County of Bernalillo

State of New Mexico

2400 BROADWAY, S.E.
ALBUQUERQUE, NEW MEXICO 87102
PUBLIC WORKS (505) 848-1500

February 4, 1999

Frank D. Lovelady, P.E.
Lovelady & Associates
300 Alamosa Road NW
Albuquerque, New Mexico 87107

RE: Engineer's for Bowlin's Convenience Store, Rio Puerco (M3/D1) (PWD-97-207) (PWDN-990013) Engineer's Certification Dated 1/27/99.

Dear Mr. Lovelady:

Prior to release of the Certificate of Occupancy for the above referenced site, the following comments from County Public Works and my office must be addressed:

1. You state that a portion of the eastern parking lot is not complete. Do you propose to recertify after this is complete? Also, it appears that the drainage patterns in this area do not match the approved plan. Please certify how this area drains.

2. A site inspection showed that the swale leading to the sink hole needed more definition in order to provide the drainage from this site.

3. The inspection also showed an opening in the concrete west of the canopy. This must be addressed.

4. Does the drop inlet that is currently under construction in the State right-of-way between this site and the frontage road impact your site?

If you have any questions, please call me at 924-3982, or contact Brad Catanach at the County.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Brad Catanach, P.E., Bernalillo County Public Works Division
File

Author: bradc@mercury.bernco.gov (Brad Catanach) at INTERNET
Date: 2/8/99 9:13 AM
Priority: Normal
Receipt Requested
BCC: Susan Calongne at CABQ-DOWNTOWN
TO: scalongne@cabq.gov at INTERNET
Subject: Bowlins Site, Comments

Susan,

Below in italics and bold are comments from G. Cashwell for Frank Lovelady's Bowlins. DO NOT SEND THE LETTER UNTIL I TALK TO ROGER ABOUT THIS SITE, THANKS.

Thursday, February 04, 1999

Performed "Pre-Final" inspection for Bowlin Convenience Store (PWD 97-207) this date with the following items noted:

1) The final surfacing of the Eastern Parking Area is not complete.
2) The drainage flows of the Eastern Parking Area do not appear to be the same as those shown on drainage plan.
3) A drop inlet is in the process of construction in the State R/W between the store and the frontage road.
4) There is presently an open rectangular opening in the concrete just west of the canopy that will need to be covered and filled in. (Open now for gas piping testing).
5) The swale leading into the sink hole needs more definition in order to allow drainage into hole.
6) Unresolved issue of North/South road easement (Roger Paul).

Grady Cashwell

Sr. Construction Inspector, Bernalillo County Public Works
Development Review Section

BERNALILLO COUNTY

PWD SUBMITTAL

Use for all PWD applications EXCEPT Street Excavation

☐ NEW SUBMITTAL

☑ RESUBMITTAL AS-BUILT ~~Grading~~ Flood Plain Ao

☐ FINAL SIGNOFF

TODAY'S DATE: January 27, 1999

PWDN 990013

CASE NO: 97-207

OWNER

OWNER: Bowlin Travel Centers PHONE: 266-5986

MAILING ADDRESS: 150 LOUISIANA CITY: ALBQ ZIP: 87108

AGENT

AGENT / CONTRACTOR: Frank D. Lovelady PHONE: 345-2267

MAILING ADDRESS: 300 ALAMOSA NW CITY: ALB ZIP: 87107

STATE LICENSE NO. EXP DATE VOLUME CLASS

ARCHITECT/ENGINEER: FRANK D. LOVELADY LICENSE NO. NMPE 6572 PHONE: 345-2267

SITE INFORMATION

SITE ADDRESS / DIRECTIONS: Take I-40 west to Rio Puerco. Take First exit Site is north of the frontage Road. ZONE ATLAS NO.: N-4.

LEGAL DESCRIPTION: Tract B-1 Land of Bowlin

LOT SIZE: 3.0 AC

EXISTING BUILDING(S) AND USE:

PROPOSED BUILDING(S):

UPC # 1-004-054-262-265-101-43

TYPE OF SUBMITTAL

- ☐ REPLAT
- ☐ MINOR SUBDIVISION
- ☐ MAJOR SUBDIVISION
- ☐ CONSTRUCTION DRAWINGS
- ☐ GRADING & DRAINAGE PLAN
- ☑ AS-CONSTRUCTED GRADING & DRAINAGE PLAN
- ☐ VARIANCE REQUEST
- ☐ LAND DIVISION
- ☐ TRAFFIC IMPACT ANALYSIS / TRAFFIC STUDY
- ☐ INFRASTRUCTURE LIST / DESIGN REVIEW
- ☐ SPECIAL USE PERMIT
- ☐ BARRICADING PERMIT
- ☐ BUILDING PERMIT
- ☐ INSPECTION
- ☐ OTHER (Specify):

The issuance of a permit or a review or approval of plan specifications, computations, and shop drawings, shall not be interpreted to be a permit for, or an approval of any variance or violation of any of the provisions of any COUNTY or STATE codes, ordinances, standards, or policies. Nor shall such issuance of a permit or approval of plans, specifications, computations, and shop drawings prevent any authorized COUNTY representative or COUNTY inspector form thereafter requiring the correction of errors in said plans, specifications, computations, or shop drawings or from stopping construction operations which are being carried on thereunder when in violation of any COUNTY or STATE codes, ordinances, standards, or policies.

☐ Owner ☑ Agent ☐ Contractor Signature Frank D Lovelady Date 1-27-99

COUNTY

BERNALILLO COUNTY USE ONLY

C/R's:		TOTAL FEE:	
		Receipt No.:	
		Received By:	

c:_PWD App-Rev: November 29, 1995

DRAINAGE INFORMATION SHEET

APPLICANT'S NAME: Bowlin Travel Centers ZONE ATLAS/DRNG. FILE #: M-3 / D-1

DRB #: _____ EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: TRACT B-1, LAND OF BOWLIN

CITY ADDRESS: _____

ENGINEERING FIRM: LOVELADY & ASSOC. CONTACT: FRANK D. LOVELADY

ADDRESS: 300 ALAMEDA NW 87107 PHONE: 345-2267

OWNER: Bowlin Travel Centers CONTACT: CINDY BIGGERS

ADDRESS: 150 LOUISIANA NE PHONE: 266-5986

ARCHITECT: GEN CON CONTACT: LARRY BROWN

ADDRESS: P.O. BOX 448 MESILLA NM PHONE: 505 523-4556

SURVEYOR: HARRIS SURVEYING CONTACT: TONY HARRIS

ADDRESS: 2416-D MONROE NE PHONE: 889-8056

CONTRACTOR: GEN CON CONTACT: LARRY BROWN

ADDRESS: P.O. BOX 448 MESILLA NM PHONE: 505 523-4556

TYPE OF SUBMITTAL:
- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ 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
- ___ DRAINAGE REQUIREMENTS
- ___ SUBDIVISION CERTIFICATION
- ___ OTHER _____ (SPECIFY)

DATE SUBMITTED: FEB 18, 1999

BY: Frank D. Lovelady

Revised 02/98

given to Jim Best

RECEIVED
FEB 18 1999
HYDROLOGY SECTION

County Public Works has issues

Do NOT Issue

C.O.

FP

Frank D. Lovelady, P.E.

FRANK D. LOVELADY, P.E.
300 ALAMOSA ROAD NW
ALBUQUERQUE, NM 87107

Telephone (505)345-2267

February 11,1999

Susan M. Calongne, P.E.
City/County Floodplain Administrator
c/o Bernalillo County Public Works Division
2400 Broadway S.E.
Albuquerque, NM 87102

RE: ENGINEER'S CERTIFICATION FOR BOWLIN'S CONVENIENCE STORE, RIO PUERCO (M3/D1) (PWD-97-207)(PWDN-990013) ENGINEER'S CERTIFICATION DATED 1-27-99.

Dear Ms. Calongne:

This letter is in response to your letter of February 9, 1999. Your letter had four (4) comments with regard to my submittal dated 1-27-99. My response follows:

1. The eastern parking lot is paved with 3" of asphalt over existing grades. The flow arrows have been revised to reflect this. No new spot elevations are shown. To find the as-constructed spot elevations in this area, add 0.25' to the existing spot elevations shown on the original topo. Paving was finished in this area on February 10, 1999.

2. The swale leading to the sink hole has been bladed and lined with gravel to provide more definition as you requested.

3. The opening in the concrete west of the canopy was an inspection hole for a splice in a fuel line. This hole has now been filled with concrete.

4. The drop inlet was originally part of the old station's drainage system. It is not in the highway right-of-way but it is in the strip that Bowlin has agreed to give the State. The original topo did not pick up this inlet but it was discovered during grading. It was too low to function with the new grades so the contractor raised the grate elevation so that it will drain the area adjacent to the right-of-way

outside of the new pavement. The inlet is connected by pipe to the other inlet which is near the SE corner of the canopy. This inlet has been shown on the plan.

If you have any questions or require additional information please do not hesitate to contact me.

Sincerely,

Frank D. Lovelady

Frank D. Lovelady, P.E.

c. Brad Catanach, P.E., Bernalillo County Public Works Division
Larry Brown, Gen Con

Give to
Susan
Calongne

County of Bernalillo

State of New Mexico

2400 BROADWAY, S.E.
ALBUQUERQUE, NEW MEXICO 87102
PUBLIC WORKS (505) 848-1500

March 2, 1998

Frank D. Lovelady, P.E.
Lovelady & Associates
300 Alamosa Road NW
Albuquerque, New Mexico 87107

RE: Drainage Report and Grading and Drainage Plan for Bowlin's Convenience Store, Rio Puerco (M3/D1) (PWD-97-207) Engineer's Stamp Dated 2/5/98.

Dear Mr. Lovelady:

Based on the information provided in the submittal of February 10, 1998, the above referenced plan is approved for Building Permit release.

Please be advised that the Engineer's Certification must be submitted to and approved by County Public Works and my office prior to Certificate of Occupancy release.

If you have any questions, please call me at 924-3982, or contact Brad Catanach at the County.

Sincerely,

Susan Calongne

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Andrew Garcia, City Hydrology
Brad Catanach, Bernalillo County Public Works Division
File

DRAINAGE INFORMATION SHEET

Rio Puerco,

OJECT TITLE: Bowlin's Convenience Store ZONE ATLAS/DRNG. FILE #: M-3 / D-1

B #: _____ EPC #: _____ WORK ORDER #: _____

GAL DESCRIPTION: Tract B-1, Land of Bowlin's & Por. Lands of Geo T. Hill

TY ADDRESS: Rio Puerco N.M.

