. BLAIR
EXECUTIVE ENGINEER

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. · ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

June 30, 1992

Gilbert Aldaz, P.E. & P.S.
City/County Floodplain Administrator
c/o Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

RE: Drainage Report for Lot 1214-A Sandia Heights Unit 12 (D-23)

Dear Gilbert:

AMAFCA has reviewed the above-referenced report by Andrews, Asbury and Robert, Inc. (dated May, 1992) and has the following comments:

a. The adjustment of cfs for contributing area appears to be reasonable. The sediment bulking factor also is reasonable for this level of analysis.

b. Only the HEC-2 summary table is included in the appendix. The input file should be included along with a more complete output.

c. The 1 foot of freeboard above energy grade plus 1 foot for aggradation is the basis for determining the top of wall elevation. We believe that the energy grade will represent a good approximate high water elevation for the expected undulating flow. In addition, surge waves and debris plugging could create somewhat higher localized waves that are carried by the arroyo freeboard. We assume that the engineer has considered these elements in his freeboard analysis.

d. It is not apparent what basis was used to establish the 20 foot horizontal depth of bury into the bank slope, at the easterly end of the flood wall. If this wall were not impacted by other structures, this distance appears to be small. Does the existing structure to the east provide a level of protection to the flood wall?

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e. We realize that there are several design configurations and material choices available for the proposed flood wall. AMAFCA is not in a position to dictate this aspect of the design as long as the wall provides appropriate erosion protection and bank stability. Please note that the wall proposed may create a highly visible concrete surface that some could find objectionable. We trust the engineer has reviewed this aspect with the property owner.

We anticipate that the engineer will be able to address the comments and concerns expressed herein by an amended or supplemental submittal. Please contact AMAFCA if you have any questions.

Sincerely,
AMAFCA

Clifford E. Anderson, P.E. & L.S.
Drainage Engineer

CEA:ij

copy: Thomas Holtman, P.E., Andrews, Asbury and Robert Inc.
Robert Foglesong, Bernalillo County Surface Water Hydrologist

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DRAIN[illegible] INFORMATION SHEET

PROJECT TITLE: Sandia Heights Lot 1214A ZONE ATLAS/DRNG. FILE #: D-23-Z/D2-H

DRB #: _____ EPC #: _____ WORK ORDER #: 92-634

LEGAL DESCRIPTION: Sandia Heights Unit 12 Lot 1214A

CITY ADDRESS: _____

ENGINEERING FIRM: Andrews, Asbury & Robert, Inc. CONTACT: Tom Holtman

ADDRESS: 149 Jackson St., N.E. PHONE: (505) 265-6631

OWNER: Gallegher Construction, Inc. CONTACT: Joe Gallegher

ADDRESS: P.O. Box 20232, Albuquerque, NM PHONE: 263-0782

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

- X DRAINAGE REPORT
- X DRAINAGE PLAN
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- X GRADING PLAN
- X EROSION CONTROL PLAN
- ____ ENGINEER'S CERTIFICATION
- ____ OTHER

PRE-DESIGN MEETING:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

CHECK TYPE OF APPROVAL SOUGHT:

- ____ SKETCH PLAT APPROVAL
- ____ PRELIMINARY PLAT APPROVAL
- ____ S. DEV. PLAN FOR SUB'D. APPROVAL
- ____ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ____ SECTOR PLAN APPROVAL
- ____ FINAL PLAT APPROVAL
- ____ FOUNDATION PERMIT APPROVAL
- ____ BUILDING PERMIT APPROVAL
- ____ CERTIFICATE OF OCCUPANCY APPROVAL
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ S.A.D. DRAINAGE REPORT
- X DRAINAGE REQUIREMENTS
- ____ OTHER _____ (SPECIFY)

RECEIVED
MAY 28 1992
HYDROLOGY DIVISION

DATE SUBMITTED: May 27, 1992

BY: Tom Holtman

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R. WARD HUNNICUTT, CHAIRMAN
PAT D. HIGDON, VICE-CHAIRMAN
REX FUNK, SECRETARY-TREASURER
DANIEL W. COOK, DIRECTOR
RONALD D. BROWN, DIRECTOR

LARRY A. BLAIR
EXECUTIVE ENGINEER

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

RECEIVED
MAR 17 1989
HYDROLOGY SECTION

March 14, 1989

To: Carlos Montoya
City Public Works

Joe Gallagher
1043 Monte Largo NE
Albuquerque, New Mexico 87123

RE: Lot 1214A, Sandia Heights South Unit 12

Dear Mr. Gallagher:

In response to your request concerning flood easements and flood elevations on the above referenced lot, we have compiled the following information for your reference:

a. The replat of Lots 1214 and 1215 Sandia Heights South Unit 12 which shows the location of drainage easements. Note that construction is prohibited in the drainage easement areas. The development of the plat must be in accordance with the drainage plan for unit 12 as amended by a letter dated April 2, 1979 from AMAFCA to Bohannan-Huston, inc.

b. The drainage report amendment letter dated April 2, 1979 is enclosed. This letter shows minimum finish floor elevation for lots in Unit 12 adjacent to the Pino Arroyo. These minimum elevations are necessary because the 100-year flood level at the Pino Arroyo would extend beyond and above the elevation of the ground as indicated by the drainage easements. Elevations are indicated at the easterly and westerly property lines. The computation sheets attached with the letter demonstrate an acceptable method of determining finish floor elevations.

c. A copy of the Pino Arroyo flood envelope information from the Leonard Rice report of February 1975 is enclosed. This report is referenced by the April 2, 1979 amendment letter.

d. A copy of the National Flood Insurance Program "Flood Insurance Rate Map" (Community Panel No. 350002 0011c) is enclosed for your reference. This map shows the 100-year flood boundary for the Pino Arroyo and is in good agreement with the Leonard Rice Report.

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This information should allow your engineer to establish an elevation for the house construction on your lot. It would be wise to check with your building mortgage company to verify that they agree with the procedures and that the structure will be outside of a 100-year flood zone so as to eliminate a requirement to purchase flood insurance. Even if the requirement is lifted, it may be prudent to purchase flood insurance for this property.

Please let us know if you have further questions concerning this information herein.

Sincerely,

Clifford E. Anderson, PE & LS
Drainage Engineer

Copy to:

Carlos Montoya, City/County Floodplain Administrator
Bob Foglesong, Engineer, Bernalillo County, PWD

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

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R. WARD HUNNICUTT, CHAIRMAN
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EXECUTIVE ENGINEER

Albuquerque
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2600 PROSPECT N.E. - ALBUQUERQUE, N.M. 87107
TELEPHONE (505) 884-2215

March 14, 1989

Dennis Yoder
5012 Arroyo Chamisa NE
Albuquerque, New Mexico 87110

RE: Lot 1215A, Sandia Heights South Unit 12

Dear Mr. Yoder:

In response to your request concerning flood easements and flood elevations on the above referenced lot, we have compiled the following information for your reference:

a. The replat of Lots 1214 and 1215 Sandia Heights South Unit 12 which shows the location of drainage easements. Note that construction is prohibited in the drainage easement areas. The development of the plat must be in accordance with the drainage plan for unit 12 as amended by a letter dated April 2, 1979 from AMAFCA to Bohannan-Huston, inc.

b. The drainage report amendment letter dated April 2, 1979 is enclosed. This letter shows minimum finish floor elevation for lots in Unit 12 adjacent to the Pino Arroyo. These minimum elevations are necessary because the 100-year flood level at the Pino Arroyo would extend beyond and above the elevation of the ground as indicated by the drainage easements. Elevations are indicated at the easterly and westerly property lines. The computation sheets attached with the letter demonstrate an acceptable method of determining finish floor elevations.

c. A copy of the Pino Arroyo flood envelope information from the Leonard Rice report of February 1975 is enclosed. This report is referenced by the April 2, 1979 amendment letter.

d. A copy of the National Flood Insurance Program "Flood Insurance Rate Map" (Community Panel No. 350002 0011c) is enclosed for your reference. This map shows the 100-year flood boundary for the Pino Arroyo and is in good agreement with the Leonard Rice Report.

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This information should allow your engineer to establish an elevation for the house construction on your lot. It would be wise to check with your building mortgage company to verify that they agree with the procedures and that the structure will be outside of a 100-year flood zone so as to eliminate a requirement to purchase flood insurance. Even if the requirement is lifted, it may be prudent to purchase flood insurance for this property.

Please let us know if you have further questions concerning this information herein.

Sincerely,

Clifford E. Anderson, PE & LS
Drainage Engineer

Copy to:

Carlos Montoya, City/County Floodplain Administrator
Bob Foglesong, Engineer, Bernalillo County, PWD

Albuquerque
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Flood
Control
Authority

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April 2, 1979

Bohannan-Huston, Inc.
4125 Carlisle Boulevard N.E.
Albuquerque, N.M. 87107

Att: M. Emery

Subject: Finish Floor Elevations, Sandia Heights Unit 12

Dear Sir:

We have reviewed the attached finish floor elevations proposed for Unit 12 along Rockrose Road dated 3/13/79.

The elevations proposed are approved as meeting AMAFCA requirements.

Sincerely,

Dan Sabo
Engineer

DS:ic

bd: Goldberg-Mann
Att: J. G. Mortensen

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Lot	Lot Line	Minimum F-F Elev.	Existing Elev.	Lot Line	Minimum F-F Elev	Existing Elev.	See Note #
* 1226	Front (60'SW)	6081	6077	Back	6074	6072	1
* 1227	Front (60'SW)	6082	6077	Back	6067	6066	2
* 1228	West	6083	6079	East	6084	6083	3
1222	West	6083	6083	East	6087	6088	3
1220	West	6087	6088	East	6092	6093	3
1218	West	6092	6093	East	6101	6099	3
1217	West	6101	6099	East	6106	6104	3
1216	West	6106	6104	East	6111	6109	3
1215	West	6111	6109	East	6116	6117	3
1214	West	6116	6117	East	6122	6128	3
1229	West	6122	6128	East	6125	6124	3
1235	West	6125	6124	East	6128	6128	3
1236	West	6128	6128	East	6137	6137	3
1237	West	6137	6137	East	6142	6147	3

Note: 1.) Elevations taken along section A-A, 50' from front lotline and at rear lotline.
2.) Elevations taken along section B-B, 50' from front lot line and at rear lotline.
3.) Elevations taken 50' South of front lotline, at east and west lotlines.

PROJECT NAME Sandia Hts Unit 12 SHEET 1 OF 3
PROJECT NO. 79-039 BY [signature] DATE 3/3/79
SUBJECT Establishing FF Elevations CH'D DATE
using Leonard Rice Flood Envelope

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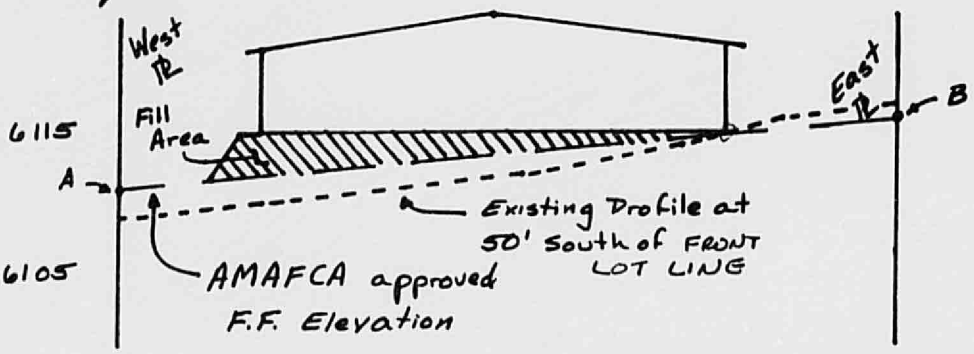
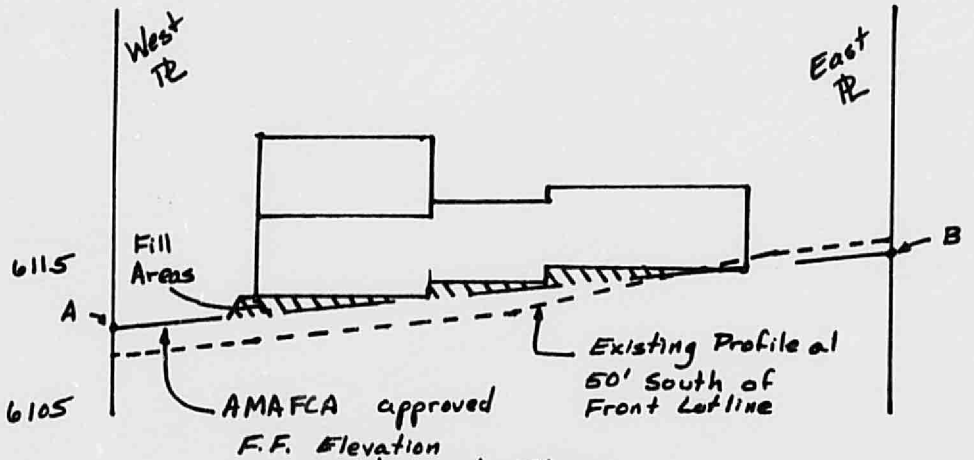
Example: Lot 1215



Single Level Floor



Split Level Floors

A.) Elevation from column 3 of sheet #1

B.) Elevation from column 6 of sheet #1

Note: Elevations on sheet #1 are tentatively approved by AMAFCA. Alternative solutions will be considered, but must be approved by AMAFCA prior to construction.

