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

Re: 9/22/03

October 1, 2003

Bruce Stidworthy, P.E.
Bohannan Huston, Inc.
7500 Jefferson NE – Courtyard 1
Albuquerque, NM 87121

Re: Crossings Subdivision Unit 1, SIA/Financial Guarantee Release
Engineer's Stamp dated 9-20-02 (H9/D1A7)
Certification dated 9-19-03

Dear Mr. Stidworthy,

Based upon the information provided in your submittal dated 9-22-03, the above referenced certification is approved for release of SIA and Financial Guarantee.

If you have any questions, you can contact me at 924-3981.

Sincerely,

Kristal D. Metro
Engineering Associate, Planning Dept.
Development and Building Services

C: Arlene Portillo, COA# 545381
file

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

H-9 / D1A7

PROJECT TITLE: Crossings Subdivision Unit I ZONE MAP/DRG. FILE # H9 & J9
DRB #: 95-537 EPC#: WORK ORDER#:

LEGAL DESCRIPTION: Unit I, The Crossings
CITY ADDRESS:

ENGINEERING FIRM: Bohannan Huston, Inc. CONTACT: Bruce Stidworthy
ADDRESS: 7500 Jefferson NE – Courtyard I PHONE: (505) 823-1000
CITY, STATE: Albuquerque, NM ZIP CODE: 87109

OWNER: Westland Development Corporation CONTACT:
ADDRESS: 401 Coors NW PHONE: 831-9600
CITY, STATE: Albuquerque, NM ZIP CODE: 87121

ARCHITECT: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

SURVEYOR: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

CONTRACTOR: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

CHECK TYPE OF SUBMITTAL:

- ____ DRAINAGE REPORT
- ____ DRAINAGE PLAN 1st SUBMITTAL, ***REQUIRES TCL or equal***
- ____ DRAINAGE PLAN RESUBMITTAL
- ____ CONCEPTUAL GRADING & DRAINAGE PLAN
- ____ GRADING PLAN
- ____ EROSION CONTROL PLAN
- X ENGINEER'S CERTIFICATION (HYDROLOGY)
- ____ CLOMR/LOMR
- ____ TRAFFIC CIRCULATION LAYOUT (TCL)
- ____ ENGINEERS CERTIFICATION (TCL)
- ____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

- X SIA / FINANCIAL GUARANTEE RELEASE
- ____ 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 (PERM.)
- ____ CERTIFICATE OF OCCUPANCY (TEMP.)
- ____ GRADING PERMIT APPROVAL
- ____ PAVING PERMIT APPROVAL
- ____ WORK ORDER APPROVAL
- ____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ____ YES
- ____ NO
- ____ COPY PROVIDED

RECEIVED
SEP 22 2003
HYDROLOGY SECTION

DATE SUBMITTED: 9-22-03 BY: Bruce Stidworthy

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature , location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans:** Required for building permits, grading permits, paving permits and site plans less than five (5) acres.
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

H-9/D1A7

WILSON & COMPANY

2600 THE AMERICAN ROAD SE, SUITE 100
RIO RANCHO, NEW MEXICO 87124
(505) 898-8021
FAX (505) 898-8501

TRANSMITTAL

Date: 12-02-03
Job No.: WCI X3218008 COA 545381
Re: Grading & Drainage Plan
Crossings III

12/2/03

To: City of Albuquerque
One Stop

Attn: **Brad Bingham**

WE ARE SENDING YOU ☑ Attached ☐ Under Separate Cover via _____ the following items:

☐ Shop Drawings ☑ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

Copies	Date	Pages/Sheets	Description
1	12-02-03	3	Grading & Drainage Plan

THESE ARE TRANSMITTED AS CHECKED BELOW:

☐ For approval/signature ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☑ As requested ☐ Return _____ copies ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____, 20___ ☐ PRINTS ON LOAN – RETURN TO WCEA AFTER BID

Remarks: Brad – Per your request (at DRC Nov 18) here is a hard copy of the G&D you signed in the session. Please call if you have further questions. Kristine

COPY TO: _____

SIGNED: Kristine Susco

RECEIVED BY: _____

DATE: _____

RECEIVED
DEC 02 2003
HYDROLOGY SECTION

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
LARRY A. LARRAÑAGA, P.E.
HOWARD C. STONE, P.E.

PRINCIPALS

WILLIAM L. VREEKE, P.E.
GORDON A. WALHOOD, JR., P.E.
MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

May 24, 1996

6/3/96

Mr. Kurt Browing, P.E
Albuquerque Metropolitan Arroyo Flood Control Authority
2600 Prospect NE
Albuquerque, NM 87107

Re: The Crossing Subdivision (Westland Development) and your letter dated May 13, 1996.

Dear Kurt:

In the letter referenced above, you summarized AMAFCA's understanding and concerns relative the subject project. Accordingly, this letter addresses each of those items.

1. The AMAFCA easement dedication language has been added to tracts A, C, and H on the Bulk Land Plat. A print, and the original of the plat have been transmitted under separate cover. The plat clearly shows all easements, prudent lines, and tract boundaries, both existing and proposed.

2. We are in the process of generating drainage covenants between Westland Development and the City. These covenants will cover; a) the west diversion b) the north diversion and c) the interim berm on the Mirehaven Arroyo, and will give maintenance responsibility to Westland.

3. As discussed above, Westland Devlopment Company Inc. will maintain the above facilities.

4. Upon completion of details (on the construction plans) affecting the Mirehaven or any of the Ladera Drainage System Ponds, prints will be sent to AMAFCA for review.

5. Three ac-ft will be removed from Pond 12 for the "hydrology volume" needs of the subdivision. The removal of any additional volume will be coordinated with AMAFCA.

6. A more through analysis of the interim berm on the Mirehaven Arroyo (at the north end of Selway Place), revealed that the required armoring would be prohibitively expensive. Therefore, as we discussed with John Kelly, we have eliminated lots 51 and 52, and we have made Selway into a stub street, terminating at the north edge of lot 53. These measures allow the berm to be constructed completely outside of the 100yr floodplain (both the FEMA floodplain, and the floodplain computed by AVID Engineering for the report entitled *Las Lomitas Unit IIB Mirehaven Arroyo Scourwall Analysis and Design*, dated 10/94.)

7. A conceptual design for the outfall to pond 10 from the west diversion swale, was agreed upon in a meeting with John Kelly, Bruce Stidworthy, and I. The agreed upon design is a soil cement plunge pool. Mr. Kelly suggested that a similar structure designed for the Middle Branch of the Piedras Marcadas Arroyo be used as a design example.

JUN - 3 1996

F:\CDP\95335\A2406\KELLY_LTR.DOC - 05/24/96

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
LARRY A. LARRAÑAGA, P.E.
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MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

Susan Calongne's comments dated 5-1-96 have been addressed, and I believe the discussion above addresses your comments. Should you have any further questions, please do not hesitate to call Bruce Stidworthy or me.

Sincerely,

Kevin Patton, E. I.
Project Manager
Community Development & Planning Group

KP/kc
Enclosures

cc. Leroy Chavez, Westland Development
Fred Ambrogi, Westland Development
John Kelly, AMAFCA
Susan Calongne, City Hydrology
Mike Emery, BHI

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

F:\CDP\95335\A2406\KELLY_LTR.DOC - 05/24/96

CITY OF
Albuquerque

Martin J. Chávez, Mayor

May 1, 1996

Bruce Stidworthy
Bohannan Huston Inc.
7500 Jefferson NE
Albuquerque, New Mexico

RE: DRAINAGE REPORT FOR THE CROSSING UNITS 1 & 2 (H9/D1A7) SUBMITTED FOR PRELIMINARY PLAT APPROVAL AND ROUGH GRADING APPROVAL, ENGINEER'S STAMP DATED 4/3/96.

Dear Mr. Stidworthy:

Prior to approval for Preliminary Plat and Rough Grading for the Crossing Subdivision Units 1 & 2, the Bulk Land Plat for the Westland Phase I Subdivision must be approved. The drainage report for Westland Phase I was included and reviewed as part of the above referenced submittal. The following comments must be addressed prior to Bulk Land Plat approval:

1. Has AMAFCA reviewed and approved this plan? Do they agree with the proposed upgrading of Dam # 12?

2. What are the limits of the "Temporary Drainage Easement Granted to AMAFCA" based on? The limits shown on the Plat are unclear.

3. Page 5 of the Westland report states that "upon completion of Phase I . . . the arroyo may be concrete lined." In order to approve all of Phase I, the treatment of the arroyo should be determined at this time. Otherwise, all properties within the prudent line must be within blanket drainage easements until the size of the proposed channel easement is determined.

4. Who will improve AMAFCA's Dam # 12? With what stage of development will this work be done? Any improvements to this dam must be approved by AMAFCA.

5. It appears that the proposed temporary diversion berm for Unit 1 will be located on Unplatted Lands on the Plat. All proposed drainage structures must be within public drainage easements with covenants.

Prior to approval for Preliminary Plat and Rough Grading for Units 1 & 2, please address the following:

6. Who will maintain the off-site berms or diversion channels for these units? Covenants must be in place prior to construction. These berms/channels must be constructed with the initial stage of development.

7. Is any development proposed within the existing Mirehaven prudent line? The plan should show this line as well as the limits of the existing FEMA floodplain. Where is the existing soil cement wall?

8. The north diversion swale is designed for a flow of 12.8 cfs, per the calculations for basin 02, as shown on the proposed conditions basin map. The existing conditions map shows 23 cfs for the off-site flow impacting Unit 2. Please clarify.

9. It appears that the storm drains for Gunnison Place were not sized for fully developed conditions. Are all of the inlets to be constructed with the development of Units 1 & 2? The plan identifies residual flow that goes to a natural swale. Where is this swale, and where does this water ultimately go? Are public drainage easements in place from the end of Gunnison to AMAFCA's dams?

10. The street capacity calculations indicate that in most cases the EGL is greater than the top of curb. The grading and drainage plan must show that the elevations at the right-of-way is 1' higher than the flowline elevation. These elevations must be certified with the grading and drainage certification.

11. Are drainage easements provided for the asphalt rundowns into the Mirehaven arroyo? This may be clarified on the Bulk land Plat.

12. Please provide more elevations on the grading plan to verify that more retaining walls are not needed. Also provide a typical lot layout to indicate elevations and direction of roof drains.

If you should have any questions regarding these comments, please call me at 768-2666.

Sincerely,

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

c: Kurt Browning, Albuquerque Metropolitan Arroyo Flood Control Authority
Leroy Chavez, Westland Development Co.
File

FAX TRANSMISSION

AMAFCA
2600 Prospect Av. NE
Albuquerque, NM 87107
Ph: (505) 884-2215
Fax: (505) 884-0214

To: Brigitte Fuller
Fax #: 898-8501
From: Lynn Mazur

Of: Wilson & Company
Pages: 10, incl. cover sheet
Date: February 23, 2004

Subject: The Crossing, Unit 3

File H9/D1A7

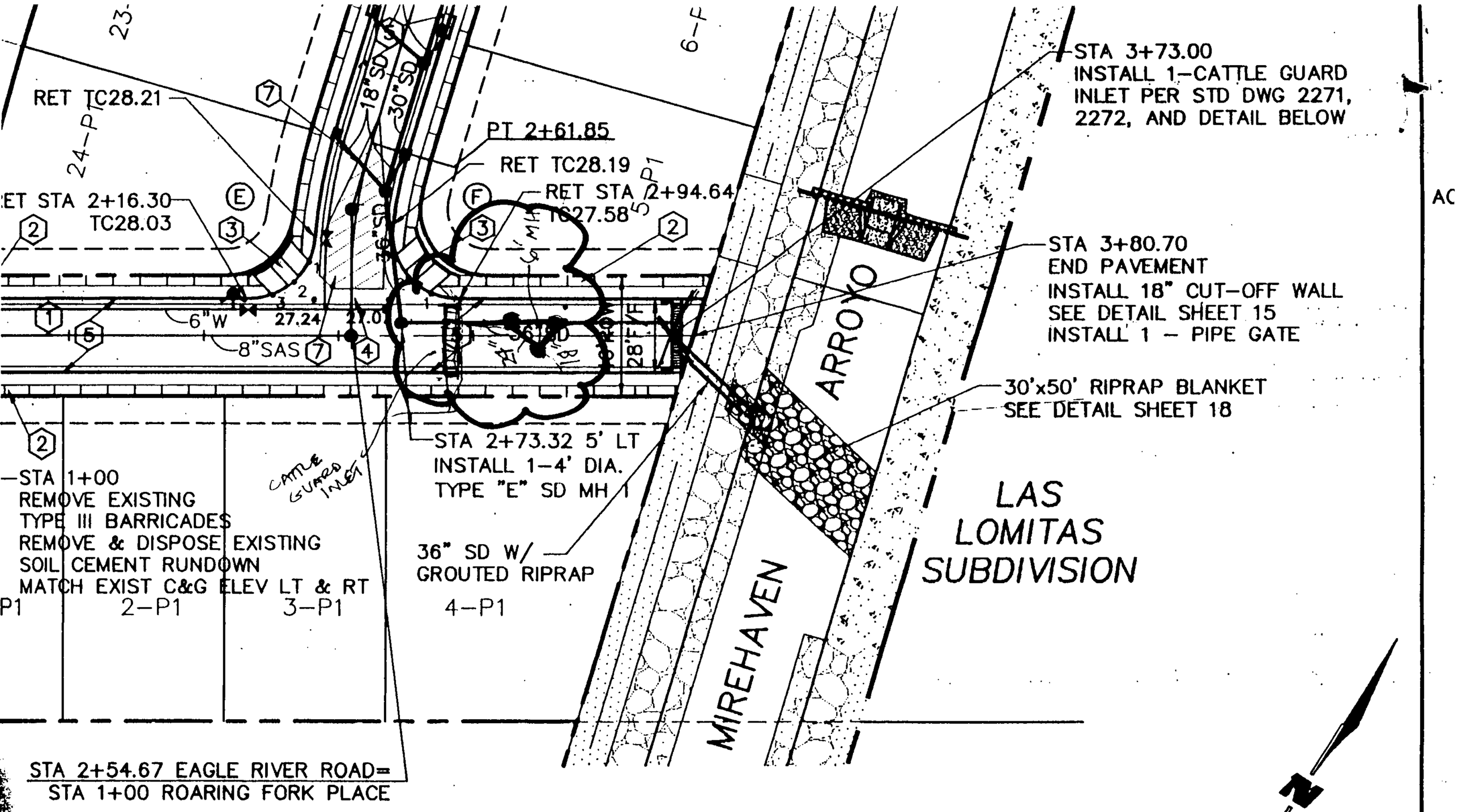
COMMENTS:

I am sending comments for the referenced plans. The water quality manhole is similar to the one that BHI did for Cielo Oeste. We have modified it somewhat by adding a drain hole in the bottom. The cattle guard inlet should be moved upstream of the WQ MH.

Brad,

FYI - We had a few minor comments on the channel plans, also.