IGINEERING FIRM: Lovelady & Associates CONTACT: Frank D. Lovelady

ADDRESS: 300 ALAMOSA NW PHONE: 345-2267

NER: BOWLIN'S INC. CONTACT: FRANK LOVELADY

ADDRESS: 150 LOUISIANA N E PHONE: 266-5985

RCHITECT: S. Duane Dorsey CONTACT: S. Duane Dorsey

ADDRESS: Las Cruces NM PHONE: _____

URVEYOR: Harris Surveying Co. CONTACT: Tony Harris

ADDRESS: 2412-D MONROE NE 87110 PHONE: 889-8056

ONTRACTOR: GEN CON CONTACT: _____

ADDRESS: P.O. Box 448, Mesilla NM 88046 PHONE: 523-4556

YPE OF SUBMITTAL:

✓ DRAINAGE REPORT

___ DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

___ OTHER

RE-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

___ DRAINAGE REQUIREMENTS

___ OTHER _____ (SPECIFY)

Review By City/County Flood Plain Administrator

ATE SUBMITTED: FEB 6, 1998

BY: Frank D. Lovelady

RECEIVED
FEB 10 1998
HYDROLOGY SECTION

Case Routing Slip

06-Feb-98 pwd - 97 - 207 Category: Resubmitt

Applicant Name: Frank D Lovelady **Application Date:** 06-Feb-98

Applicant Category: Drainage Engineer **Due Date:** 27-Feb-98

	Owner Info	Agent Info	Egr/Svy Info
Name	Bowlins Inc	FRANK D LOVELADY	
Address	150 Louisiana Blvd NE	300 Alamosa NW	
City	Albuquerque	Albuquerque	
State	NM	NM	
ZIP	87108	87107	
Ph	266-5985	345-2267	

Legal Description: TR B LAND OF BOWLIN & LANDS OF GEORGE T HILL

UPC: **Zone Map** M-3

Street Address: I-40 No Frontage Rd

Submittal Type: Design Review

Comments Required From:

DRAN ☑ **DRE** ☐ **ENGA** ☐ **INSP** ☐ **TRAF** ☐ **UTIL** ☐ **OTHE** ☐

Brad

Original
2/9/98

FP
2/9/98

RECEIVED
FEB 10 1998
HYDROLOGY SECTION

BERNALILLO COUNTY — PWD SUBMITTAL

Use for all PWD applications EXCEPT Street Excavation

☑ NEW SUBMITTAL
☐ RESUBMITTAL
☐ FINAL SIGNOFF

$20 /6935

TODAYS DATE: FEB. 6, 1998 CASE NO: PWD 97-207

OWNER

OWNER: BOWLIN'S, INC. PHONE: 266-5985
MAILING ADDRESS: 150 LOUISIANA BLVD. NE CITY: ALBUQ ZIP: 87108

AGENT

AGENT / CONTRACTOR: FRANK D. LOVELADY PHONE: 345-2267
MAILING ADDRESS: 300 ALAMOSA NW CITY: ALBUQ ZIP: 87107
STATE LICENSE NO. EXP DATE VOLUME CLASS
ARCHITECT/ENGINEER: FRANK D. LOVELADY LICENSE NO. NMPE 6512 PHONE: 345-2267

SITE INFORMATION

SITE ADDRESS / DIRECTIONS: TAKE I-40 WEST TO RIO PUERCO. ZONE ATLAS NO.: ~~N-A~~ M-3
TAKE EXIT BEFORE CROSSING BRIDGE. SITE IS ON THE RIGHT
LEGAL DESCRIPTION: TRACT B LAND OF BOWLIN AND A PORTION OF THE
NORTHERLY PORTION OF LANDS OF GEORGE T. HILL LOT SIZE: 2.2575 AC.
EXISTING BUILDING(S) AND USE: NO EXISTING BUILDINGS PROPOSED BUILDING(S): CONVENIENCE STORE
UPC # — — — — — —

TYPE OF SUBMITTAL

☐	REPLAT	☐	TRAFFIC IMPACT ANALYSIS / TRAFFIC STUDY
☐	MINOR SUBDIVISION	☐	INFRASTRUCTURE LIST / DESIGN REVIEW
☐	MAJOR SUBDIVISION	☐	SPECIAL USE PERMIT
☐	CONSTRUCTION DRAWINGS	☐	BARRICADING PERMIT
☑	GRADING & DRAINAGE PLAN	☑	BUILDING PERMIT
☐	AS-CONSTRUCTED GRADING & DRAINAGE PLAN	☐	INSPECTION
☐	VARIANCE REQUEST	☐	OTHER (Specify):
☐	LAND DIVISION		

The issuance of a permit or a review or approval of plan specifications, computations, and shop drawings, shall not be interpreted to be a permit for, or an approval of any variance or violation of any of the provisions of any COUNTY or STATE codes, ordinances, standards, or policies. Nor shall such issuance of a permit or approval of plans, specifications, computations, and shop drawings prevent any authorized COUNTY representative or COUNTY inspector form thereafter requiring the correction of errors in said plans, specifications, computations, or shop drawings or from stopping construction operations which are being carried on thereunder when in violation of any COUNTY or STATE codes, ordinances, standards, or policies.

☐ Owner ☑ Agent ☐ Contractor Signature: Frank D. Lovelady Date: FEB 6, 1998

COUNTY

BERNALILLO COUNTY USE ONLY

C/R's: TOTAL FEE:
Receipt No.:
Received By:

c:_PWD App-Rev: November 29, 1995

DRAINAGE REPORT

FOR

BOWLIN'S CONVENIENCE STORE AND TRAVEL STORE

RIO PUERCO

Bernalillo County, New Mexico

December 2, 1997 (Revised February 5, 1998)

Prepared by:

Frank D. Lovelady, P.E.

300 Alamosa NW

Albuquerque, New Mexico 87107

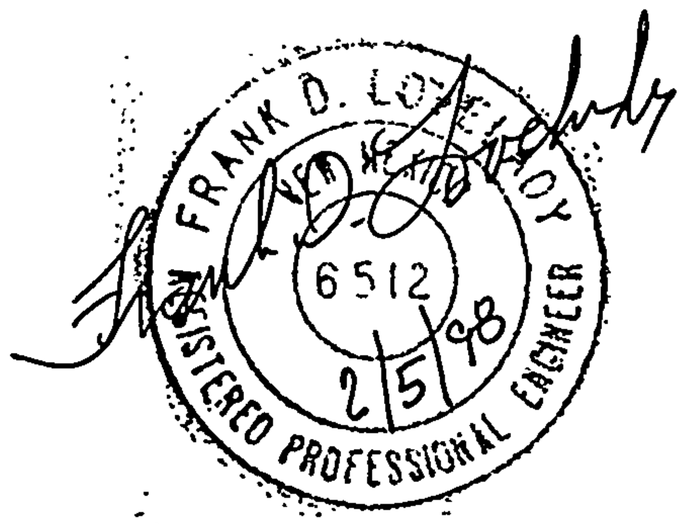
DRAINAGE REPORT

FOR

BOWLIN'S CONVENIENCE STORE AND TRAVEL STORE

RIO PUERCO

Bernalillo County, New Mexico



ENGINEER'S STAMP

SCOPE:

This report has been prepared for the purpose of obtaining a building permit for the construction of a convenience store/travel store on property abutting the north frontage road of Interstate Highway 40 east of the existing bridge crossing the Rio Puerco in Bernalillo County, New Mexico. The on-site runoff generated by the 100-year storm has been addressed and off-site flow generated by the unnamed arroyo west of the site is also addressed including the capacity of the arroyo and box culvert and it impact on the site. Initial steps have been taken in the process of initiating a Traffic Impact Analysis.

EXISTING CONDITIONS:

The site includes Tract B-1, Lands of Bowlin (0.8975 ac) and 1.25 acres west of Tract B-1 and 0.11 acre north of Tract B-1, both of which are a part of "Northerly Portion of Lands of George T. Hill, a Tract containing 32.8782 acres. The site is located adjacent to the North Frontage Road of Interstate Highway 40 approximately 1,000 feet east of the existing east bridge abutment of the North Frontage Road bridge over the Rio Puerco. Directly east of the site is an unnamed arroyo which has a concrete box culvert under the North Frontage Road and the westbound and eastbound lanes of I-40. The box culvert is approximately 225' east of the east boundary of the site.

The site is geographically located on a relatively flat bench of land lying between the Rio Puerco and the unnamed arroyo. At the widest part, adjacent to the I-40 North Frontage Road, the bench is approximately 1,400 feet between the west bank of the unnamed arroyo and the east bank of the Rio Puerco. At the narrowest point, 400 to 500 feet north of the frontage road, the width is approximately 900 feet. A berm has been constructed at some time in the past from the unnamed arroyo to the Rio Puerco at approximately a 30 degree angle with Interstate Highway 40 alignment. The berm

apparently was constructed to protect property improvements in the bench area from flooding resulting from overflow of the unnamed arroyo and to convey any such overflow into the Rio Puerco. The property improvements consist of a residence, a mobile home and several garage and service station buildings. The garage and service station buildings have recently been razed. The residence and mobile home are still present.

Adjacent to the site, the distance between the frontage road pavement and the right-of-way line is approximately 50 feet. The distance between the north edge of the westbound lane and the south edge of pavement on the frontage road is approximately 85 feet. The exit ramp from I-40 westbound lanes to the frontage road is east of the unnamed arroyo.

PROPOSED CONDITIONS:

It is proposed to construct a convenience store and fuel pump canopy as shown (See Grading and Drainage Plan at the back of this report). The Highway and Transportation Department District Engineer for District 3 has indicated a need to move the frontage road further north to give a wider separation at the off-ramp location. However, this situation has been resolved in meetings that representatives of Bowlin's have had with the Highway and Transportation Department.

FLOOD INSURANCE RATE MAPS (FIRM):

The site is covered by Flood Insurance Rate Maps (FIRM) 35001C0287 D and 35001C0291 D. The site is, for the most part, in Zone AO (depth 1). The extreme easterly end of the site in Zone AE which encompasses the unnamed arroyo and a reasonable distance on either side of the arroyo. The definitions for the two zones are as follows:

Zone AO Flood depths of one to three feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.

Zone AE - Base flood elevations determined.

Portions of the two FIRM maps which show the site have been spliced together and are presented in Figure 2.

FLOOD INSURANCE STUDY:

The Federal Emergency Management Agency has published a two-volume study entitled *"Flood Insurance Study, Bernalillo County, New Mexico and Incorporated Areas, Volumes 1 and 2 of 2 "*, Revised September 1996. Pages from this study have been included in this report as Figures 4 through 8. These pages are pertinent to the site in that they include information relative to the unnamed arroyo adjacent to the site.

OFF-SITE DRAINAGE CALCULATIONS:

There is really no off-site flow, as such, effecting the site other than overflow from the unnamed arroyo east of the site. The site is adjacent to the unnamed arroyo and is, therefore, subject to overflow from the arroyo that may occur because the box culvert under I-40 is not sufficiently large to accommodate the 100-year peak discharge. This can be seen from the FEMA Flood Profile which is shown in the back of this report. Figure 5 shows Table 2, a FEMA listing of peak discharge rates for various analysis points, including the unnamed Tributary No. 1, which is believed to be the unnamed arroyo adjacent to the site. The 100-year peak discharge rate for the unnamed arroyo is 4,450 cubic feet per second. The sections of the unnamed arroyo shown in Figure 4 show that the first section above the box culvert, Section D, has a water surface elevation of 5282.5' (NGVD). The second section, Section E, which is 419 feet upstream from Section D, has

a water surface elevation of 5282.5' (NGVD). The third section, Section F, which is 881 feet upstream from Section E, has a water surface elevation of 5282.6' (NGVD).

It should be noted that this arroyo has an extremely flat channel slope. The elevation shown for the culvert under the frontage road is approximately 66.5 and the quad map shows the 80 contour crossing the arroyo approximately 3300 feet upstream from the culvert. This is a slope of 0.0041 ft. per ft. Another thing that should be noted is that the culvert is only a short distance downstream from the site and it acts as a grade-control structure.

The cross sectional areas and mean velocities at Sections C and D shown in Figure 4, Floodway Data, are shown again in the following table along with the calculated peak discharge:

Section	Area (sf)	Mean Velocity(fps)	Peak Discharge(cfs)
C	167	8.4	1,403 *
D	1,935	2.3	4,450 *

*Calculated as follows: (Peak Discharge = Area x Mean Velocity)

The peak discharge rate at Section C, the first section south of I-40, is 1403 cfs. The Peak discharge rate at Section D, the first section north of I-40, is 4,450 cfs. This is also the figure for peak discharge shown in Figure 6 for the Unnamed Tributary No. 1. These figures indicate that a quantity of 4,450 - 1,430 = 3,047 cfs, almost 70 percent of the flow in the arroyo, overflows the arroyo banks and flows into the Rio Puerco as indicated by the AO flood zone. It is believed that the highest velocity would occur in the arroyo as the culvert reaches capacity, i.e., when the flow in the arroyo is 1,403 cfs. This is slightly larger than the ten year peak discharge, which is shown in Figure 6 as 1,290 cfs.

The flow is analyzed by means of Manning's Equation to determine the velocity and Froude number. The section analyzed begins near the building and ends where it intersects the 5273 contour. The contours only show the steep, high bank on the west and a gradually sloping area to the east . For the purposes of calculating the cross-sectional area, the east bank is assumed to begin to rise where the cross section intersects the 5273 contour. In the event the bank is further east, this assumption will be conservative.

