HYDROLOGY B23/D1 5 PLANS

B23/D1

5 PLANS

ENGINEERS PLANNERS PHOTOGRAMMETRISTS

BOHANNAN-HUSTON INC.

4125 CARLISLE BLVD., N.E. ALBUQUERQUE, NEW MEXICO 87107 505 881-2000
6713 VISCOUNT BLVD., EL PASO, TEXAS 79925 915 778-4491
330 GARFIELD, SANTA FE, NEW MEXICO 87501 505 988-7671

August 8, 1983

B23-D1

RECEIVED
AUG 10 1983
CITY ENGINEER

Mr. Richard Leonard
Executive Engineer
AMAFCA
2600 Prospect N.E.
Albuquerque, NM 87110

Re: Drainage Management Plan for Portions of Sandia Heights South, Unit 7 and Chamisa Park, Unit 3

Dear Rich:

Enclosed for your review is a copy of the referenced report. Please note that this document is an amendment to the February, 1975 report entitled "Drainage Report for Tracts 1 and 2, Unit 7 Sandia Heights South".

Please contact Brian Burnett or me if you have any questions regarding the submittal.

Sincerely yours,

for Michial M. Emery, P.E.
Vice President

Enclosure

cc: Mr. Orv Johnson
Mr. Bob Martin
Mr. Bruce Walcutt
Mr. Morris Hoover
Mr. Fred Aguirre
Mr. Don Krueger

BGB/blm
Job No. 3 161 2 – 3 161 3

PRINCIPALS
JERRY R. BOHANNAN, P. E. & L.S.
LARRY W. HUSTON
DONALD T. CREMANS, P. E.
C. J. (SKIP) MEAD, P. E.
MICHIAL M. EMERY, P. E.

ASSOCIATES
ANDRES ARAGON VIAMONTE, P. E.
JACK EICHORN
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G. LEE TRUSSELL
ISAAC J. PINO, P. E.
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DARRELL L. WADE, P. E.
PATRICK L. STIEHR, P. E.
DAVID M. Y. MILLIKAN, P. E.

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

October 3, 1983

Mr. Richard Leonard
Executive Engineer
A.M.A.F.C.A.
2600 Prospect N.E.
Albuquerque, N.M. 87110

RE: DRAINAGE MANAGEMENT PLAN FOR PORTIONS OF SANDIA HEIGHTS SOUTH, UNIT 7 AND CHAMISA PARK, UNIT 3

Dear Mr. Leonard:

I have reviewed the subject report and do not have any adverse comments. It appears that the drainage concerns have been addressed and the plan is workable if the report is followed.

Should you have any questions or comments concerning the review, please feel free to contact me.

Sincerely yours,

Billy J. Goolsby P.E.

Billy J. Goolsby, P.E.
Civil Engineer/Hydrology

BJG/tsl

Mr. Richard Leonard
Executive Engineer
AMAFCA
2600 Prospect N.E.
Albuquerque, NM 87110

RE: Drainage Management Plan for Portions of Sandia Heights South, Unit 7 and Chamisa Park, Unit 3

Dear Mr. Leonard:

I have reviewed the subject report and do not have any adverse comments. It appears that the drainage concerns have been addressed and the plan is workable if the report is followed.

Should you have any questions or comments concerning the review, please feel free to contact me.

Sincerely yours

Billy J Goolsby P.E.

Civil Engineer / Hydrology

9/28/83 ~~AA~~.

Review of Drainage Management Plan
For Portions of Sandia Heights South
Unit 7 and Chamisa Park Unit 3

Do not have any adverse comments

FORWARD A
MEMO TO RICH
LEONARD REGARDING
OUR REVIEW.

RECEIVED
AUG 10 1983
CITY ENGINEER

DRAINAGE MANAGEMENT PLAN FOR PORTIONS OF SANDIA HEIGHTS SOUTH UNIT 7 AND CHAMISA PARK UNIT 3

JULY, 1983

BOHANNAN-HUSTON INC.

DRAINAGE MANAGEMENT
PLAN
FOR PORTIONS OF
SANDIA HEIGHTS SOUTH UNIT 7
AND
CHAMISA PARK UNIT 3

JULY, 1983

NOTE: This document is an amendment to the "Drainage Report for Tracts 1 and 2, Unit 7 Sandia Heights South" – February, 1975

DRAINAGE MANAGEMENT PLAN
FOR PORTIONS OF
SANDIA HEIGHTS SOUTH UNIT 7
AND
CHAMISA PARK UNIT 3

JULY, 1983

PREPARED FOR

LINE ENTERPRISES
MR. ORVILLE JOHNSON
MR. BOB MARTIN

PREPARED BY

BOHANNAN–HUSTON, INC.
4125 CARLISLE BOULEVARD, N.E.
ALBUQUERQUE, NM 87107
505/881-2000

DAVID M. Y. MILLIKAN
NEW MEXICO
7547
8-8-83
REGISTERED PROFESSIONAL ENGINEER

David M Y Millikan

DAVID M. Y. MILLIKAN, P.E.
N.M.P.E. NO. 7547

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METHOD OF ANALYSIS	1
EXISTING CONDITIONS	2
PROPOSED CONDITIONS	3
EROSION CONTROL PLAN	4

PLATES

PLATE 1 – Vicinity Map

PLATE 2 – SCS Soils Map

PLATE 3 – Flood Hazard Boundary Map

PLATE 4 – Off-Site Watershed Boundaries

PLATE 5 – Box Culvert and 24" RCP Detail

PLATE 6 – Chamisa Park Site Layout

PLATE 7 – Drainage Management Plan (in rear pocket)

APPENDIX

APPENDIX 1 – Off-Site Runoff Computations

APPENDIX 2 – July 6, 1983 Letter from Michial Emery to Richard Leonard

APPENDIX 3 – Arroyo Capacity Calculations

PURPOSE AND SITE LOCATION

The purpose of this report is to present a comprehensive management plan for the area bounded by Tramway Lane on the south, Tramway Boulevard on the west, the Sandia Peak Access Road on the north, and the Chamisa Park development on the east. More specifically, the site is identified as Lots 2A, 3A, and 4A, Tract 1 Sandia Heights South, Unit 7 and a portion of Tract B Chamisa Park Unit 3. Plate 1 identifies the location and associated Zone Atlas pages. A copy of the plat indicating these areas is included in the rear pocket of this report.