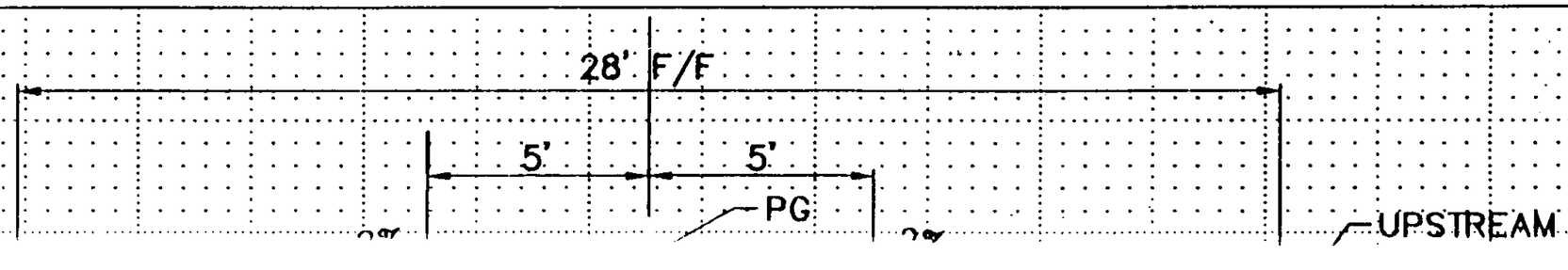
LM²



GLE RIVER ROAD

PLAN

PROFILE

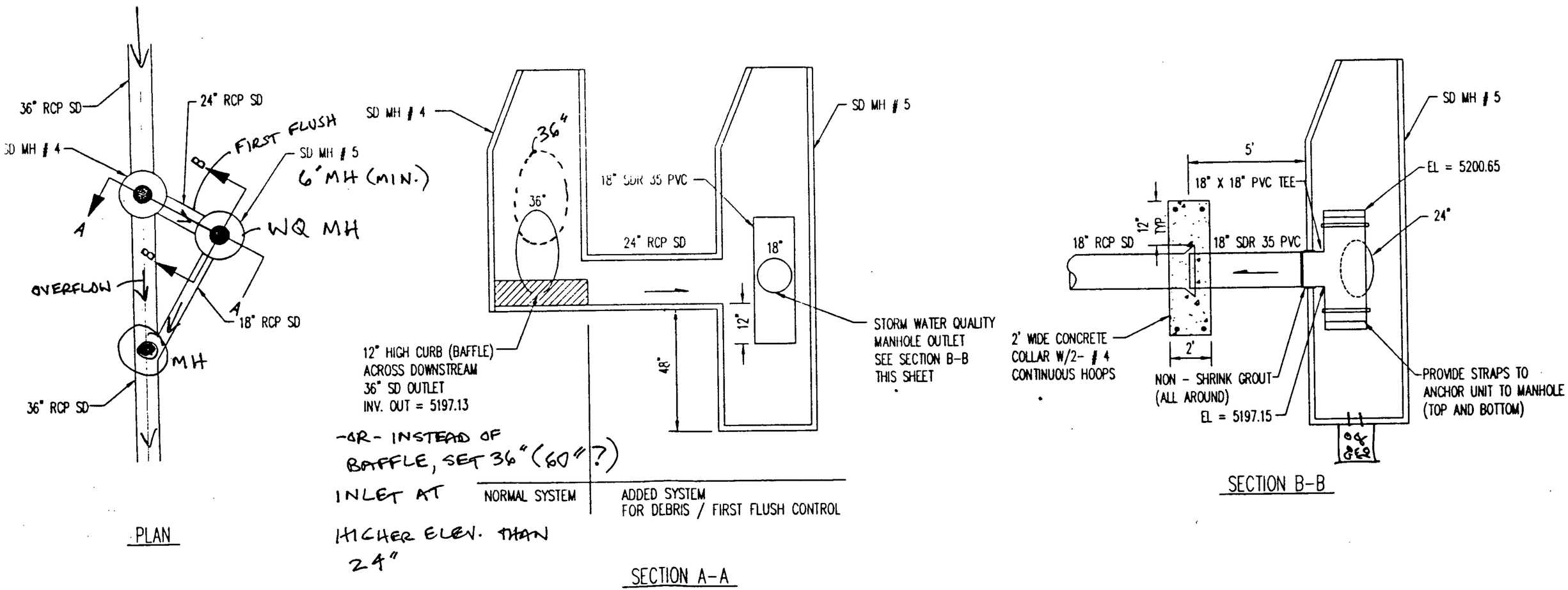


1. ALL MECHANICAL JOINTS SHALL BE RESTRAINED AT THE

2. THE CONTRACTOR SHALL PROVIDE A MINIMUM PIPE LENG
20 LF FROM ALL MECHANICAL JOINTS. UNLESS SPECIFIED DIF
IN THE PLANS, ALL PIPE JOINTS WITHIN 20 LF OF A MECHAN
SHALL BE RESTRAINED AT THE CONTRACTORS EXPENSE.

3. THE CONTRACTOR SHALL RESTRAIN ALL PIPE JOINTS IN
SPECIFIED DISTANCE LISTED IN THE ACCOMPANYING TABLE.

4. THE CONTRACTOR SHALL RESTRAIN ALL FIRE HYDRANT J
THE TEE ON THE MAIN TO THE FIRE HYDRANT FLANGE.



MANHOLE SYSTEM
DEBRIS / FIRST FLUSH TREATMENT

NOT TO SCALE

4/23/96

April 23, 1996

CAPACITY OF THE LADERA DRAINAGE SYSTEM PONDS 9, 10 & 11.

AMAFCA expressed concern over the capacity the above ponds. The analysis discussed below shows that the above ponds have excess capacity even under fully developed conditions.

The following analysis of Ponds 9, 10, and 11 is taken from the *Drainage Report for Westland Phase 1 Subdivision,* previously submitted to AMAFCA for review. That report, in its entirety is included in Appendix A of the *Drainage Report for The Crossing Units 1 and 2.*

The existing characteristics of the Ladera Dams are listed in the table below. By using AHYMO to analyze the flows into the dams under 'Existing Plus Phase I' and 'Developed' Conditions, the need for dam improvements was determined. (See the notes under the table below for an explanation of 'Existing Plus Phase 1' and 'Developed' flows). On the right side of the table below, the Ladera Dams AHYMO results are shown.

Ladera Dam #9 receives no flow from Phase 1. Under Existing Plus Phase I Conditions, Dam #10 receives undeveloped flows that are diverted by the proposed diversion berm west of Phase 1. The AHYMO results show that Dams #10 and #11 have adequate capacity to accommodate fully developed flows. Except for Dam #12, the dams are minimally impacted by the initial build out of Phase I (Units 1 & 2).

April 23, 1996

LADERA DAM SYSTEM SUMMARY: LADERA DAMS #9, #10, #11, #12

DAM NO.	EXISTING CHARACTERISTICS OF DAMS 9, 10, 11, 12 (1)						100 YR EVENT - AHYMO RESULTS			
							WSEL		STORAGE (ac-ft)	
	BOTTOM ELEV	TOP ELEV.	EMERG. SPILLWAY ELEV	EMERG. SPILLWAY LENGTH	100 YEAR STORAGE (ac-ft)	PRINCIPAL SPILLWAY	EXISTING PLUS (3)	DEV	EXISTING PLUS (3)	DEV
9	5267	5279	5276	45	20.5	2- 24" x 330 LF	5270.3	5274.7	6.6	18.3
10	5244	5260	5257	50	51.6	1- 24" x 330 LF	5247.6	5255.3	12.5	43.7
11	5226.5	5236.5	5234.7	50	29	1- 24" x 390 LF	5230.2	5234.7	11.6	29
12	5202	5217	5211.3	625	57.5	8- 42" , lengths vary	INSUFFICIENT CAPACITY (2)			

2 NOTES:

(1) Existing characteristics information from Ladera System As-builts.

(2) Dam No. 12 has insufficient capacity under existing conditions. See Table 3 for additional analysis.

(3) Conditions are defined as follows:

CONDITION	PHASE I DEVELOPMENT	DEVELOPMENT UPLAND FROM PHASE I
EXISTING	No	No
EXISTING PLUS PHASE I	Yes	No
DEVELOPED	Yes	Yes

As shown in the table above, Ponds 9, 10 and 11 do have adequate capacity to accept 'Existing Plus Phase I' as well as 'Developed' flows. It should be noted that the analysis above was based on the Ladera Dam #15 hydrologic model. The Dam #15 model was based on USGS quad map topography, and resulted in a larger drainage area upstream of ponds 9-12 than the current, more accurate mapping indicates. Consequently, the flowrates in the above table are substantially greater than those calculated in the *I-40 DMP.* Therefore, Ponds 9, 10 and 11 have even greater excess capacity than indicated in the table above.

REQUIRED EXPANSION OF DAM #12. AMAFCA expressed concern over the capacity pond 12. The analysis discussed below shows that ponds 12 is in need of expansion, and details the required volumes under each condition.

According to the hydrologic analysis performed in the *Drainage Report for Westland Phase 1 Subdivision*, Dam #12 has inadequate capacity for existing conditions, and will be further impacted by future development. (See Table below a for comparison of storage requirements for the 100-year storm event.)

DAM #12 REQUIRED STORAGE

CONDITION (1)	STORAGE INCREASE FACTOR (2)	REQUIRED 100-YEAR STORAGE (ac-ft)
Existing	1.75	100.3
Existing Plus Phase I	1.8	103.3
Developed	3.2 (3)	246

NOTES:

(1) Conditions are defined as follows:

CONDITION	PHASE I DEVELOPMENT	DEVELOPMENT UPLAND FROM PHASE I
Existing	No	No
Existing Plus Phase I	Yes	No
Developed	Yes	Yes

(2) This is factor applied to each level of existing Dam #12 storage in AHYMO "Route Reservoir" command. Applied an increased factor until WSEL did not exceed elevation of 5211.3.

(3) Includes diversion of 1500 cfs of the outflow to be diverted south to the West Bluff Diversion.

Dam #12 requirements are given for three conditions: Existing, Existing Plus Phase I, and Developed. Required volumes were obtained through an iterative process. The storage of Dam #12 was increased until the outflow remained below the emergency spillway level (elevation 5211.3) for the prescribed condition of development. Storage expansion factors used in the analysis are listed in table above.

For Existing conditions, the required 100-year storage volume is 100.3 acre-feet. The dam currently has 57.5 acre-feet of storage for the 100-year storm. Consequently, the dam pool must be increased by roughly 43 acre-feet to provide adequate capacity

for the 100-year storm. The existing easement is large enough to accommodate upsizing Dam #12 to contain this increase in storage.

For Existing Plus Phase I conditions, the required 100-year storage volume is 103.3 acre-feet. The difference in storage, approximately 3 acre-feet, is due to the increased runoff from Phase I initial build out.

For Developed conditions with no upstream attenuation other than the Ladera System, Dam #12 requires a 100-year storage volume of nearly 250 acre-feet. The AMAFCA easement surrounding the dams presently is not large enough to accommodate a structure of this size.

Expansion of Dam #12 to contain runoff from Developed conditions has been examined in a preliminary manner. Beyond the AMAFCA easement, there is adequate vacant land to the north and east (within proposed Tracts A and H of the Bulk Land Plat) of the present dam location to expand it to the requirements of Developed conditions. The decision to expand Dam #12 and the determination of how this expansion is to occur will ultimately be made by the *I-40 DMP*. Temporary Drainage easements will be placed over Tracts A and H to allow for the expansion of Dam 12, should that be the conclusion of the *I-40 DMP*.

POND #12 SENSITIVITY ANALYSIS This analysis has been performed in order to verify that even if only 500cfs is diverted to the West Bluff Outfall, there is still adequate space for pond 12.

As noted in the table, the above analysis assumed that 1500cfs would be diverted from the Ladera Drainage System to the West Bluff Outfall. A sensitivity analysis relating the amount of flow diverted from the Ladera Drainage System to the Required Storage Volume of Pond #12 has been performed. Three scenarios were

analyzed. For each scenario varying flow rates to be diverted from the Ladera System at Dam #12 to the proposed I-40 Diversion Channel were considered. Diversion of 500, 1000, and 1500 cfs were studied. The resulting impacts on the required dam storage volume for the 100-year storm for fully developed conditions were determined. A summary of these findings is provided on the table on page 12 of this document.

Based on this analysis, the previously proposed expansion for Dam #12 is sufficient (within proposed Tracts A and H on the Bulk Land Plat). However, depending on the magnitude of the diverted flow rate, modifications to the emergency spillway may be required. If only 500 cfs are diverted to the I-40 Diversion Channel, then the dam spillway crest must be raised 1.2'. Similarly, if 1000 cfs are diverted, the spillway crest must be raised 0.7'. Finally, if the full 1,500 cfs recommended in the *Ladera Dam #15 Drainage Report* are diverted, no increase in the spillway height is required. Diversion of flows was modeled in the same manner as in the *Ladera Dam #15 Drainage Report*.

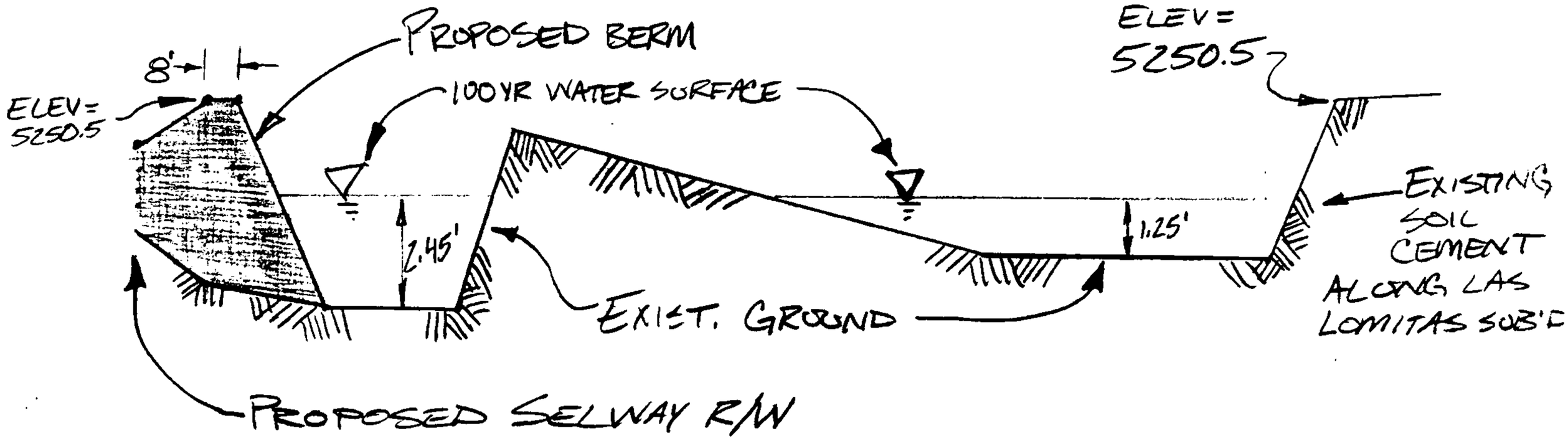
These possible increases in the emergency spillway crest elevation do not necessarily translate directly to an equivalent increase in the top of dam elevation. With adjustments to the spillway elevation, the length of the spillway can also be increased, potentially eliminating the need to raise the height of the dam. The present top of the dam elevation is 5217'.

REVISION OF THE GRADING PLAN Revision of the grading plan was not done as a result of an AMAFCA comment. This modification was necessary in order to come closer to balancing the cut and fill quantities for the site. None of the drainage concepts discussed in the drainage report are affected by this change. This revised plan is also being submitted to the DRB members for the preliminary plat approval hearing.

The most significant change in the grading plan is that the area encompassed by Units 1 and 2 has been lowered by 2.0'. The remainder of the changes resulted from

the 2' drop mentioned above. These changes are summarized as follows: The slopes in Gunnison and Casa Verde were slightly decreased between the boundary of Unit 1 and the low points. This change was necessary in order to keep the low points at their original elevations. An analysis of the flow in Gunnison and Casa Verde for the new slopes has been included with this supplementary information. The 2' soil cement drop structure originally proposed for the west diversion channel will no longer be necessary. The North and West Diversion Channels, as well as the asphalt rundown at the east end of Platte Court have been adjusted with the change in grade of the subdivision. The asphalt rundown at the east end of Casa Verde Avenue has been eliminated because it is no longer necessary. As mentioned above, these grading changes **do not** alter any of the drainage concepts presented in the drainage report.

SECTION A-A



① ASSUME: SLOPE = 2%, $n = 0.03$, $Q_{100} \simeq 1300$ cfs
(Q_{100} Above, based on I-40 DMP, & The following bulking factors;
West of Paseo Del Volcan: 2.5% UNDEV. & 2.5% DEV.
EAST OF PASEO DEL VOLCAN: 7.0% UNDEV & 2.5% DEV.

② USING THE CHANNEL SECTION ABOVE; (SEE COMP. OUTPUT, Pg. 10)

100YR WATER SURFACE = 5248.45

VEL. = 7.9 FPS

③ ENERGY GRADE LINE (EGL):

WATER SURFACE + VEL HD = EGL

$$\text{VEL HEAD} = \frac{7.9^2}{64.4} = 1.0'$$

WATER SURFACE = NORMAL FLOW + DISTURBANCES.