By trial and error, a water surface elevation of 74.7 was found to result in a flow of 1,425 cf as shown below: Total Area = 220 sf. P = 78.5 ft. R = 220 / 78.5 = 2.80 N = 0.035.

$V = (1.486 / N)(R)^{2/3} (S)^{1/2} = 1.486 / 0.035)(2.80)^{2/3}(0.0059)^{1/2} = 6.48$ fps

$Q = AV = 220 \times 6.48 = 1{,}425$ cfs

FROUDE NUMBER:

The maximum depth is 74.7 - 69.0 = 5.7 feet. This is Y_1.

$F_R = (V / gd)1/2 \quad d = Y_1 + V^2 / 2g = 5.7 + 6.48^2 / (2 \times 32.2) = 6.35$ ft.

$F_R = (6.48 / (32.2 \times 6.35)^{1/2} = 0.45$

SCOUR DEPTH CALCULATIONS:

$Y_S = Y_1(4 F_R^{0.33}) = 5.7 (4 \times 0.45^{0.33}) = 17.52$ ft.

RIPRAP TYPE SELECTION:

Refer to "Urban Storm Drainage Criteria Manual, Volume 2", Denver Regional Council of Governments:

Use Table 5-5. The riprap selection factor, R, is given by the following equation:

$R = VS^{0.17} / (S_S - 1)^{0.66}$ $S_S = 2.5$ S = 0.0059 ft. / ft. V = 6.48 fps

$R = 6.48 \times 0.0059^{0.17} / (2.65 - 1)^{0.66} = 1.95$ $1.4<1.95<3.2$ Use Type VL riprap.

RIPRAP BLANKET THICKNESS:

Refer to "Urban Storm Drainage Criteria Manual, Volume 2", Denver Regional Council of Governments, Section 5.4.2 Rock Size and Lining Dimensions.

The riprap blanket thickness should be at least 1.75 times d_{50}. (See Grading and Drainage Plan. d_{50} is the same as K_m shown in the riprap specification table.) Therefore, the blanket thickness should be 1.75 x K_m or 1.75 x 6" = 10.5" thick. Use 12"

GRANULAR BEDDING UNDER RIPRAP BLANKET:

Refer to "Urban Storm Drainage Criteria Manual, Volume 2", Denver Regional Council of Governments, Table 5-4. Also refer to "Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico", Soil Conservation Service. The type of soil is Ha, Hantz, which is a silty clay, qualifying as a fine grained soil. For Type M riprap and fine-grained soils, 4" of Type I bedding and 4" of Type II bedding is required. One 12" layer of Type II bedding may be substituted.

RIPRAP LIMITS:

The slope of the channel is very flat so only one section was used to evaluate flow in the channnel. The erosion protection determined above is designed only for 1,403 cfs. As the culvert reaches capacity, the depth will increase, and the velocity will decrease.

The lower limits of the riprap would normally be determined by the scour analysis. However, in this case, the scour equation yields a scour depth of 17 feet, which, considering the downstream constraint of the box culvert acting as a grade control structure, is somewhat excessive. Another method of calculating the depth of riprap is to calculate the critical slope. The elevation of the toe of the riprap blanket would be equal to the elevation of the culvert inlet or grade-control structure plus the critical slope multiplied by the distance between the riprap protection and the culvert.

Critical slope: $S_c = (14.56\ n^2)\ /\ D_m^{1/3}$ (Brater/King 8-83)

Where, D_m is the area divided by the width at mean depth, or 220 / 23 = 8.46, and n is the Manning's coefficient.

$S_c = [14.56\ (0.035)^2]\ /\ 8.46^{1/3} = 0.0088$ ft./ft.

Elev. of riprap toe = 5265.5* + 400 x 0.0088 = 5269.0 Use elevation 5268.0 for an additional margin of protction. (*5265.5 is elev. of culvert, or grade control structure as shown on flood profiles, 78P.) It should be noted that the toe of the riprap slope, as measured 24' from the top of the bank, falls around the 5271 contour. So it will be buried approximately 3'.

The upper limits of riprap would normally be placed at the depth previously calculated as d, or 6.35', above the lowest level of the channel cross section (5269.0), plus a reasonable freeboard. This would be 6269.0 + 6.35 + 1.0 = 76.35. However, due to the backwater condition that will occur during the 100-year storm, the flow in the arroyo will gradually

rise with a decreasing velocity all the way to the top of the bank (approximately contour 80). Since this is on a curve, it is prudent to carry the riprap the additional 3.65 vertical feet to the top of bank.

RIPRAP THICKNESS:

ON-SITE DRAINAGE CALCULATIONS:

The site is almost entirely paved with a small area of landscaping on either side of the proposed convenience store.

Tract size - 2.2575 Acres.

Precipitation Zone 1, (DPM Part A.1)

Excess Precipitation, E (DPM Part A.5)

A = 0.44" B = 0.67" C = 0.99" D = 1.97" (100-year, 6-hour)

Assumptions:

Treatment A, Areas remaining natural	0 sf	0.0000 ac.
Treatment B, Landscaping	836 sf	0.0096 ac
Treatment C, Gravel Areas	0 sf	0.0000 ac
Treatment D, Building and Paved Areas	97,501 sf	2.2479 ac.
Totals	98,337 sf	2.2575 ac.

Volume, 100-year, 6-hour:

V = (E / 12)(A)

Treat B	V = (0.67/12)836	=	47 cf
Treat D	V = (1.97 / 12)(97,501)	=	16,006 cf
Total		=	16,053 cf

Peak Discharge, 100-year:

$$Q = (q)(A)$$

Peak Discharge per Acre (DPM, Table A-9);

q: A = 1.29 B = 2.03 C = 2.87 D = 4.37

Treat B	Q = 1.29 x 0.0096	=	0.01 cfs
Treat D	Q = 4.37 x 2.1033	=	9.19 cfs
Total			9.20

FIGURE 1 - VICINITY MAP

SHOWN ON A PORTION OF USGS QUADRANGLE MAP, LA MESITA NEGRA, NM

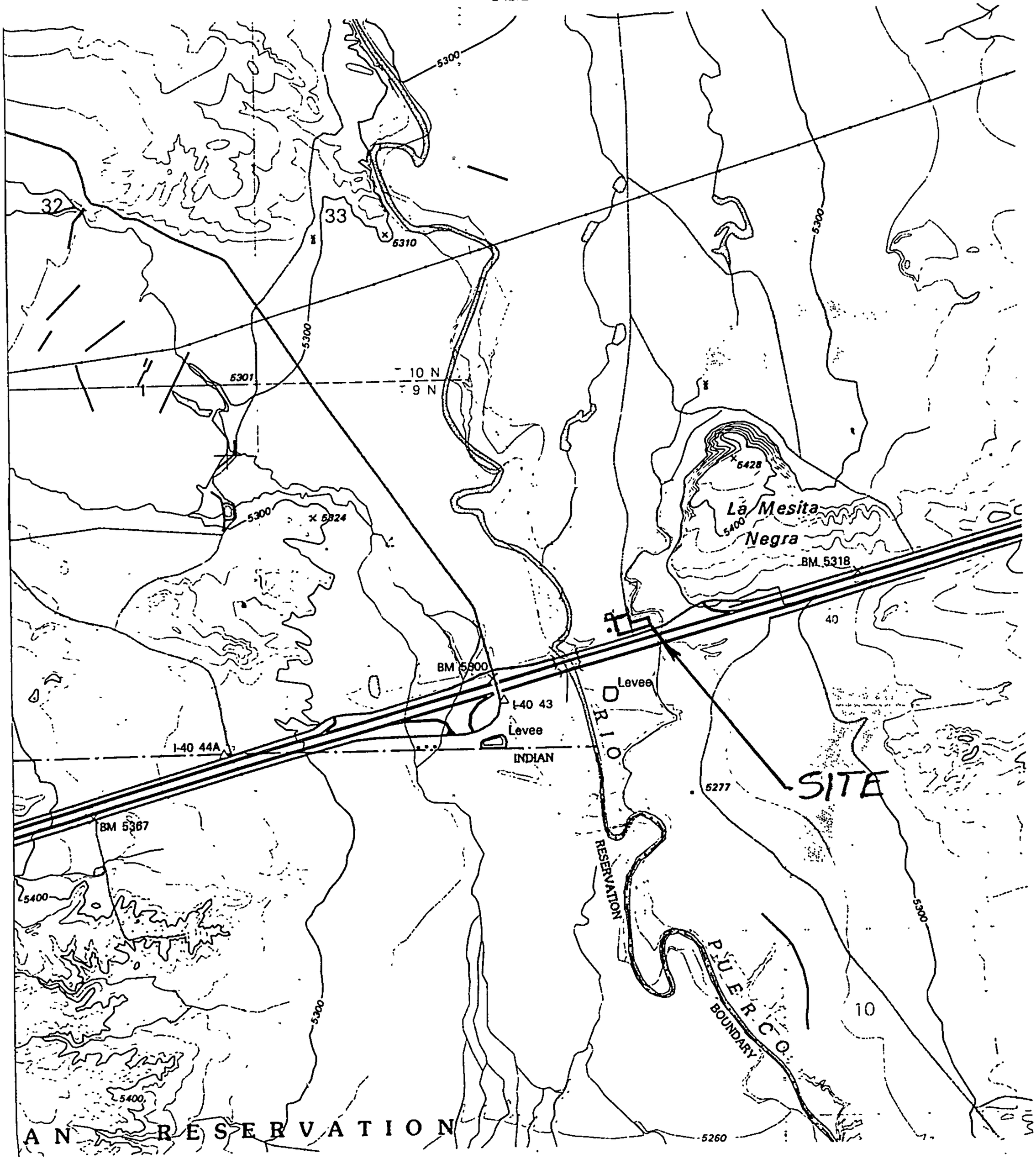


FIGURE 2 - FLOOD INSURANCE RATE MAP (FIRM)

PORTION OF MAPS 35001C0287 D AND 35001C0291 D

(For interpretation of symbols on this map, see Figure 3)