Plans for the proposed developments will be in accordance with critiera and guidelines established by the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA). This report also serves as an amendment to the "Drainage Report for Tracts 1 and 2, Unit 7—Sandia Heights South", which was prepared by Bohannan—Huston, Inc. in February of 1975.

SITE DESCRIPTION

The site slopes from the east to the west at approximately 4-6%. Soil type in the area is classified as Embudo—Tijeras Complex, and is listed as soil type 'B' (Plate 2). Native vegetation covers approximately 65-70% of the site. Natural, meandering arroyos, typical throughout Sandia Heights, traverse this area as well. Plate 3 is taken from the Flood Hazard Boundary Maps which identifies the extent of flooding during the 100-year storm.

METHOD OF ANALYSIS

Criteria outlined in Section 22.2 of the Development Process Manual (DPM) was used to compute existing and developed flowrates.

More specifically:

- 'C' Value: Plate 22.2 C-1
- Time of Concentration: Kirpich Equation
- Rainfall Amount: Plate 22.2 D-1
- Intensity: Plate 22.2 D-2
- Flowrate Computation: Rational Formula

The DPM and AMAFCA guidelines were used to establish design guidelines for channel improvements.

EXISTING CONDITIONS

The 1975 drainage report identified the off-site watersheds impacting the site. The watershed boundaries are outlined on Plate 4. Runoff computations (Appendix 1) indicate that "new" and "old" methods of estimating flow yield the same rates. Therefore, the values of 350 cfs for Area I and 250 cfs for Area II will be used for design purposes.

The 1975 report also called for the construction of a berm located northeast of the sites as a means to divert flows from Area II around the Chamisa Park development. This facility was constructed in 1976 and a recent field inspection indicated that the berm is functioning as intended.

In 1976, Bohannan–Huston, Inc. prepared plans for the construction of a double 6' x 6' box culvert under Tramway Boulevard. The culverts were designed to carry a combined flowrate of approximately 600 cfs assuming inlet control. The box culvert has been constructed. There is minimal sedimentation within the culvert and there is very little erosion occurring upstream and downstream of the concrete aprons. The plans also called for construction of an earthen embankment immediately south of the arroyo at the upstream end of the culvert (Plate 5). A 24" RCP was also to be installed in order to convey the flows generated immediately east of Tramway beneath the roadway. At this time, the embankment and RCP have not been constructed .

The site has been identified as three different areas. Area A – County Line Restaurant, Area B – Chamisa Park/Sandia Heights South, and Area C – Lots 3A/4A Sandia Heights South. The south side of Area A is impacted by runoff within the arroyo. The access road to the Sandia Peak Tram serves as a buffer to protect the site from any other off-site flows. Much of Area A slopes toward the arroyo.

Area B represents the final phase of the Chamisa Park Development. Runoff diverted by the berm impacts the south boundary of this area. The arroyo in this area is covered by a 50' drainage easement.

Area C is impacted by the main arroyo which crosses the NE corner of the property. Pirate channels carrying flows generated within the Chamisa and Sandia Park developments also traverse Area C before rejoining the main arroyo near the box culverts.

PROPOSED CONDITIONS

Development criteria for the three parcels is contained in a July 6, 1983 letter from Michial Emery to Rich Leonard (Appendix 2). Plate 7 identifies the areas referenced in the letter.

Area A

Construction of the County Line Restaurant is anticipated in the near future. However, the site plan has not yet been finalized. Once the site plan is finalized, a detailed grading plan will be submitted to ensure compliance with development requirements contained in the letter.

Area B

The drainage management plan identifies the layout for three units and typical cross-sections. As per item 2a of the July 6, 1983 letter, no parking is proposed in the easement. Appendix 3 contains calculations verifying that there is adequate capacity within the easement to carry the required 250 cfs.

Prior to certificates of occupancy being issued for units presently being constructed south of the arroyo, the improvements indicated on the drainage management plan for Area B must be constructed.

Area C

No formal development plans have been prepared for this area at this time. It is proposed that until such plans are formulated, the drainage patterns across the site remain as they currently exist. Any development in this area will require a grading/drainage plan which addresses items such as:

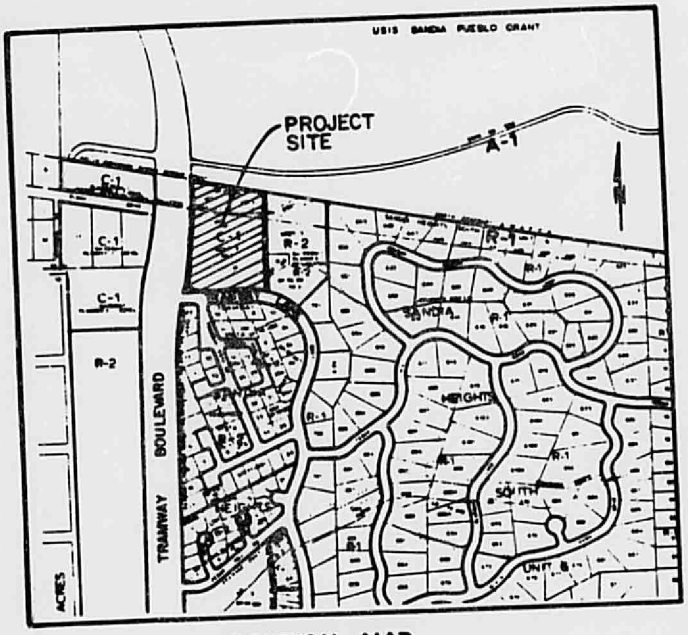
a. Diversion of off-site flows
b. Construction of the culvert and berm
c. Bank protection
d. Management of flows generated on-site

This plan will be coordinated with, and submitted along with the plan for the restaurant site.

EROSION CONTROL PLAN

An attempt should be made during the construction phase of Chamisa Park Unit 3 to prevent sediment from impacting the natural arroyo and the box culverts downstream. It is recommended that an erosion control berm (as indicated on Plate 7) be constructed immediately downhill from the building during construction.