PROJECT NAME Sandia Hts Unit 12 SHEET 2 OF 3

PROJECT NO. 79-039 BY Dmyn DATE 3/13/79

SUBJECT Establishing F.F. Elevations CH'D DATE

Maine Lonsdorf Bire Ehard Engineers

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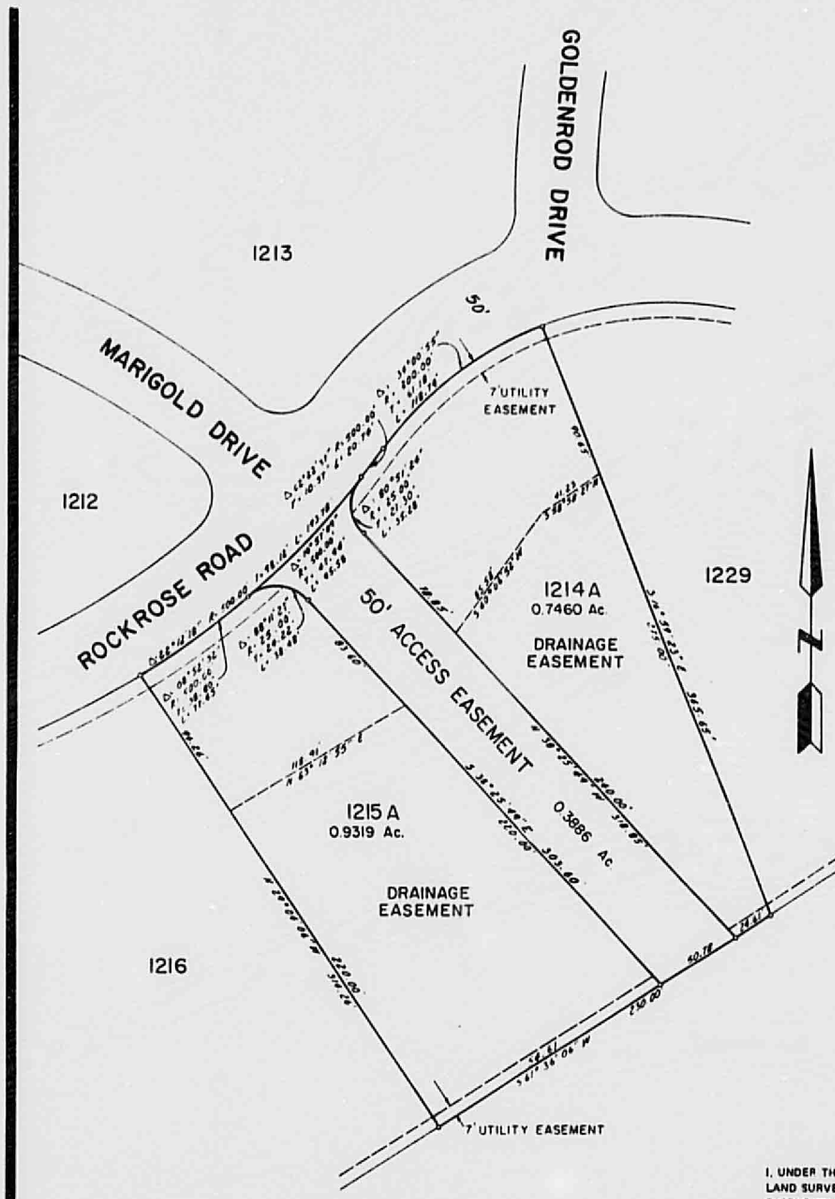
REPLAT OF
LOTS 1214 AND 1215
SANDIA HEIGHTS SOUTH UNIT 12
(FILED FEBRUARY 12, 1975)
BERNALILLO COUNTY, NEW MEXICO
SCALE 1"=50' NOVEMBER 1980

C17-178



JAN 13, 1981

NOTES:

1. Distances are ground distances.
2. Elevations are field elevations.
3. Number 5 rebar with plastic cap marked PE & LS No. 2455 were set on corners designated by a small solid circle.
4. Zone Atlas No. D23.
5. 0.0633 miles of road (0.3886 Ac.) within replat.
6. Construction is prohibited within Drainage Easement. Natural drainage channels shall not be changed by any construction.
7. Land within this replat shall be developed in accordance with drainage plan prepared by Bohannan, Westman, Huston & Assoc. and approved by AMAFCA on November 30, 1973, and as amended by letter of April 2, 1979 from AMAFCA to Bohannan-Huston, Inc.

DESCRIPTION

A certain tract of land situate in the Elena Gallegos Grant, within projected Section 23, T11N, R4E, being a replat of Lots 1214 and 1215 of SANDIA HEIGHTS SOUTH UNIT 12, as the same is shown and designated on the plat filed in the office of the County Clerk of Bernalillo County, New Mexico on February 12, 1975, and being more particularly described by plat bearings and ground distances as follows:

BEGINNING at the southwest corner of the tract herein described, said corner being the southerly corner common to Lots 1215 and 1216 of said SANDIA HEIGHTS SOUTH UNIT 12, whence the southeast corner of said SANDIA HEIGHTS SOUTH UNIT 12, bears N61°36'06"E, 1043.66 feet, and from beginning point running thence,
N29°04'06"W, 314.26 feet along the property line common to said Lots 1215 and 1216 to the northerly corner common to said Lots 1215 and 1216, being a point of curvature on the southerly right-of-way of Rockrose Road; thence continuing along the southerly right-of-way of Rockrose Road and along the northerly boundary of said Lots 1214 and 1215, 193.78 feet along the arc of a curve to the left having a radius of 500.00 feet and a chord bearing N51°09'07"E, 192.57 feet to a point of reverse curvature; thence,
118.74 feet along the arc of a curve to the right having a radius of 700.00 feet and a chord bearing N57°03'25"E, 117.00 feet to the northeast corner, said point being the northerly corner common to Lots 1214 and 1229, of said SANDIA HEIGHTS SOUTH UNIT 12; thence leaving the southerly right-of-way of Rockrose Road and continuing along the property line common to said Lots 1214 and 1229, S16°58'23"E, 365.65 feet to the southerly corner common to said Lots 1214 and 1229, a point on the southerly boundary of said SANDIA HEIGHTS SOUTH UNIT 12, thence, S61°36'06"W, 230.00 feet along the southerly boundary of said Lots 1214 and 1215 to the point and place of beginning.

Tract contains 2.0666 acres, more or less.

DEDICATION

The subdivision on the land herein described is with free consent and in accordance with the desires of the undersigned owner and proprietor thereof, and said owner and proprietor does hereby dedicate all easements shown on this plat. Power and communication easements are reserved where shown by dashed lines, except as noted, including the right of ingress and egress and the right to trim interfering trees.

SANDIA PEAK TRAM COMPANY

BY: _____
Robert M. Murphy
Vice President

STATE OF NEW MEXICO)
COUNTY OF BERNALILLO) ss

The foregoing instrument was acknowledged before me this ____ day of _____, 19__, by Robert M. Murphy of Sandia Peak Tram Company, a corporation, on behalf of said corporation.

My commission expires: _____

_____
Notary Public

I, UNDER THE LAWS OF NEW MEXICO, CERTIFY THAT I AM A REGISTERED LAND SURVEYOR AND THAT THIS PLAT WAS PREPARED BY ME, SHOWS ALL EASEMENTS OF RECORD, MEETS THE MINIMUM REQUIREMENTS FOR MONUMENTATION AND SURVEYS OF THE ALBUQUERQUE SUBDIVISION ORDINANCE AND IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

A. Dwain Weaver
A. DWAIN WEAVER N.M.P.L.S. 6544

APPROVALS D-23 COUNTY

City/County Planning Division	SP-81-7	1-9-81 Date
AMAFCA		12/29/80 Date
Qwest		12/29/80 Date
Public Service Company of New Mexico		12-29-80 Date
Gas Company of New Mexico		12/29/80 Date

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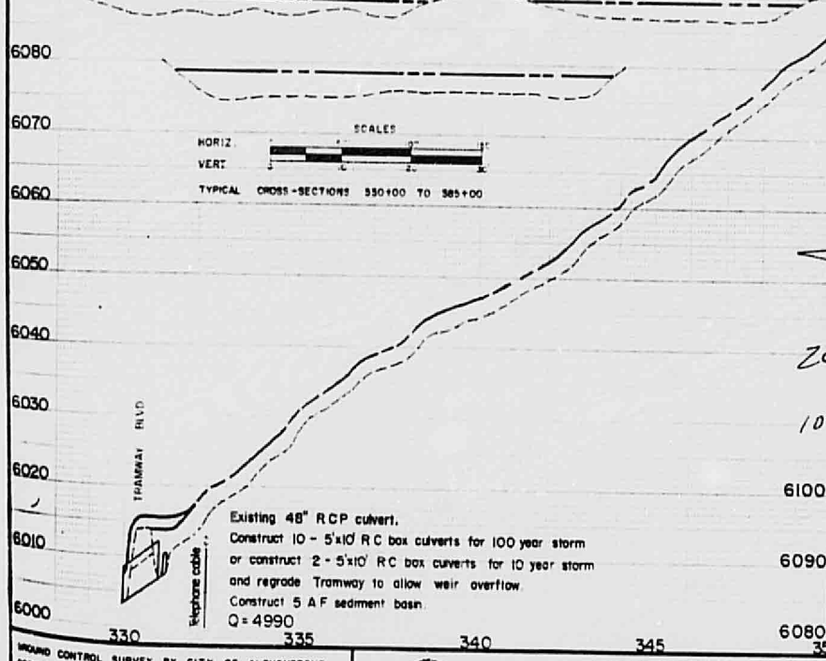

GROUND CONTROL SURVEY BY CITY OF ALBUQUERQUE
AERIAL PHOTOGRAPHY BY BOHANNAN WESTMAN HUSTON
TOPOGRAPHIC MAPPING BY BOHANNAN WESTMAN HUSTON
CONTOUR INTERVAL 2 FEET DATE FLOWN 5/15/73

Leonard Rice Consulting Water Engineers Inc.
Denver Albuquerque

DESIGNED	K.H.L.	DATE FEB. 1975
DRAWN	D.J.B.	DATE FEB 1975
CHECKED	L.H.B.	DATE FEB 1975
REVISED		DATE

ALBUQUERQUE METROPOLITAN
ARROYO FLOOD CONTROL AUTHORITY

DRAINAGE MANAGEMENT PLAN
NORTHEAST HEIGHTS

PROFILE REACH
ARROYO DEL PINO
STA. 330+00 TO STA. 385+00

E-23, D-23 27
SHEET NUMBER
8 OF 9

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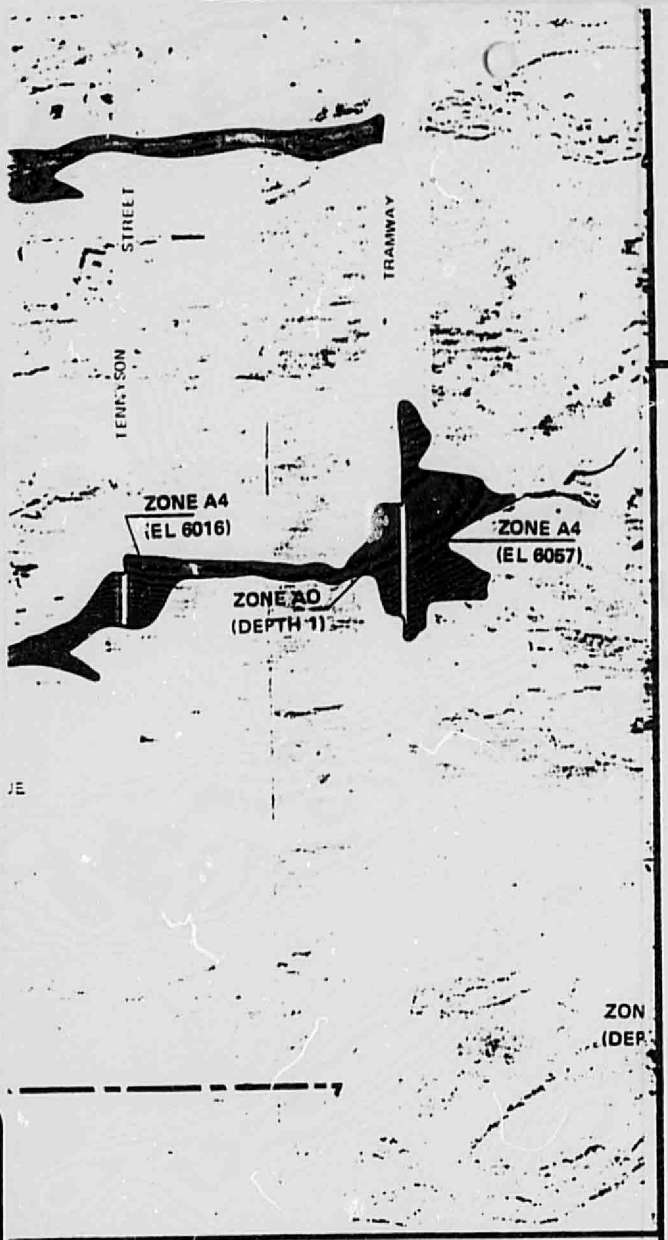

date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program at (800) 638-6620.