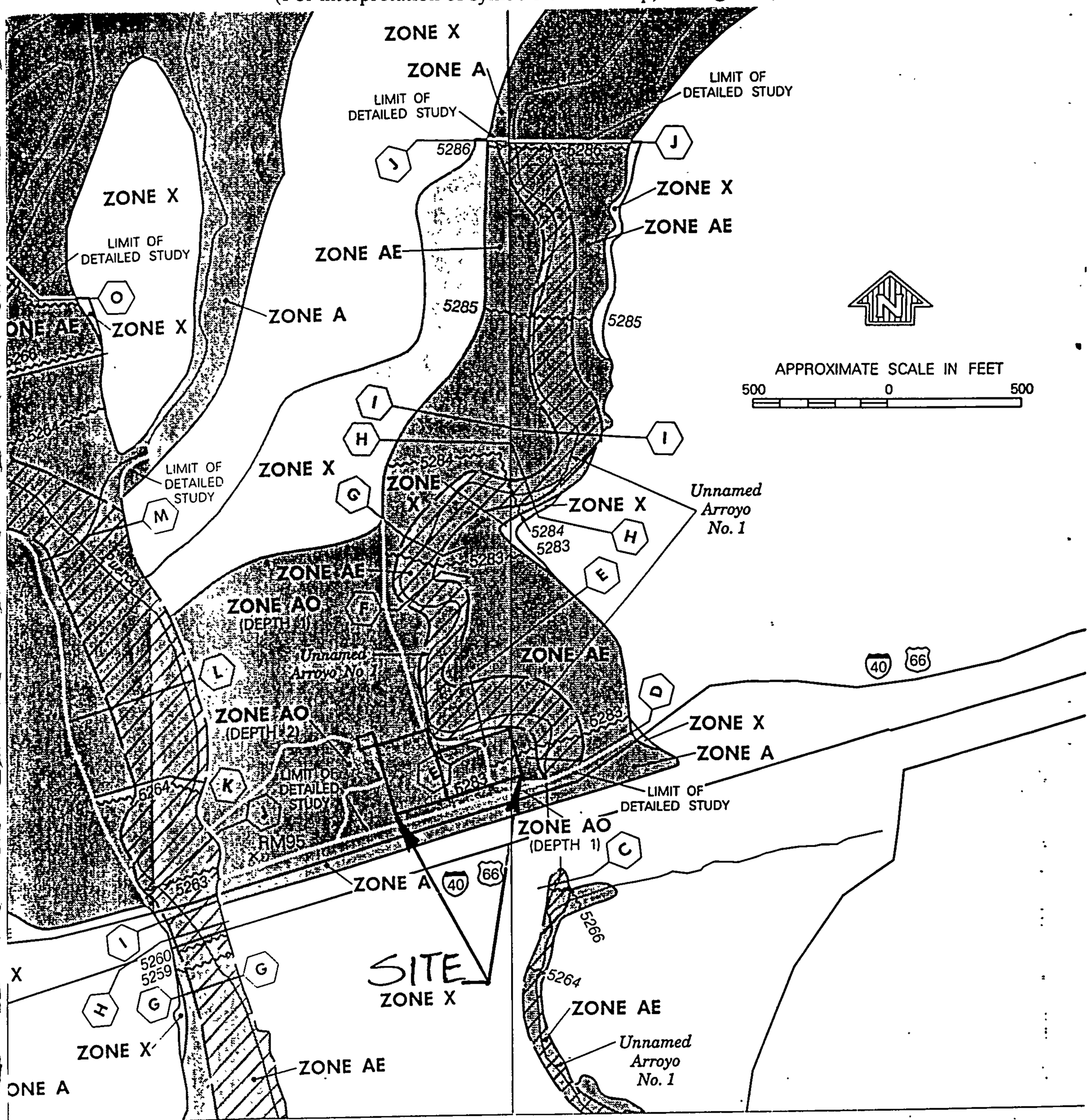


FIGURE 3 - LEGEND AND NOTES FOR FIRM MAP.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D—D Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × Elevation Reference Mark

● M2 River Mile

97°07'30", 32°22'30" Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size or all planimetric features outside Special Flood Hazard Areas

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action, these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AH, AO, A99, V, and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

SEPTEMBER 20 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE DATE shown on this map to determine when actuarial rates apply to structures in zones where elevations or depths have been established.

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

APPROXIMATE SCALE IN FEET

500 0 500

FIGURE 4 - FLOODWAY DATA

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Frost Arroyo (Cont'd)								
AA	12,660[1]	150	358	8.5	6,710.8	6,710.8	6,711.1	0.3
AB	12,310[1]	100	483	6.3	6,711.6	6,711.6	6,711.8	0.2
AC	12,880[1]	120	320	9.5	6,714.8	6,714.8	6,714.8	0.0
AD	13,365[1]	120	323	9.4	6,723.1	6,723.1	6,723.6	0.5
Unnamed Arroyo No. 1								
A	1,300[2]	45	140	10.0	5,258.4	5,255.4[3]	5,255.4[3]	0.0
B	2,030[2]	80	266	5.3	5,259.5	5,259.5	5,259.5	0.0
C	3,100[2]	78	167	8.4	5,266.0	5,266.0	5,266.0	0.0
D	3,550[2]	177	1,935	2.3	5,282.5	5,282.5	5,282.5	0.0
E	3,974[2]	180	1,660	2.7	5,282.5	5,282.5	5,282.5	0.0
F	4,855[2]	140	892	5.0	5,282.6	5,282.6	5,282.6	0.0
G	5,105[2]	150	593	7.5	5,282.6	5,282.6	5,282.6	0.0
H	5,625[2]	93	643	6.9	5,284.2	5,284.2	5,284.2	0.0
I	5,924[2]	173	1,059	4.2	5,284.6	5,284.6	4,285.1	0.5
J	7,155[2]	193	936	4.8	5,285.8	5,285.8	5,286.1	0.3

[1]Feet Above Confluence With San Pedro Creek
[2]Feet Above Confluence With Rio Puerco
[3]Elevations Computed Without Consideration of Backwater Effects

FIGURE 5 - SUMMARY OF PEAK DISCHARGES - RIO PUERCO

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Arroyo de las Calabacillas					
At confluence with Rio Grande	98.0	2,700	8,500	12,700	28,000
Upstream of confluence with Black's Arroyo	85.1	2,460	7,800	11,900	26,200
At upstream study limit	71.9	2,300	7,200	11,000	24,500
Canada del Ojo					
At Interstate Highway 40	76.5	5,100	8,870	10,800	15,800
Cedro Canyon Arroyo					
At confluence with Tijeras Arroyo	18.9	1,830	3,730	5,420	10,840
Frost Arroyo					
At downstream study limit	24.8	3,520	6,480	8,740	17,500
Upstream of unnamed tributary	10.5	1,710	2,910	3,790	7,580
Rio Grande					
At downstream study limit	14,650	3,300	10,200	15,200	34,200
At upstream study limit	14,100	4,000	11,850	17,860	37,900
Rio Puerco					
At Interstate Highway 40	2,490	15,400	26,900	32,600	47,900
San Pedro Creek					
Within detailed study limit	7.24	1,040	2,140	2,990	5,980

FIGURE 6 - SUMMARY OF PEAK DISCHARGES - UNNAMED ARROYO

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

Table 2. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Tijeras Arroyo					
At downstream study limit	67.1	5,080	9,970	14,060	28,100
Upstream of confluence with Cedro Canyon Arroyo	37.5	4,120	7,890	11,100	22,200
Upstream of confluence with Arroyo San Antonio	20.6	2,670	5,210	7,320	14,640
Upstream of confluence with South Diversion Channel	114	4,340	9,150	14,700	29,400
At USGS gage, 1 mile upstream of study limit	75.3	5,120	10,000	14,300	28,600
Unnamed Tributary No. 1					
At Interstate Highway 40	8.78	1,290	3,220	4,450	8,550
Arroyo A-B					
At Sage Road	0.1	81	149	179	1,767
Arroyo A-C					
At the Arenal Main Canal	0.2	122	247	263	372
Arroyo B-A					
At Unser Boulevard	0.1	29	67	90	126
Arroyo B-B					
At Unser Boulevard	0.5	71	225	338	544
Arroyo B-C					
At Unser Boulevard	0.7	138	342	494	757