PLATES

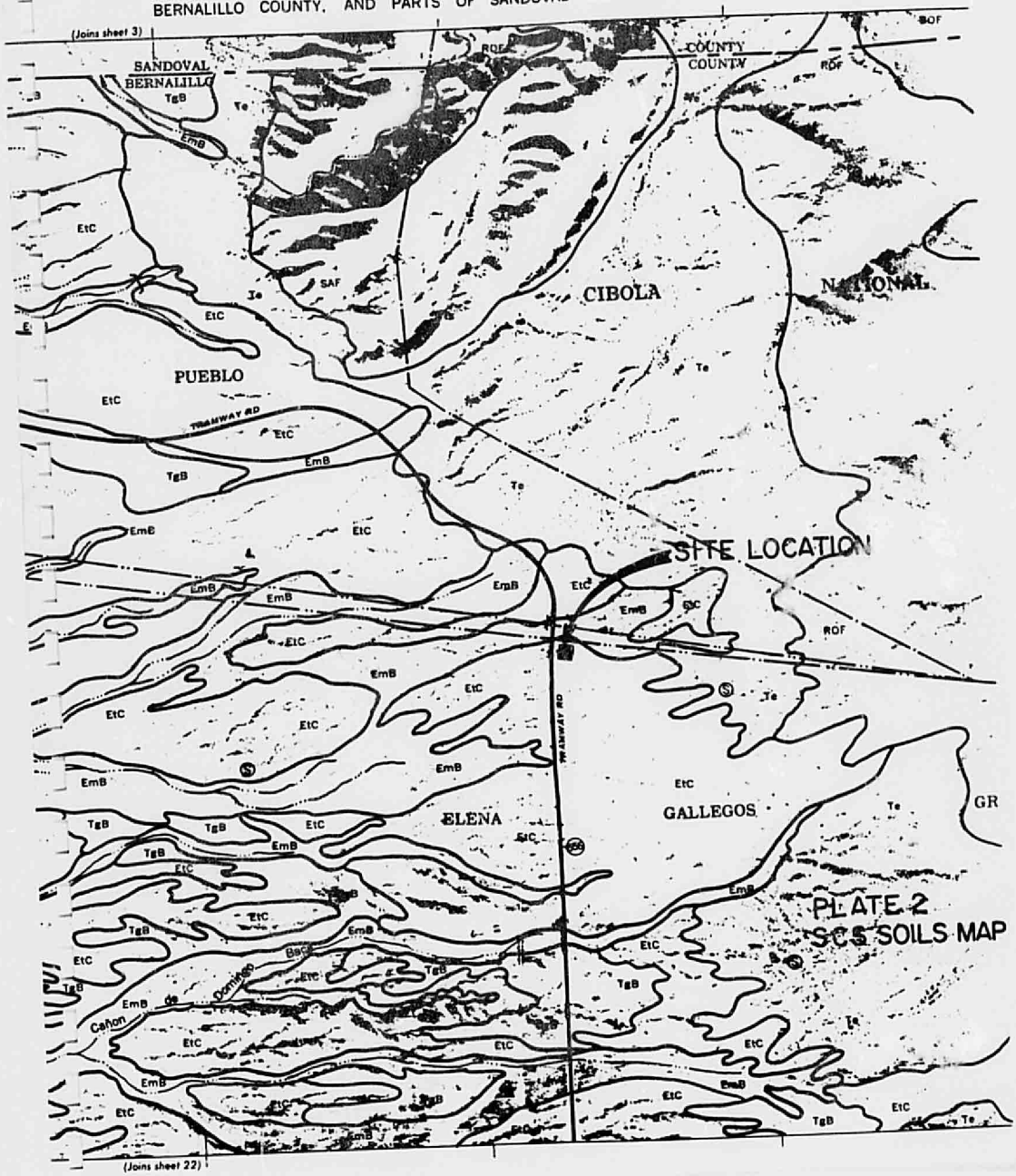


LOCATION MAP

ZONE ATLAS MAP NO'S B-23-Z & C-23-Z

PLATE I
VICINITY MAP