= 5248.45 + 0.43' (SUPER ELEV.) = 4888

EGL = 5249.88 < 50.52 ok

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 1 OF 2
PROJECT NO. _____ BY BS DATE 4/23/96
SUBJECT MIREHAVEN X-SECT CH'D _____ DATE _____

④ SUPERELEVATION CALC:

$$S = 1.3 \frac{V^2(b + 2ZD)}{gr}$$

(CONCERNED ONLY W/ FLOW ON OUTSIDE EDGE OF CHANNEL.)

$$= 1.3 \frac{7.9^2(50 + 2(4)1.25)}{32.2(350)}$$

[DPM SEC 22.3 Pg. 59]

$$= 0.43'$$

⑤ REQ'D FREEBOARD CALCS:

[DPM SEC. 22.3 Pg. 61]

$$Fbd = 0.7(2.0 + 0.025 Vd^{1/3})$$

$$= 0.7(2.0 + 0.025(7.9)(2.45)^{1/3})$$

$$= 1.59'$$

⑥ CHECK ACTUAL FREEBOARD:

MAX WATER SURFACE =

NORMAL FLOW + SUPERELEV

$= 48.45 + 0.43' = 48.88$

TOP OF CHANNEL = 50.5

$$\boxed{\text{ACTUAL } Fbd = 50.5 - 48.88 = 1.62 > 1.59 \text{ ok}}$$

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 2 OF 2

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

Analysis of Mirehaven Arroyo - Near NE corner of site
(Section A-A of the Supplemental Information to
The Drainage Report for The Crossing Units 1 & 2)

MANNING'S N = .0300 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	49.50	4	40.00	46.00	7	180.00	47.20
2	14.00	50.50	5	68.00	46.00	8	210.00	47.20
3	22.00	50.50	6	80.00	49.80	9	255.00	50.50

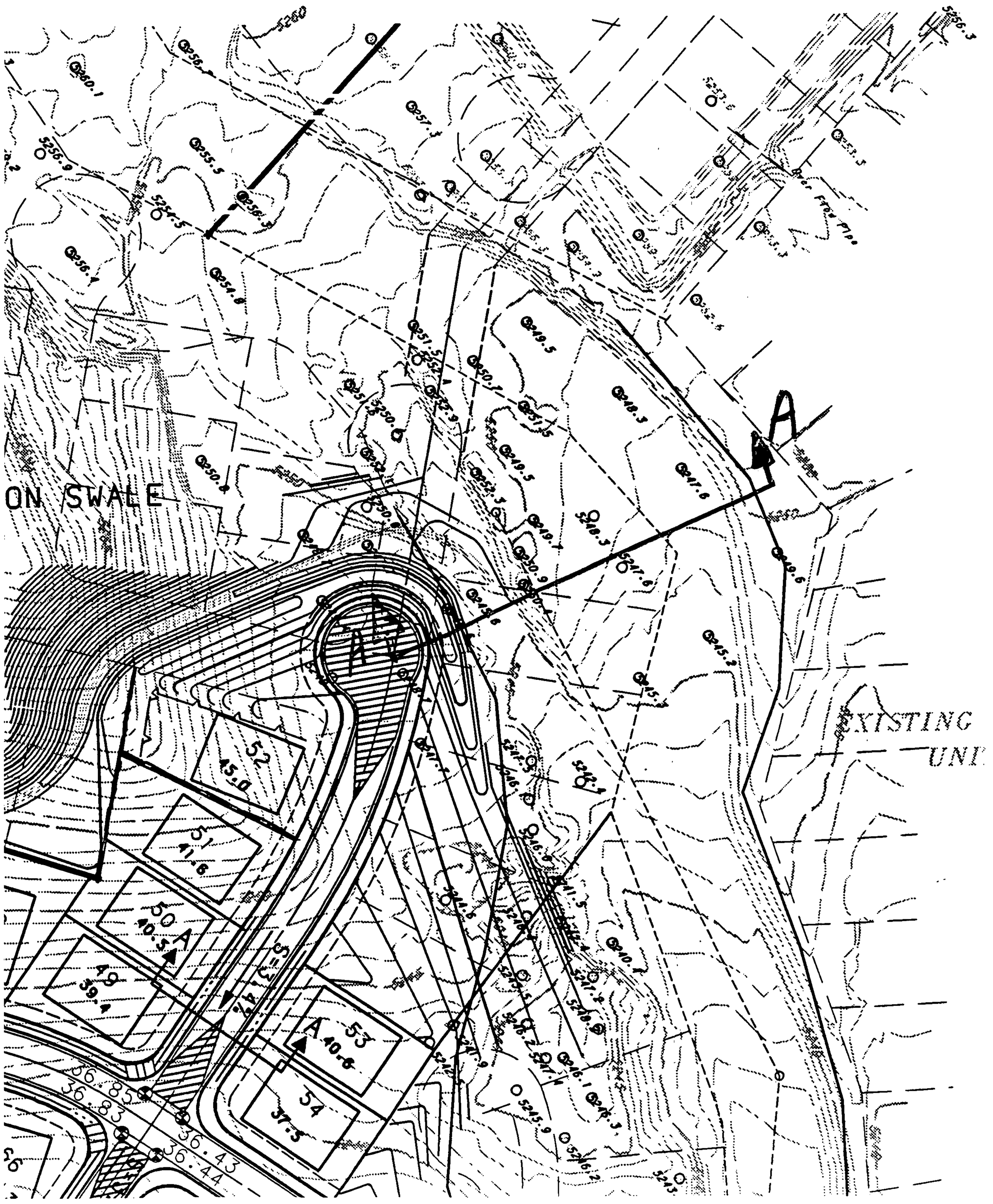
WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
46.10	0.10	2.8	4.2	28.7	1.5	28.72
46.20	0.20	5.7	13.5	29.5	2.4	29.43
46.30	0.30	8.7	26.7	30.2	3.1	30.15
46.40	0.40	11.8	43.3	31.0	3.7	30.86
46.50	0.50	14.9	63.0	31.7	4.2	31.58
46.60	0.60	18.1	85.8	32.5	4.7	32.29
46.70	0.70	21.4	111.4	33.2	5.2	33.01
46.80	0.80	24.7	139.9	33.9	5.7	33.73
46.90	0.90	28.1	171.0	34.7	6.1	34.44
47.00	1.00	31.6	204.9	35.4	6.5	35.16
47.10	1.10	35.1	241.3	36.2	6.9	35.87
47.20	1.20	38.8	280.4	36.9	7.2	66.59
47.30	1.30	45.7	234.6	72.9	5.1	72.52
47.40	1.40	53.3	287.2	78.8	5.4	78.44
47.50	1.50	61.4	346.8	84.8	5.6	84.37
47.60	1.60	70.1	413.7	90.8	5.9	90.29
47.70	1.70	79.5	488.2	96.7	6.1	96.22
47.80	1.80	89.4	570.8	102.7	6.4	102.14
47.90	1.90	99.9	661.6	108.6	6.6	108.07
48.00	2.00	111.0	761.1	114.6	6.9	113.99
48.10	2.10	122.7	869.5	120.5	7.1	119.92
48.20	2.20	135.0	987.2	126.5	7.3	125.85
48.30	2.30	147.9	1114.4	132.5	7.5	131.77
48.35	2.35	154.5	1181.7	135.4	7.6	134.73
48.40	2.40	161.3	1251.5	138.4	7.8	137.70
48.45	2.45	168.3	1323.9	141.4	7.9	140.66
48.50	2.50	175.4	1398.8	144.4	8.0	143.62
48.55	2.55	182.6	1476.3	147.4	8.1	146.58
48.60	2.60	190.0	1556.5	150.3	8.2	149.55
48.65	2.65	197.6	1639.3	153.3	8.3	152.51
48.70	2.70	205.3	1724.9	156.3	8.4	155.47
48.75	2.75	213.1	1813.2	159.3	8.5	158.44
48.80	2.80	221.1	1904.3	162.3	8.6	161.40
48.85	2.85	229.3	1998.2	165.2	8.7	164.36
48.90	2.90	237.6	2095.0	168.2	8.8	167.32
48.95	2.95	246.0	2194.7	171.2	8.9	170.29
49.00	3.00	254.6	2297.3	174.2	9.0	173.25

$Q_{100} \approx$ 1300 CFS

SUMMARY OF WEIR/SENSITIVITY ANALYSIS FOR DAM NO. 12

LIMIT OUTFLOW TO (cfs)	INCREASE EXIST. DAM12 BY FACTOR	DIVERSION WEIR ELEV (feet)	LENGTH OF WEIR (feet)	EMERGENCY SPILLWAY CREST ELEV & TOP OF WEIR	Qout WEIR PLUS PIPE OUTFLOW (cfs)	WSEL (feet)	STORAGE (acre-ft) **	COMMENTS
500	4.3	5208.9	20	5212.5	1730	5212.32	288	NEED TO RAISE SPILLWAY 1.2 FT
1000--OPTION 1	4.5	5207	30	5211.3	2112	5211.28	271	DON'T NEED TO RAISE SPILLWAY
1000--OPTION 2	4.3	5208	38	5212	2031	5211.81	268	NEED TO RAISE SPILLWAY 0.7 FT
1500--FROM DAM15 REPORT	4.3	5207	45	5211.3	2672	5211.24	246	DON'T NEED TO RAISE SPILLWAY

** Note: Dam No. 12 as drawn in the latest PADED file has a storage capacity of 265 ac-ft at elevation 5211.30.


ON SWALE
EXISTING
UNI
52
45.0
51
41.6
50
40.5
49
39.4
53
40.6
54
37.5
36.85
36.83
36.43
36.44

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

PRINCIPALS
LARRY W. HUSTON, C.P.
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KERRY L. DAVIS, P.E.
LARRY A. LARRAÑAGA, P.E.
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WILLIAM L. VREEKE, P.E.
GORDON A. WALHOOD, JR., P.E.
MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

Susan
FYI & File

MEMORANDUM

TO: MEETING ATTENDEES

FROM: CRAIG HOOVER, P.E. CH

DATE: JANUARY 22, 1996

RE: MINUTES FROM WESTLAND PHASE I SUBDIVISION MEETING WITH AMAFCA AND THE CITY ON JANUARY 17, 1996

On January 17, 1996, a meeting was held at the AMAFCA offices to discuss the proposed Westland Subdivision. In attendance at this meeting were the following:

Fred Ambrogi - Westland Development Corporation
Fred Aguirre - City of Albuquerque, Public Works Department - Hydrology
Larry Blair - AMAFCA
John Kelly - AMAFCA
Kurt Browning - AMAFCA
Michial Emery - Bohannan-Huston
Craig Hoover - Bohannan-Huston

The following is a summary of the issues discussed and the agreed upon actions or responses to these issues.

1. Are the erosion limits defined by the Avid study still acceptable to AMAFCA?

   No. The erosion limits should be based on the more recent 100-year existing conditions flow rate of 2,600 cfs. However, AMAFCA does not see the need for another prudent line analysis. In lieu of further office analysis AMAFCA staff (John Kelly and Kurt Browning) will meet with Bohannan-Huston (BHI) staff (Craig Hoover) in the field to modify the prudent line as necessary. Kurt Browning presented a possible location for the prudent line which established a number of lots which could not be developed with the first phase which closely matched the BHI configuration.

   Additionally, the City and AMAFCA suggested the use of a municipal lien on the drainage easement area and some additional acreage upland of the currently proposed project area, as a means of guarantying future improvements to the Mirehaven Arroyo with any upland development. Westland Development agreed to this in concept, subject to the value of the acreage liened being commensurate to the estimated cost of the future arroyo improvements. Details of such an agreement were not established and will need to be agreed upon at a later date. The drainage easement area will include the Mirehaven Arroyo from the inlet to Pond 12 upstream to the Unit 1 boundary. The width of this drainage easement will be established as noted above. Additionally, the

JAN 29 1996

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necessary area to expand Pond 12 to the east will be resolved by Westland for AMAFCA should the need arise in the future.

2. Is the extent of the Pond 12 expansion area defined by the BHI study satisfactory for AMAFCA's need should no detention facility in the Mirehaven Arroyo upper basin come to pass?

   Possibly. AMAFCA expressed concern over the possibility that the diversion from Dam 12 to the future West I-40 Diversion Channel may be limited to less than the 2,000 cfs stated in the report. The 2,000 cfs stated in the report was found to be in error upon review after the meeting. The actual diversion used in the model which determined the size increase for Dam 12 was 1,540 cfs. Since the ultimate allowable diversion rate to the I-40 channel will not be known until later this year with the completion of the current West I-40 Drainage Management Plan, AMAFCA requested examining other smaller diversion rates. A sensitivity analysis will be preformed by BHI starting with a diversion flow rate of 500 cfs.

3. Have the impacts of the proposed upland diversion to Pond 10 been addressed adequately in the BHI study?

   Conceptually the plan is acceptable. AMAFCA however expressed concern about sediment generated in the diversion ditch/dike since it will have a 100-year velocity of 4 fps. Two options were suggested. The first option is to reduce the slope of the channel using drop structures to decrease the flow velocity. The second is to expand the capacity of Dam 10 to offset the anticipated increased sediment load.

4. Is the extent of the temporary drainage easement defined on the attached map adequate to protect the AMAFCA and City interests for drainage purposes?

   Yes, contingent upon the field review discussed under Item 1 and assuming the Dam 12 sensitivity analysis (Item 2) results in not necessitating a change.

5. Is a waterline easement across the above referenced drainage easement from 98th Street of concern to AMAFCA or the City from a drainage standpoint?

   Yes, but this easement may be granted provided the waterline is buried sufficiently deep.

6. Is the proposed temporary emergency access concept and location of concern to AMAFCA or the City assuming we can meet design criteria?

   Conceptually, it was approved. However, AMAFCA staff would like to review it in the field along with Item 1.

7. What licenses from AMAFCA, if any, need to be obtained for the:

   - Permanent Access?
   - Temporary Emergency Access?
   - Waterline Easement/Future Road R/W?

   A license to the City from AMAFCA, and AMAFCA approval of the plans are required for all three.

8. Is the grading area for interim volume expansion of Pond 12 to satisfy the subdivision needs conceptually satisfactory?

   Yes, contingent upon the results of the sensitivity analysis detailed in item 2.

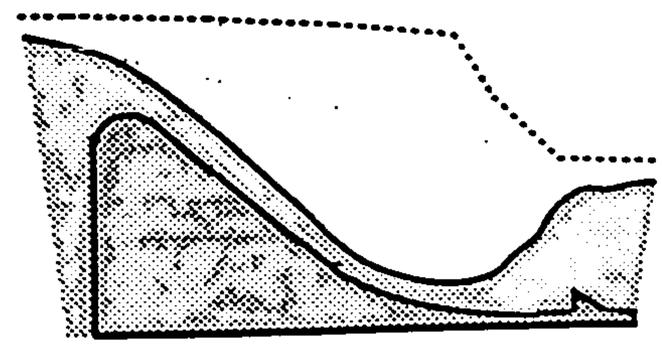
9. What other issues are apparent at this time?

   Fred Aguirre suggested that a separate infrastructure list for the future Mirehaven Channel, and an SIA for the lien agreement items be submitted along with Unit 1.

If you have any corrections, comments or questions, please call me at 823-1000. If I receive no comments concerning the contents of this memo, we will proceed with our planning efforts based on the above information.

/kc

Richard J. Heggen
PE, PH, PhD
Water Resources Engineering
620 Ridgecrest SE
Albuquerque, NM 87108



Monday, July 20, 1992

The following notes refer to channel scour analysis estimated in accord with *Sediment and Erosion Design Guide*, prepared for AMAFCA by Resource Consultants, Inc., draft copy, August, 1991.

It is my opinion that these calculations may overestimate scour depth, as

1) All scour mechanisms are considered to be independent and additive.

2) Local scour is exponentially related to Froude Number. Model calibration appears to be for subcritical data. Extrapolation into the supercritical regime may not be justified.

3) The scour formulae presume a rectangular channel.

As overestimation leads to conservative engineering design, I support RCI's methodology until such a time that improved methods are justified.

My analysis employs Excel 3.0. Channel reaches are indicated by rows. Reach data, including scour, are indicated by columns.

Column		Notes
A	Reach	Reach number
B	Q	Discharge
C	ALOB	Area, left overbank, from HEC-2
D	ACH	Area, channel, from HEC-2
E	AROB	Area, left overbank, from HEC-2
F	A tot	Total area, **C** + **D** + **E**
G	TOPWID	Top width, from HEC-2
H	b eff	Width of rectangular channel approximation, $\mathbf{G}\left(\frac{\mathbf{C}/2 + \mathbf{D} + \mathbf{E}/2}{\mathbf{F}}\right)$

The rectangular channel approximation is a channel where

(505) 277-5737, 277-2722 FAX (505) 277-1988 bitnet rheggen@unmb

Scour depth 6'
Channel invert
@ 5254

top of pipe 5248

width = top width of actual cross-section, if all flow is confined to channel

$$\text{width} = \frac{\text{top width of actual cross-section}}{2}$$, if all flow is on overbank

width is interploated from above when flow is on both channel and overbank.

The rectangular channel approximation preserves both the cross-sectional area and velocity of the actual channel.

Figs. 1 and 2 illustrate consequences of channel and overbank delineation (STCHL and STCHR, the channel-overbank stations, on the X1, cross-section record, in HEC-2) on the rectangular approximation. The illustrations are simplified, as actual cross-sections of any configuration can be input into HEC-2. If scour is likely to occur in the central portion of the channel, flow along the outer boundaries (above the sideslopes in Figs. 1 and 2) should be defined in HEC-2 as overbank flow (Fig. 1). If scour is likely to occur under the full water surface, flow at the outer boundaries should be defined as channel flow (Fig. 2).