SCALE 1"=500'

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

CITY OF

ALBUQUERQUE, NEW MEXICO

BERNALILLO COUNTY

PANEL 11 OF 50

COMMUNITY-PANEL NUMBER

350002 0011 C

EFFECTIVE DATE:

OCTOBER 14, 1983

Federal Emergency Management Agency

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Correction

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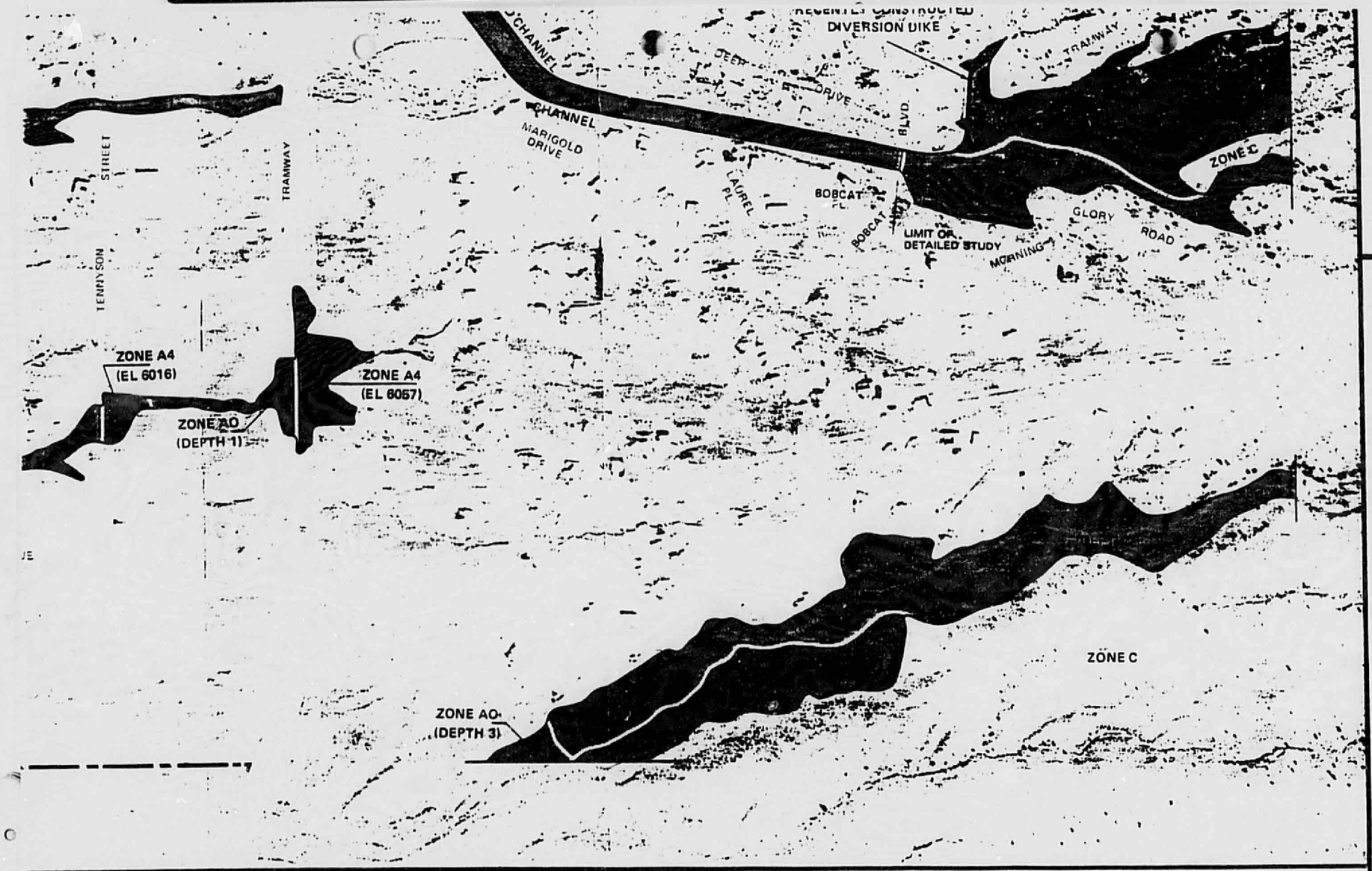

date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program at (800) 638-6620.

N

SCALE 1"=500'

500 0 500

REFERENCE MARK	ELEVATION (FT. NGVD)	DESCRIPTION OF LOCATION
RM 18	5829.04	City of Albuquerque (ACS) standard brass tablet, stamped "I-C22", set in top of concrete post projecting 0.5', located 15' north of Los Angeles Avenue and 20' east of Browning Street.
RM 19	6062.97	A 1" diameter iron pipe anchored in a mound of concrete with no stampings, projecting about 0.2' located 105' east of the centerline of Tramway Boulevard, 800' south of Live Oak Road, and 1' west of a 7' tall sawed-off powerline pole.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
ALBUQUERQUE, NEW MEXICO
BERNALILLO COUNTY

PANEL 11 OF 50

COMMUNITY-PANEL NUMBER
350002 0011 C
EFFECTIVE DATE:
OCTOBER 14, 1983

Federal Emergency Management Agency

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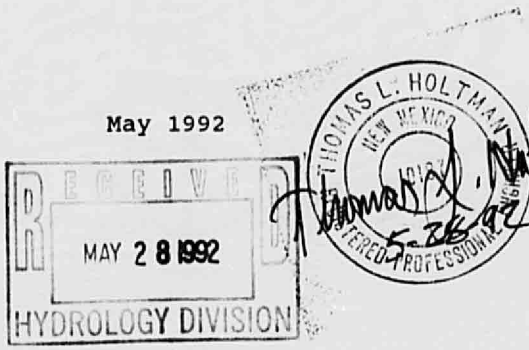
Gallegher Construction, Inc.
Albuquerque, New Mexico

DRAINAGE REPORT
for
LOT 1214-A
SANDIA HEIGHTS UNIT 12

May 1992



Prepared by
Andrews, Asbury & Robert, Inc.
Consulting Engineers
149 Jackson Street, N.E.
Albuquerque, New Mexico 87108

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IV.	Hydraulics	4 - 6
V.	Erosion and Sedimentation	6 - 7
VI.	Slope Paving Flood Wall Requirements	8
CALCULATIONS		APPENDIX
GRADING & DRAINAGE PLAN	Sheets 1 - 2	Back Pocket

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I

INTRODUCTION

An analyses of the flood hazard potential at Lot 1214-A of the replat of lots 1214 and 1215, Sandia Heights South Unit 12 is contained within this report. Figure 1 is a vicinity map of the site from the City of Albuquerque Zone Atlas. A grading and drainage plan accompanies this report. The specific site characteristics can be found on the grading plan along with the recommendations explained in the remainder of this document.

II

GENERAL

The site is located on the north bank and bottom of the Pino Arroyo. In this area the arroyo is in a nearly undisturbed condition. Little or no development is anticipated upstream of the site which will influence long term trends of the arroyo. The restrictive zoning and current city ordinances should maintain this assumption.

The proposed building site is on the high ground of the north arroyo bank. Figure 2 shows the site on the City of Albuquerque Flood Insurance Study (FIS) floodway maps. The site is on the outside of an existing meander of the arroyo. Due to the limited area of high ground, prudent lin setbacks are impractical.

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Therefore, it is proposed to build concrete slope paving along the north arroyo bank. This flood wall will prevent further northward migration of the arroyo meander and thereby protect the proposed building in 100 year frequency events.

In the vicinity of the site, the Pino Arroyo is fairly well incised with some evidence of braiding and meandering in the geologic past. The channel flood plain is between 400 and 500 feet wide. The upstream arroyo banks reach heights from 5 to 30 feet. Comparison of air photography from 1935 (Figure 3) with 1989 photos (Figure 4) shows no quantifiable change in the arroyo meander pattern at the site.

Approximately 2000 feet upstream of the site, the arroyo is very well incised with banks over 20 feet high. From this point, divided flow occurs in the arroyo and definition of the exact low flow channel invert is difficult. However, upon field inspections there is little doubt that the flow divides into several streams.

At the site, two major channels can be seen in the Pino Arroyo 100 year flood plain. Due to the unstable nature of this type of arroyo, it is difficult to predict exactly how the upstream flow divides into these two channels. A rough estimate is that 60 percent arrives in the north channel with the remainder flowing in the south channel. However, due to the uncertainty in the estimate, a conservative approach has been taken in the analyses by

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assuming all the flow arrives at the site in the north channel. It becomes obvious that this assumption has little impact on the final design of the flood control wall.

III

HYDROLOGY

100 year frequency discharges for the Pino Arroyo were quantified in the 1975 Leonard Rice study of Albuquerque's Northeast Heights performed for AMAFCA. These flows were also utilized to establish the flood plains shown in the 1983 FIS. To determine the 100 year flows at the site, we began with the summary of discharges in the FIS. At Tramway Dam the FIS lists a flow of 4990 cfs. Next, the basin delineation from the Leonard Rice study was obtained and the contributing drainage area at the site determined. Since the site is upstream from the Tramway Dam, the Pino Arroyo flow at the site can be reduced to a value of 4600 cfs using graphical methods (reference calc #1 found in the appendix).

A very small local basin originates off-site, flows south down Goldenrod Drive and then west on Rockrose Road. This off-site flow is generally contained within the existing roadways. No evidence can be seen at the site (such as small eroded channels) which suggest the local off-site flows currently cross the site on their way to the Pino Arroyo. However, the flow from Goldenrod Drive may jump the asphalt curb on the south side of Rockrose in a major

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frequency event. This 5 cfs flow crosses the eastern edge of the site from north to south and is defined as flow path number 1 for study purposes. Calculation 1 quantifies this local off-site drainage as well as the on-site drainage. Due to the nature of the site, these local flows are of little consequence and easily disposed of into the Pino Arroyo. However, provisions are needed to assure passage of flowpath number 1 while protecting the future structure. A small swale exists along the eastern property line which can contain all of flow path 1 as shown on the grading and drainage plan. Furthermore, where the proposed driveway enters the property from Rockrose Road a water block will be graded into the property to prevent Rockrose runoff from leaving the existing roadway and traveling down the driveway. A 1 foot high vertical curve will form the water block and it will be constructed from waste fill generated by excavation of the building.

Drainage which develops on-site will be routed around the proposed structure in small swales and discharged into the Pino arroyo upstream of Marigold Drive. The flow paths of the on-site drainage are shown on the grading and drainage plan.

IV

HYDRAULICS

A HEC2 computer model was constructed for the Pino Arroyo. Cross sections at the site (Figure 5, Sections 30, 40, 45, 50, 60

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& 70) were derived from actual field surveys performed at the time of this report. The 1 foot contours shown on the grading and drainage plan were also a product of the same survey. Additional cross sections for the HEC2 model upstream and downstream of the site were obtained from 1"=200' orthotopo mapping with 2 foot contours dated 1973 as shown in Figure 5.

For analyses purposes, all of the 100 year Pino Arroyo discharge was confined to the north channel. A 20 percent bulking factor was applied to the 100 year hydrologic flow of 4600 cfs bringing the total design discharge to 5520 cfs. In most of the sections, this flow just reaches the top of the small hill which divides the north and south channels. A couple of sections required vertical extension to confine the flow to the north channel. This shows that, any flow exceeding the 5520 cfs value would be lost to the south channel and thereby not change the results of this analysis at the site. Furthermore, it shows that the arroyo flood plain could easily be encroached upon with little effect to the existing 100 year flood plain on the south bank (however, no encroachment is proposed).

The average depth of flow at the site from the HEC2 run is 3 feet while the average velocity is 12 fps. A complete printout of the HEC2 model with profiles is included in calculation #2.

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Using the HEC2 model results, the 100 year flood plain was delineated upon the grading and drainage plan. This line was compared with the 1983 FIS mapping and no discrepancies could be identified. However, the scale and quality of the FIS mapping as well as the level of analyses detail used in the FIS is such that, the flood plain shown on the grading and drainage plan is the better representation of the true impact to the site.

V

EROSION and SEDIMENTATION

Once the flows and the hydraulics were quantified, estimates could be developed to determine the required height and depth of bury of the flood wall. Long term aggredation/degradation potential was first qualified. Using mapping from 1973, 1981 and the newly produced site survey from 1992, a profile of the north channel was established. No aggredation/degradation trends could be identified. However, due to the small mapping scale, the contour intervals, and the changes introduced by the construction of Marigold drive, this comparison had little meaning.

Marigold Drive is a low water crossing that was constructed across the Pino Arroyo sometime after the 1981 mapping was flown. The roadway includes a 3' vertical concrete cutoff wall on the upstream side as well as approximately 30 feet of 3" asphalt paving. The 1992 survey shows that the roadway is approximately

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equal too or slightly higher than the 1973 flowline. This roadway acts as grade control for the arroyo and will minimize the potential for degradation at the site. Furthermore, as shown in the HEC2 run, velocities will tend to increase across the asphalt roadway. This increase in velocity should tend to minimize any aggredation trends in the arroyo adjacent to the site. The final qualitative conclusion is that, due to the influence of the Marigold Roadway, aggredation/degradation on the Pino arroyo adjacent to the site will be minimal in the long term.