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



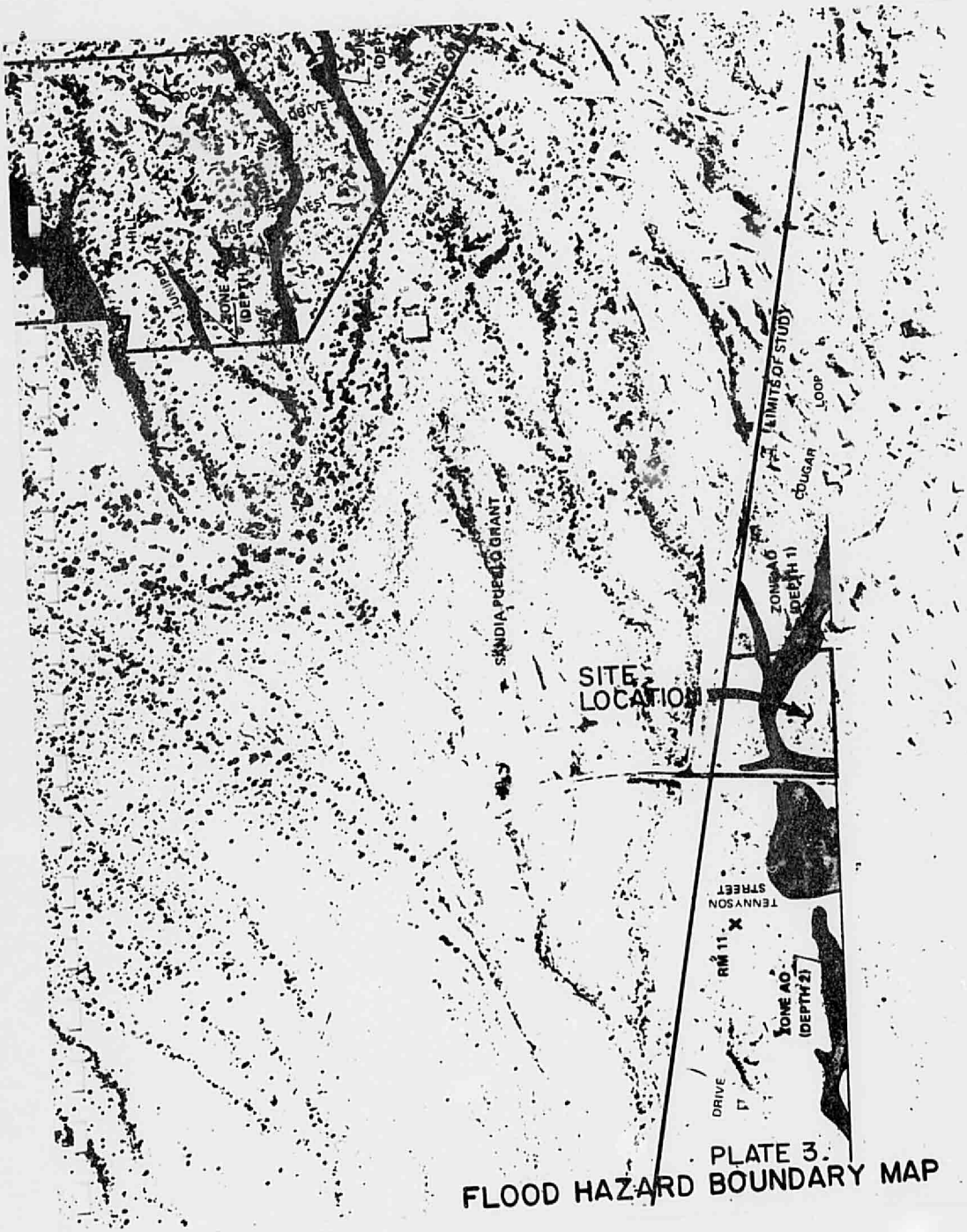
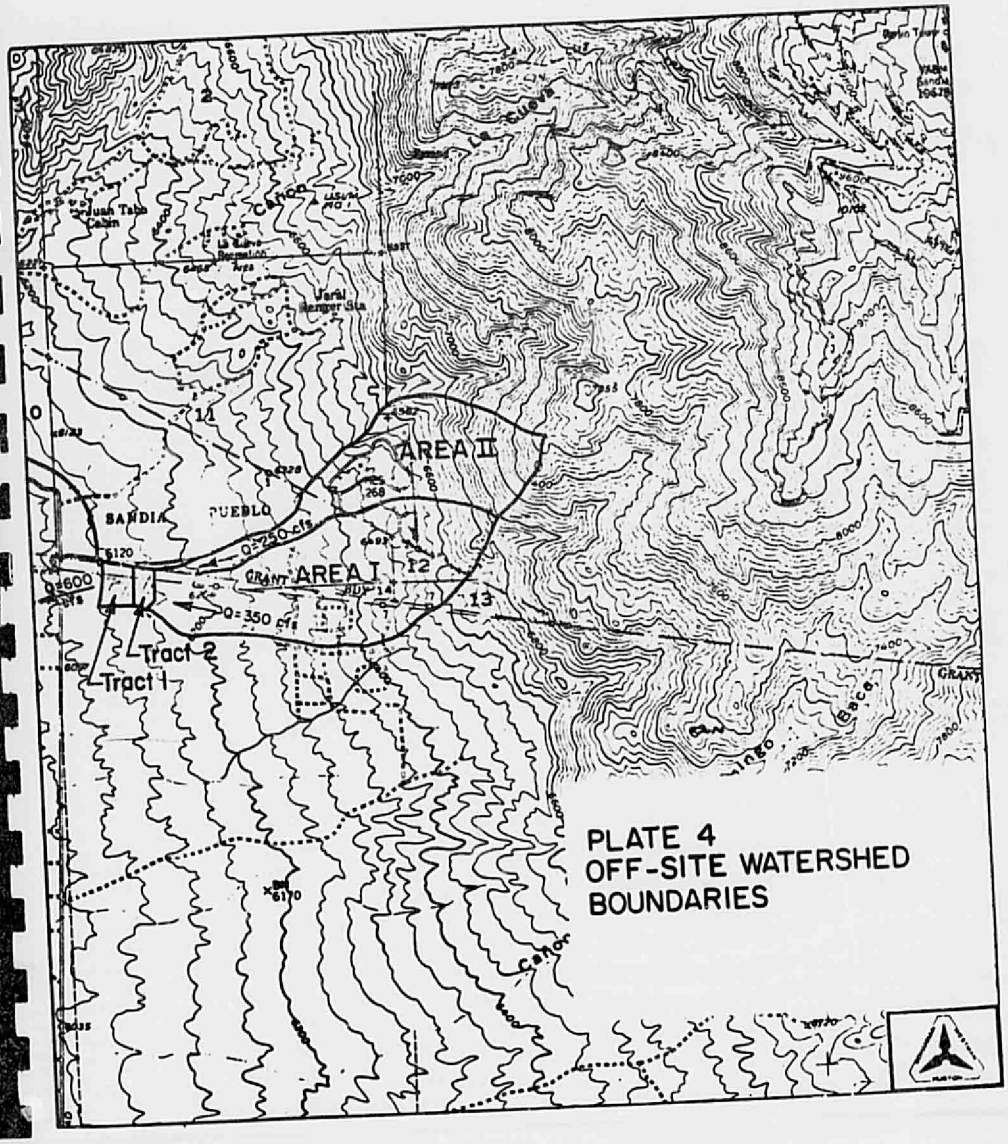