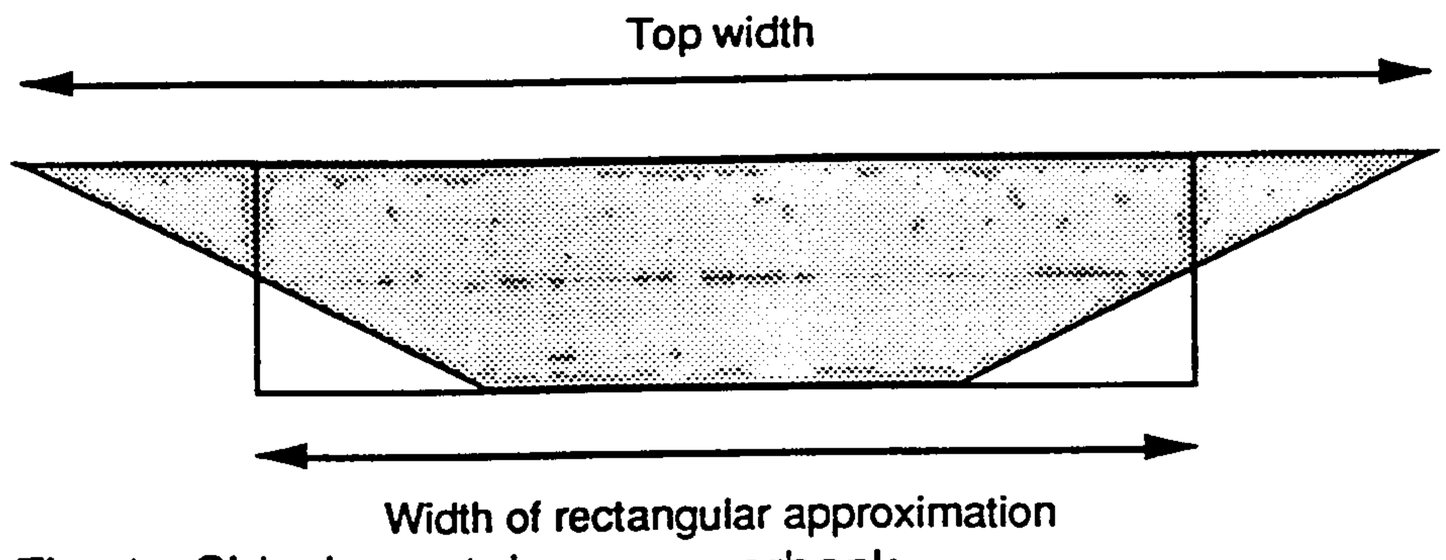


Fig. 1. Sideslopes taken as overbank

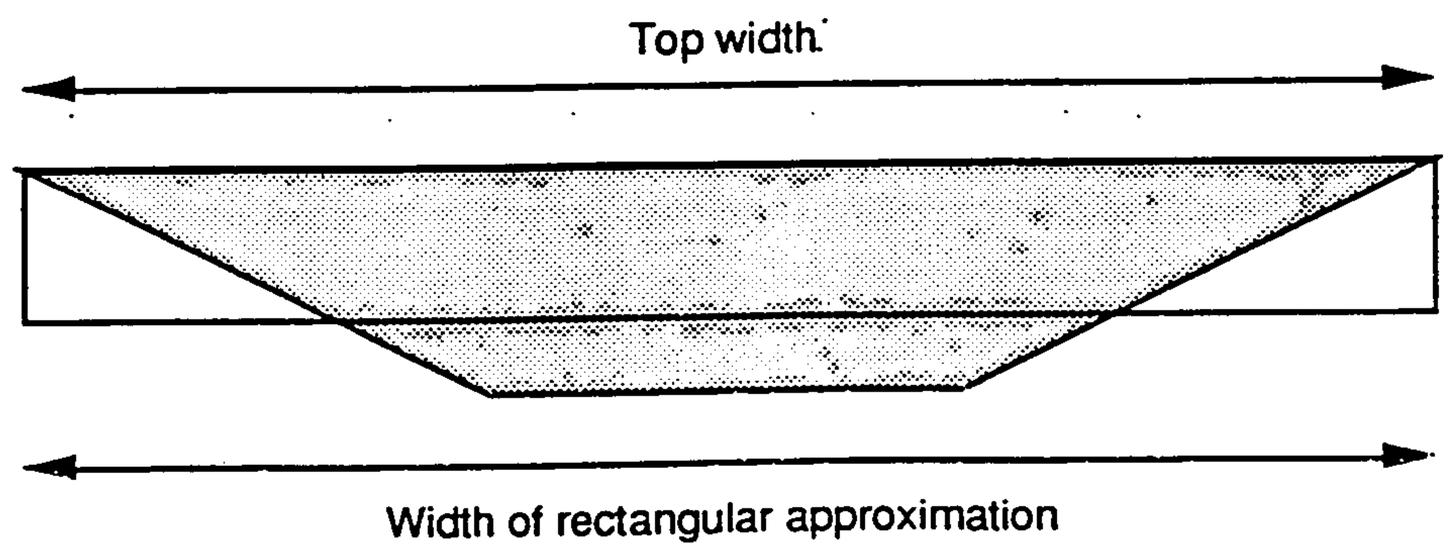


Fig. 2. Sideslopes taken as channel

I	V	Velocity, $\frac{B}{F}$
J	D	Hydraulic depth of rectangular approximation, $\frac{F}{G}$
K	F	Froude number for rectangular approximation, $\frac{I}{\sqrt{g\,J}}$
L	≈ q	Unit discharge in rectangular channel approximation, $\frac{B}{H}$
M	≈ yc	Critical depth in rectangular channel approximation, $\sqrt[3]{\frac{L^2}{g}}$
		Included for general information. Not used for scour estimation.
N	scour t	Long term scour
		Estimated from anticipated geomorphic trends. See RCI Sec. 3.4.2-3.4.4 for discussion of equilibrium slope.
O	scour c	Contraction scour
		Estimated from abutment, pier, or other contraction analogies. See RCI Sec. 3.4.5 for discussion of bridges.
P	scour l	Local scour, $4 * J * K^{1/3}$
		The limiting scour depth, FHWA, HEC 20, 1991. The Froehlich equation is also considered acceptable by RCI. See RCI Sec. 3.6 for alternative methods.
Q	scour a	Antidune scour, $0.44 * J * K^2$
		Derived from the Kennedy formula, $h_a = 0.14\frac{2\pi V^2}{g}$
R	scour tot	Total scour, **N + O + P + Q**

WESTLAND MASTERPLAN WATERLINE ARROYO CROSSINGS SCOUR ANALYSIS
JOB NO. 96178A 2134
FILE NAME: HYDRO:[H96178A2100.SCOUR]SCOUR.WK3
DATE: 3/14/96

SCOUR ANALYSIS - HEGGEN'S METHOD

LONG TERM SCOUR
Based on Arroyo Equlibrium Slope from CURVCALC Computer Sediment Analysis for comprable arroyos

PARAMETER	DESCRIPTION	UNIT	
			Mirehaven Arroyo
REACH	Reach Number/Bridge Name		@ AP7
Crossing Elevation	Arroyo Invert Elev. at crossing		5254
Se	Equilibrium Slope		0.0254
Control	Arroyo Control Elev.		5254.15
Length	Distance from Control		0.00
Crossing Equilibrium Elevation	Long Term Arroyo Invert		5254.15
Q	Disharge		2571.00
ALOB	Area Lt. Overbank	(sf)	0.00
ACH	Area Channel	(sf)	320.50
AROB	Area Rt. Overbank	(sf)	0.00
ATOTAL	Total Area	(sf)	320.50
TOPWID	Top Width	(ft)	234.00
Beff	Width	(ft)	234.00
V	Velocity	(fps)	8.02
D	Hydraulic Depth	(ft)	1.37
F	Froude Number		1.21
q	Unit Discharge	(cfs/ft)	10.99
yc	Critical Depth	(ft)	1.55
scour t	Long Term Scour	(ft)	0.00
scour c	Contraction Scour	(ft)	0.00
scour l	Local Scour	(ft)	5.83
scour tot	Total Scour	(ft)	5.83

CROSS SECTION AT CROSSING

MANNING'S N = .0350 SLOPE = .0254

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5256.69	4	100.00	5254.15	7	295.00	5265.00
2	20.00	5256.00	5	250.00	5255.00	8	320.00	5270.00
3	30.00	5255.00	6	270.00	5260.00	9	340.00	5275.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
5254.20	0.05	0.3	0.2	12.9	0.6	12.94
5254.25	0.10	1.3	1.2	25.9	0.9	25.88
5254.30	0.15	2.9	3.5	38.8	1.2	38.82
5254.35	0.20	5.2	7.5	51.8	1.5	51.76
5254.40	0.25	8.1	13.7	64.7	1.7	64.70
5254.45	0.30	11.6	22.2	77.6	1.9	77.64
5254.50	0.35	15.9	33.6	90.6	2.1	90.58
5254.55	0.40	20.7	47.9	103.5	2.3	103.52
5254.60	0.45	26.2	65.6	116.5	2.5	116.46
5254.65	0.50	32.3	86.9	129.4	2.7	129.40
5254.70	0.55	39.1	112.0	142.3	2.9	142.34
5254.75	0.60	46.6	141.3	155.3	3.0	155.28
5254.80	0.65	54.7	174.9	168.2	3.2	168.22
5254.85	0.70	63.4	213.1	181.2	3.4	181.16
5254.90	0.75	72.8	256.1	194.1	3.5	194.10
5254.95	0.80	82.8	304.2	207.0	3.7	207.04
5255.00	0.85	93.5	357.6	220.0	3.8	219.97
5255.05	0.90	104.5	429.6	220.7	4.1	220.70
5255.10	0.95	115.6	506.9	221.4	4.4	221.40
5255.15	1.00	126.6	589.2	222.1	4.7	222.10
5255.20	1.05	137.8	676.5	222.8	4.9	222.80
5255.25	1.10	148.9	768.7	223.5	5.2	223.50
5255.30	1.15	160.1	865.5	224.3	5.4	224.20
5255.35	1.20	171.3	967.0	225.0	5.6	224.90
5255.40	1.25	182.6	1073.0	225.7	5.9	225.60
5255.45	1.30	193.9	1183.4	226.4	6.1	226.30
5255.50	1.35	205.2	1298.2	227.1	6.3	227.00
5255.55	1.40	216.6	1417.3	227.8	6.5	227.70
5255.60	1.45	228.0	1540.6	228.5	6.8	228.40
5255.65	1.50	239.4	1668.1	229.2	7.0	229.10
5255.70	1.55	250.9	1799.7	229.9	7.2	229.80
5255.75	1.60	262.4	1935.4	230.6	7.4	230.50
5255.80	1.65	274.0	2075.0	231.3	7.6	231.20
5255.85	1.70	285.5	2218.7	232.1	7.8	231.90
5255.90	1.75	297.2	2366.3	232.8	8.0	232.60
5255.95	1.80	308.8	2517.8	233.5	8.2	233.30
5256.00	1.85	320.5	2673.1	234.2	8.3	234.00
5256.05	1.90	332.2	2825.0	235.8	8.5	235.65
5256.10	1.95	344.1	2980.7	237.5	8.7	237.30
5256.15	2.00	356.0	3140.0	239.1	8.8	238.94
5256.20	2.05	367.9	3302.9	240.8	9.0	240.59
5256.25	2.10	380.0	3469.6	242.5	9.1	242.24
5256.30	2.15	392.2	3640.0	244.1	9.3	243.89
5256.35	2.20	404.4	3814.0	245.8	9.4	245.54
5256.40	2.25	416.7	3991.6	247.4	9.6	247.19
5256.45	2.30	429.1	4173.0	249.1	9.7	248.84
5256.50	2.35	441.6	4357.9	250.7	9.9	250.49
5256.55	2.40	454.2	4546.6	252.4	10.0	252.14
5256.60	2.45	466.8	4738.8	254.1	10.2	253.79
5256.65	2.50	479.6	4934.7	255.7	10.3	255.44
5256.69	2.54	489.8	5094.3	257.0	10.4	256.76

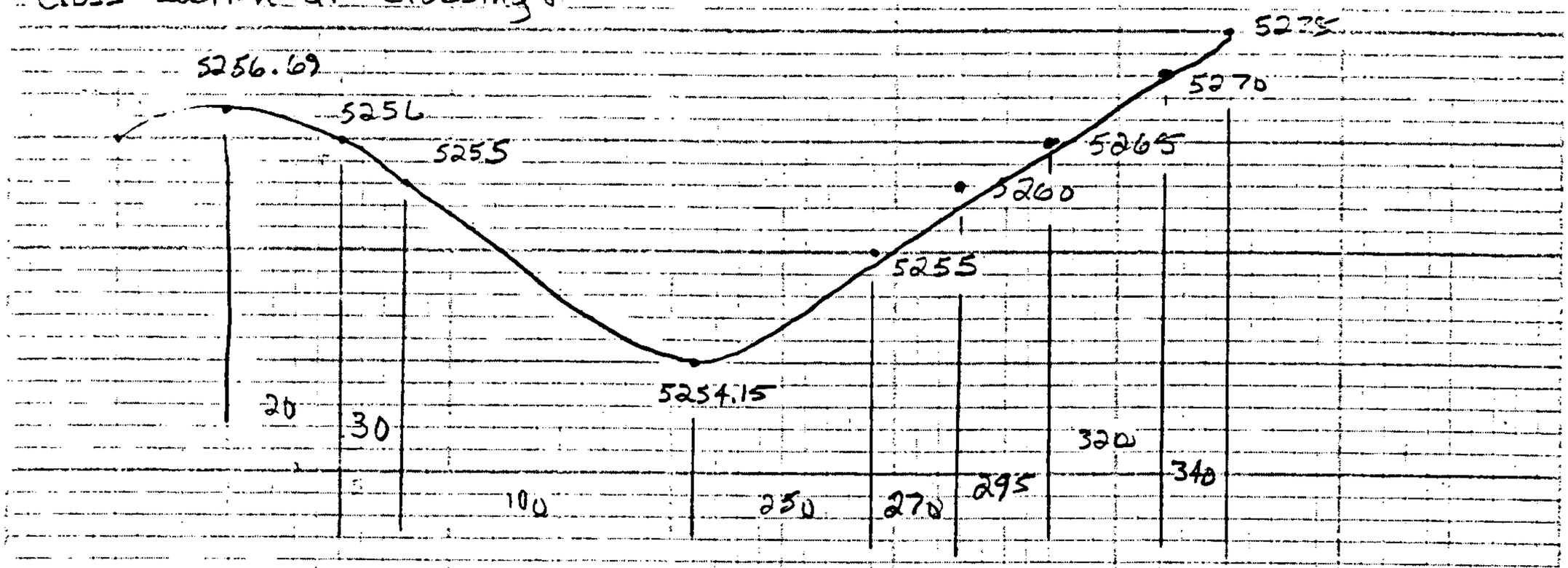
Mirehaven Arroyo:

Existing Plus Phase I Developement Flowrate = 2,571 cfs

$$\text{Slope} = \frac{5260 - 5245'}{590'} = \frac{15'}{590} = 0.0254$$

Crossing Elev. ≈ 5254

Cross Section at Crossing:



Q = 2,571 cfs

WSEL = 5256

TOP WIDTH = 234'

AREA = 320.5 ft^2

BOHANNAN-HUSTON INC.

PROJECT NAME Westland Waterline SHEET 1 OF

PROJECT NO. 96178 A BY DEB DATE 3/14

SUBJECT Scour Analysis CH'D DATE

Drainage Report for Westland Phase I Subdivision

- has AMAFCA reviewed/approved this report?
- are the "Mirehaven Channel drainage easements" existing or proposed? Does it belong to AMAFCA? What are the limits based on?
- is Westland Phase I a bulk land plat? (w/ easement dedication)
- Where are Units 1 & 2 located w/in Phase I?
- any development proposed w/in existing Mirehaven prudent line? Show existing FEMA floodplain; Where is existing soil cement wall?
- "upon completion of Phase I ... the arroyo may be concrete lined ..." (page 5) - this needs to be designed at this time for approval of all of Phase I
- Improvements to AMAFCA Dam #12 needed - who does this? with what stage? AMAFCA must approve this work
- Offsite flows to be diverted around Phase I - if using pond, outfall must be to storm drain system or to channel - not overland flow through the streets. - design this system
- diversion channels must be within public drn. easements w/ parent covenants - where are these?
- must be built first.

CITY OF
Albuquerque

Martin J. Chávez, Mayor

June 24, 1996

Bruce Stidworthy
Bohannan Huston Inc.
7500 Jefferson NE
Albuquerque, New Mexico

RE: DRAINAGE REPORT FOR THE CROSSING UNITS 1 & 2 (H9/D1A7) SUBMITTED FOR PRELIMINARY AND FINAL PLAT APPROVAL AND ROUGH GRADING APPROVAL, ENGINEER'S STAMP DATED 5/15/96 ON UNIT 1 AND 6/4/96 ON UNIT 2.