Scouring along the flood wall was quantified in calculation 2. Guidelines from the multitude of available literature were examined. The proposed flood wall does not encroach on the existing arroyo and therefore contraction scour is zero. Local scour at the upstream end of the flood wall approaches 2.8 feet in depth with 2:1 slope paving. Scour due to dune/antidune development is approximately 2.5 feet. Therefore, combining the local scour and antidune depth produces a total potential scour depth of 5' 3" in the 100 year event. This combination of local and antidune scour applies only to the first 20 or 30 feet of the flood wall. Down stream of the local scour hole, a 4' minimum depth of bury below the equilibrium slope of the arroyo flowline is proposed.

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VI

SLOPE PAVING FLOOD WALL REQUIREMENTS

The required height of the slope paving above the existing arroyo flowline is a combination of the potential aggredation, water surface elevation and freeboard. As discussed in the last section of the report, no significant aggredation is anticipated. However, an equilibrium slope was established which allows for a maximum of 1 foot of aggredation just upstream of Marigold Drive. The HEC2 run established an average depth of just over 3'. This depth is somewhat conservative because all the flow was confined to the north channel. A freeboard value for the concrete slope paving of 3 feet above the 100 year water surface elevation is proposed. Calculation number 2 shows that this freeboard is approximately 1 foot above the total energy grade line. The grading and drainage plan gives a plan view and profile with details of the proposed slope paving flood wall.

To protect against floodwaters eroding behind the flood wall, we propose to bury the slope paving into the existing north arroyo bank a minimum of 20 feet as shown on the grading and drainage plan. This bury into the bank will also prevent further erosion to the west due to the waters of flow path 1.

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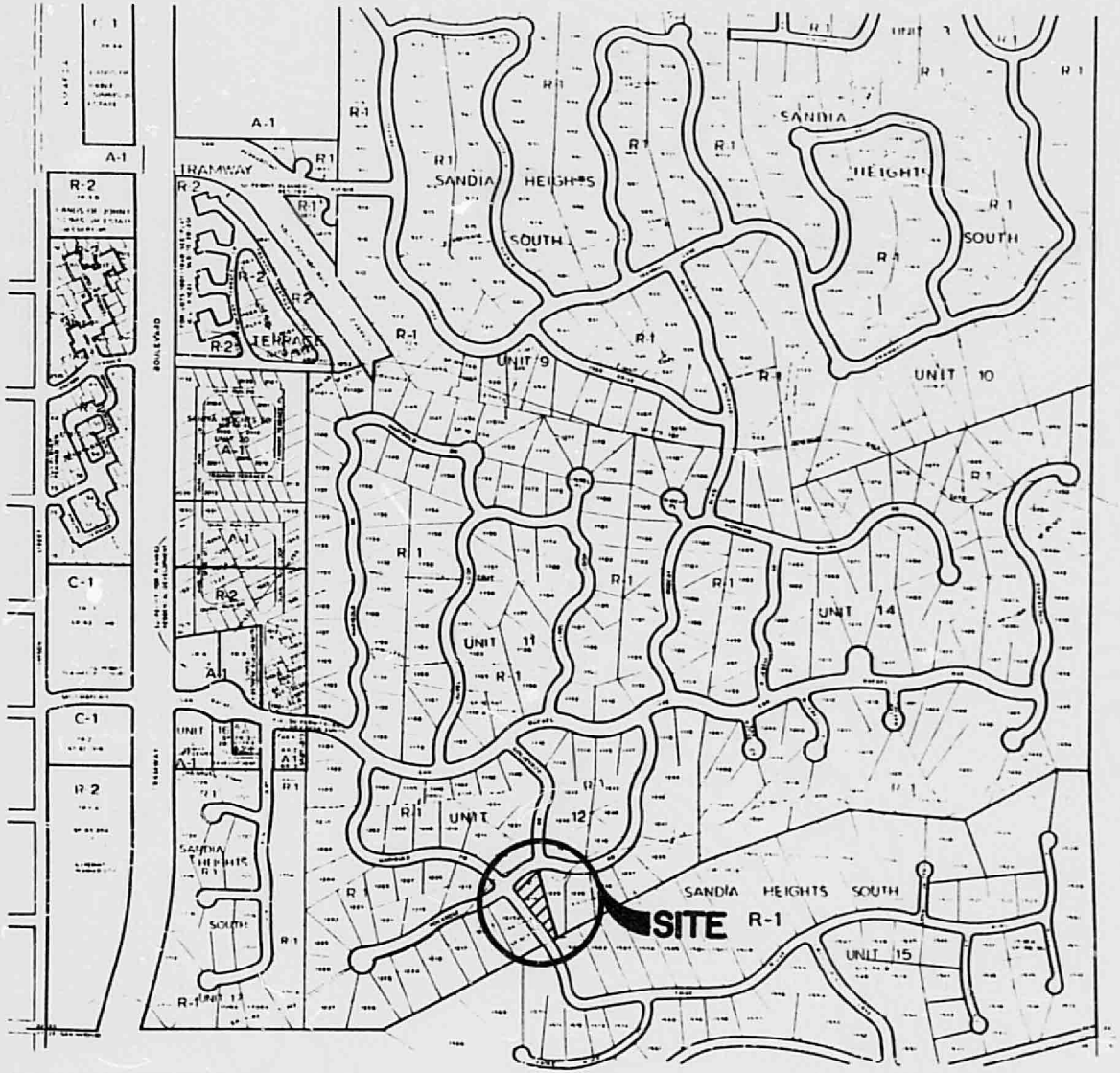

FIGURE 1

VICINITY MAP

D-23-Z

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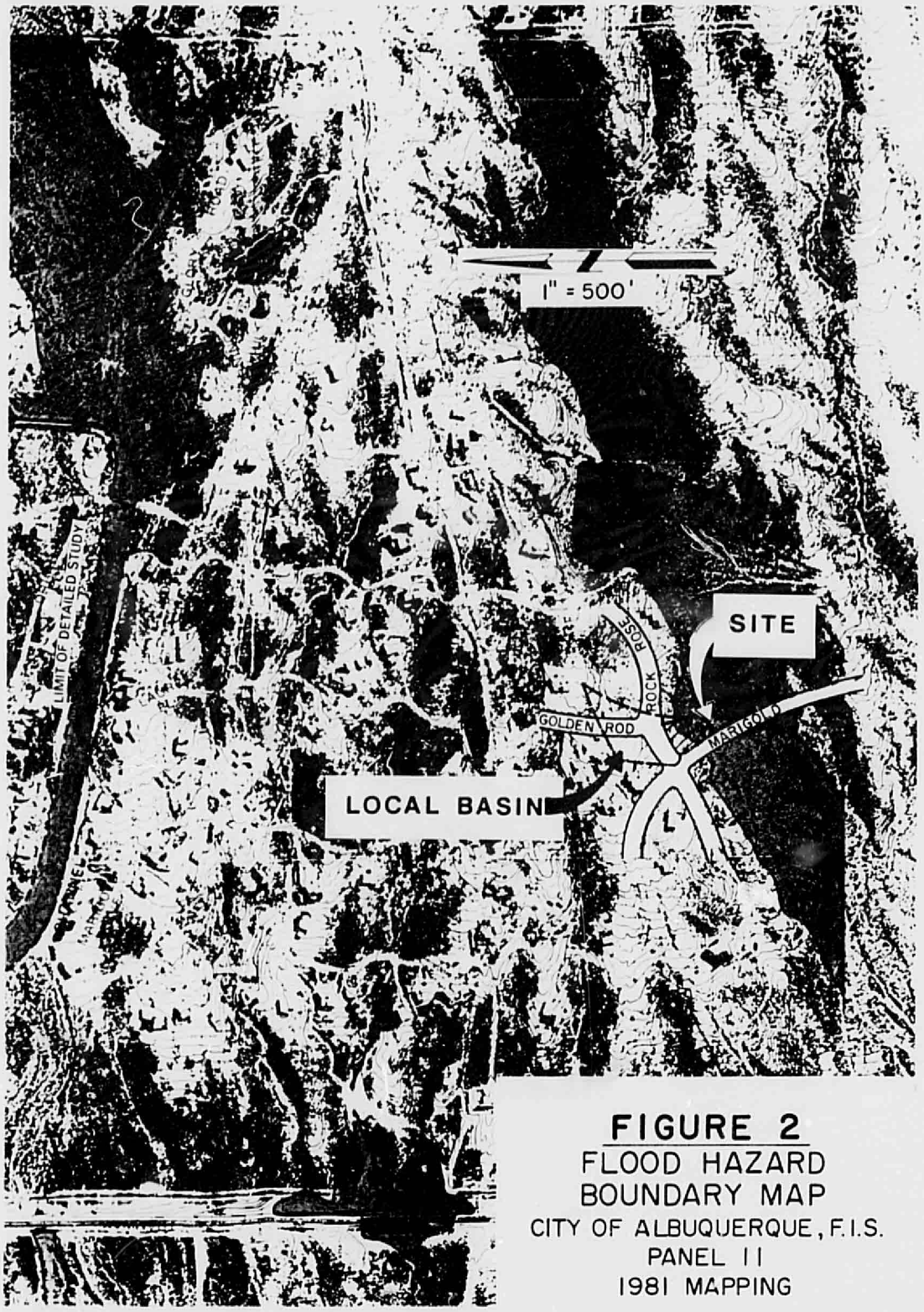

FIGURE 2
FLOOD HAZARD
BOUNDARY MAP
CITY OF ALBUQUERQUE, F.I.S.
PANEL 11
1981 MAPPING

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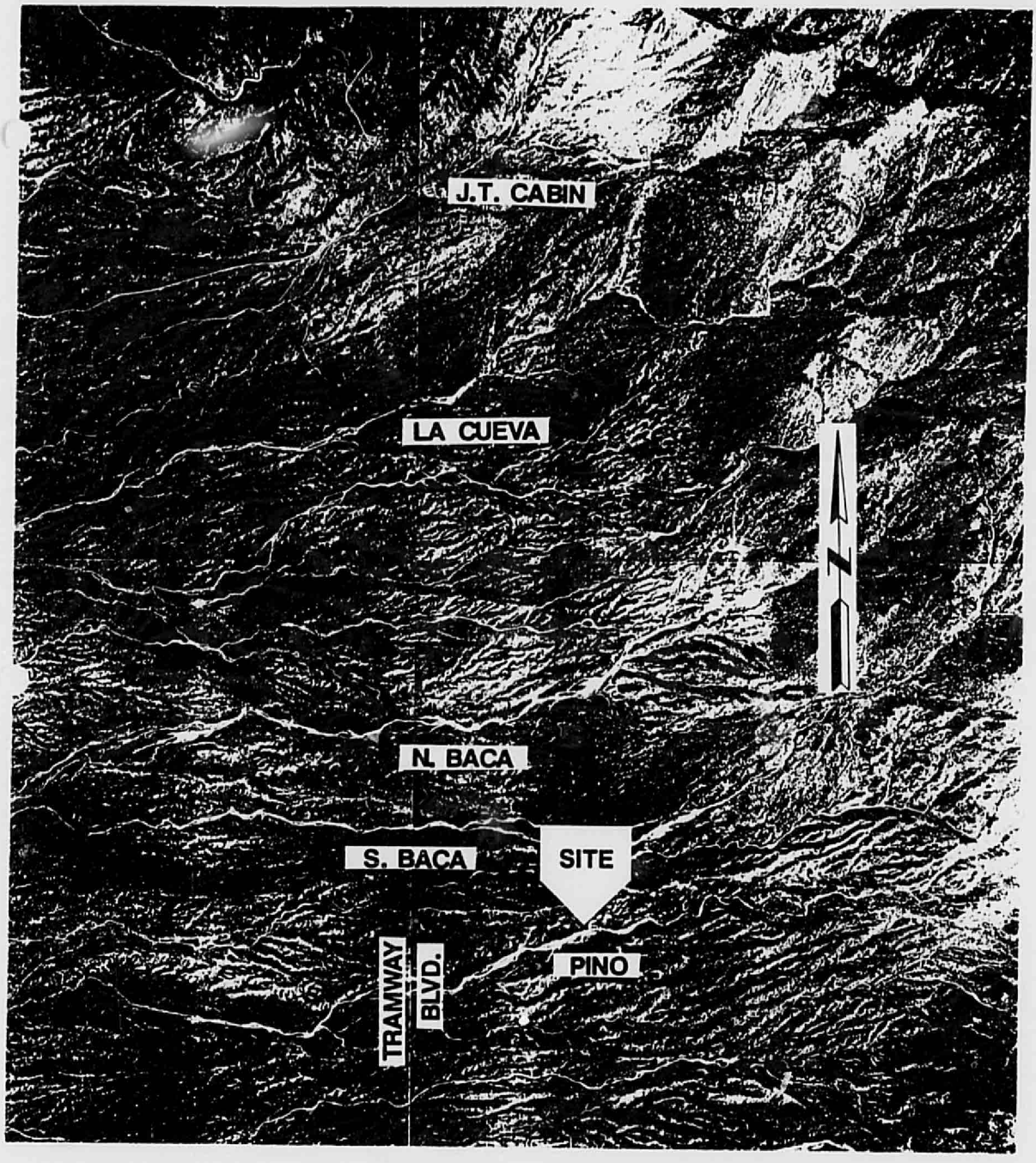