PLATE 3.
FLOOD HAZARD BOUNDARY MAP

Plate I
Location & Upland Drainage
Tracts 1 & 2, Unit 7
Sandia Heights South



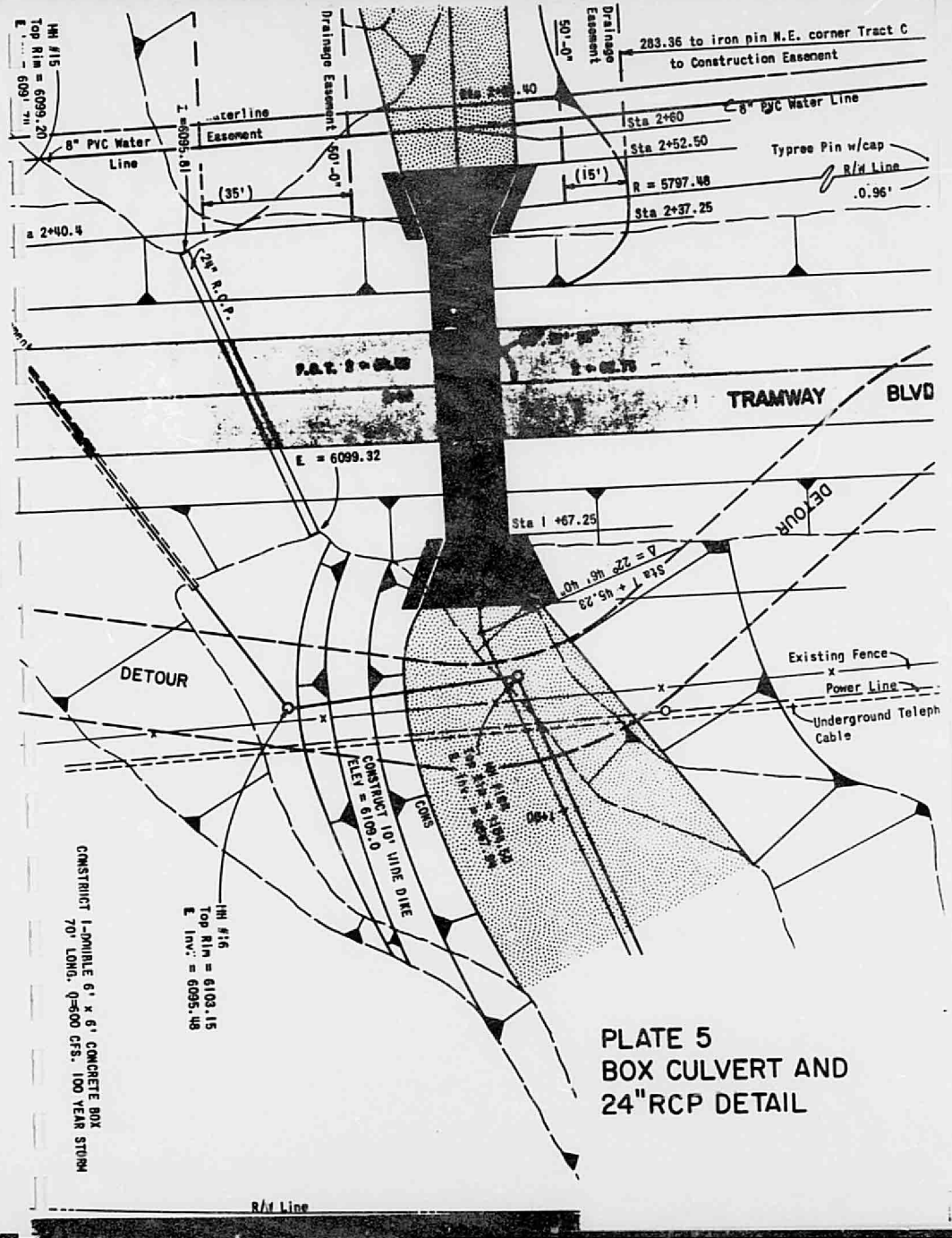


PLATE 5
BOX CULVERT AND
24"RCP DETAIL

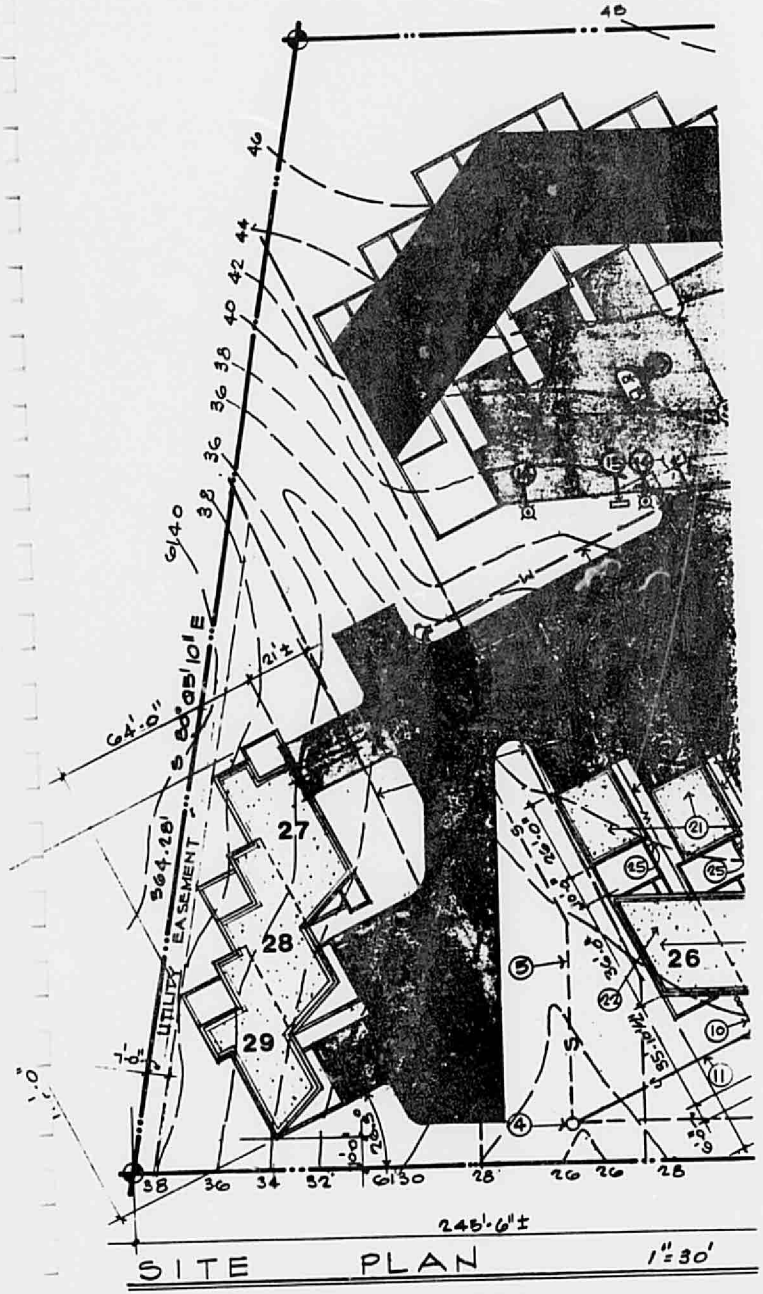


PLATE 6
CHAMISA PARK
SITE LAYOUT

APPENDIX 1

OFF-SITE RUNOFF CALCULATIONS

Hydrologic Computations

	Area 1	Area 2
A. Acreage (acres)	~200	~135
B. High Point (ft.)	7000	7680
C. Low Point (ft.)	6144	6134
D. Longest Reach (ft.)	5600	6600
E. Slope	0.153	0.234
F. Time of Concentration P.3 DPM Kirpich (minutes)	12.3	11.9
G. 'SCS' Soil Type	B	B
H. 'C' Value DPM Plate 22.2C-1	0.34	0.34
I. Rainfall Amount		
• 10 yr	1.77"	1.77"
• 100 yr	2.7"	2.7"
J. Intensities (in/hr.):		
• 10 yr	3.37	3.43
• 100 yr	5.1	5.22
K. Flowrates (cfs):		
• 10 yr	229	157
• 100 yr	347	240
1975 Report Values:	**350**	**250**