Dear Mr. Stidworthy:

Based on the information provided in the submittals of May 15, 1996 and June 4, 1996, the Grading and Drainage Plans for The Crossing Units 1 & 2 are approved for Preliminary Plat action. Based on the additional information provided to my office on May 15, 1996, the Bulk Land Plat is also approved.

The Grading plans for Units 1 & 2 are also acceptable for Rough Grading approval. A topsoil disturbance permit will be required before any grading may take place.

Prior to Final Plat approval, financial guarantees and all drainage covenants must be in place.

Please be aware that all necessary drainage easements and covenants for off-site diversions must be in place prior to commencement of any work within those areas.

If you should have any questions, please call me at 768-2666.

Sincerely,

Susan Calongne

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

c: Kurt Browning, Albuquerque Metropolitan Arroyo Flood Control Authority
Leroy Chávez, Westland Development Co.
File

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
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PRINCIPALS

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SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

June 10, 1996

Mr. Roger Green
City of Albuquerque
Public Works Department
P.O. Box 1293
Albuquerque, NM 87103

Re: College Trunk - Master Plan 20" Waterline Submittal of Complete Construction Plans and Contract Documents

Dear Roger:

Enclosed with this letter for final signatures are the Following:

- One (1) set of Construction Plans (mylar) for the College Trunk - Master Plan 20" Waterline.
- One (1) set of review blueline prints.
- One (1) set of Contract Documents.
- One (1) copy of the final Engineer's Estimate for the referenced project.
- One (1) copy of the scour analysis at the Mirehaven Arroyo.
- Three (3) sets of Construction Plans and Contract Documents from the DRC members with their comments and our responses.

Please note the bulk land plat is included with this submittal and has not been approved by the City DRB yet. We anticipate receiving signatures on June 11, 1996. Once the plat has been approved, we will include it in the final plans.

Please schedule a final signature hearing at your earliest convenience. If you have any questions please call me at 823-1000.

Sincerely,

Craig Hoover

Craig Hoover, P.E.
Project Manager
Water Resources Group

DEB:CWH/sh
Enclosures

cc: Susan Calogne, City of Albuquerque Hydrology (scour analysis only)
Michial Emery, BHI (w/o attachments)
Kevin Patton, BHI (w/o attachments)

JUN 17 1996

M:\HYDRO\96178\A2100\GREEN.LTR.DOC - 6/10/96

Richard J. Heggen
PE, PH, PhD
Water Resources Engineering
620 Ridgecrest SE
Albuquerque, NM 87108

Monday, July 20, 1992

The following notes refer to channel scour analysis estimated in accord with *Sediment and Erosion Design Guide*, prepared for AMAFCA by Resource Consultants, Inc., draft copy, August, 1991.

It is my opinion that these calculations may overestimate scour depth, as

1) All scour mechanisms are considered to be independent and additive.

2) Local scour is exponentially related to Froude Number. Model calibration appears to be for subcritical data. Extrapolation into the supercritical regime may not be justified.

3) The scour formulae presume a rectangular channel.

As overestimation leads to conservative engineering design, I support RCI's methodology until such a time that improved methods are justified.

My analysis employs Excel 3.0. Channel reaches are indicated by rows. Reach data, including scour, are indicated by columns.

Column		Notes
A	Reach	Reach number
B	Q	Discharge
C	ALOB	Area, left overbank, from HEC-2
D	ACH	Area, channel, from HEC-2
E	AROB	Area, left overbank, from HEC-2
F	A tot	Total area, **C** + **D** + **E**
G	TOPWID	Top width, from HEC-2
H	b eff	Width of rectangular channel approximation, $\mathbf{G}\left(\frac{\mathbf{C}/2 + \mathbf{D} + \mathbf{E}/2}{\mathbf{F}}\right)$

The rectangular channel approximation is a channel where

(505) 277-5737, 277-2722 FAX (505) 277-1988 bitnet rheggen@unmb

width = top width of actual cross-section, if all flow is confined to channel

width = $\frac{\text{top width of actual cross-section}}{2}$, if all flow is on overbank

width is interploated from above when flow is on both channel and overbank.

The rectangular channel approximation preserves both the cross-sectional area and velocity of the actual channel.

Figs. 1 and 2 illustrate consequences of channel and overbank delineation (STCHL and STCHR, the channel-overbank stations, on the X1, cross-section record, in HEC-2) on the rectangular approximation. The illustrations are simplified, as actual cross-sections of any configuration can be input into HEC-2. If scour is likely to occur in the central portion of the channel, flow along the outer boundaries (above the sideslopes in Figs. 1 and 2) should be defined in HEC-2 as overbank flow (Fig. 1). If scour is likely to occur under the full water surface, flow at the outer boundaries should be defined as channel flow (Fig. 2).

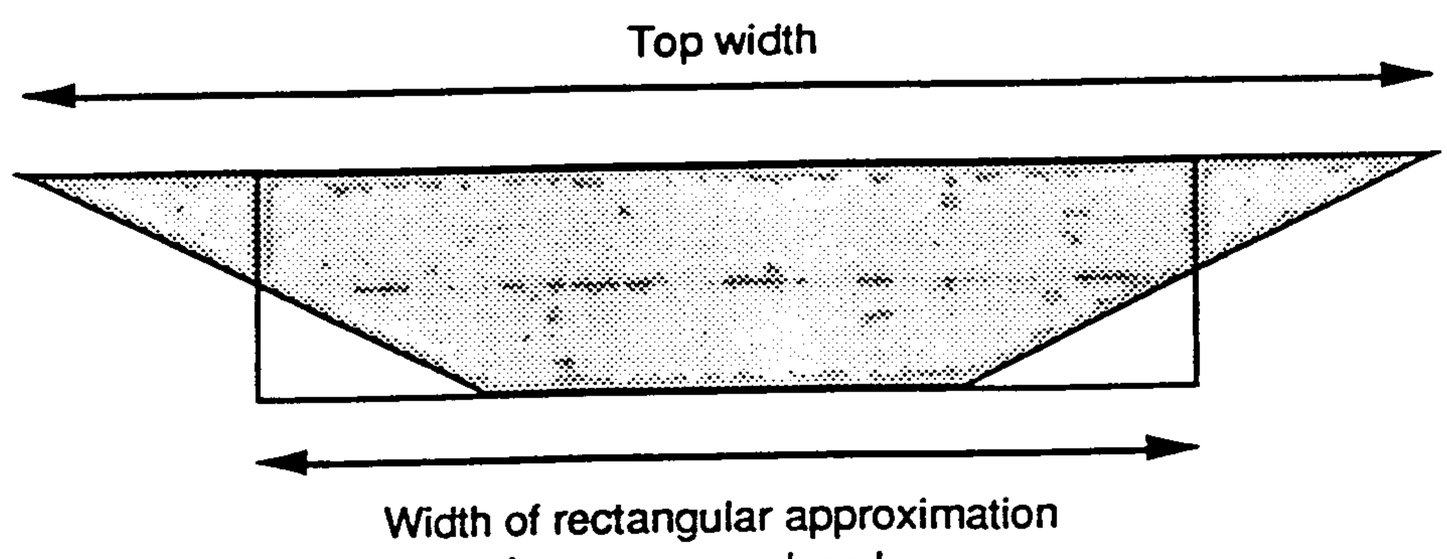


Fig. 1. Sideslopes taken as overbank

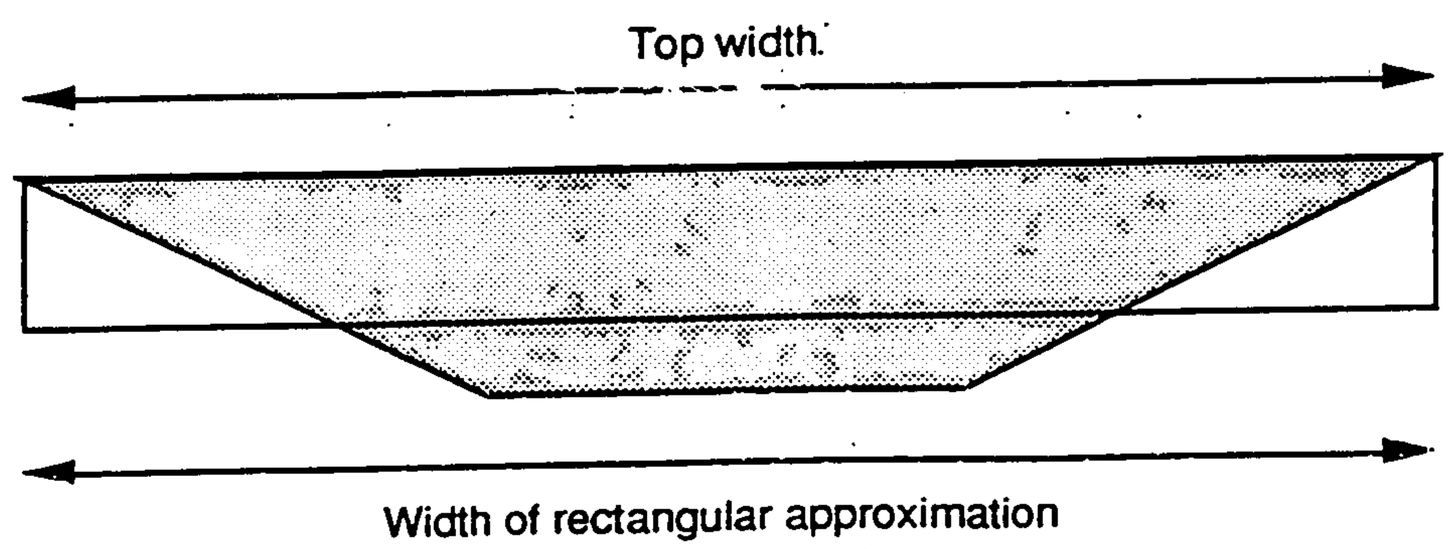


Fig. 2. Sideslopes taken as channel

I	V	Velocity, $\frac{B}{F}$
J	D	Hydraulic depth of rectangular approximation, $\frac{F}{G}$
K	F	Froude number for rectangular approximation, $\frac{I}{\sqrt{g\,J}}$
L	≈ q	Unit discharge in rectangular channel approximation, $\frac{B}{H}$
M	≈ yc	Critical depth in rectangular channel approximation, $\sqrt[3]{\frac{L^2}{g}}$
		Included for general information. Not used for scour estimation.
N	scour t	Long term scour
		Estimated from anticipated geomorphic trends. See RCI Sec. 3.4.2-3.4.4 for discussion of equilibrium slope.
O	scour c	Contraction scour
		Estimated from abutment, pier, or other contraction analogies. See RCI Sec. 3.4.5 for discussion of bridges.
P	scour l	Local scour, $4 * \mathbf{J} * \mathbf{K}^{1/3}$
		The limiting scour depth, FHWA, HEC 20, 1991. The Froehlich equation is also considered acceptable by RCI. See RCI Sec. 3.6 for alternative methods.
Q	scour a	Antidune scour, $0.44 * \mathbf{J} * \mathbf{K}^2$
		Derived from the Kennedy formula, $h_a = 0.14\frac{2\pi V^2}{g}$
R	scour tot	Total scour, **N** + **O** + **P** + **Q**

WESTLAND MASTERPLAN WATERLINE ARROYO CROSSINGS SCOUR ANALYSIS
JOB NO. 96178A 2134
FILE NAME: HYDRO:[H96178A2100.SCOUR]SCOUR.WK3
DATE: 3/14/96

SCOUR ANALYSIS - HEGGEN'S METHOD

LONG TERM SCOUR
Based on Arroyo Equlibrium Slope from CURVCALC Computer Sediment Analysis for comprable arroyos

PARAMETER	DESCRIPTION	UNIT	
			Mirehaven Arroyo
REACH	Reach Number/Bridge Name		@ AP7
Crossing Elevation	Arroyo Invert Elev. at crossing		5254
Se	Equilibrium Slope		0.0254
Control	Arroyo Control Elev.		5254.15
Length	Distance from Control		0.00
Crossing Equilibrium Elevation	Long Term Arroyo Invert		5254.15
Q	Disharge		2571.00
ALOB	Area Lt. Overbank	(sf)	0.00
ACH	Area Channel	(sf)	320.50
AROB	Area Rt. Overbank	(sf)	0.00
ATOTAL	Total Area	(sf)	320.50
TOPWID	Top Width	(ft)	234.00
Beff	Width	(ft)	234.00
V	Velocity	(fps)	8.02
D	Hydraulic Depth	(ft)	1.37
F	Froude Number		1.21
q	Unit Discharge	(cfs/ft)	10.99
yc	Critical Depth	(ft)	1.55
scour t	Long Term Scour	(ft)	0.00
scour c	Contraction Scour	(ft)	0.00
scour l	Local Scour	(ft)	5.83
scour tot	Total Scour	(ft)	5.83

CROSS SECTION AT CROSSING

MANNING'S N = .0350 SLOPE = .0254

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5256.69	4	100.00	5254.15	7	295.00	5265.00
2	20.00	5256.00	5	250.00	5255.00	8	320.00	5270.00
3	30.00	5255.00	6	270.00	5260.00	9	340.00	5275.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
5254.20	0.05	0.3	0.2	12.9	0.6	12.94
5254.25	0.10	1.3	1.2	25.9	0.9	25.88
5254.30	0.15	2.9	3.5	38.8	1.2	38.82
5254.35	0.20	5.2	7.5	51.8	1.5	51.76
5254.40	0.25	8.1	13.7	64.7	1.7	64.70
5254.45	0.30	11.6	22.2	77.6	1.9	77.64
5254.50	0.35	15.9	33.6	90.6	2.1	90.58
5254.55	0.40	20.7	47.9	103.5	2.3	103.52
5254.60	0.45	26.2	65.6	116.5	2.5	116.46
5254.65	0.50	32.3	86.9	129.4	2.7	129.40
5254.70	0.55	39.1	112.0	142.3	2.9	142.34
5254.75	0.60	46.6	141.3	155.3	3.0	155.28
5254.80	0.65	54.7	174.9	168.2	3.2	168.22
5254.85	0.70	63.4	213.1	181.2	3.4	181.16
5254.90	0.75	72.8	256.1	194.1	3.5	194.10
5254.95	0.80	82.8	304.2	207.0	3.7	207.04
5255.00	0.85	93.5	357.6	220.0	3.8	219.97
5255.05	0.90	104.5	429.6	220.7	4.1	220.70
5255.10	0.95	115.6	506.9	221.4	4.4	221.40
5255.15	1.00	126.6	589.2	222.1	4.7	222.10
5255.20	1.05	137.8	676.5	222.8	4.9	222.80
5255.25	1.10	148.9	768.7	223.5	5.2	223.50
5255.30	1.15	160.1	865.5	224.3	5.4	224.20
5255.35	1.20	171.3	967.0	225.0	5.6	224.90
5255.40	1.25	182.6	1073.0	225.7	5.9	225.60
5255.45	1.30	193.9	1183.4	226.4	6.1	226.30
5255.50	1.35	205.2	1298.2	227.1	6.3	227.00
5255.55	1.40	216.6	1417.3	227.8	6.5	227.70
5255.60	1.45	228.0	1540.6	228.5	6.8	228.40
5255.65	1.50	239.4	1668.1	229.2	7.0	229.10
5255.70	1.55	250.9	1799.7	229.9	7.2	229.80
5255.75	1.60	262.4	1935.4	230.6	7.4	230.50
5255.80	1.65	274.0	2075.0	231.3	7.6	231.20
5255.85	1.70	285.5	2218.7	232.1	7.8	231.90
5255.90	1.75	297.2	2366.3	232.8	8.0	232.60
5255.95	1.80	308.8	2517.8	233.5	8.2	233.30
5256.00	1.85	320.5	2673.1	234.2	8.3	234.00
5256.05	1.90	332.2	2825.0	235.8	8.5	235.65
5256.10	1.95	344.1	2980.7	237.5	8.7	237.30
5256.15	2.00	356.0	3140.0	239.1	8.8	238.94
5256.20	2.05	367.9	3302.9	240.8	9.0	240.59
5256.25	2.10	380.0	3469.6	242.5	9.1	242.24
5256.30	2.15	392.2	3640.0	244.1	9.3	243.89
5256.35	2.20	404.4	3814.0	245.8	9.4	245.54
5256.40	2.25	416.7	3991.6	247.4	9.6	247.19
5256.45	2.30	429.1	4173.0	249.1	9.7	248.84
5256.50	2.35	441.6	4357.9	250.7	9.9	250.49
5256.55	2.40	454.2	4546.6	252.4	10.0	252.14
5256.60	2.45	466.8	4738.8	254.1	10.2	253.79
5256.65	2.50	479.6	4934.7	255.7	10.3	255.44
5256.69	2.54	489.8	5094.3	257.0	10.4	256.76