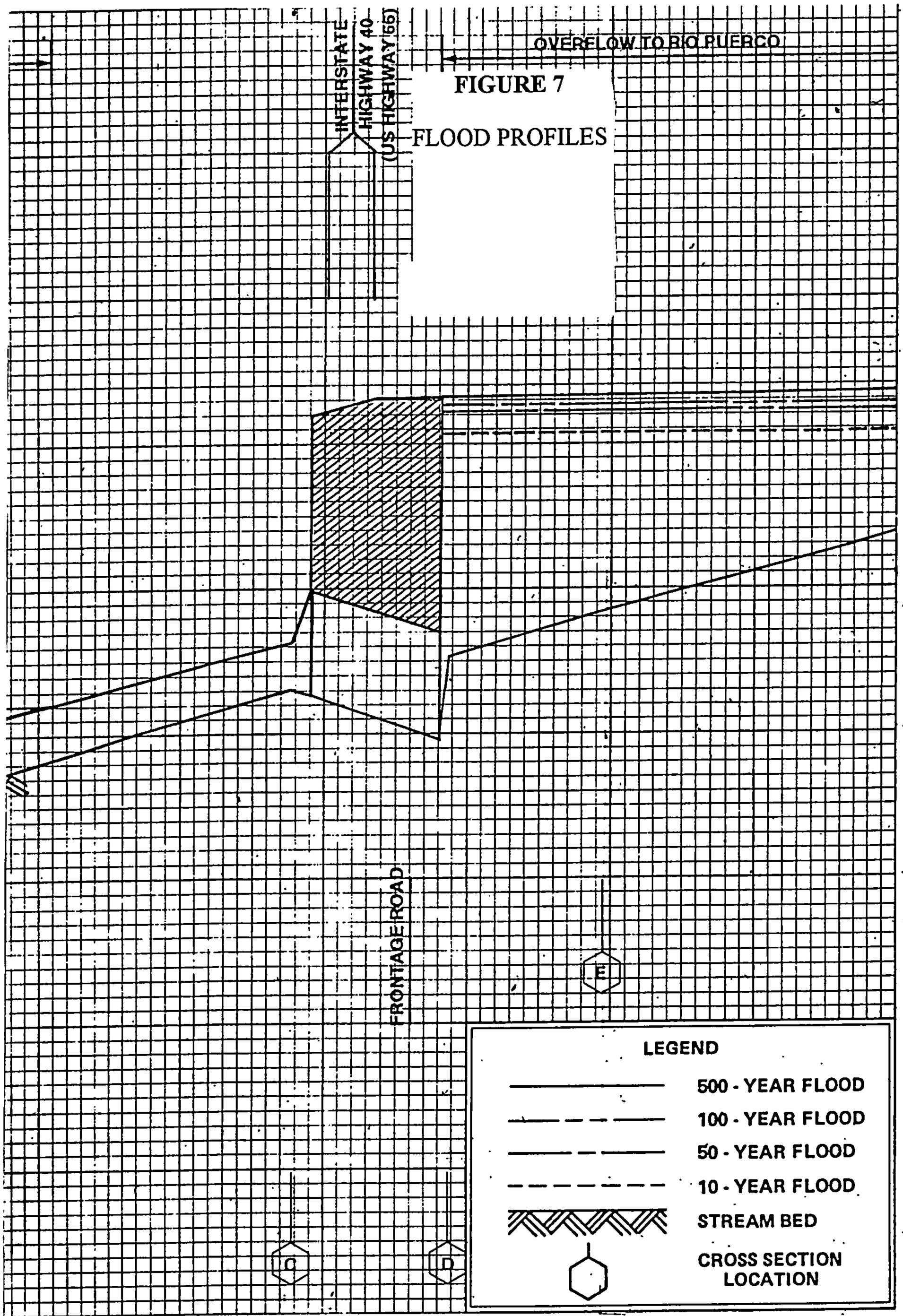


FIGURE 7

FLOOD PROFILES

FLOOD PROFILES

UNNAMED ARROYO NO.1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

78P

FIGURE 8

FLOOD PROFILES, CONTINUED

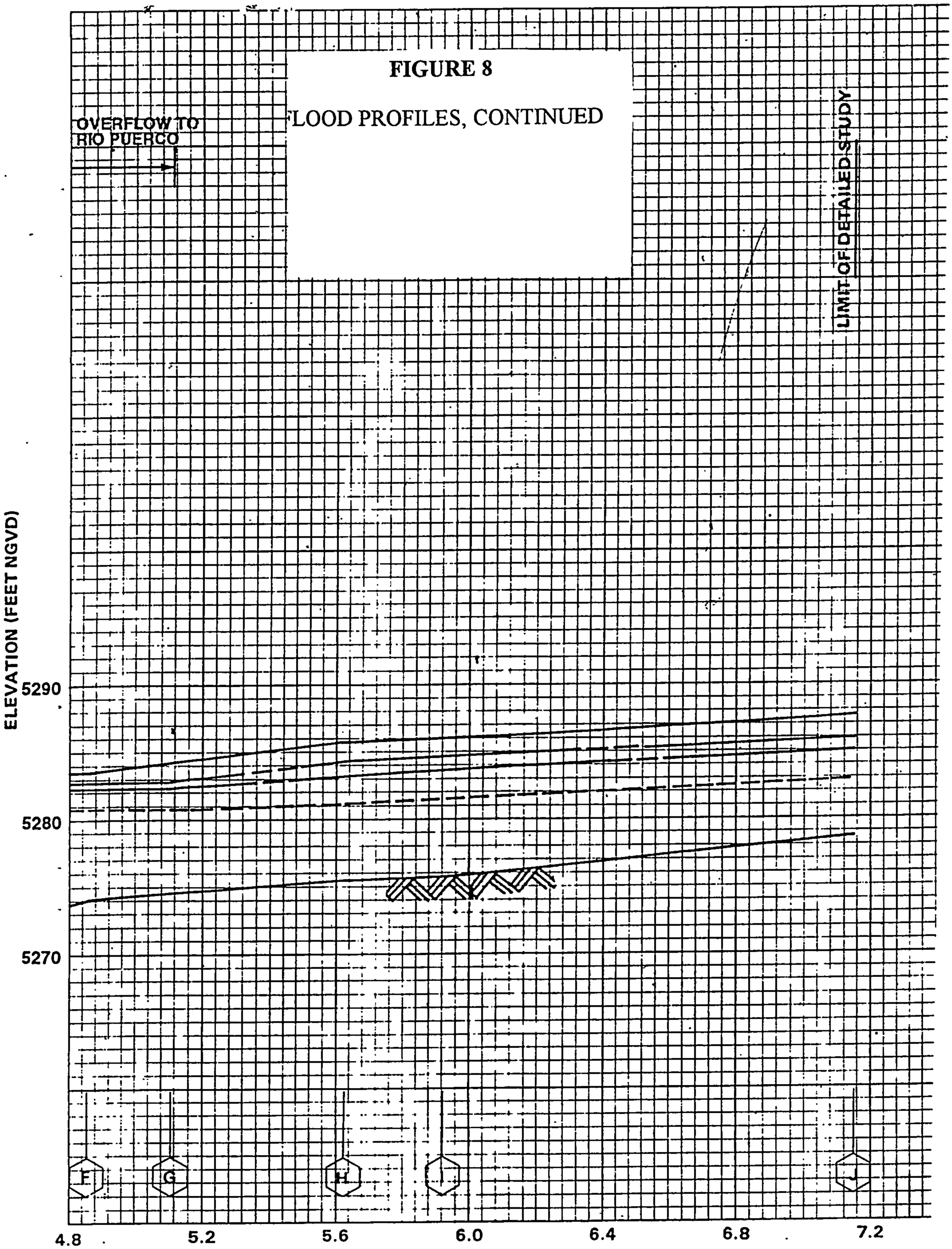


FIGURE 9

BERNALILLO COUNTY SOIL MAP

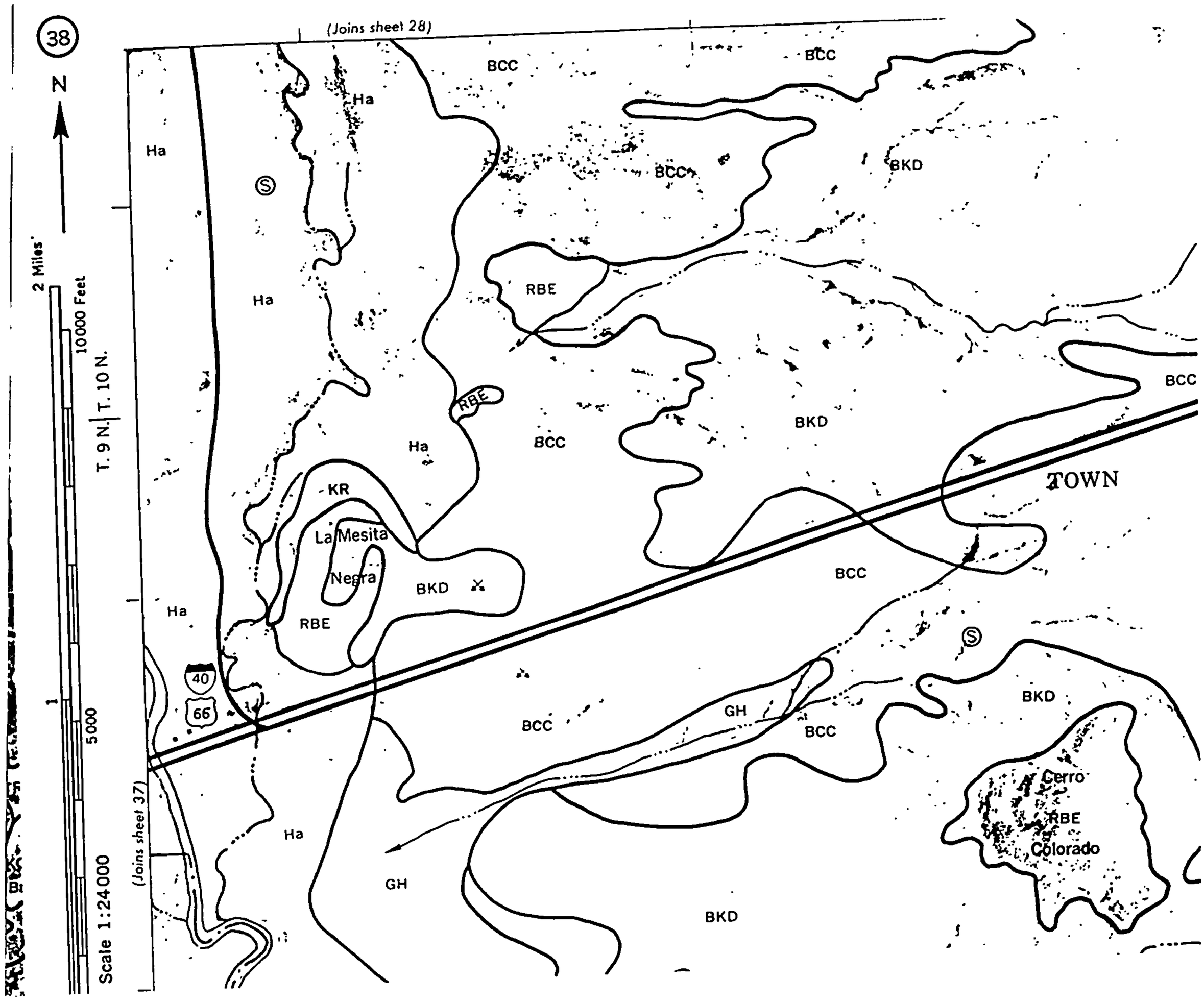
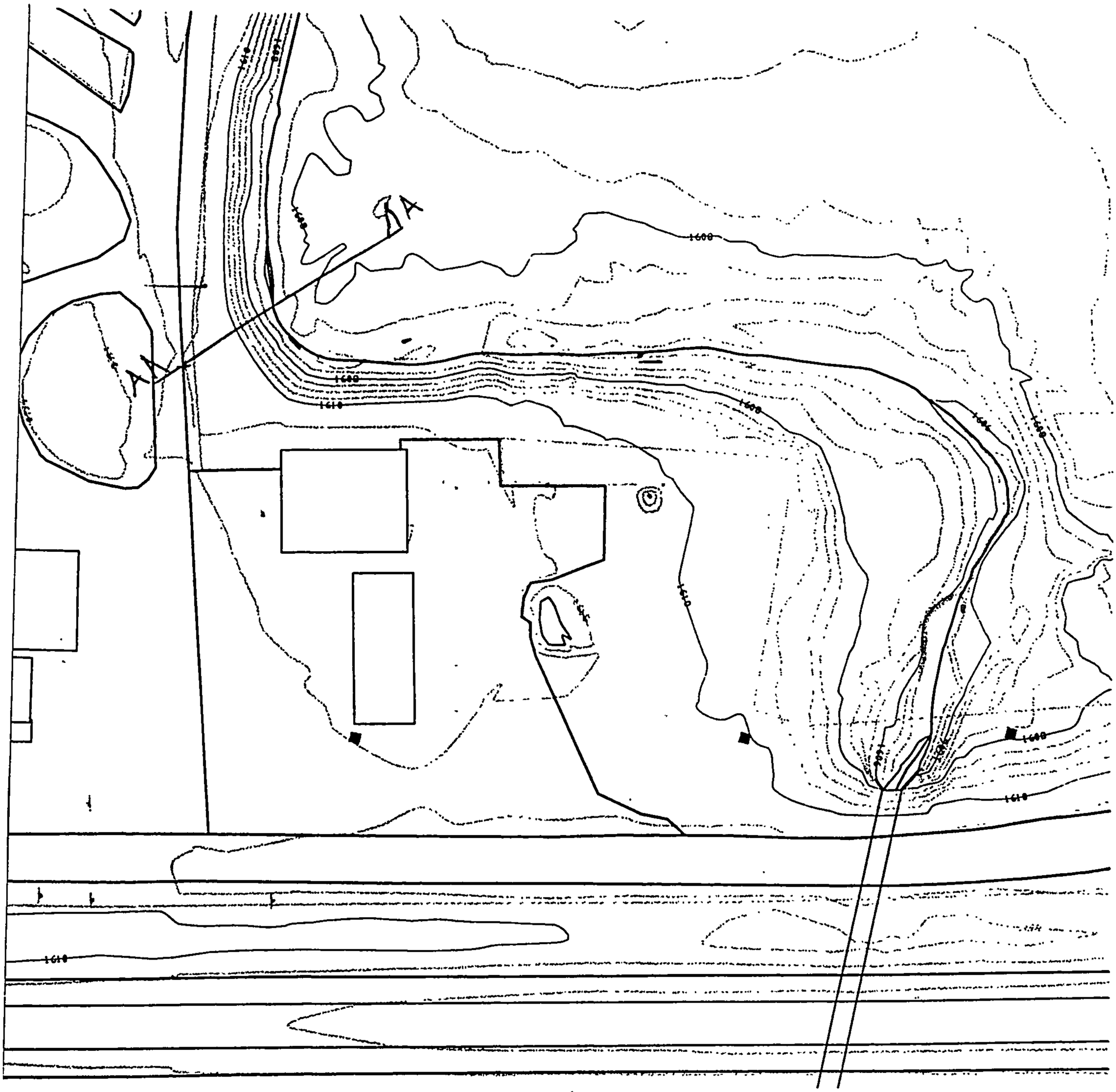


FIGURE 10

HIGHWAY DEPARTMENT TOPO MAP - SHOWING SHAPE OF UNNAMED ARROYO

This map is show for the purpose of showing the shape of the east bank of the unnamed arroyo which is not fully shown on the topographic survey that was performed for this site.



CONCLUSIONS:

1. The finish floor of the proposed convenience store should be at a minimum elevation of

5283.00, the elevation of the 100-year AO Floodplain.

3. The issue of moving the alignment of the existing frontage road (Old U.S. 66) to the

north has been resolved with the New Mexico State Highway and Transportation Department.

County of Bernalillo

State of New Mexico

2400 BROADWAY, S.E.
ALBUQUERQUE, NEW MEXICO 87102
PUBLIC WORKS (505) 848-1500

December 23, 1997

Frank D. Lovelady, P.E.
Lovelady & Associates
300 Alamosa Road NW
Albuquerque, New Mexico 87107

RE: Drainage Report and Grading and Drainage Plan for Bowlin's Convenience Store, Rio Puerco (M3/D1) (PWD-97-207) Engineer's Stamp Dated 12/2/97.

Dear Mr. Lovelady:

This letter is a compilation of comments from myself as well as from Bernalillo County Public Works Division. Prior to approval for Building Permit release, the following comments must be addressed:

1. It appears that this site must be protected against the arroyo on the northeast corner. Has bank protection been provided? Or is it proposed? A HEC-RAS or other analysis based on the downstream culvert capacity will be required. Consider a scour analysis based on the culvert capacity.

2. How will the realignment of the frontage road effect this site? Is information from the Highway Department available? Or will this information be provided in the future?

3. The Flood Insurance Study gives the elevation of the water surface adjacent to this site as 5283. Please provide justification for the floor elevation used.

If you should have any questions regarding these comments, please call me at 924-3982.

Sincerely,

Susan Calongne

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Brad Catanach, Bernalillo County Public Works Division
File

Rio Puerco, DRAINAGE INFORMATION SHEET

PROJECT TITLE: Bowlin's Convenience Store ZONE ATLAS/DRNG. FILE #: M-3/D-001 NEW

DRB #: _____ EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: Tract B-1, Land of Bowlin's & Por. Lands of Geo. T. Hill

CITY ADDRESS: Rio Puerco N.M.