County Line
2 941 3
Watershed Analysis

BGB

1 2
6-30-83

Overview of Hydrologic Computations:

1. DPM - Rational method used in analysis
2. B & H report (dated February 1975) indicates flowrates of
   - 250 cfs Area II
   - 350 cfs Area I
3. Computations check extremely close
4. Conclusion:
   → USE FLOWRATES INDICATED IN 1975 REPORT

County Line
2 9413
Watershed Analysis

B.B 2

630.83 2

APPENDIX 2

JULY 6, 1983 LETTER FROM MICHIAL EMERY
TO
RICHARD LEONARD

July 6, 1983

Mr. Richard Leonard
Executive Engineer
AMAFCA
P. O. Box 25851
Albuquerque, NM 87125

Re: Meeting of July 5, 1983 – Property at Northeast Corner of Tramway Boulevard and Tramway Lane

Dear Rich:

Outlined below are topics discussed at the referenced meeting. Please refer to the enclosed plat for identification of the various areas.

1. Area A:

   a. The proposed restaurant and parking area should not incroach into the existing 50-foot easement.

   b. Where required, bank protection in the form of riprap will be provided along the north arroyo bank. The material should extend up the bank to provide one foot of vertical freeboard and should be imbedded below the bottom of the arroyo a distance of two feet, measured along the side slope of the embankment.

   c. An effort should be made to "blend" the treatment with existing vegetation.

   d. Vehicular access to the channel for maintenance purposes should be provided from the site.

2. Area B:

   a. Parking will not be allowed in the existing drainage easement.

b. A dip-section will be allowed to access the units.

c. Sufficient capacity to allow the safe conveyance of the 100-year flows should be provided for any paved surface.

3. Area C:

a. A berm placed along the east property line or on adjacent property to the east should be provided to divert "pirate" channels into the main arroyo.

b. No development should encroach into the existing 50' easement.

c. Bank protection will be provided along the south arroyo bank, as outlined in 1b, when development occurs in Area C.

4. General:

a. The hydrology as presented in the 1975 Bohannan—Huston, Inc. report, "Drainage Report for Tracts 1 and 2, Unit 7, Sandia Heights South," will be used for design purposes.

b. The channel bank proposed along the north edge of Area C should be extended to tie into the existing double 6' x 6' box culverts, as called for in the construction plans entitled "Tramway Box Culverts – North Location, April 1976," prepared by Bohannan–Huston, Inc.

c. Areas B and A may be constructed at the same time. The anticipated phasing of projects is (1) Area B, (2) Area A, and (3) Area C.

I trust that the above items adequately convey the spirit of our meeting. Please contact me if you feel any changes or additions are necessary.

Thank you for taking time out from your busy schedule to discuss these projects.

Sincerely,

MME

Michial M. Emery, P.E.
Vice President

cc: Mr. Bob Martin
Mr. Bruce Walcutt
Mr. Morris Hoover
Mr. Orv Johnson
Mr. Don Krueger
Mr. Fred Aguirre

Enclosure

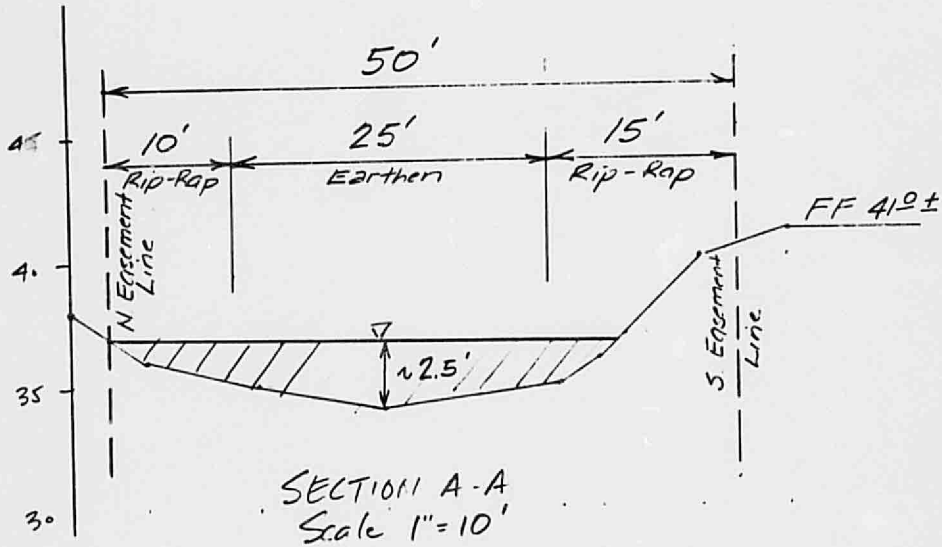
BB/dlh
Job No. 3 161 2
3 161 3

APPENDIX 3

ARROYO CAPACITY CALCULATIONS

FLOWRATE CALCULATIONS - SEC. A-A

A. Typical Cross-section



SECTION A-A
Scale 1" = 10'

B. Compute Maximum flow capacity in easement

1. Flow depth ~ 2.5'
2. Flow area ≅ 50 sq. ft
3. Wetted perimeter ~ 50 ft.

County Line
Orv Johnson
3161 2 3161 3 BB 7.28.85
Flowrate Calculations

4. Compute composite 'n' value

a. Use Equation p.62 DPM

b. Equation Parameters:

Taken from DPM 223 B-1

- n_a = 'n' rip-rap ~ 0.045
- P_a = wetted perimeter of rip-rap ~ 16'
- n_b = 'n' earthen bottom ~ 0.03
- P_b = wetted perimeter of earthen bottom ~ 25'

c. Plug values into equation

$$n_{comp} = \left[\frac{16(.045)^{3/2} + 25(0.03)^{3/2}}{50}\right]^{2/3}$$

$$= 0.032$$

5. Slope ~ 0.035 (conservative)

6. Flowrate - use Manning's Equ.

$$Q = \frac{1.49}{.032}(50)\left(\frac{50}{50}\right)^{2/3}(.035)^{1/2}$$

$$Q = 435 > 250 \text{ cfs OK}$$

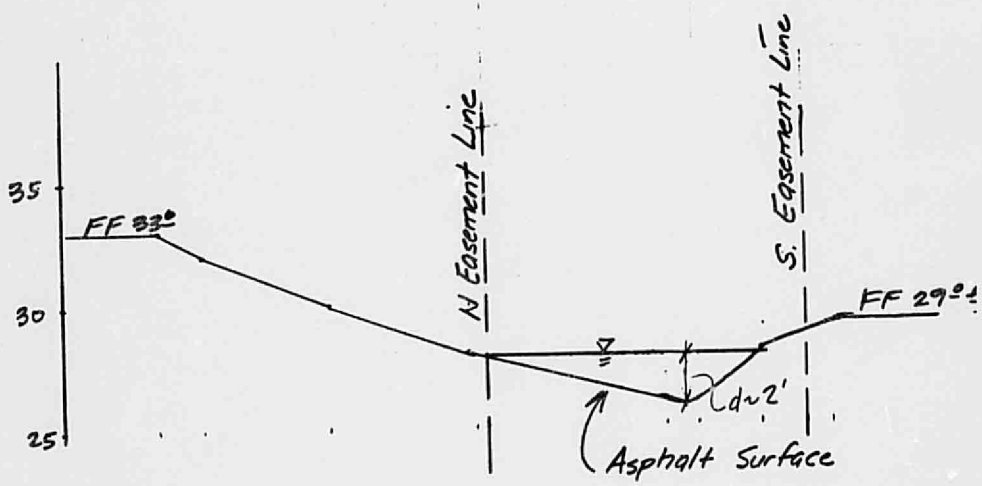
7. Flow depth @ 250 cfs ~ 1.8'

County Line
Orv Johnson
PROJECT NAME
PROJECT NO. 31612 31613
SUBJECT Flowrate Calculation

BB 7.28.83

FLOWRATE CALCULATIONS - SEC B-B

A. Typical Cross-section



SECTION B-B
Scale 1" = 20'

B. Compute maximum flow in easement

1. Flow depth ~ 2'
2. Flow area ~ 42 sq. ft.
3. Wetted permiter ~ 42'

County Line
Orr-Johnson
3161 2 31613 BB 7-28-83
Flowrate Calculations

4. n value = 0.017
(DPM 22.3 B-1)

5. Slope ~ 0.04 (conservative)

6. Flowrate

$$Q = \frac{1.49}{.017}(42)\left(\frac{42}{42}\right)^{2/3}(.04)^{1/2}$$

$$Q = 736 > 250 \text{ OK}$$

7. Flow depth @ 250 cfs ~ 1.4'

<u>SUMMARY</u>

The computations indicate that the arroyo sections proposed have sufficient capacity to handle the 100 year flowrate of about 250 cfs.

Velocity ~ 3 fps

County Line
Orv Johnson
3 161 2 3 613 BE 7.28.82
Flowrate Calculations

SIZE RIP-RAP MATERIAL

Use Chart 27 - "Design of Stable Channels with Flexible Linings" HEC No 15

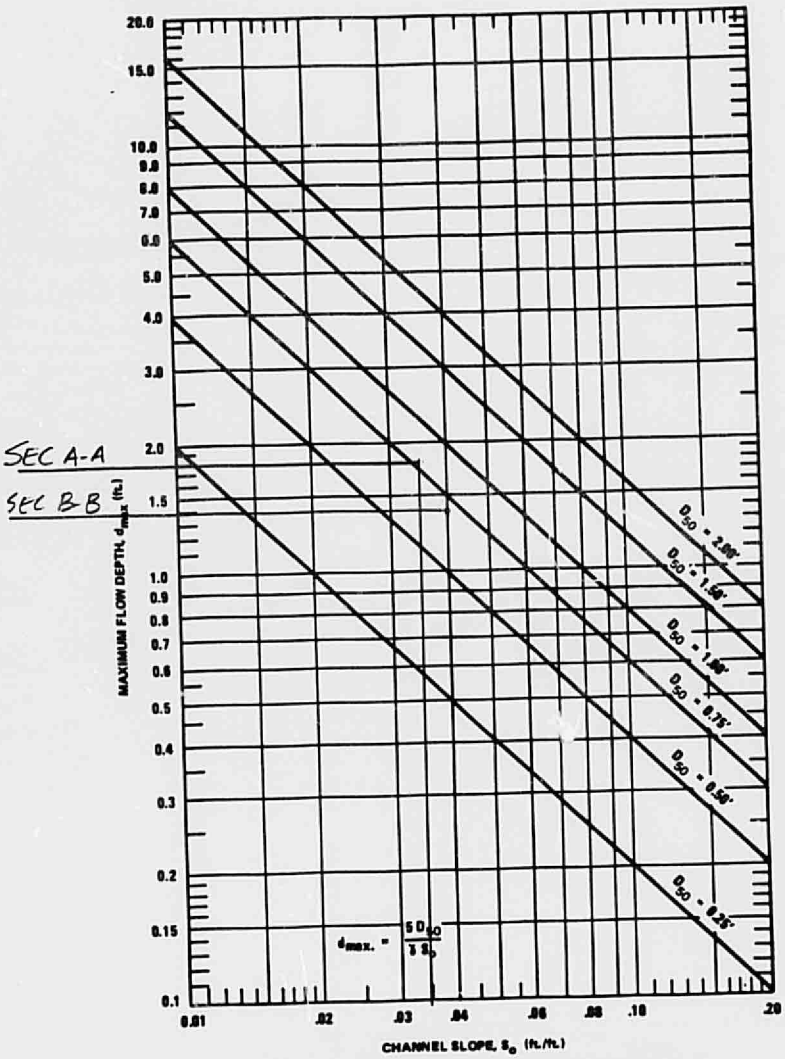
For both cases:

A-A $d_{100} \cong 1.8'$

B-B $d_{100} \cong 1.4'$

the D_{50} material is equal to 0.75'

Chart 27



MAXIMUM PERMISSIBLE DEPTH OF FLOW (d_{max})
FOR CHANNELS LINED WITH ROCK RIPRAP

323-01

ADDENDUM TO THE DRAINAGE MANAGEMENT PLAN FOR PORTIONS OF SANDIA HEIGHTS SOUTH UNIT 7 AND CHAMISA PARK UNIT 3

SEPTEMBER, 1983

BOHANNAN-HUSTON INC.