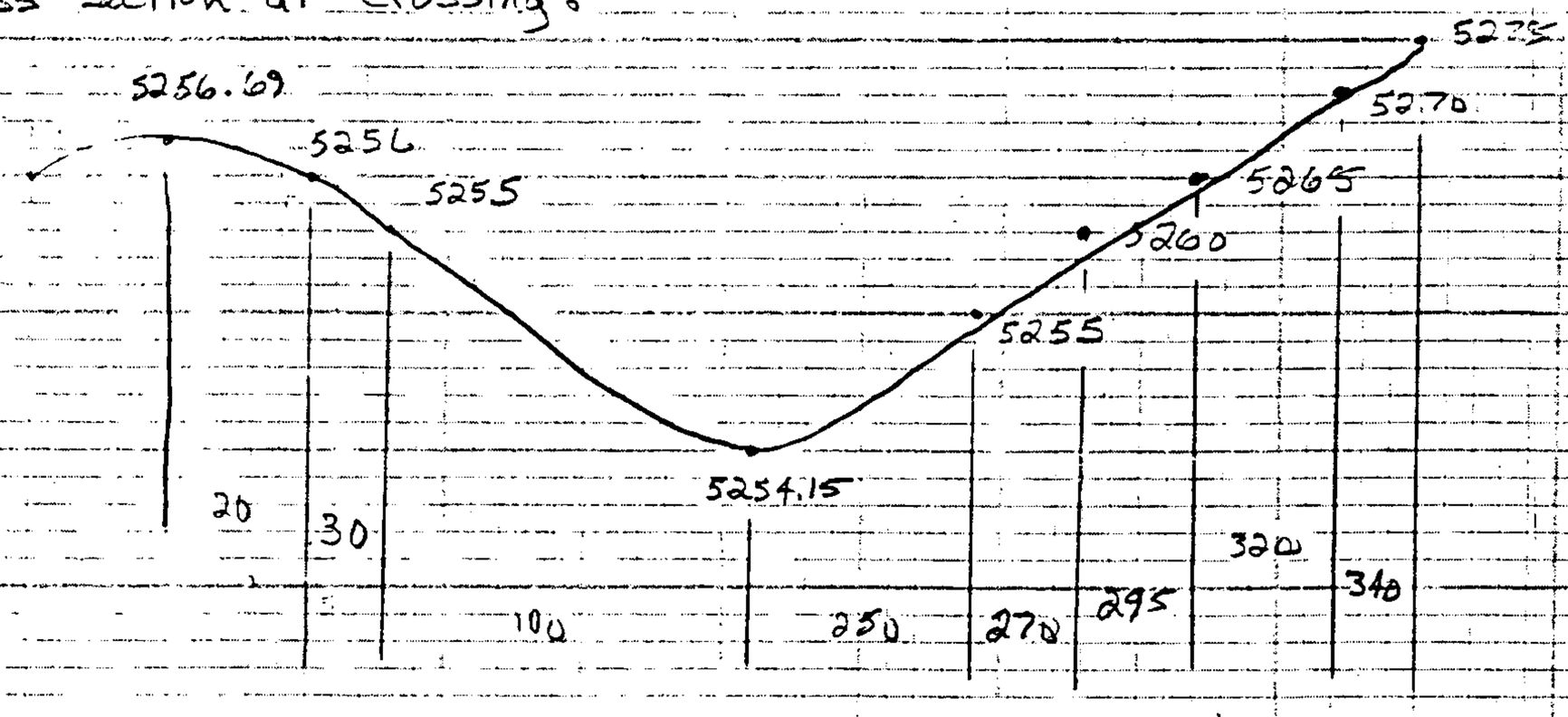
Mirehaven Arroyo:

Existing Plus Phase I Developement Flowrate = 2,571 cfs

$$\text{Slope} = \frac{5260 - 5245'}{590'} = \frac{15'}{590} = 0.0254$$

Crossing Elev. ≈ 5254

Cross Section at Crossing:



Q = 2,571 cfs

WSEL = 5256

TOP WIDTH = 234'

AREA = 320.5 ft²

BOHANNAN-HUSTON INC.

PROJECT NAME Westland Waterline SHEET 1 OF

PROJECT NO. 96178 A BY DEB DATE 3/14

SUBJECT Scour Analysis CH'D DATE

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
LARRY A. LARRAÑAGA, P.E.
HOWARD C. STONE, P.E.

PRINCIPALS

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GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

H9/D1A7

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

June 26, 1996

Mr. Kurt Browning, P.E
Albuquerque Metropolitan Arroyo Flood Control Authority
2600 Prospect NE
Albuquerque, NM 87107

Re: The Crossing Subdivision (Westland Development) and Your Letter Dated June 19, 1996

Dear Kurt:

In the letter referenced above, you summarized AMAFCA's remaining concerns relative to the subject project. Accordingly, this letter addresses each of those items.

1. The berm required at the upper end of the site has been thoroughly analyzed, and all computations and figures are attached. As the attached analysis shows, the 100-year water surface, and the energy grade line are significantly below the bottom of the berm. An additional safety factor for the subdivision is the curvature of the arroyo; the subject berm is on the inside of the curve.

2. Complete analyses of the plunge pool into Dam 10 and the outfalls (Type VI) into Dams 11 and 12 are enclosed. The plunge pool was designed based upon the criteria given on pages IV-B-8 through IV-B-12 of *Hydraulic Design of Energy Dissipators for Culverts and Channels* (FHWA H.E.C. #14). The impact basins (Type VI) were designed based on the criteria given on pages 308 to 322 of *Design of Small Canal Structures* (USBR).

3. A letter, along with appropriate scour analysis for licenses, has been previously sent to AMAFCA. The letter was addressed to you, dated May 15, 1996.

4. Appropriate covenants covering maintenance of temporary drainage facilities are being coordinated with the City.

5. A set of 95% complete construction plans for both Units 1 and 2 are enclosed for your review. Construction plans sets were submitted to DRC on Friday June 21st, and a DRC meeting has been scheduled for Tuesday July 2nd at 1:30pm. It is our intention to bring final mylars to that meeting for signature. If at all possible, we would like to get your comments and mark-ups by Friday so that correct and complete mylars can be prepared for Tuesday's meeting.

With regard to the "piece meal" analyses mentioned in your letter; we understand that a comprehensive report is convenient, and it is unfortunate that the results of the January meetings were not included in the March 1996 report. However, some "piece meal" analysis is unavoidable due to the nature of the review on this project (i.e. two separate reviewing agencies, and multiple individuals within each agency).

E:\CDP\95335\A2440\BROWNING2_LTR.DOC - 06/26/96

Please contact me or Kevin Patton if you have any questions while reviewing the above mentioned materials.

Sincerely,

Bruce Stidworthy

Bruce Stidworthy, E.I.
Community Development & Planning Group

KP/rac

Enclosures

cc: Leroy Chavez, Westland Development
Fred Ambrogi, Westland Development
John Kelly, AMAFCA
Susan Calongne, City Hydrology
Mike Emery, BHI

JUL - 1 1996

GENEIVA MEEKER, CHAIR
DANIEL W. COOK, VICE-CHAIR
RONALD D. BROWN, SECRETARY-TREASURER
MICHAEL MURPHY, ASST. SECRETARY-TREASURER
TIM EICHENBERG, DIRECTOR

LARRY A. BLAIR
EXECUTIVE ENGINEER

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

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

Susan

June 19, 1996

Mr. Bruce Stidworthy
Bohannan-Huston, Inc.

VIA FAX: BHI

RE: The Crossing Subdivision, Preliminary Plat status

Dear Bruce:

Per our phone conversation yesterday, I am noting below the issues that we discussed. I anticipate preliminary plat approval next Tuesday.

1. My main concern is the interim berm required at the upper end of the site next to the Mirehaven Arroyo. Per our field trip with Craig Hoover, this berm is definitely needed for protection of the subdivision and must withstand the 100 year event. John Kelly informs me that a 12 foot top width was discussed at your last meeting. A complete analysis is still required supporting the design and size of this berm.

2. Complete analyses of the plunge pool into Dam 10 and the outfalls (Type VI) into Dams 11 and 12 are still required for review.

3. Martin Eckert of our office is preparing the utility crossing licenses. Appropriate scour analysis with details that can be attached to the licenses must be sent.

4. I assume the City is coordinating the appropriate covenants that I referenced in my May 13 letter to Mr. Emery.

5. Due to the proximity of the Mirehaven Arroyo and the Ladera Dam system, we are requesting a set of construction prints (at least 90% complete with all appropriate details) for AMAFCA to mark-up and make comments. Hopefully, all comments can be addressed on the first go around.

Items one and two above must be addressed prior to final plat approval. We would like to be included in the DRC review meetings and have communicated this to Ms. Susan Calongne.

As I stated on the phone, the latest complete report we have is dated March 1996. Everything else has come in "piece meal" as analyses are made and changes are incorporated. It makes it very difficult to review the entire project and put together the puzzle. It is my opinion that the first four items above, as well as most of the May 13 letter comments, should have been

addressed in the drainage report submittal or a revision. The six pages of text in the report are lacking with regard to these issues, especially the January meetings, minutes and decisions, with unifying discussion and supporting documentation. A final, stand alone report, is convenient to have for reference purposes.

Please send a set of prints for our review. Should you have any questions or comments, do not hesitate to call me or John Kelly.

Sincerely,
AMAFCA

Kurt Browning, P.E.
Drainage Engineer

c: Mr. Fred Aguirre, COA Hydrology
Ms. Susan Calongne, COA Hydrology

DRAINAGE INFORMATION SHEET

H9/D147

PROJECT TITLE: THE CROSSING, UNITS 1 & 2 ZONE ATLAS/DRNG. FILE # ~~H-9, J-9~~

DRB #: 95-537 EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: (EXIST.) - EL RANCO ATRISCO TR A2A & UNPLATTED LAND IN SW 1/4, SECT. 9 TION R2E NMPM

CITY ADDRESS: NW OF THE CORNER OF LADERA DRIVE & UNSER BLVD.

ENGINEERING FIRM: BOHANNAN HUSTON, INC. CONTACT: BRUCE STIDWORTHY

ADDRESS: 7500 JEFFERSON NE, ALB. NM 87109 PHONE: 823-1000

OWNER: WESTLAND DEV. CO. INC. CONTACT: LEROY CHAVEZ

ADDRESS: 401 COORS BLVD NW PHONE: 831-9600

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

TYPE OF SUBMITTAL:

___ DRAINAGE REPORT
___ DRAINAGE PLAN
___ CONCEPTUAL GRADING & DRAINAGE PLAN
___ GRADING PLAN
___ EROSION CONTROL PLAN
___ ENGINEER'S CERTIFICATION
✓ OTHER - RESPONSE TO COMMENTS

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
___ OTHER _____ (SPECIFY)

DATE SUBMITTED: _____

BY: _____

RECEIVED JUN 4 1996 6-4-96 HYDROLOGY

GENEIVA MEEKER, CHAIR
DANIEL W. COOK, VICE-CHAIR
RONALD D. BROWN, SECRETARY-TREASURER
MICHAEL MURPHY, ASST. SECRETARY-TREASURER
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LARRY A. BLAIR
EXECUTIVE ENGINEER

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

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

5/14/96

May 13, 1996

Mr. Michial Emery, P.E.
President
Bohannan-Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

RE: The Crossing Subdivision (Westland Development) and 5-9-96 meeting at City Hydrology (Mirehaven Arroyo and Dam 12)

Dear Mr. Emery:

I wanted to summarize AMAFCA's understanding and concerns from the referenced meeting. They are as follows:

1. The AMAFCA easement dedication language will apply to Tracts A, C and H on the bulk plat. Please send a print of the final proposed bulk land plat for our review. The plat should clarify, easements, prudent lines, and tract boundaries, both existing and proposed.

2. Covenants to the City that address maintenance will be required for a) the west diversion b) the north berm diversion and c) the interim berm on the Mirehaven Arroyo.

3. AMAFCA will not maintain any of these facilities.

4. AMAFCA will want to sign the mylars that affect the Mirehaven or any ponds on the Ladera system. Please send preliminary prints for review.

5. We understand that only three acre feet will need to be removed from Dam 12 for subdivision "hydrology volume" needs, however more might be anticipated. This should be coordinated with John Kelly and me.

6. A complete analysis of the interim berm on the Mirehaven with several sections, profile, velocities, etc. is required to establish possible armoring needs.

7. The outfall to Dam 10 must be approved by AMAFCA. Per our discussion, an impact basin is desired. It appears that an interim outfall (rip-rap, plunge pool, etc.) is being considered, and maintenance may become an issue depending on the design. Due to the larger flows and sediment issues, AMAFCA will need to review this analysis in detail.

RECEIVED
MAY 14 1996

Again, a pipe and impact basin is preferred if AMAFCA is responsible for maintenance. I suggest a design meeting to discuss your design proposal and discuss maintenance of this outfall.

We assume that City Hydrology will coordinate all other issues such as financial guarantees via municipal liens. Also, Susan Calongne's comments dated 5-1-96 must be addressed. Should you or your staff have any questions, do not hesitate to call .

Sincerely,
AMAFCA

Kurt Browning, P.E.
Drainage Engineer

c: Fred Aguirre, COA
Susan Calongne, City/County Floodplain Administrator
Bruce Stidworthy, BHI
Fred Ambrogi, Westland Development

5/9/96

for A, C/H and Mirkham piece

EASEMENT DEDICATION

WESTLAND DEVELOPMENT CO., INC., a New Mexico Corporation "Grantor", hereby Dedicates to the ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY, a political subdivision of the State of New Mexico ("Grantee"), its successors and assigns, an Easement for drainage, flood control, conveyance of storm water, stockpiling of sediment, and the construction, reconstruction, operation, maintenance of, and access to such facilities, on, in, under, over and across the real estate designated herein as "Temporary Drainage Easement". This Dedication is with the full force and free consent and in accordance with the desire of the Grantor. This Easement shall be considered temporary and any portion of the Easement granted herein shall revert to the Grantor, its successors or assigns, as and to the extent said portion is declared unnecessary for flood control or drainage by the Board of Directors of Grantee. Any reversion shall be conveyed by quitclaim deed. There is reserved to the Grantor, its successors and assigns, the right to use said Easement Area for open space, landscaping and other purposes which will not interfere with the rights and Easements hereby granted, provided that Grantor obtains Grantee's prior written Licensed approval for such use, not to be unreasonably withheld. Grantor hereby acknowledges that the Easement Area is located in an area which is currently being studied as a part of a Drainage Management Plan and understands that all, or a portion of the Easement Area may be determined by the Grantee in the future to be necessary for permanent drainage facilities and improvements for any and / or all of the uses referenced above. Grantee shall only maintain property and/or improvements that it has constructed or has agreed in writing to maintain.

5-7-96

ME, FA, FA, BS, SC, KB – follow up

- language is OK above for bulk land plat
- covenants to the City for ① west diversion, ② north berm diversion ③ interim berm
- AMAFCA to not maintain anything
- AMAFCA to be part of DAC and approve mylars – especially outfalls
- future discussion on how much fill will be removed from Dam 12 – only 3A+F is needed right now. to discuss w/JK
- need full analysis on interim berm
- outfall Dam 10 – who maintains – AMAFCA to approve

H9-D1A7

Meeting to address comments -

1. Yes - dam upgrade ok
4. Crossing - 3 acft
2. ok

easement to AMAFCA - temporary for Meacham
need Maint. covenant for Westland to maintain
Kurt wants berm to protect for 1 - 100-yr event
Covenant to City?
need berm analysis

3. ok
5. paper easement

Kurt Browning, Bruce, Mike Emery, SC, FA
May 9, 1996

Resubmittal to address comments - will be addendum
Check plat for AMAFCA language
Kurt & John to check DRC plans

BOHANNAN-HUSTON INC.
ENGINEERS ▪ PLANNERS ▪ PHOTOGRAMMETRISTS ▪ SURVEYORS ▪ LANDSCAPE ARCHITECTS
COURTYARD I, 7500 JEFFERSON NE, ALBUQUERQUE, NM 87109 TEL (505) 823-1000 FAX (505) 821-0892

CLIENT/COURIER TRANSMITTAL

To: Susan Calongne, P.E
City Hydrology

Requested By: Bruce Stidworthy

Date: May 22, 1996
Time Due: This A.M. X This P.M.
X Rush ____ ☐ By Tomorrow

Job No.: 95335a2406

Job Name: Westland
(The Crossing Units 1 & 2)

DRB# 95-357
File: H9/D1A7

DELIVERY VIA

x Courier ☐ Federal Express
☐ Mail ☐ UPS
☐ Other _____

PICK UP

Item:

ITEM NO.	QUANTITY	DESCRIPTION
1	1	Revised Overall grading plan of Units 1 & 2 (1"=100')
2	1	Revised Infrastructure List

COMMENTS / INSTRUCTIONS

Note: Susan, the enclosed grading plan has a very minor change from the one submitted to you with our response to your comments. AMAFCA has requested that the alignment of the west diversion channel be adjusted, that change is reflected on the enclosed plan. Also, a few pads in the northeast corner of the site have been adjusted. These changes have absolutely no effect on the drainage design or methods.