ENGINEERING FIRM: Lovelady & Associates CONTACT: Frank D. Lovelady

ADDRESS: 300 ALAMOSA NW PHONE: 345-2267

OWNER: BOWLIN'S INC. CONTACT: FRANK LOVELADY

ADDRESS: 150 LOUISIANA N E PHONE: 266-5985

ARCHITECT: S. Duane Dorsey CONTACT: S. Duane Dorsey

ADDRESS: Las Cruces NM PHONE: _____

SURVEYOR: Harris Surveying Co. CONTACT: Tony Harris

ADDRESS: 2412-D MONROE NE 87110 PHONE: 889-8056

CONTRACTOR: GEN CON CONTACT: _____

ADDRESS: P.O. Box 448, Mesilla NM 88046 PHONE: 523-4556

TYPE OF SUBMITTAL: 3 F

✓ DRAINAGE REPORT

___ DRAINAGE PLAN

___ CONCEPTUAL GRADING & DRAINAGE PLAN

___ GRADING PLAN

___ EROSION CONTROL PLAN

___ ENGINEER'S CERTIFICATION

___ OTHER

PRE-DESIGN MEETING:

___ YES

✓ NO

___ COPY PROVIDED

RECEIVED
DEC 05 1997
HYDROLOGY SECTION

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

1 ✓ BUILDING PERMIT APPROVAL

___ CERTIFICATE OF OCCUPANCY APPROVAL

___ GRADING PERMIT APPROVAL

___ PAVING PERMIT APPROVAL

___ S.A.D. DRAINAGE REPORT

___ DRAINAGE REQUIREMENTS

___ OTHER _____ (SPECIFY)

Review By City/County Floodplain Administrator

DATE SUBMITTED: Dec 3, 1997

BY: Frank D. Lovelady

MOLZEN-CORBIN & ASSOCIATES

2701 Miles Road Southeast, Albuquerque, NM 87106
505-242-5700

☐ 205 West Bowa Number 4, Suite Number 5, P.O. Box 1360, Las Cruces, NM 88004
505-525-2397

LETTER OF TRANSMITTAL

DATE 12/5/97 JOB NO.

ATTENTION Floodplain Administration

RE: Drainage Reviews

TO Susan Calongne
600 2nd St. N.W.
Hydrology Division

GENTLEMEN:

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

COPIES	DATE	NO.	DESCRIPTION
			PWD-97-207

THESE ARE TRANSMITTED as checked below:

☐ For approval ☒ For your use ☐ As requested ☐ For review and comment

☐ Other _____

REMARKS _____

COPY TO _____

SIGNED: Debi Doose

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

RECEIVED
DEC 05 1997
HYDROLOGY SECTION

Case Routing Slip

03-Dec-97 | PWD - 97 - 207 | Category: Submittal

Applicant Name: BOWLINS INC
Application Date: 03-Dec-97
Applicant Category: Owner
Due Date: 24-Dec-97

	Owner Info	Agent Info	Egr/Svy Info
Name	BOWLINS INC	FRANK D LOVELADY	
Address	150 LOUISIANA BLVD N	300 ALAMOSA NW	
City	Albuquerque	ALBUQUERQUE	
State	NM	NM	
ZIP	87108	87107	
Ph	266-5985	345-2267	

Legal Description: TR B LAND OF BOWLIN & N PORT LANDS OF GEORGE HILL
UPC:
Zone Map M-3
Street Address: WEST OF RIO PUERCO
Submittal Type: Grading & Drainage Plan

Comments Required From:

DRAN ☑ DRE ☐ ENGA ☐ INSP ☐ TRAF ☐ UTIL ☐ OTHE ☐

Brad

RECEIVED
DEC 05 1997
HYDROLOGY SECTION

Original
12-4-97

F-P
12-4-97

BERNALILLO COUNTY

PWD SUBMITTAL

☑ NEW SUBMITTAL

☐ RESUBMITTAL

Use for all PWD applications EXCEPT Street Excavation

☐ FINAL SIGNOFF

TODAY'S DATE: 12-3-97

CASE NO: PWA-97-207

OWNER

OWNER: BOWLIN'S, INC. PHONE: 266-5985

MAILING ADDRESS: 150 LOUISIANA BLVD. NE CITY: ALBUQ ZIP: 87108

AGENT

AGENT / CONTRACTOR: FRANK D. LOVELADY PHONE: 345-2267

MAILING ADDRESS: 300 ALAMOSA NW CITY: ALBUQ ZIP: 87107

STATE LICENSE NO. EXP DATE VOLUME CLASS

ARCHITECT/ENGINEER: FRANK D. LOVELADY LICENSE NO: NMPE 6512 PHONE: 345-2267

SITE INFORMATION

SITE ADDRESS / DIRECTIONS: TAKE I-40 WEST TO RIO PUERCO. ZONE ATLAS NO.: N/A. M-3

TAKE EXIT BEFORE CROSSING BRIDGE. SITE IS ON THE RIGHT

LEGAL DESCRIPTION: TRACT B LAND OF BOWLIN AND A PORTION OF THE NORTHERLY PORTION OF LANDS OF GEORGE T. HILL

LOT SIZE: 2.2575 AC.

EXISTING BUILDING(S) AND USE: NO EXISTING BUILDINGS

PROPOSED BUILDING(S): CONVENIENCE STORE

UPC #: _ _ _ _ _ _ _ _ _ _ _ _ _ _

TYPE OF SUBMITTAL

- ☐ REPLAT
- ☐ MINOR SUBDIVISION
- ☐ MAJOR SUBDIVISION
- ☐ CONSTRUCTION DRAWINGS
- ☑ GRADING & DRAINAGE PLAN
- ☐ AS-CONSTRUCTED GRADING & DRAINAGE PLAN
- ☐ VARIANCE REQUEST
- ☐ LAND DIVISION
- ☐ TRAFFIC IMPACT ANALYSIS / TRAFFIC STUDY
- ☐ INFRASTRUCTURE LIST / DESIGN REVIEW
- ☐ SPECIAL USE PERMIT
- ☐ BARRICADING PERMIT
- ☑ BUILDING PERMIT
- ☐ INSPECTION
- ☐ OTHER (Specify):

RECEIVED
DEC 05 1997
HYDROLOGY SECTION

The issuance of a permit or a review or approval of plan specifications, computations, and shop drawings, shall not be interpreted to be a permit for, or an approval of any variance or violation of any of the provisions of any COUNTY or STATE codes, ordinances, standards, or policies. Nor shall such issuance of a permit or approval of plans, specifications, computations, and shop drawings prevent any authorized COUNTY representative or COUNTY inspector form thereafter requiring the correction of errors in said plans, specifications, computations, or shop drawings or from stopping construction operations which are being carried on thereunder when in violation of any COUNTY or STATE codes, ordinances, standards, or policies.

☐ Owner ☑ Agent ☐ Contractor Signature: Frank D. Lovelady Date: 12-3-97

COUNTY

BERNALILLO COUNTY USE ONLY

C/R's:

TOTAL FEE:

Receipt No.:

Received By:

c:_PWD App-Rev. November 29, 1995

DRAINAGE REPORT

FOR

BOWLIN'S CONVENIENCE STORE AND TRAVEL STORE

RIO PUERCO

Bernalillo County, New Mexico

December 2, 1997

Prepared by:

Frank D. Lovelady, P.E.

300 Alamosa NW

Albuqueque, New Mexico 87107

DRAINAGE REPORT

FOR

BOWLIN'S CONVENIENCE STORE AND TRAVEL STORE

RIO PUERCO

Bernalillo County, New Mexico

ENGINEER'S STAMP

SCOPE:

This report has been prepared for the purpose of obtaining a building permit for the construction of a convenience store/travel store on property abutting the north frontage road of Interstate Highway 40 east of the existing bridge crossing the Rio Puerco in Bernalillo County, New Mexico. The on-site runoff generated by the 100-year storm has been addressed and off-site flow generated by the unnamed arroyo west of the site is also addressed including the capacity of the arroyo and box culvert and it's impact on the site. Initial steps have been taken in the process of initiating a Traffic Impact Analysis.

EXISTING CONDITIONS:

The site includes Tract B-1, Lands of Bowlin (0.8975 ac) and 1.25 acres west ot Treact B-1 and 0.11 acre north of Tract B-1, both of which are a part of "Northerly Portion of Lands of George T. Hill, a Tract containing 32.8782 acres. The site is located adjacent to the North Frontage Road of Interstate Highway 40 approximately 1,000 feet east of the existing east bridge abutment of the North Frontage Road bridge over the Rio Puerco. Directly east of the site is an unnamed arroyo which has a concrete box culvert under the North Frontage Road and the westbound and eastbound lanes of I-40. The box culvert is approximately 225' east of the east boundary of the site.

The site is geographically located on a relatively flat bench of land lying between the Rio Puerco and the unnamed arroyo. At the widest part, adjacent to the I-40 North Frontage Road, the bench is approximately 1,400 feet between the west bank of the unnamed arroyo and the east bank of the Rio Puerco. At the narrowest point, 400 to 500 feet north of the frontage road, the width is approximately 900 feet. A berm has been

constructed at some time in the past from the unnamed arroyo to the Rio Puerco at approximately a 30 degree angle with Interstate Highway 40 alignment. The berm apparently was constructed to protect property improvements in the bench area from flooding resulting from overflow of the unnamed arroyo and to convey any such overflow into the Rio Puerco. The property improvements consist of a residence, a mobile home and several garage and service station buildings. The garage and service station buildings have recently been razed. The residence and mobile home are still present.

Adjacent to the site, the distance between the frontage road pavement and the right-of-way line is approximately 50 feet. The distance between the north edge of the westbound lane and the south edge of pavement on the frontage road is approximately 85 feet. The exit ramp from I-40 westbound lanes to the frontage road is east of the unnamed arroyo.

PROPOSED CONDITIONS:

It is proposed to construct a convenience store and fuel pump canopy as shown (See Grading and Drainage Plan at the back of this report). The Highway and Transportation Department District Engineer for District 3 has indicated a need to move the frontage road further north to give a wider separation at the off-ramp location. The frontage road would then transition back to its present location between the convenience store and the Rio Puerco Bridge. Of course, the Highway Department has design standards that must be adhered to but the question that arises is this: Why should the transition to the present alignment take place between the convenience store and the Bridge? It would seem that a transition with reverse curves would not be appropriate for the approach to a bridge. It would seem that the approach to the bridge should be as straight as possible for as long a distance as possible. Again, it would seem that the transition from a wider separated frontage road alignment to the existing frontage road alignment would be more logically made east of the unnamed arroyo. Offsetting the frontage road at the location of the convenience store will have a very negative impact on the proposed development. Other development currently taking place in the area may be influencing the constraints being placed on this site. Therefore, until a Traffic Impact Analysis has been approved, this

report is based on the assumption that the owner will be allowed to develop the site as shown.

FLOOD INSURANCE RATE MAPS (FIRM):

The site is covered by Flood Insurance Rate Maps (FIRM) 35001C0287 D and 35001C0291 D. The site is, for the most part, in Zone AO (depth 1). The extreme easterly end of the site in Zone AE which encompasses the unnamed arroyo and a reasonable distance on either side of the arroyo. The definitions for the two zones are as follows:

Zone AO Flood depths of one to three feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.

Zone AE - Base flood elevations determined.

Portions of the two FIRM maps which show the site have been spliced together and are presented in Figure 2.

FLOOD INSURANCE STUDY:

The Federal Emergency Management Agency has published a two-volume study entitled *"Flood Insurance Study, Bernalillo County, New Mexico and Incorporated Areas, Volumes 1 and 2 of 2 "*, Revised September 1996. Pages from this study have been included in this report as Figures 4 through 8. These pages are pertinent to the site in that they include information relative to the unnamed arroyo adjacent to the site.