FIGURE 3
PLAN VIEW
1935 MAPPING

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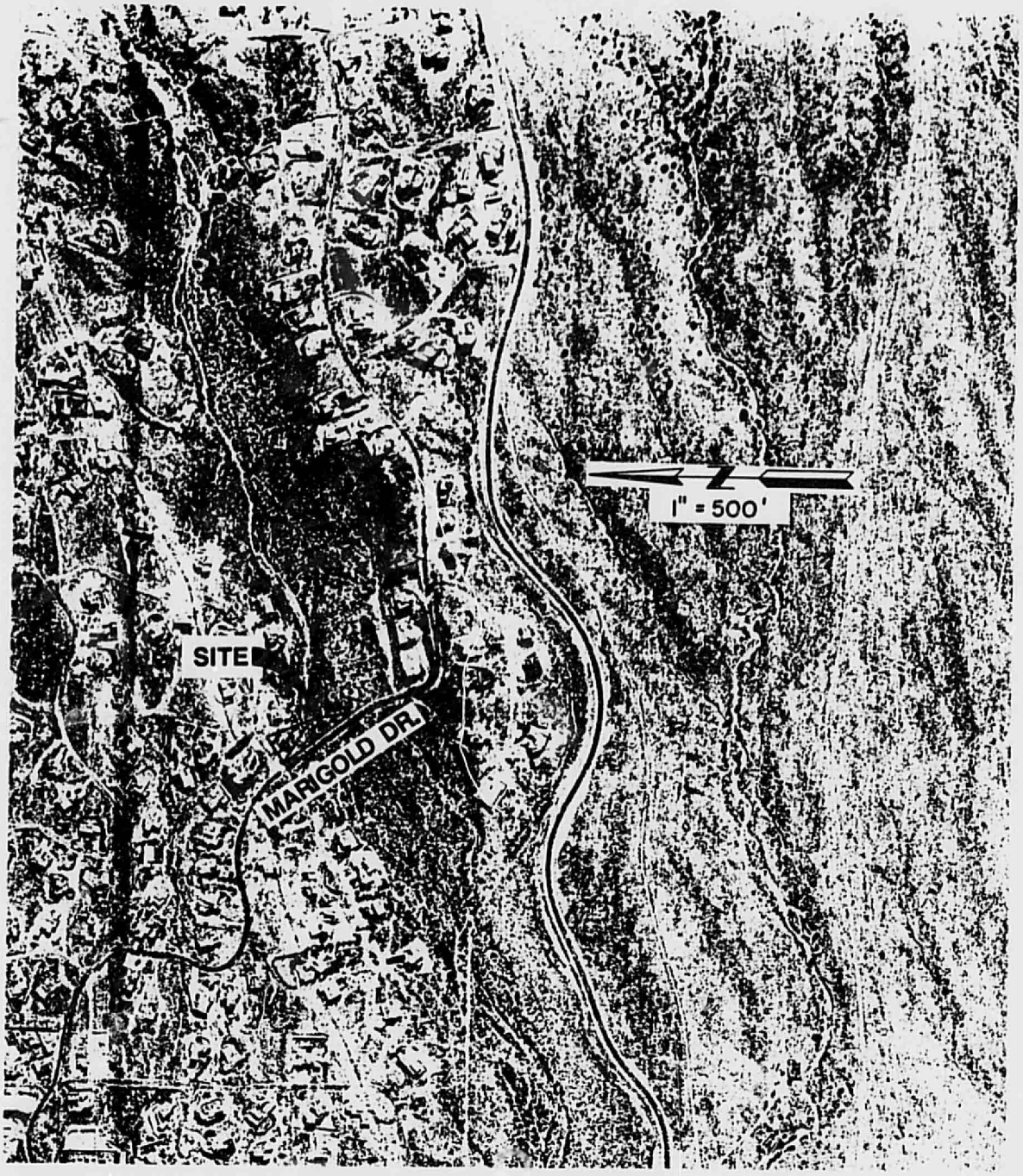

FIGURE 4
PLAN VIEW
1989 MAPPING

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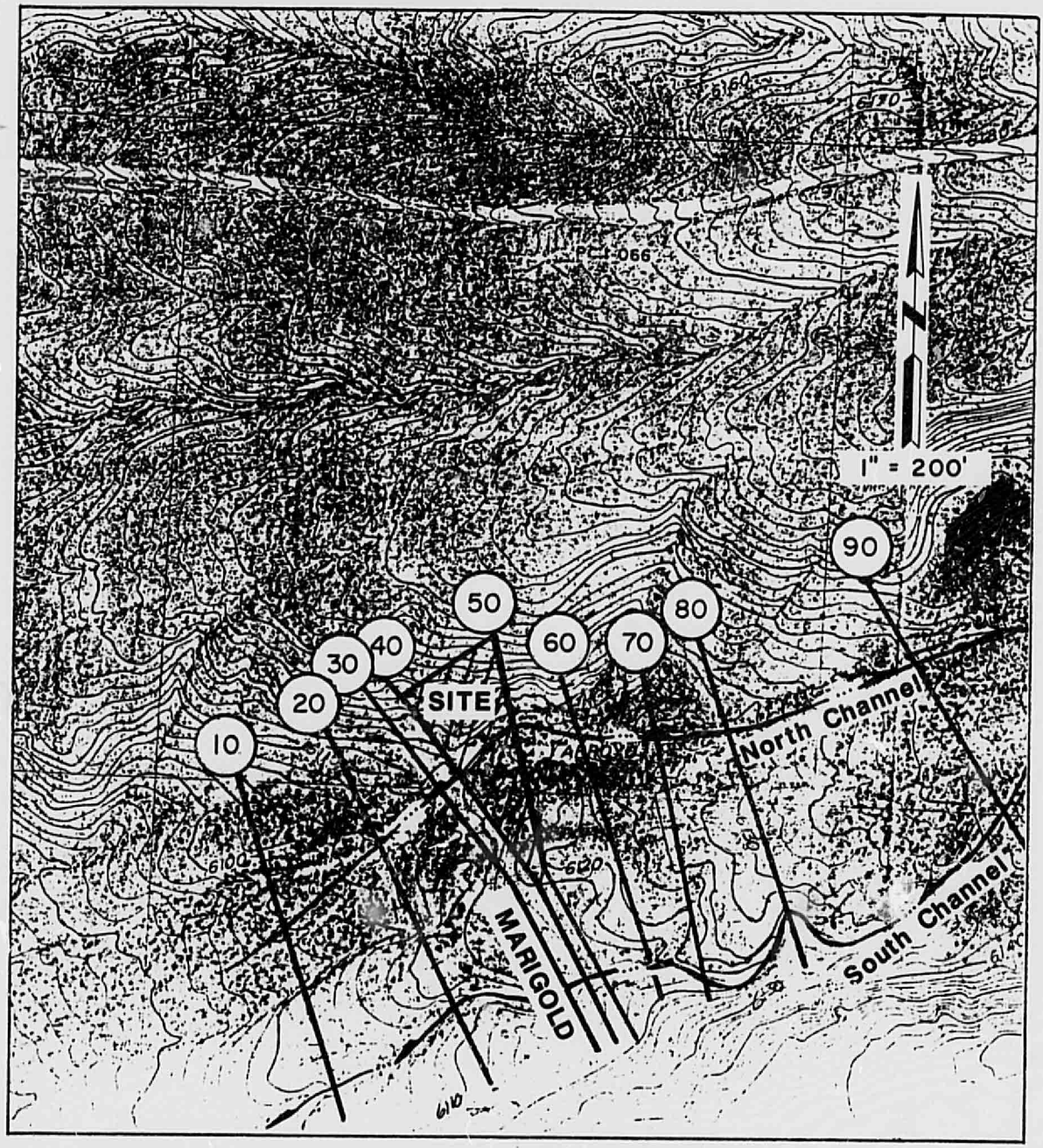

FIGURE 5

HEC 2 MODEL
PLAN VIEW
PINO ARROYO
1973 MAPPING

25×

THIS MICROIMAGE IS THE BEST POSSIBLE REPRODUCTION DUE TO THE POOR QUALITY OF THE ORIGINAL DOCUMENT.

BERNALILLO COUNTY, AND PARTS OF SANDOVAL AND VALENCIA COUNTIES, NEW MEXICO

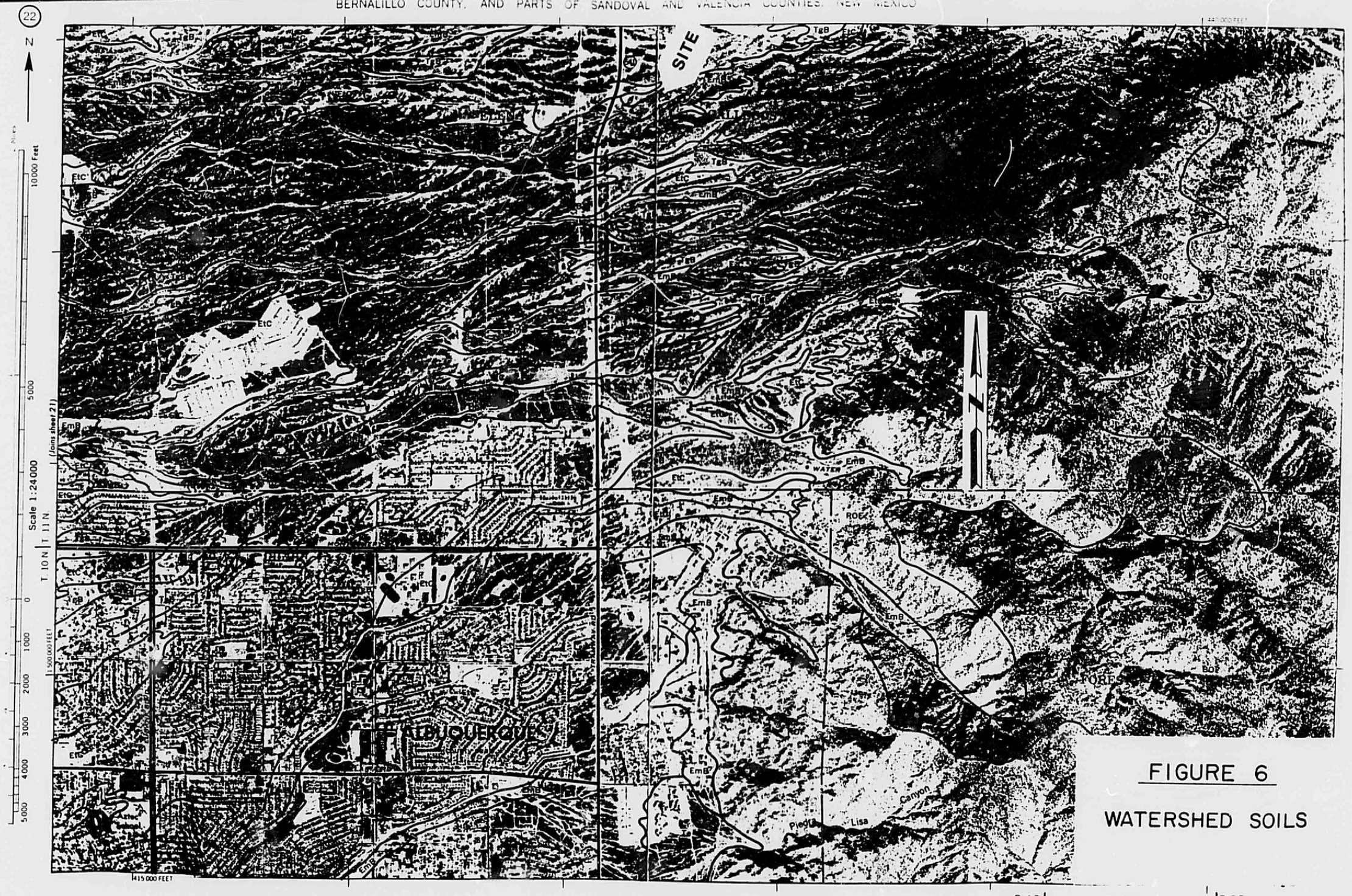

FIGURE 6

WATERSHED SOILS

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APPENDIX

25×10

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Project Gallagher Calc #2 Sheet 1 of 14
Sandia Heights Lot 12A-A Job No. 634
By JH Chk'd _____ Date 4-21-92

PURPOSE: Determine Scour @ site for Flood Wall design.

REFERENCES:

1. "Design Guidelines + Criteria Channels & Hydraulic Structures on Sandy Soil"; Simons + Li 1981

2. Letter to Cliff Anderson from Resource Consultants
   Reference: "Mechanics of Dunes + Antidunes in Erodible Bed Channels" Journal of Fluid Mechanics, Vol 16 pt 4 pg 521-544

3. "Design Manual for Engineering Analysis of fluvial Systems" by Simons + Li (AZ) 1985

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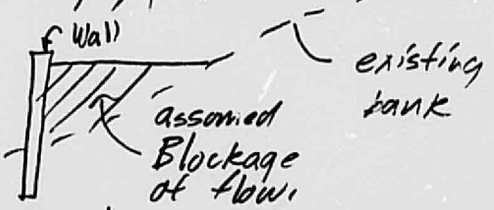
Project _____ Sheet 2 of 14
Job No. _____
By _____ Chk'd _____ Date _____

- A HEC2 run establishes velocity & depth (back of calc)

- Contraction scour is zero at the site. Arroyo actually expands due to Marigold Drive Geometry

- Local Scour along the wall to be constructed. The wall is aligned with the flow. At the upstream end, the wall will be buried into the arroyo bank. Some blockage to flow could occur due to the slope change, (however the wall will not encroach the flood plain) This is a Conservative approach.