RECEIVED
MAY - 8 1996

5/8/96

REC'D BY: _____ ***DATE:*** _____ ***TIME:*** _____

DRB Case No. 95-537
DRC Project No.
Date Submitted 5/22/96

Figure 12

INFRASTRUCTURE LIST

EXHIBIT "A"
TO SUBDIVISION IMPROVEMENTS AGREEMENT
DEVELOPMENT REVIEW BOARD (D.R.B.) REQUIRED INFRASTRUCTURE LIST

THE CROSSING - UNITS 1 & 2
(EL RANCHO ATRISCO, TRACT A2A & UNPLATTED LAND IN THE SW 1/4, SECTION 9, T10N, R2E, NMPM)

Following is a summary of Public/Private Infrastructure required to be constructed or financially guaranteed to be constructed for the above development. This summary is not necessarily a complete listing. During the design process, if the City determines that appurtenant items have not been included in the summary, those items will be included in the listing and related financial guarantee, if the items normally are Subdivider responsibility. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility are the responsibility of the Subdivider and will be included in the financial guarantee provided to the City.

Size	Type Improvement	Location	From	TO
ROADWAY IMPROVEMENTS - UNIT 1				
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
36' F-F	RESIDENTIAL PAVING W/ PCC CURB AND GUTTER & SIDEWALK ON EACH SIDE*	ARKANSAS DRIVE	CASA VERDE AVENUE	WEST BOUNDARY
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	GALLATIN COURT	GUNNISON PLACE	CUL-DE-SAC TERMINUS
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	GUNNISON PLACE	~300' SOUTH OF UNIT 1 BOUNDARY	NORTH BOUNDARY
24' WIDE	TEMPORARY PAVING W/IN A TEMP. ACCESS EASEMENT	GUNNISON PLACE	~300 FT SOUTH OF BOUNDARY	LADERA DRIVE
36' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE	LADERA DRIVE	ARKANSAS DRIVE
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE	GUNNISON PLACE	ARKANSAS DRIVE
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CLARK'S FORK PLACE	GUNNISON PLACE	EAST BOUNDARY
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY

* SIDEWALKS TO BE DEFERRED

TEMPORARY PAVING MAY BE USED ON THE TEMPORARY CUL-DE-SAC AT ANIMAS PLACE
STREET LIGHTS AS REQUIRED PER THE CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL

Size	Type Improvement	Location	From	TO
WATER LINE IMPROVEMENTS - UNIT 1				
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	ARKANSAS DRIVE	CASA VERDE AVENUE	ANIMAS PLACE
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	GALLATIN COURT	GUNNISON PLACE	CUL-DE-SAC TERMINUS
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	GUNNISON PLACE	SOUTH BOUNDARY	NORTH BOUNDARY
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CASA VERDE AVENUE	SOUTH BOUNDARY	ARKANSAS DRIVE
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CASA VERDE AVENUE	GUNNISON PLACE	ARKANSAS DRIVE
20" DIA**	TRANSMISSION LINE W/ NEC. VALVES, MJ'S & RJ'S	WL EASEMENTS & COA ROW IN UNITS 1 & 2	LADERA DRIVE	98 STREET

**THE 20" DIA TRANSMISSION LINE ABOVE IS BEING BUILT BY THE COA PUBLIC WORKS DEPARTMENT AND DOES NOT REQUIRE UNITS 1 AND 2 TO PROVIDE FINANCIAL GUARANTEES FOR THIS PORTION OF WORK. (8" DIST. LINE CONNECTS TO 20" WL AT GUNNISON PLACE)

SANITARY SEWER IMPROVMENTS - UNIT 1				
8" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	ARKANSAS DRIVE	CASA VERDE AVENUE	WEST BOUNDARY
8" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	GALLATIN COURT	GUNNISON PLACE	CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	GUNNISON PLACE	SOUTH BOUNDARY	NORTH BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	CASA VERDE AVENUE	GUNNISON PLACE	SOUTH BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC MH"S AND SERVICES	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC MH'S AND SERVICES	PUBLIC SAS EASEMENT	PLATTE COURT	EXISTING CALLE DEL ENTRADA NW
STORM DRAINAGE IMPROVMENTS - UNIT 1				
18" - 36"	RCP W/ NEC. MS'S AND INLETS	CASA VERDE AVENUE	~300 FT SOUTH OF UNIT 1 BOUNDARY	AMAFCA POND #11
18" - 36"	RCP W/ NEC. MS'S AND INLETS	GUNNISON PLACE	~200 FT SOUTH OF UNIT 1 BOUNDARY	AMAFCA POND #12

A TEMPORARY DIVERSION SWALE SHALL BE BUILT ALONG THE WESTERN BOUNDARY OF UNIT 1 TO DIVERT EXISTING STORM WATER TO THE AMAFCA POND SOUTH OF UNIT 1. TEMPORARY OUTFALLS W/ NECESSARY EROSION CONTROL AT EXISTING SWALE AT EASTERN TERMINUS OF CLARK'S FORK AND PLATTE COURT.

GRADING AND DRAINAGE CERTIFICATION OF UNIT 1 IS REQUIRED PRIOR TO RELEASE OF FINANCIAL GUARANTEES.

Size	Type Improvement	Location	From	TO
ROADWAY IMPROVEMENTS - UNIT 2				
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CLARK'S FORK PLACE	GUNNISON PLACE	EAST BOUNDARY
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	SELWAY PLACE	CLARK'S FORK PLACE	N. CUL-DE-SAC TERMINUS
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	SELWAY PLACE	PLATTE COURT	CLARK'S FORK PLACE
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS
36' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE	LADERA DRIVE	ARKANSAS DRIVE
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE PLACE	GUNNISON DRIVE	ARKANSAS
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK	GUNNISON PLACE	~300' SOUTH OF UNIT 1 BOUNDARY	NORTH BOUNDARY
24' WIDE	TEMPORARY PAVING W/IN A TEMP. ACCESS EASEMENT	GUNNISON PLACE	~300 FT SOUTH OF BOUNDARY	LADERA DRIVE

* SIDEWALKS TO BE DEFERRED

TEMPORARY PAVING MAY BE USED ON TEMPORARY CUL-DE-SACS
STREET LIGHTS AS REQUIRED PER THE CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL

WATER LINE IMPROVEMENTS - UNIT 2				
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CLARK'S FORK PLACE	GUNNISON PLACE	EAST BOUNDARY
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	SELWAY PLACE	PLATTE COURT	CUL-DE-SAC TERMINUS
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	GUNNISON PLACE	SOUTH BOUNDARY	NORTH BOUNDARY
SANITARY SEWER IMPROVMENTS - UNIT 2				
8" - 10" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	GUNNISON PLACE	SOUTH BOUNDARY	NORTH BOUNDARY
8" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS

8" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	CLARK'S FORK PLACE	GUNNISON PLACE	SELWAY PLACE
8" DIA	SANITARY SEWER W/ NEC. MH"S AND SERVICES	SELWAY PLACE	PLATTE COURT	CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC MH"S AND SERVICES	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC MH'S AND SERVICES	PUBLIC SAS EASEMENT	PLATTE COURT	EXISTING CALLE DEL ENTRADA NW

STORM DRAINAGE IMPROVMENTS - UNIT 2

A TEMPORARY DIVERSION SWALE SHALL BE BUILT ALONG THE NORTH BOUNDARY OF UNIT 2 TO DIVERT EXISTING STORM WATER TO THE MIREHAVEN ARROYO. TEMPORARY OUTFALLS W/ NECESSARY EROSION CONTROL AT EXISTING SWALE ALONG EAST BOUNDARY.

GRADING AND DRAINAGE CERTIFICATION OF UNIT 2 IS REQUIRED PRIOR TO RELEASE OF FINANCIAL GUARANTEES.

Prepared by: Bruce Stidworthy
Print Name: Bruce Stidworthy, E.I.
Firm: Bohannan-Huston, Inc.

****

Development Review Board Member Approval

Traffic	Date	Water	Date	Parks & Rec	Date
City Engineer/AMAFCA	Date	DRB Chair	Date		

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
LARRY A. LARRAÑAGA, P.E.
HOWARD C. STONE, P.E.

PRINCIPALS

WILLIAM L. VREEKE, P.E.
GORDON A. WALHOOD, JR., P.E.
MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

May 10, 1996

5/15/96

Susan M. Calongne, P.E.
City/County Floodplain Administrator
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Response to written comments on the Drainage Report for The CrossingUnits 1 & 2 (H9/D1A7).

Dear Ms. Calongne:

In your letter dated May 1, 1996, you provided a number of comments regarding the Drainage Report for High Desert Tract 3A Subdivision. Below I have addressed your written comments:

Bulk Land Plat:

1. AMAFCA has reviewed and verbally approved the subject drainage report, (including the improvements to Pond #12) with the subsequent *Supplementary Information to the Drainage Report for the Crossing Units 1 & 2* which was submitted to AMAFCA. A copy of the supplementary information is submitted with this letter.

2. The limits of the subject easement were established based on three separate sources; starting at Pond #12, the stretch from Pond 12 to the south boundary of Las Lomitas, is an "existing interim floodplain drainage easement", this easement corresponds to the FEMA floodplain. Just north of the south boundary of Las Lomitas, the"maximum lateral erosion limit" established by AVID Engineering, goes outside of the FEMA floodplain boundary. At this point, the new"Temporary Drainage Easement Granted to AMAFCA" (as shown on the bulk land plat) follows the"maximum lateral erosion limit" to the west boundary of Las Lomitas. West of the west boundary of Las Lomitas, the new easement follows the FEMA floodplain.

3. A blanket easement over of all of Tract A on the bulk land plat has been provided. An updated copy of the bulk land plat is enclosed. ?

4. Westland will improve the volume of Dam #12 by removing approximately 53,000CY of earth from behind the dam. This volume can be removed from Tract H without affecting the elevation of the bottom of the pond or the spillway elevation. This work will be done with the construction of Units 1 & 2. We are currently working with AMAFCA regarding approval of these improvements.

5. Easements and drainage covenants are currently being prepared.

MAY 15 1996

Preliminary Plat/Rough Grading:

6. Maintenance of the upstream diversion channels and berms will be by Westland Development Company Inc. This will be formally established by the drainage covenants currently being prepared. It is our intention to construct the temporary upstream diversion berms/swales with the construction of Units 1 & 2, and to have the drainage covenants in place prior to construction. This can be enforced by the City Hydrology representative to DRC.

7. No development is proposed within the existing Mirehaven Arroyo prudent line. The prudent line, as well as the existing soil cement improvements, have been added to the grading plan. An updated grading plan has been enclosed.

8. The north diversion swale accepts flows from basin O2 (12.8cfs). However, the existing basin which generates 23cfs (as shown on the existing conditions basin map), is broken up into proposed basins O2, O3 (1.9cfs), and O5 (6.9cfs), for a total of approximately 23cfs. Basins O3 and O5 drain onto the streets (through desiltation ponds) within the subdivision.

9. The storm drains for Gunnison were sized for fully developed flows, however, additional future inlets will (under fully developed conditions) be added within the proposed basin D13, these inlets will tie to the 36" storm drain line in Gunnison (to be constructed with Units 1 & 2). All of the inlets shown on Gunnison, will be constructed in conjunction with Units 1 & 2. The residual flow (6.8cfs) passing the inlets in Gunnison (under proposed conditions) will get into a natural swale which drains to Pond 12. This natural swale has been identified on the grading plan, and lies entirely within Tract H (which contains a blanket drainage easement). As shown on the bulk land plat, a 50' public access and drainage easement is being granted (connecting Gunnison to Pond 12) with the filing of the bulk land plat.

10. The typical cross-sections provided on the grading plan have been modified to show that the right-of-way is 0.33' above the top of curb (as per CoA Standard drawing # 2405). That corresponds to 1' above flow line for standard curb and gutter, and 8' above flowline for rolled curb and gutter. These elevations will be certified with the grading and drainage certification.

11. The asphalt rundowns into the Mirehaven Arroyo are in Tract A, and are therefore covered by the blanket drainage easement over Tract A. Please see the enclosed, updated bulk land plat.

12. More spot elevations have been provided on the grading plan, and the typical lot layout has been modified to show spot elevations with respect to the pad elevation, as well as direction of roof drainage.

I believe the above responses satisfy your comments regarding the Drainage Report for The Crossing Units 1 & 2. The first submittal of construction plans to DRC will be the week of May 13-17, with the first DRC meeting anticipated for the week of May 20-24. The DRB hearing (DRB # 95-537) for preliminary plat approval is scheduled for May 28. If you should have any further concerns or questions, please notify me as soon as possible.

Sincerely,

Bruce Stidworthy

Bruce Stidworthy, E.I.
Community Development and Planning Group

BS/kc
Enclosures

cc: Fred Ambrogi, Westland Development Company Inc.
Kurt Browning, AMAFCA
Michial Emery, BHI
Kevin Patton, BHI

5/15/96

April 23, 1996

SUPPLEMENTARY INFORMATION TO THE

DRAINAGE REPORT FOR THE CROSSING UNITS 1 & 2

(March 1996)

This document has been prepared in order to respond to a number of verbal comments made by AMAFCA regarding the above drainage report. Those comments are addressed below under several subheadings.

THE BULK LAND PLAT: AMAFCA expressed that the purpose of each tract being created by the bulk land plat was unclear. Therefore, an explanation of the Bulk Land Plat follows.

It should be noted that changes have been made to the Bulk Land Plat for The Crossing since the Drainage Report was completed. Therefore, the most current Bulk Land Plat is being submitted with this supplemental information. The old plat consisted of Units 1, 2, 3, and 4, and Tracts A, B, C, D, E, F, G, H, and J, while the new plat consists of Units 1 and 2, and Tracts A, B, C, D, E, H, and J. ✓

The Tracts shown on the new bulk land plat are summarized as follows: Tract A consists of approximately 35.3ac, and will have a temporary blanket drainage easement for the benefit of AMAFCA. Tract B consists of 50ac., and will have a lien (held by the City of Albuquerque) placed upon it for the purpose of insuring that the Mirehaven Arroyo is lined in the future. Tract C consists of approximately 10.3ac., and contains Pond 11. Tract C will have a temporary blanket drainage easement for the benefit of AMAFCA. North of the northern boundary of Tract C, an additional easement on Tract E has been granted over the existing 15' maintenance road around the north edge of

MAY 1 5 1996

Pond 11 (see figure attached to transmittal letter). Tract D, consisting of 5.11ac., is slated for future development as a park. Tract E, consisting of 13.1 acres, is slated for future residential development. Tract H consists of 29.5 acres, and contains Pond 12. Tract H will also have a temporary blanket drainage easement for the benefit of AMAFCA. Tract J consists of 5.2 acres, and is slated for future residential development. Units 1 and 2 consist of approximately 29.5 acres combined. A 128-home residential subdivision is proposed for Units 1 & 2. This report seeks preliminary plat approval for that subdivision.

THE BERM ALONG THE MIREHAVEN ARROYO AT THE NORTHEAST CORNER OF THE SITE The subject berm connects two high points near the northeast corner of Unit 2, and was requested by AMAFCA.

The 100 year storm flow for the arroyo (~1300cfs, under existing conditions) was determined by the *West I-40 Diversion Drainage Management Plan, (I-40 DMP).* This flowrate is substantially less than the flowrate (~2600cfs) reported by the *Drainage Report for Westland Phase 1 Subdivision* (which is included in its entirety in Appendix A of the *Drainage Report for The Crossing Units 1 and 2*). The flowrate of 2600cfs comes from the hydrologic model developed for the *Ladera Dam #15 Drainage Report.* The report utilized USGS quad map topography, which resulted in a larger drainage area upstream of ponds 9-12 than the current, more accurate mapping indicates. It should be noted that the existing condition hydrology for the *I-40 DMP* has been review and tentatively approved by the AMAFCA staff.

A cross section of the channel and the berm are provided on page 9 of this document. Calculations showing the depth of flow, velocity, superelevation, required freeboard, and energy grade line are provided on pages 9-11. The above analysis indicates that the Mirehaven Arroyo, with the subject berm, can safely pass the100 year storm with freeboard in excess of that required by the DPM.