OFF-SITE DRAINAGE CALCULATIONS:

There is really no off-site flow, as such, effecting the site. The site is adjacent to the unnamed arroyo and is, therefore, subject to overflow from the arroyo that may occur because the box culvert under I-40 is not sufficiently large to accomodate the 100-year peak discharge. This can be seen from the FEMA Flood Profile which is shown in the back of this report. Figure 5 shows Table 2, a FEMA listing of peak discharge rates for various analysis points, including the unnamed Tributary No. 1, which is believed to be the unnamed arroyo adjacent to the site. The 100-year peak discharge rate for the unnamed arroyo 4,450 cubic feet per second. The sections of the unnamed arroyo shown in Figure 4 show that the first section above the box culvert, Section D, has a water surface elevation of 5282.5' (NGVD). The second section, Section E, which is 419 feet upstream from Section D, has a water surface elevation of 5282.5' (NGVD). The third section, Section F, which is 881 feet upstream from Section E, has a water surface elevation of 5282.6' (NGVD).

The mean velocity at Section E, adjacent to the site, is 2.7 feet per second. This allows the Froude Number, F_R, to be calculated as follows:

$F_R = (V^2 / gd)^{1/2}$ $d = Y_1 + V^2/2g$ Y_1 = Flow depth, or water surface elevation minus bottom elevation ($Y_1 = 5282.5 - 5270.0 = 12.5$)

$d = 12.5 + (2.7^2 / 2 * 32.2) = 12.5 + 0.11 = 12.61$

$F_R = [2.7^2 / (32.2 \times 12.61)]^{1/2} = (0.134)$

ON-SITE DRAINAGE CALCULATIONS:

The site is almost entirely paved with a small area of landscaping on either side of the proposed convenience store.

Tract size - 2.2575 Acres.

Precipitation Zone 1, (DPM Part A.1)

Excess Precipitation, E (DPM Part A.5)

A = 0.44" B = 0.67" C = 0.99" D = 1.97" (100-year, 6-hour)

Assumptions:

Treatment A, Areas remaining natural	0 sf	0.0000 ac.
Treatment B, Landscaping	836 sf	0.0096 ac
Treatment C, Gravel Areas	0 sf	0.0000 ac
Treatment D, Building and Paved Areas	97,501 sf	2.2479 ac.
Totals	98,337 sf	2.2575 ac.

Volume, 100-year, 6-hour:

$V = (E / 12)(A)$

Treat B	$V = (0.67/12)836$	=	47 cf
Treat D	$V = (1.97 / 12)(97,501)$	=	16,006 cf
Total		=	16,053 cf

Peak Discharge, 100-year:

$Q = (q)(A)$

Peak Discharge per Acre (DPM, Table A-9);

q: A = 1.29 B = 2.03 C = 2.87 D = 4.37

Treat B	Q = 1.29 x 0.0096	=	0.01 cfs
Treat D	Q = 4.37 x 2.1033	=	9.82 cfs
Total			9.93

FIGURE 1 - VICINITY MAP

SHOWN ON A PORTION OF USGS QUADRANGLE MAP LA MESITA NEGRA, NM

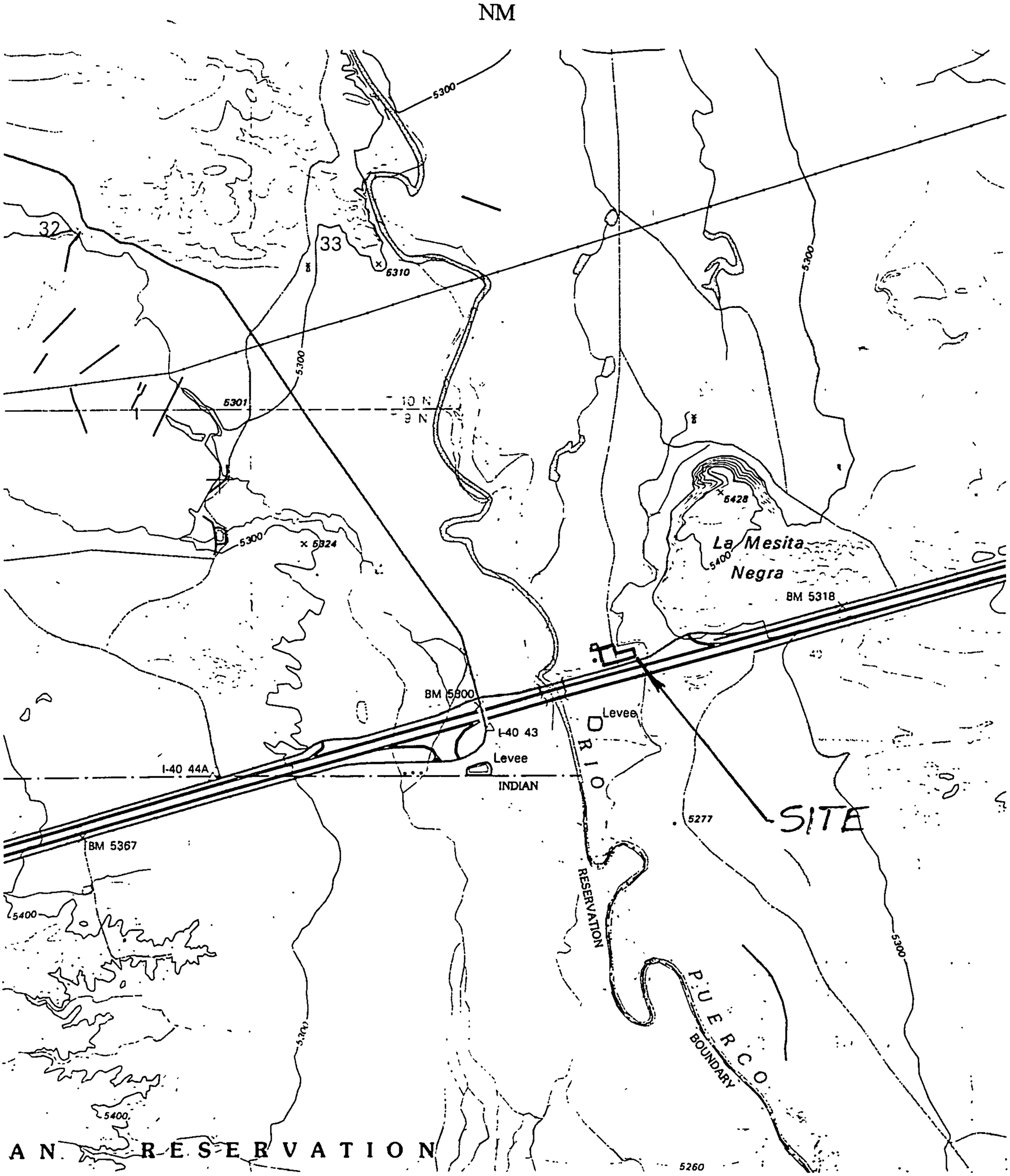


FIGURE 2 - FLOOD INSURANCE RATE MAP (FIRM)

PORTION OF MAPS 35001C0287 D AND 35001C0291 D

(For interpretation of symbols on this map, see Figure 3)

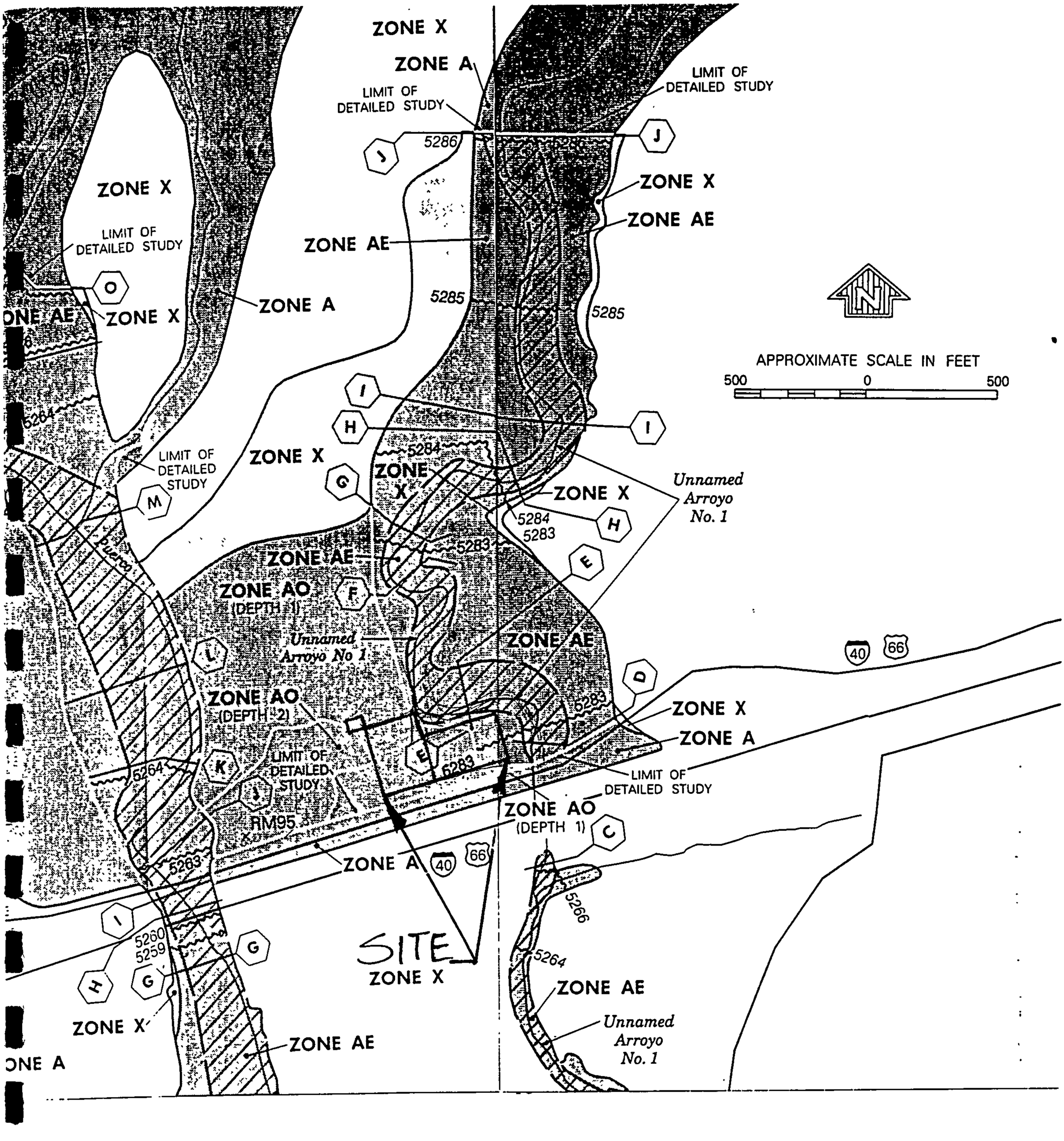


FIGURE 3 - LEGEND AND NOTES FOR FIRM MAP.

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100–YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100–year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500–year flood; areas of 100–year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100–year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500–year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D Cross Section Line

(EL 987) Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 Elevation Reference Mark

● M2 River Mile

97°07'30", 32°22'30" Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size or all planimetric features outside Special Flood Hazard Areas

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action, these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Areas of Special Flood Hazard (100–year flood) include Zones A, AE, AH, AO, A99, V, and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101–591).

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index

MAP REPOSITORY

Refer to Repository Listing on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP:

SEPTEMBER 20 1996

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE DATE shown on this map to determine when actuarial rates apply to structures in zones where elevations or depths have been established.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638–6620.