Use the eq for Local Scour from Ref 1, Pg 48, eq 3-8 for vert wall

25×10

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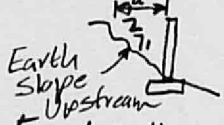
Job No. _____
By _____ Chk'd _____ Date _____

$$y_s = y_1(2.15)\left(\frac{a}{y_1}\right)^{0.40}\left(F_E\right)^{0.33}$$

Where y_s = Scour depth
y_1 = flow depth upstream
a = Embankment length



for 1:1 s.s. @ 3' depth $a = 6$

F_E = Fvoude # = $\frac{V}{\sqrt{gd}}$

V = Velocity = 12 fps (average)
g = 32.2
d = hydraulic depth = $\frac{\text{Area}}{\text{Top Width}}$
$d = \frac{516}{211} = 2.44'$ } HEC2 Values @ section 45

$$Fr_1 = \frac{12}{\sqrt{32.2(2.44)}} = 1.35$$

$$y_s = 3(2.15)\left(\frac{6}{3}\right)^{0.4}(1.35)^{0.33} = 5.4' \text{ for Vert Wall}$$

Using Eq 3-8 Ref 1 $y_s = y_1(1.1)\left(\frac{a}{y_1}\right)^{0.4}\left(F_V\right)^{0.33}$

Using Eq 3-7 Ref 1 $y_s = \frac{1.1}{2.15}(5.4) = 2.76'$ for slope paving

The problem is defining what 'a' is.

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Project _____ Sheet 4 of 14
Job No. _____
By _____ Chk'd _____ Date _____

Ref 3, Pg 5.96 Recommends

$$y_s = y_1(4)(F_r)^{0.33} \quad \text{when } \frac{a}{y} \text{ is } < 25$$

$$y = 3(4)(1.35)^{0.33} = 13.2'$$

- The idea is that the dimension 'a' is how far the embankment projects into the flow. Ref 3 Fig 5.24 shows bridge abutments which encroach on overbank and channel flows, then suggests using worst case.
- At our site, all flow is basically in the channel ⇒ the 6' value used with a vertical wall is reasonable.
- However, using slope paving at a 2:1 slope, there is very little projection (if any)

25×

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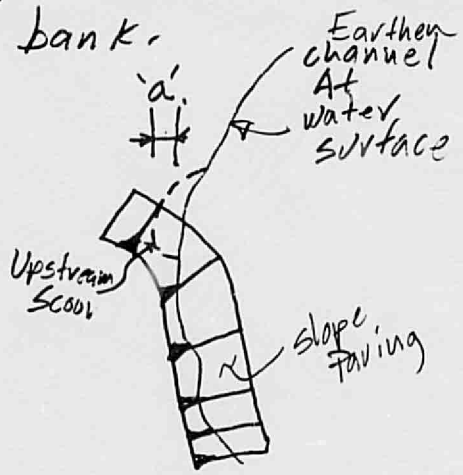
Project _____ Sheet 5 of 14
Job No. _____
By _____ Chk'd _____ Date _____

into the channel. Some projection could occur if the arroyo scours upstream of where the slope paving is to be buried into the bank.



6' seems reasonable in this case, And in this case eq. 3-7 applies.

⇒ Local scour @ upsteam end
w/ Vert Wall ~ 5.4' → 13.1' depending on eq.
w/ Slope Paving @ 2:1 ~ 2.76'

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Project _____ Sheet 6 of 14
Job No. _____
By _____ Chk'd _____ Date _____

- Finally estimate dune/antidune height

$$h_a = 0.14 \frac{2\pi V^2}{g} \quad (\text{ref } 2)$$

$$= 0.14 \left[\frac{2\pi(12)}{32.2}^2\right] = 2.5'$$

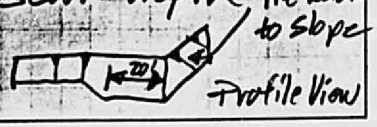
- Total Scour = 2.8 + 2.5 = 5.3'
for Slope Paving

for Vert Wall = 5.4' + 2.5' = 7.9'

- Finally remember the local scour applies only at the upstream end of the slope protection as shown in Fig 5.24 Ref 3

if the scour hole forms @ a 3:1 slope parallel to flow, for slope paving 5.3(3) = 16'

→ extend local scour depth say 20'



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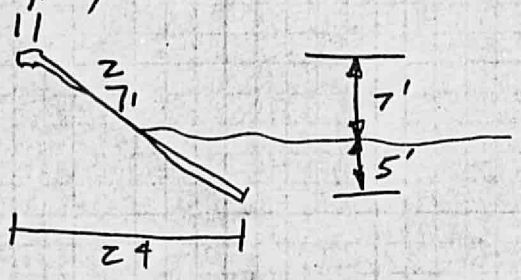
Project _____ Sheet 7 of 14
Job No. _____
By _____ Chk'd _____ Date _____

Now
Compare Costs of alternate protection

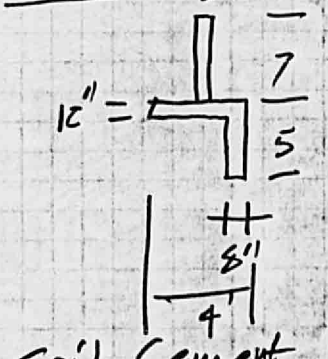
Slope Paving



$L = \sqrt{12^2 + 24^2} = 27'$

$28'\left(\frac{1}{9}\right)(\$40/cy) = \$124/lf$

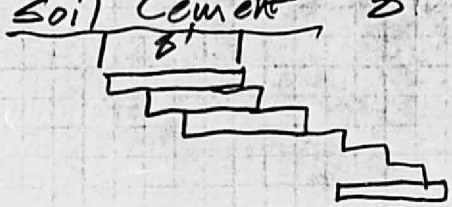
Vert Wall 8"



$7(0.67) + .4(1) + 5(.67) = 12.0\ ft^2$

$\frac{12}{27}(\$300) = \$134\ lf$

Soil Cement



8" lifts

12'

$\frac{12}{0.67}(8) = 64$

$\frac{64}{27}(\$60/cy) = \$143/lf$

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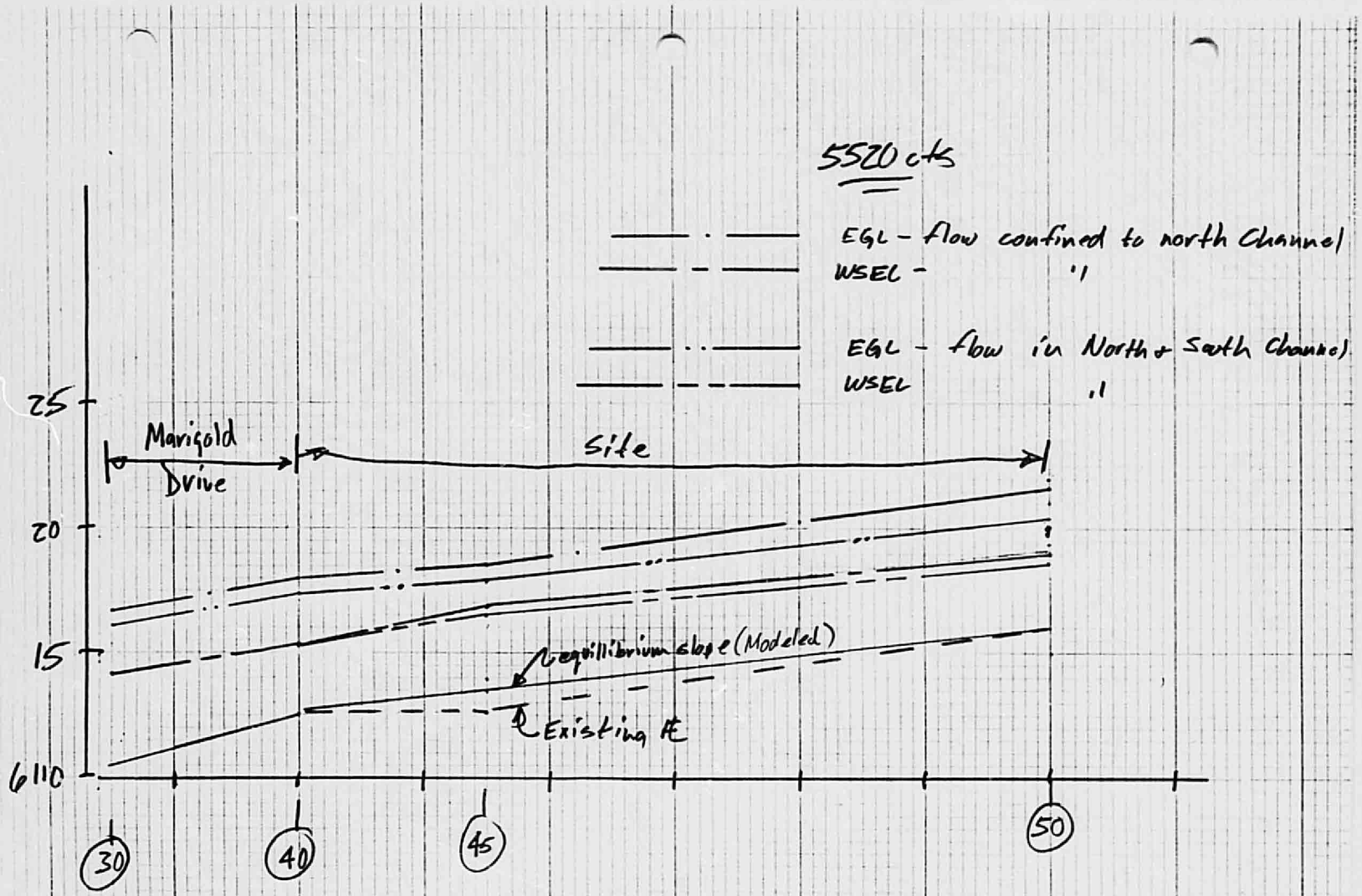
Project _____ Sheet 8 of 14
Job No. _____
By _____ Chk'd _____ Date _____

Slope Paving is looking best + produces the smallest local Scour

Notes ON HEC2 RUN

Two channels exist at the site. Runs were made allowing flow in both channels, and confining flow to the north channel. Flows of 1000, 3000, 4600, 5520 were modeled in both runs. In All cases sustained super critical flow was output by HEC2. The run confining all flow to the north channel produces the max WSEL + EGL. The flow of 5520 cfs accounts for 20% bulking. Fig 1 is a profile of the 5520 cfs @ the site. Appling 3' freeboard to the WSEL as shown in Figure 2 establishes the top of the slope paving. This top is approx. 1' over the energy grade line.



1"=20' Horz

Figure 1
HECZ Model Results

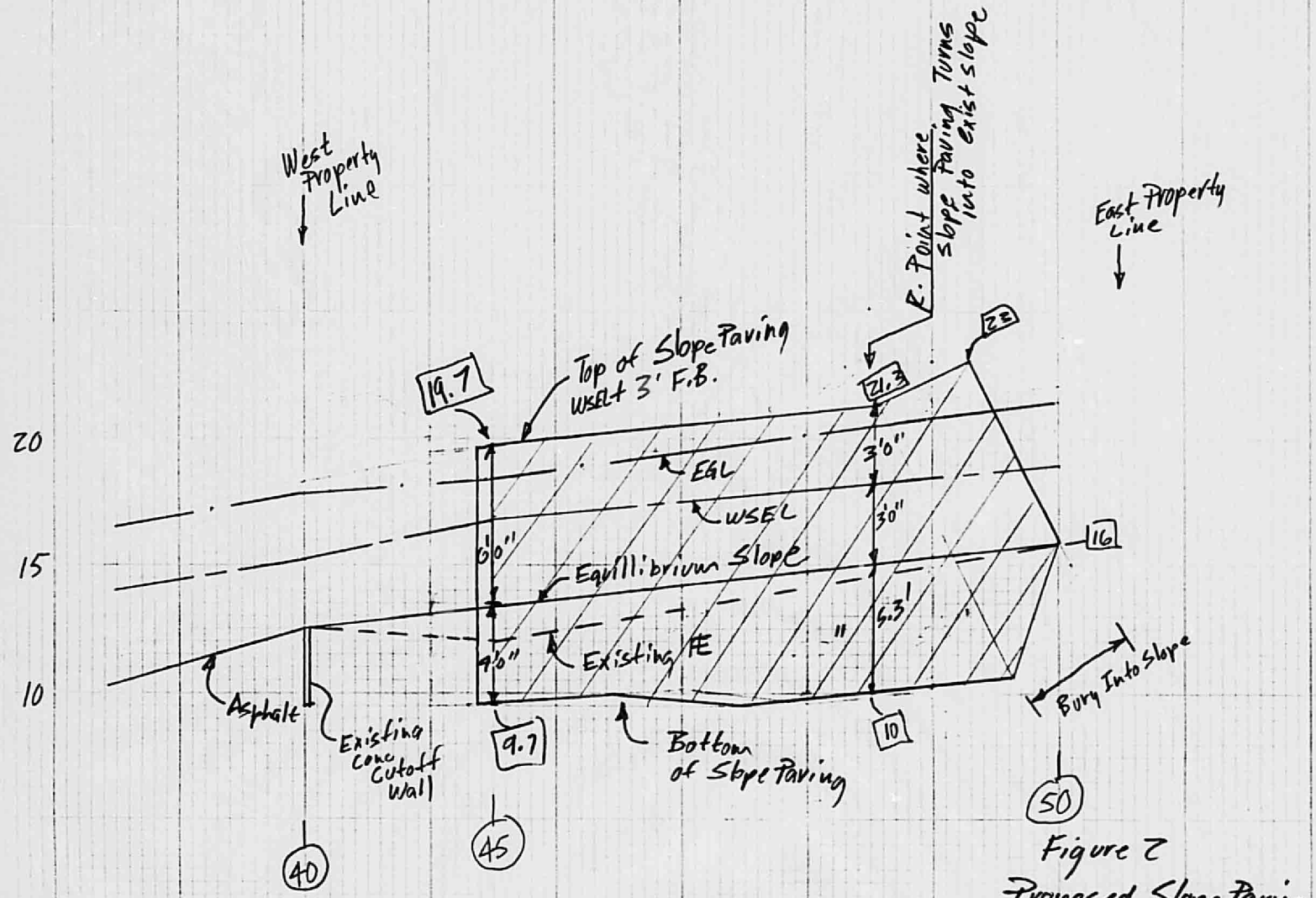


Figure 7
Proposed Slope Paving Elevations
Page 10 of 14

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Project _____ Sheet 11 of 14
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Depth of Slope Paving