B23/D1

ADDENDUM TO THE DRAINAGE MANAGEMENT PLAN FOR PORTIONS OF SANDIA HEIGHTS SOUTH UNIT 7 AND CHAMISA PARK UNIT 3

SEPTEMBER, 1983

ADDENDUM TO THE DRAINAGE MANAGEMENT PLAN
FOR
PORTIONS OF SANDIA HEIGHTS SOUTH UNIT 7
AND
CHAMISA PARK UNIT 3

SEPTEMBER, 1983

PREPARED FOR

LINE ENTERPRISES
MR. ORV JOHNSON
MR. BOB MARTIN

PREPARED BY

BOHANNAN–HUSTON, INC.
4125 CARLISLE BOULEVARD, N.E.
ALBUQUERQUE, NEW MEXICO 87107
505/881-2000

DAVID M.Y.MILLIKAN, P.E.
N.M.P.E. NO. 7547

PURPOSE

The purpose of this addendum is to outline the proposed drainage scheme for the County Line Restaurant and the westerly portion of Chamisa Park Unit 3, designated as Areas A and B in the "Drainage Management Plan for Portions of Sandia Heights South Unit 7 and Chamisa Park Unit 3".

BACKGROUND INFORMATION

The management plan contains background information relating to the restaurant site's physical description, the method of analyzing flowrates, and the existing conditions on, and adjacent to the proposed development.

PROPOSED CONDITIONS

On-site:

The grading plan indicates the proposed building and parking layouts. The 100-year runoff from the site is approximately 8.5 cfs (see computation section) and is directed to the arroyo through several curb openings and rip-rap rundowns.

To provide better continuity along the boundary between the restaurant site and Chamisa Park Development, grading has been modified slightly from that proposed in the drainage management plan. Contained in this report is a copy of the letter to Mr. Orv Johnson requesting approval of the concept. It is recognized that approval of the restaurant plan will be contingent on receiving concurrence from Mr. Johnson.

Arroyo Treatment:

The arroyo bank will be stabilized with rip-rap and filter material. A typical cross-section and material criteria are shown on the detail sheet contained in the rear pocket. Computations for sizing the bank stabilization are contained in the drainage management plan.

The channel dimensions were computed assuming that the south bank of the channel cross-section is constructed when Area B develops. For a channel with a 20' bottom width and 2:1 sideslopes, the flow depth at a rate of 600 cfs is approximately 2.2' (see computation section). Two feet of vertical free board has been provided.

Until Area B develops, it is proposed to grade the channel bottom to match existing ground. When plans for Area B are formulated in the future, a detailed grading plan will be submitted outlining how the flows will be directed to the box culvert.

ENGINEERS PLANNERS PHOTOGRAMMETRISTS

BOHANNAN-HUSTON INC.

4125 CARLISLE BLVD., N. E. ALBUQUERQUE, NEW MEXICO 87107 505 881-2000
6713 VISCOUNT BLVD., EL PASO, TEXAS 79925 915 778-4491
330 GARFIELD, SANTA FE, NEW MEXICO 87501 505 988-7671

September 6, 1993

Mr. Orville Johnson
Sandia Homes
15 Tramway Road NE
Albuquerque, NM 87122

Re: Revised Grading for Proposed Chamisa Park Unit 3 Development

Dear Orv:

As you know, Bohannan-Huston, Inc., is preparing the site grading plan and details for the County Line Restaurant which lies directly west of your property. In order to provide a workable plan for both sites, we propose that some minor off-site grading take place on your property. This change to the approved drainage management plan will negate the need for a retaining wall along the common west boundary line. We feel that our proposal reflects the most economical and visually attractive solution for both parcels.

Before AMAFCA will approve the restaurant's plan, your concurrence with the grading scheme is required. If you feel that the changes meet the needs of your development, please sign on the line provided and return the letter to this office.

We appreciate your cooperation on this matter. Please contact Brian Burnett or me if you have any questions.

Sincerely yours,

Michial M. Emery, P.E.
Vice President

APPROVED

_____
Mr. Orv Johnson

_____
Date

cc: Mr. Don Krueger
Mr. Dan Sabo

BGB/blm
Job No. 3 161 2

PRINCIPALS
JERRY R. BOHANNAN, P. E. & L.S.
LARRY W. HUSTON
DONALD T. CREMANS, P. E.
C. J. (SKIP) MEAD, P. E.
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RAMON LARA, P. E.
DARRELL L. WADE, P. E.
PATRICK L. STIEHR, P. E.
DAVID M. Y. MILLIKAN, P. E.

COMPUTATIONS

100-Year Developed Runoff

- Assumptions & Knowns:
  1. Total Area of Site ~ 2.13 acres
  2. Approximately 85% Impervious
  3. 10 minute – T_c
  4. Rainfall Amount: 2.6" 100-year
  5. Intensity ~ 5.50 in/hr

- Computations:
  - Use Rational Formula
  - 'C' ≐ 0.80 (DPN)

  $Q = (0.80)(5.5)\,2.13 = 8.52$ cfs

- Summary:

  This site will contribute approximately 8.5 cfs to the downstream arroyo system.

PROJECT NAME County Line Restaurant
PROJECT NO. 31612
SUBJECT Developed Flowrate
BGB 8-30-83

100-Year Flowrate Depth:

- **Assumptions & Knowns:**
  1. Channelized Flow - (i.e. both sides of arroyo improved)
  2. Typical Cross-section:
     a. 20' Earthen bottom
     b. 2:1 rip-rap side slopes
     c. channel slope ~ 0.033
     d. $n = 0.045$ (from DPM)
  3. Two feet vertical freeboard
  4. 100-year flowrate = 600 cfs
- **Computations:**

$$\text{Area} = 20x + 2x^2$$

$$\text{Perimeter (wetted)} = 20 + 4.47x$$

$$Q = 600 \text{ cfs (from management plan)}$$

$$Q = 600 = \frac{1.49}{.045}(20x+2x^2)\left(\frac{20x+2x^2}{20+4.47x}\right)^{2/3}(.033)^{1/2}$$

By trial and error: $x = 2.5'$

- **Summary:**
  1. Extend rip-rap protection 4.5' above channel floor
  2. Embed protection 3' below channel floor

PROJECT NAME County Line Restuarant
PROJECT NO. 31612
SUBJECT Channel Computations

BGB 8-30-83