N

APPROXIMATE SCALE IN FEET

500 0 500

FIGURE 4 - FLOODWAY DATA

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Frost Arroyo (Cont'd)								
AA	12,660[1]	150	358	8.5	6,710.8	6,710.8	6,711.1	0.3
AB	12,310[1]	100	483	6.3	6,711.6	6,711.6	6,711.8	0.2
AC	12,880[1]	120	320	9.5	6,714.8	6,714.8	6,714.8	0.0
AD	13,365[1]	120	323	9.4	6,723.1	6,723.1	6,723.6	0.5
Unnamed Arroyo No. 1								
A	1,300[2]	45	140	10.0	5,258.4	5,255.4[3]	5,255.4[3]	0.0
B	2,030[2]	80	266	5.3	5,259.5	5,259.5	5,259.5	0.0
C	3,100[2]	78	167	8.4	5,266.0	5,266.0	5,266.0	0.0
D	3,550[2]	177	1,935	2.3	5,282.5	5,282.5	5,282.5	0.0
E	3,974[2]	180	1,660	2.7	5,282.5	5,282.5	5,282.5	0.0
F	4,855[2]	140	892	5.0	5,282.6	5,282.6	5,282.6	0.0
G	5,105[2]	150	593	7.5	5,282.6	5,282.6	5,282.6	0.0
H	5,625[2]	93	643	6.9	5,284.2	5,284.2	5,284.2	0.0
I	5,924[2]	173	1,059	4.2	5,284.6	5,284.6	4,285.1	0.5
J	7,155[2]	193	936	4.8	5,285.8	5,285.8	5,286.1	0.3

[1]Feet Above Confluence With San Pedro Creek
[2]Feet Above Confluence With Rio Puerco
[3]Elevations Computed Without Consideration of Backwater Effects

FIGURE 5 - SUMMARY OF PEAK DISCHARGES - RIO PUERCO

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

Table 2. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Arroyo de las Calabacillas					
At confluence with Rio Grande	98.0	2,700	8,500	12,700	28,000
Upstream of confluence with Black's Arroyo	85.1	2,460	7,800	11,900	26,200
At upstream study limit	71.9	2,300	7,200	11,000	24,500
Canada del Ojo					
At Interstate Highway 40	76.5	5,100	8,870	10,800	15,800
Cedro Canyon Arroyo					
At confluence with Tijeras Arroyo	18.9	1,830	3,730	5,420	10,840
Frost Arroyo					
At downstream study limit	24.8	3,520	6,480	8,740	17,500
Upstream of unnamed tributary	10.5	1,710	2,910	3,790	7,580
Rio Grande					
At downstream study limit	14,650	3,300	10,200	15,200	34,200
At upstream study limit	14,100	4,000	11,850	17,860	37,900
Rio Puerco					
At Interstate Highway 40	2,490	15,400	26,900	32,600	47,900
San Pedro Creek					
Within detailed study limit	7.24	1,040	2,140	2,990	5,980

FIGURE 6 - SUMMARY OF PEAK DISCHARGES - UNNAMED ARROYO

(From *Flood Insurance Study, Bernalillo County, New* Mexico *and Incorporated Areas* - FEMA, Revised September 20, 1996)

Table 2. Summary of Discharges (Cont'd)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
Tijeras Arroyo					
At downstream study limit	67.1	5,080	9,970	14,060	28,100
Upstream of confluence with Cedro Canyon Arroyo	37.5	4,120	7,890	11,100	22,200
Upstream of confluence with Arroyo San Antonio	20.6	2,670	5,210	7,320	14,640
Upstream of confluence with South Diversion Channel	114	4,340	9,150	14,700	29,400
At USGS gage, 1 mile upstream of study limit	75.3	5,120	10,000	14,300	28,600
Unnamed Tributary No. 1					
At Interstate Highway 40	8.78	1,290	3,220	4,450	8,550
Arroyo A-B					
At Sage Road	0.1	81	149	179	1,767
Arroyo A-C					
At the Arenal Main Canal	0.2	122	247	263	372
Arroyo B-A					
At Unser Boulevard	0.1	29	67	90	126
Arroyo B-B					
At Unser Boulevard	0.5	71	225	338	544
Arroyo B-C					
At Unser Boulevard	0.7	138	342	494	757

BOWLIN'S CONVENIENCE STORE - RIO PUERCO, NM 12/3/97

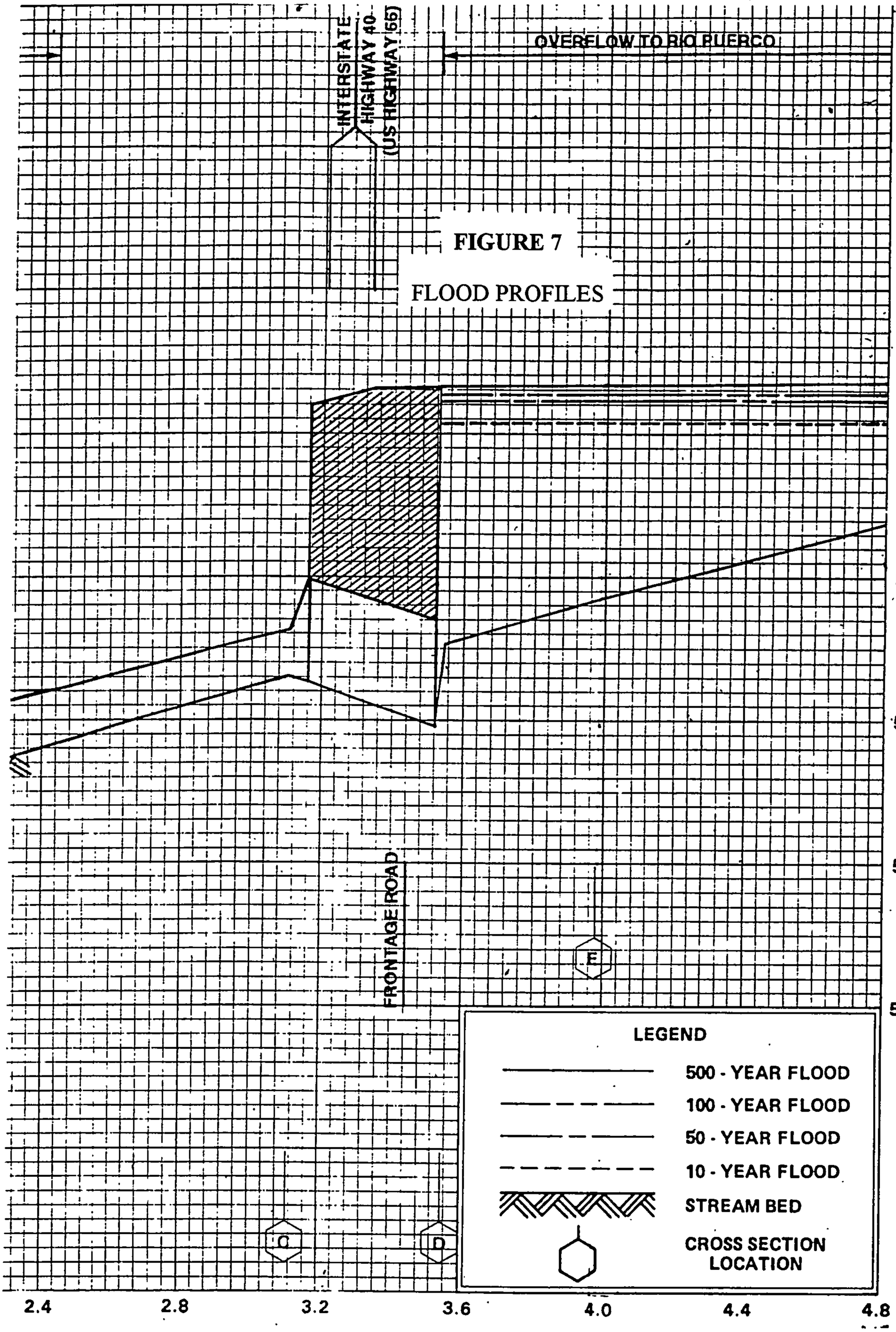


FIGURE 7

FLOOD PROFILES

FLOOD PROFILES

UNNAMED ARROYO NO.1

FEDERAL EMERGENCY MANAGEMENT AGENCY

BERNALILLO COUNTY, NM
AND INCORPORATED AREAS

78P

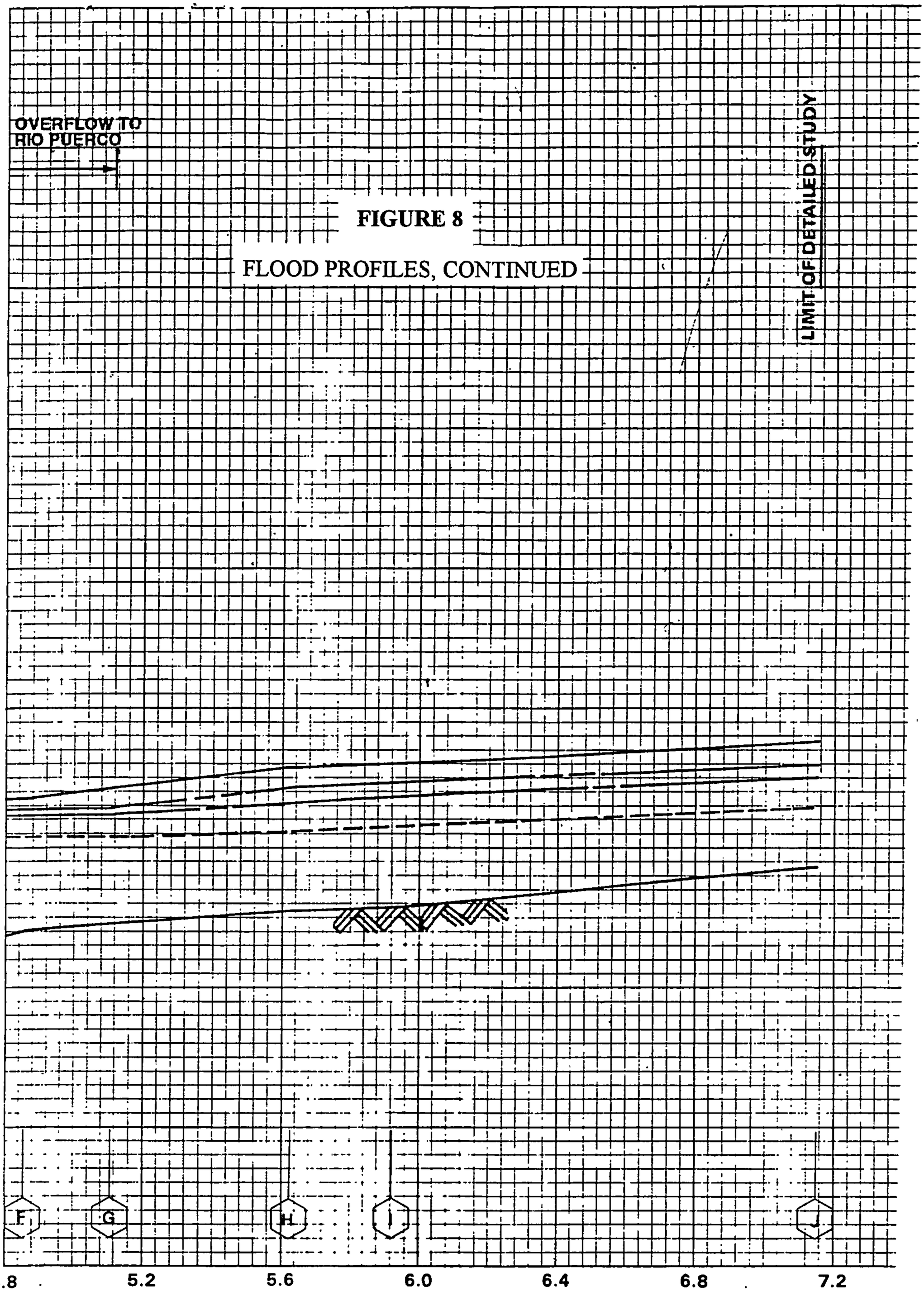


FIGURE 8

FLOOD PROFILES, CONTINUED

CONCLUSIONS:

1. The finish floor of the proposed convenience store should be at a minimum elevation of 5282.50, the elevation of the 100-year water surface at Section E of the unnamed arroyo. The elevation of the existing frontage road in front of the convenience store is 81.70 so the proposed finish floor elevation is somewhat conservative.

2. Attempts to obtain information from the Highway Department or from their consultant with regard to hydrologic or hydraulic studies of the unnamed arroyo were unsuccessful. Design of scour protection, if required, and rundown and other details cannot be successfully completed until this information becomes available.

3. Moving the alignment of the existing frontage road (Old U.S. 66) to the north will leave little possibility for developing the site in any reasonable manner. It will also result in a less desireable approach to the bridge over the Rio Puerco.