Page 6 of this calc established the upstream scour of 5.3'. This value was applied to Fig 2 for the depth of bury at the upstream section from 20 to 40 feet downstream of the beginning of the slope paving the depth of bury is reduced to 4'. This is because the local scour hole forms only on the upstream end of the slope paving

CASE 1 -
DIVIDED FLOW IN NORTH + SOUTH CHANNELS

SUMMARY PRINTOUT

	SECNO	ELMIN	CWSEL	CRIWS	DEPTH	VCH	EG	SSTA	ENDST
*	90.000	6140.00	6141.14	6141.14	1.14	5.21	6141.56	117.72	611.86
*	90.000	6140.00	6142.05	6142.05	2.05	6.62	6142.73	115.90	624.02
*	90.000	6140.00	6142.53	6142.53	2.53	7.37	6143.37	114.94	630.38
*	90.000	6140.00	6142.77	6142.77	2.77	7.69	6143.69	114.46	633.63
	80.000	6125.00	6126.56	6127.44	1.56	14.06	6129.63	179.20	240.40
	80.000	6125.00	6127.76	6129.03	2.76	16.23	6131.85	163.28	506.36
	80.000	6125.00	6128.35	6129.71	3.35	17.40	6133.05	152.98	510.60
	80.000	6125.00	6128.65	6130.05	3.65	17.64	6133.48	147.01	514.11
	70.000	6119.00	6122.12	6122.56	3.12	9.39	6123.48	105.63	552.18
	70.000	6119.00	6123.69	6123.98	4.69	9.08	6124.97	100.92	558.72
	70.000	6119.00	6124.07	6124.60	5.07	10.78	6125.88	100.00	560.30
	70.000	6119.00	6124.30	6124.84	5.30	11.34	6126.29	100.00	561.23
*	60.000	6117.00	6120.08	6120.08	3.08	5.47	6120.55	107.01	549.51
	60.000	6117.00	6121.01	6121.17	4.01	7.76	6121.95	100.00	554.44
	60.000	6117.00	6121.67	6121.75	4.67	7.78	6122.61	100.00	557.92
	60.000	6117.00	6121.86	6121.96	4.86	8.29	6122.93	100.00	558.99
	50.000	6115.00	6117.03	6117.28	2.03	7.14	6117.82	141.63	584.15
	50.000	6115.00	6117.87	6118.30	2.87	9.54	6119.28	132.16	587.91
	50.000	6115.00	6118.35	6118.92	3.35	10.46	6120.05	126.70	590.07
	50.000	6115.00	6118.62	6119.16	3.62	10.69	6120.40	123.70	591.27
*	45.000	6113.90	6115.10	6115.10	1.20	5.24	6115.53	126.54	572.65
	45.000	6113.90	6115.91	6116.03	2.01	7.52	6116.79	115.24	574.59
	45.000	6113.90	6116.33	6116.57	2.43	8.75	6117.52	109.35	575.60
	45.000	6113.90	6116.50	6116.84	2.60	9.50	6117.91	107.01	576.00
	40.000	6113.00	6114.20	6114.46	1.20	7.39	6115.05	152.88	573.20
	40.000	6113.00	6114.92	6115.35	1.92	9.44	6116.30	129.67	581.54
	40.000	6113.00	6115.27	6115.85	2.27	10.59	6117.01	123.39	585.58
	40.000	6113.00	6115.43	6116.03	2.43	11.18	6117.37	121.19	587.45

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PAGE 20

SECNO	ELMIN	CWSEL	CRIWS	DEPTH	VCH	EG	SSTA	ENDST
30.000	6111.50	6112.86	6113.13	1.36	7.69	6113.78	396.93	557.04
30.000	6111.50	6113.79	6114.23	2.29	9.29	6115.14	162.75	585.76
30.000	6111.50	6114.29	6114.75	2.79	9.75	6115.77	154.15	601.33
30.000	6111.50	6114.52	6115.01	3.02	9.95	6116.06	149.55	608.50
20.000	6105.00	6106.54	6106.77	1.54	7.06	6107.32	229.49	598.17
20.000	6105.00	6107.08	6107.64	2.08	10.83	6108.90	223.38	606.19
20.000	6105.00	6107.43	6108.16	2.43	12.37	6109.80	219.40	611.42
20.000	6105.00	6107.61	6108.42	2.61	12.96	6110.22	217.23	614.26
10.000	6098.00	6100.23	6100.31	2.23	6.17	6100.82	176.09	478.59

1000 cfs
3000
4600
5520

Page 12 of 14

25 X

SUMMARY PRINTOUT

CASE 2 - FLOW CONFINED TO NORTH CHANNEL

	SECNO	ELMIN	CWSEL	CRIWS	DEPTH	VCH	EG	SSTA	ENDST	
*	90.000	6140.00	6141.81	6141.81	1.81	6.37	6142.44	493.81	620.79	1000 cfs
*	90.000	6140.00	6143.18	6143.18	3.18	8.19	6144.23	460.41	639.11	3000
*	90.000	6140.00	6143.94	6143.94	3.94	8.99	6145.19	441.57	649.16	4600
*	90.000	6140.00	6144.33	6144.33	4.33	9.24	6145.66	425.82	654.41	5520
	80.000	6126.80	6128.78	6129.56	1.98	13.18	6131.48	442.27	515.76	
	80.000	6126.80	6129.85	6131.11	3.05	16.83	6134.24	414.17	528.17	
	80.000	6126.80	6130.44	6131.90	3.64	18.13	6135.55	402.96	543.27	
	80.000	6126.80	6130.73	6132.29	3.93	18.70	6136.16	400.00	551.75	
	70.000	6121.30	6123.83	6124.04	2.53	7.74	6124.76	413.23	559.29	
	70.000	6121.30	6124.75	6125.37	3.45	11.64	6126.86	408.23	563.18	
	70.000	6121.30	6125.27	6126.11	3.97	13.66	6128.17	405.52	565.00	
	70.000	6121.30	6125.51	6126.55	4.21	14.71	6128.87	404.23	565.00	
	60.000	6118.90	6120.57	6120.70	1.67	7.04	6121.34	422.13	552.07	
	60.000	6118.90	6121.73	6122.12	2.83	9.85	6123.23	405.37	558.21	
	60.000	6118.90	6122.50	6122.81	3.60	10.20	6124.12	345.00	562.40	
	60.000	6118.90	6122.74	6123.15	3.84	11.06	6124.63	345.00	563.57	
	50.000	6115.80	6117.30	6117.54	1.50	7.56	6118.19	425.17	585.36	
	50.000	6115.80	6118.07	6118.69	2.27	11.54	6120.14	418.27	588.83	
	50.000	6115.80	6118.66	6119.46	2.86	12.65	6121.15	412.96	591.51	
	50.000	6115.80	6118.95	6119.83	3.15	13.27	6121.69	410.38	592.81	
	45.000	6114.00	6115.22	6115.24	1.22	6.01	6115.78	417.23	572.93	
	45.000	6114.00	6116.27	6116.42	2.27	8.94	6117.51	408.02	575.45	
	45.000	6114.00	6116.81	6117.22	2.81	10.75	6118.60	402.13	581.52	
	45.000	6114.00	6117.11	6117.63	3.11	11.42	6119.13	396.94	587.67	
	40.000	6113.00	6114.12	6114.48	1.12	8.56	6115.26	419.22	572.40	
	40.000	6113.00	6114.90	6115.58	1.90	11.58	6116.98	369.31	581.37	
	40.000	6113.00	6115.29	6116.13	2.29	13.24	6118.01	347.64	585.86	
	40.000	6113.00	6115.49	6116.38	2.49	13.98	6118.52	332.97	588.09	

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	SECNO	ELMIN	CWSEL	CRIWS	DEPTH	VCH	EG	SSTA	ENDST
	30.000	6111.50	6112.86	6113.13	1.36	7.67	6113.77	396.79	557.10
	30.000	6111.50	6113.64	6114.22	2.14	10.81	6115.45	365.96	580.97
	30.000	6111.50	6114.06	6114.82	2.56	12.23	6116.38	348.49	594.38
	30.000	6111.50	6114.30	6115.13	2.80	12.70	6116.80	333.78	601.49
	20.000	6105.00	6106.53	6106.77	1.53	7.20	6107.34	367.72	598.02
	20.000	6105.00	6107.13	6107.66	2.13	10.81	6108.94	363.04	606.80
	20.000	6105.00	6107.48	6108.21	2.48	12.49	6109.91	360.11	612.29
	20.000	6105.00	6107.68	6108.49	2.68	13.23	6110.39	358.57	615.18
	10.000	6098.00	6100.18	6100.27	2.18	6.67	6100.87	336.49	476.02
	10.000	6098.00	6101.71	6101.51	3.31	8.48	6102.43	313.96	536.09

Page 13 of 14.

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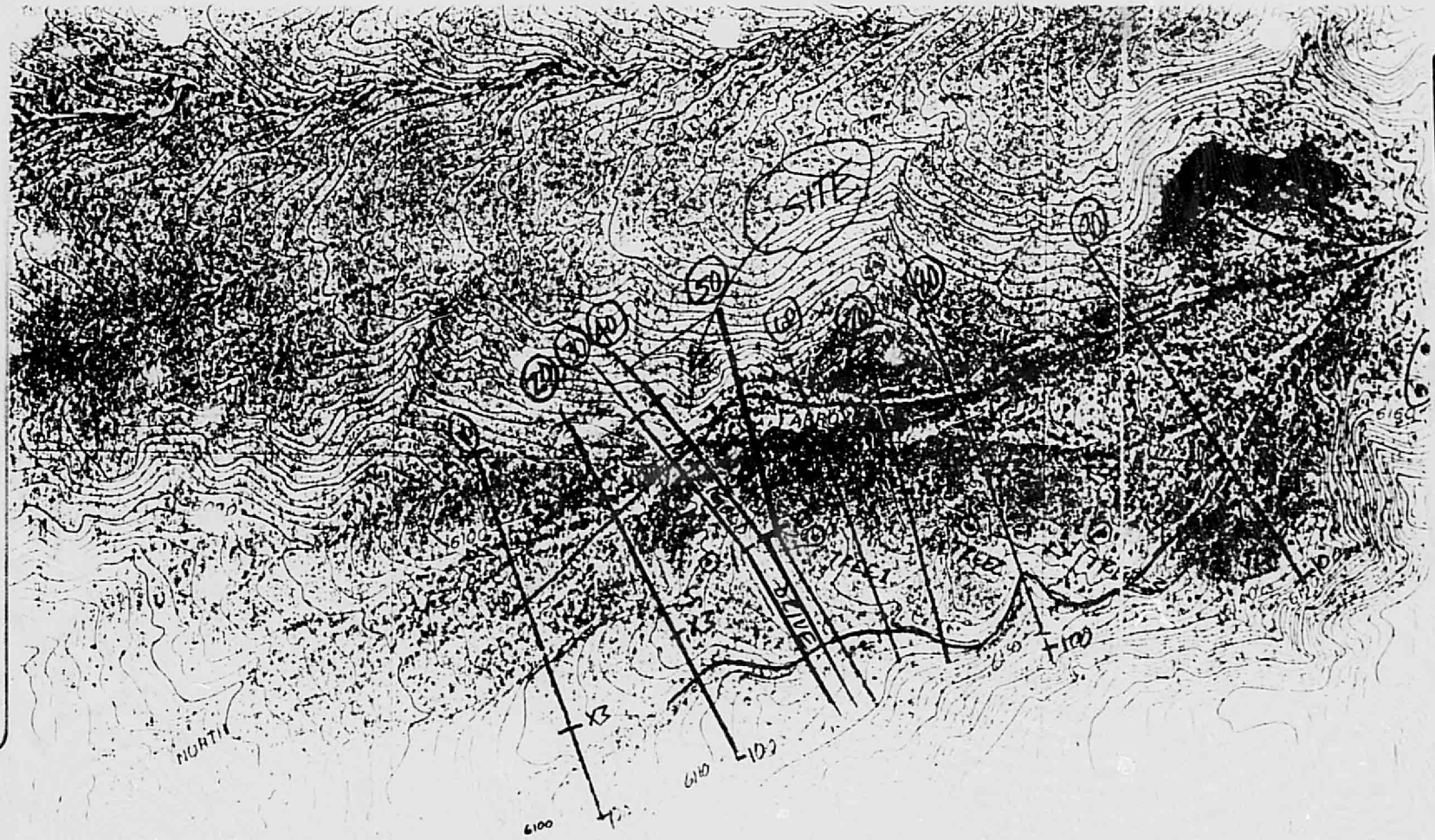

HEC 2 LAYOUT

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Project Gallagher Site Calc#1 Sheet 1 of 7
Sandia Heights Lot 1214-A Job No. 634
By TH Chk'd _____ Date 4-20-92

PURPOSE : Hydrology for S. Pino @ Site
+ Local Flows

REF

1. "Flood Insurance Study for City of Abq."
FEMA; April 1983

2. "Northeast Heights Drainage Management Plan" by Lenard Rice Engr for AMFCA
April 1975

25×

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Project _____ Sheet 2 of 7
_____ Job No. _____
By _____ Chk'd _____ Date _____

- Ref 1. pg 16 lists 100yr @ Tramway (termed Dam Inflow) as 4990 cfs with a basin area of 5.05 mi.² This flow was ref to the Leonard Rice study (Ref 2).

- Using Ref 2 basins, the area upstream of Tramway dam was planimetered for an area of 3227ac or 5.034mi² ⇒ Close to FEMA value

- Basin was subdivided to determine actual basin area @ site. Fig 1 (back) shows the basin, Total area @ site = 4.24mi²

- Use other FIS flows to develop a basin Area/Flow relationship as shown in Fig 2. Now use curve to find flow for 4.24 mi² of 4600 cfs. Check with straight ratio:

$$\frac{4.24}{5.05}(4990) = 4190$$

worst case is from graph
⇒ use 4600 cfs @ site

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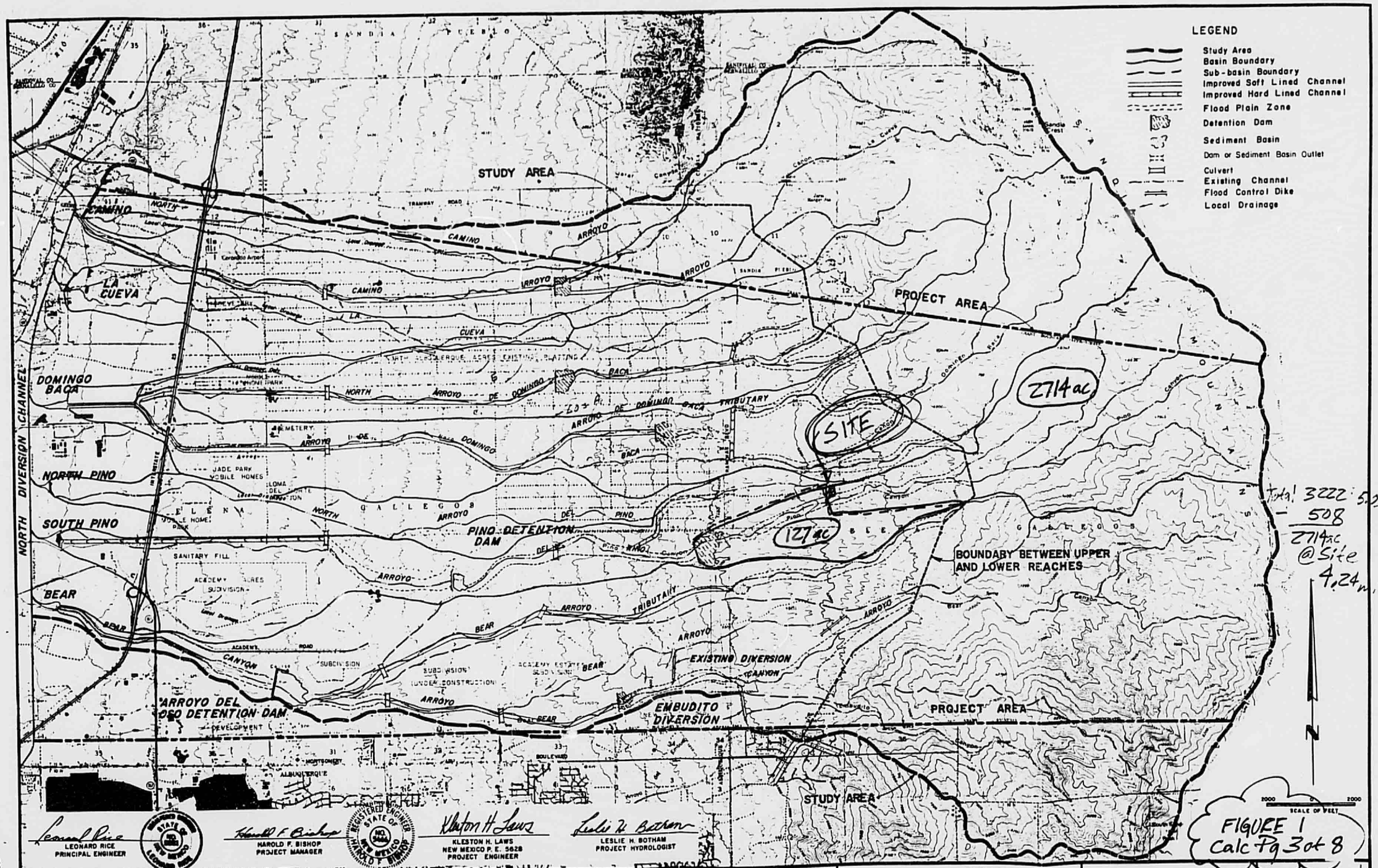

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FIGURE 1
Calc Pg 3 of 8

BASE MAP 7-1/2 MINUTE QUADRANGLE BY U. S. GEOLOGICAL SURVEY 1:24,000

Leonard Rice Consulting Water Engineers Inc
Denver Albuquerque

DESIGNED	K.H.L.	DATE	FEB. 1975
DRAWN	M.M.	DATE	MAR. 1975
CHECKED	H.F.B.	DATE	MAR. 1975
REVISED		DATE	

ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

DRAINAGE MANAGEMENT PLAN
NORTHEAST HEIGHTS

MASTER PLAN AND BASIN BOUNDARIES

SHEET NUMBER 1 OF 4

25×10 32×10 25×10

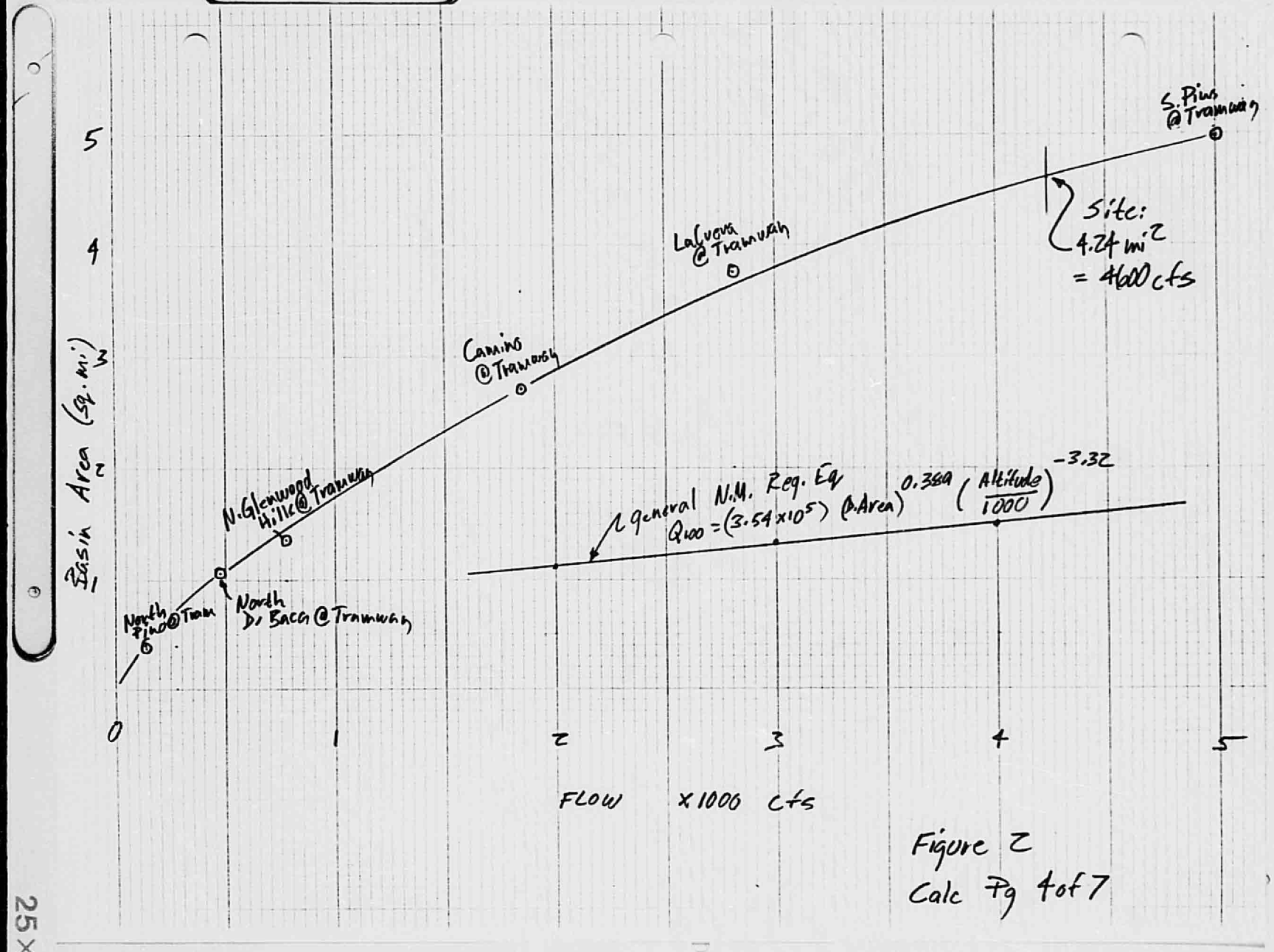

Figure 2
Calc Pg 4 of 7

621 : 0000 0000

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Project _____ Sheet 5 of 7
Job No. _____
By _____ Chk'd _____ Date _____

LOCAL HYDROLOGY (Drainage Report)

- Figure Z1 shows the site with Local Offsite Basin. The drainage area is approx. 1 acre upstream of the site. The onsite basin is 0.33 ac and this includes 0.053 ac of roof area.

-ONSITE DEVELOPED
Using DPM 22.2 Aug 1991 Table 2:

Zone 4 $P_{100} = 2.23"$ $P_{360} = 2.90"$

Impervious area = $\frac{\text{Roof + Conc Drive + walks}}{\text{Total Site}}$

$\frac{0.053 + 0.03}{0.33} = 25\%$

Gravel Drive + misc Type C = 30%
Remainder Type B + A, say B = 45%
Table 9.
Zone 4 Type A = 2.20
B = 2.92
C = 3.73
D = 5.25

$Q_{P100} = [2.92(0.45) + 3.73(0.30) + 5.25(0.25)]0.33$
$= 1.25$ cfs 100yr Peak Flow Developed

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Project _____ Sheet 6 of 7
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- ONSITE EXISTING

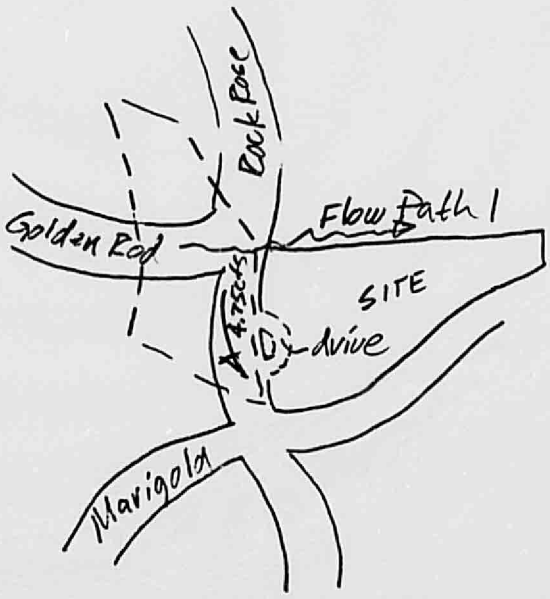
Entire site is undisturbed Type A

$Q'_{P_{100}} = 2.20(0.33) =$ **0.73 cfs**
100 yr Peak Existing

- OFFSITE LOCAL

Assume 70% Type D (Mostly Roadway)
30% Type C
for 1 acre basin

$3.73(0.3) + 5.25(0.7) =$ **4.75 cfs**
100 yr Local Offsite



- By inspection, Rock Rose Street section can carry 5 cfs (asphalt curbs). Need to elevate Drive way for water Block. Also Provide Flow path 1 for when

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Project _____ Sheet 7 of 7
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the flow from Golden Rod jumps the South Curb on Rock Rose.

May Be Desirable to provide rundown on East Property Line (Flow Path 1)

- All flow can be discharged to Pino arroyo without changing its capacity.

25×10

0000 0000 1133

PLANS/PLATS ON FILE

FILE DESC: D23/D2H

PLANS/PLATS 4

25×10

0000 0000 1134

25×10