5/15/96

DRB Case No. 95-537
DRC Project No.
Date Submitted 5/15/96

Figure 12

INFRASTRUCTURE LIST

EXHIBIT "A"
TO SUBDIVISION IMPROVEMENTS AGREEMENT
DEVELOPMENT REVIEW BOARD (D.R.B.) REQUIRED INFRASTRUCTURE LIST

THE CROSSING - UNITS 1 & 2
(EL RANCHO ATRISCO, TRACT A2A & UNPLATTED LAND IN THE SW 1/4, SECTION 9, T10N, R2E, NMPM)

Following is a summary of Public/Private Infrastructure required to be constructed or financially guaranteed to be constructed for the above development. This summary is not necessarily a complete listing. During the design process, if the City determines that appurtenant items have not been included in the summary, those items will be included in the listing and related financial guarantee, if the items normally are Subdivider responsibility. In addition, any unforeseen items which arise during construction which are necessary to complete the project and which normally are the Subdivider's responsibility are the responsibility of the Subdivider and will be included in the financial guarantee provided to the City.

Size	Type Improvement	Location	From	TO
ROADWAY IMPROVEMENTS - UNIT 1				
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
36' F-F	RESIDENTIAL PAVING W/ PCC CURB AND GUTTER & SIDEWALK ON EACH SIDE*	ARKANSAS DRIVE	CASA VERDE AVENUE	WEST BOUNDARY
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	GALLATIN COURT	GUNNISON AVENUE	CUL-DE-SAC TERMINUS
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	GUNNISON AVENUE	~300 FT SOUTH OF BOUNDARY	NORTH BOUNDARY
36' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE	LADERA DRIVE	ARKANSAS DRIVE
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CASA VERDE AVENUE	GUNNISON AVENUE	ARKANSAS DRIVE
24' WIDE	TEMPORARY PAVING W/IN A TEMP. ACCESS EASEMENT	GUNNISON AVENUE	~300 FT SOUTH OF BOUNDARY	LADERA DRIVE

* SIDEWALKS TO BE DEFERRED

TEMPORARY PAVING MAY BE USED ON THE TEMPORARY CUL-DE-SAC AT ANIMAS PLACE
STREET LIGHTS AS REQUIRED PER THE CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL

MAY 15 1996

Size	Type Improvement	Location	From	TO

ROADWAY IMPROVEMENTS - UNIT 2

32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	CLARK'S FORK PLACE	GUNNISON AVENUE	EAST BOUNDARY
32' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	SELWAY PLACE	CLARK'S FORK PLACE	N. CUL-DE-SAC TERMINUS
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	SELWAY PLACE	PLATTE COURT	CLARK'S FORK PLACE
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
28' F-F	RESIDENTIAL PAVING W/ PCC CURB & GUTTER & SIDEWALK ON EACH SIDE*	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS

* SIDEWALKS TO BE DEFERRED

TEMPORARY PAVING MAY BE USED ON THE TEMPORARY CUL-DE-SAC AT SELWAY PLACE
STREET LIGHTS AS REQUIRED PER THE CITY OF ALBUQUERQUE DEVELOPMENT PROCESS MANUAL

WATER LINE IMPROVEMENTS - UNIT 2

6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CLARK'S FORK PLACE	GUNNISON AVENUE	EAST BOUNDARY
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	SELWAY PLACE	PLATTE COURT	CUL-DE-SAC TERMINUS
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	PLATTE COURT	GUNNISON PLACE	EAST BOUNDARY
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS

SANITARY SEWER IMPROVMENTS - UNIT 2

8" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	POWDER COURT	SELWAY PLACE	CUL-DE-SAC TERMINUS
8" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	CLARK'S FORK PLACE	GUNNISON AVENUE	SELWAY PLACE
8" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	SELWAY PLACE	PLATTE COURT	CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC MH'S AND SERVICES	PLATTE COURT	GUNNISON AVENUE	EAST BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC MH'S AND SERVICES	PUBLIC SAS EASEMENT	PLATTE COURT	EXISTING CALLE DEL ENTRADA NW

STORM DRAINAGE IMPROVMENTS - UNIT 2

TEMPORARY OUTFALL W/ NECESSARY EROSION CONTROL AT EXISTING SWALE ALONG EAST BOUNDARY.
GRADING AND DRAINAGE CERTIFICATION OF UNIT 2 IS REQUIRED PRIOR TO RELEASE OF FINANCIAL GUARANTEES.

Berm on northeast ~~side~~ corner of Subdivision @ Mirehaven Arroyo

Outlet Structures at ends of Casa Verde and Platte Cts into Mirehaven

Size	Type Improvement	Location	From	TO
WATER LINE IMPROVEMENTS - UNIT 1				
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	ARKANSAS DRIVE	CASA VERDE AVENUE	ANIMAS PLACE
6" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	GALLATIN COURT	GUNNISON AVENUE	CUL-DE-SAC TERMINUS
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	GUNNISON AVENUE	SOUTH BOUNDARY	NORTH BOUNDARY
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CASA VERDE AVENUE	SOUTH BOUNDARY	ARKANSAS DRIVE
6" - 8" DIA	WATER LINE W/ NEC. VALVES FH'S, MJ'S & RJ'S	CASA VERDE AVENUE	GUNNISON AVENUE	ARKANSAS DRIVE
20" DIA**	TRANSMISSION LINE W/ NEC. VALVES, MJ'S & RJ'S	WL EASEMENTS & COA ROW IN UNITS 1 & 2	LADERA DRIVE	98 STREET

**THE 20" DIA TRANSMISSION LINE ABOVE IS BEING BUILT BY THE COA PUBLIC WORKS DEPARTMENT AND DOES NOT REQUIRE UNITS 1 AND 2 TO PROVIDE FINANCIAL GUARANTEES FOR THIS PORTION OF WORK. (8" DIST. LINE CONNECTS TO 20" WL AT GUNNISON PLACE)

SANITARY SEWER IMPROVMENTS - UNIT 1				
8" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	ANIMAS PLACE	S. CUL-DE-SAC TERMINUS	N. CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	ARKANSAS DRIVE	CASA VERDE AVENUE	WEST BOUNDARY
8" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	GALLATIN COURT	GUNNISON AVENUE	CUL-DE-SAC TERMINUS
8" - 10" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	GUNNISON AVENUE	SOUTH BOUNDARY	NORTH BOUNDARY
8" - 10" DIA	SANITARY SEWER W/ NEC. MH'S AND SERVICES	CASA VERDE AVENUE	GUNNISON AVENUE	SOUTH BOUNDARY
STORM DRAINAGE IMPROVMENTS - UNIT 1				
18" - 36"	RCP W/ NEC. MS'S AND INLETS	CASA VERDE AVENUE	~300 FT SOUTH OF UNIT 1 BOUNDARY	AMAFCA POND #11
18" - 36"	RCP W/ NEC. MS'S AND INLETS	GUNNISON AVENUE	~200 FT SOUTH OF UNIT 1 BOUNDARY	AMAFCA POND #12

A TEMPORARY DIVERSION SWALE SHALL BE BUILT ALONG THE WESTERN BOUNDARY OF UNIT 1 TO DIVERT EXISTING STORM WATER TO THE AMAFCA POND SOUTH OF UNIT 1.

GRADING AND DRAINAGE CERTIFICATION OF UNIT 1 IS REQUIRED PRIOR TO RELEASE OF FINANCIAL GUARANTEES.

outlet structures into ponds 11 & 12 per AMAFCA

Prepared by: _____
Print Name: Bruce Stidworthy, E.I.
Firm: Bohannan-Huston, Inc.

****

Development Review Board Member Approval

Traffic	Date	Water	Date	Parks & Rec	Date
City Engineer/AMAFCA	Date	DRB Chair	Date		

BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

PRINCIPALS

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
LARRY A. LARRANAGA, P.E.
HOWARD C. STONE, P.E.
WILLIAM L. VREEKE, P.E.
GORDON A. WALHOOD, JR. P.E.
MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

Kurt

Copy to Susan — see comments

May 10, 1996

6 1996

A

Susan M. Calongne, P.E.
City/County Floodplain Administrator
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Lots of work still to be done

5/16/96

Re: Response to written comments on the Drainage Report for The CrossingUnits 1 & 2 (H9/D1A7).

Dear Ms. Calongne:

In your letter dated May 1, 1996, you provided a number of comments regarding the Drainage Report for High Desert Tract 3A Subdivision. Below I have addressed your written comments:

Bulk Land Plat:

we still need proposed to see contours

1. AMAFCA has reviewed and verbally approved the subject drainage report, (including the improvements to Pond #12) with the subsequent *Supplementary Information to the Drainage Report for the Crossing Units 1 & 2* which was submitted to AMAFCA. A copy of the supplementary information is submitted with this letter.

2. The limits of the subject easement were established based on three separate sources; starting at Pond #12, the stretch from Pond 12 to the south boundary of Las Lomitas, is an "existing interim floodplain drainage easement", this easement corresponds to the FEMA floodplain. Just north of the south boundary of Las Lomitas, the"maximum lateral erosion limit" established by AVID Engineering, goes outside of the FEMA floodplain boundary. At this point, the new"Temporary Drainage Easement Granted to AMAFCA" (as shown on the bulk land plat) follows the"maximum lateral erosion limit" to the west boundary of Las Lomitas. West of the west boundary of Las Lomitas, the new easement follows the FEMA floodplain.

AMAFCA needs to see this

3. A blanket easement over of all of Tract A on the bulk land plat has been provided. An updated copy of the bulk land plat is enclosed.

33A-F

4. Westland will improve the volume of Dam #12 by removing approximately 53,000CY of earth from behind the dam. This volume can be removed from Tract H without affecting the elevation of the bottom of the pond or the spillway elevation. This work will be done with the construction of Units 1 & 2. We are currently working with AMAFCA regarding approval of these improvements. — ??

5. Easements and drainage covenants are currently being prepared.

Definitely need to see plans for this. AMAFCA not approved yet

Preliminary Plat/Rough Grading:

6. Maintenance of the upstream diversion channels and berms will be by Westland Development Company Inc. This will be formally established by the drainage covenants currently being prepared. It is our intention to construct the temporary upstream diversion berms/swales with the construction of Units 1 & 2, and to have the drainage covenants in place prior to construction. This can be enforced by the City Hydrology representative to DRC.

7. No development is proposed within the existing Mirehaven Arroyo prudent line. The prudent line, as well as the existing soil cement improvements, have been added to the grading plan. An updated grading plan has been enclosed. Where is AMAFCA's

8. The north diversion swale accepts flows from basin O2 (12.8cfs). However, the existing basin which generates 23cfs (as shown on the existing conditions basin map), is broken up into proposed basins O2, O3 (1.9cfs), and O5 (6.9cfs), for a total of approximately 23cfs. Basins O3 and O5 drain onto the streets (through desiltation ponds) within the subdivision.

9. The storm drains for Gunnison were sized for fully developed flows, however, additional future inlets will (under fully developed conditions) be added within the proposed basin D13, these inlets will tie to the 36" storm drain line in Gunnison (to be constructed with Units 1 & 2). All of the inlets shown on Gunnison, will be constructed in conjunction with Units 1 & 2. The residual flow (6.8cfs) passing the inlets in Gunnison (under proposed conditions) will get into a natural swale which drains to Pond 12. This natural swale has been identified on the grading plan, and lies entirely within Tract H (which contains a blanket drainage easement). As shown on the bulk land plat, a 50' public access and drainage easement is being granted (connecting Gunnison to Pond 12) with the filing of the bulk land plat.

10. The typical cross-sections provided on the grading plan have been modified to show that the right-of-way is 0.33' above the top of curb (as per CoA Standard drawing # 2405). That corresponds to 1' above flow line for standard curb and gutter, and 8' above flowline for rolled curb and gutter. These elevations will be certified with the grading and drainage certification.

Not maintained by AMAFCA - make sure bulk land easement clearly states this

11. The asphalt rundowns into the Mirehaven Arroyo are in Tract A, and are therefore covered by the blanket drainage easement over Tract A. Please see the enclosed, updated bulk land plat.

12. More spot elevations have been provided on the grading plan, and the typical lot layout has been modified to show spot elevations with respect to the pad elevation, as well as direction of roof drainage.

AMAFCA should be a part of !!

I believe the above responses satisfy your comments regarding the Drainage Report for The Crossing Units 1 & 2. The first submittal of construction plans to DRC will be the week of May 13-17, with the first DRC meeting anticipated for the week of May 20-24. The DRB hearing (DRB # 95-537) for preliminary plat approval is scheduled for May 28. If you should have any further concerns or questions, please notify me as soon as possible.

Sincerely,

Bruce Stidworthy

Bruce Stidworthy, E.I.
Community Development and Planning Group

What about armoring of temporary berm @ upstream end of Mirehaven arroyo ??

BS/kc
Enclosures

cc: Fred Ambrogi, Westland Development Company Inc.
Kurt Browning, AMAFCA
Michial Emery, BHI
Kevin Patton, BHI

F:\CDP\9517042\CALONGNE.LTR-5/10/96

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003)

H-9/D001A7

PROJECT TITLE: The Crossing Unit 3 ZONE MAP/DRG. FILE#: H-9-Z

DRB#: 1001939 EPC#: WORK ORDER #: 545383

LEGAL DESCRIPTION: Tract A-1-B, Plat of Cielo Oeste and a Portion of Tract A-1 of Unit 2B

CITY ADDRESS:

ENGINEERING FIRM: Wilson & Company CONTACT: Carolyn Donnelly
ADDRESS: 2600 The American Rd. SE, Suite 100 PHONE: (505) 898-8021
CITY, Rio Rancho, NM ZIP CODE: 87124

OWNER: WESTLAND DEVELOPMENT CORPORATION, CONTACT: Leroy Chavez
ADDRESS: 401 Coors Boulevard, NW PHONE: (505) 831-9600
CITY, Albuquerque, NM ZIP CODE: 87121

ARCHITECT: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

SURVEYOR: CONTACT:
ADDRESS: PHONE:
CITY, ZIP CODE:

CONTRACTOR: CONTACT:
ADDRESS: PHONE:
CITY, ZIP CODE:

CHECK TYPE OF SUBMITTAL:

- ___ DRAINAGE REPORT
- ___ DRAINAGE PLAN 1st SUBMITTAL. REQUIRES TCL OR EQUAL
- ___ CONCEPTUAL GRADING & DRAINAGE PLAN
- ___ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEERS CERTIFICATION (HYDROLOGY)
- X CLOMR\LOMR
- ___ TRAFFIC CIRCULTAION LAYOUT (TCL)
- ___ ENGINEERS CERTIFICATION (TCL)
- ___ ENGINEERS CERTIFICATION (DRB. APPR. SITE PLAN)
- ___ OTHER – Drainage Report Revisions from 2-11-04

CHECK TYPE OF APPROVAL SOUGHT:

- ___ SIA / FINANCIAL GUARANTEE RELEASE
- ___ PRELIMINARY PLAT APPROVAL
- ___ S. DEV. PLAN FOR SUB'D. APPROVAL
- ___ S. DEV. PLAN FOR BLDG. PERMIT APPROVAL
- ___ SECTOR PLAN APPROVAL
- X FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT APPROVAL
- ___ BUILDING PERMIT APPROVAL
- ___ CERTIFICATION OF OCCUPANCY (PERM.)
- ___ CERTIFICATION OF OCCUPANCY (TEMP.)
- ___ GRADING PERMIT APPROVAL
- ___ PAVING PERMIT APPROVAL
- ___ WORK ORDER APPROVAL
- X OTHER (SPECIFY) For your records LOMR

#178

RECEIVED
OCT 20 2004
HYDROLOGY SECTION

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ___ YES
- X NO
- ___ COPY PROVIDED

Date Submitted: October 20, 2004 By: Carolyn Donnelly

Kristine Sum for Carolyn Donnelly

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5)
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

CITY OF ALBUQUERQUE

THREE HUNDRED YEARS 1706 • 2006
ALBUQUERQUE
Making History

October 28, 2004

Mr. Kevin Patton, PE
BOHANNAN-HUSTON, INC.
7500 Jefferson St. NE
Albuquerque, NM 87109

RE: THE CROSSING SUBDIVISION, UNIT 2 (H-9/D1A7)
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 06/04/1996
Engineers Certification dated 10/25/2004

Dear Kevin:

Based upon the information provided in your Engineer's Certification Submittal dated 10/28/2004, the above referenced plan is adequate to satisfy the Grading and Drainage Certification for Release of Financial Guaranty.

If you have any questions, you can contact me at 924-3982

Sincerely,

Arlene V. Portillo
Plan Checker, Planning Dept.- Hydrology
Development and Building Services

C: Marilyn Maldonado, COA# 545382
File

P.O. Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(REV. 1/11/2002)

H-9/D001A7

PROJECT TITLE: **The Crossing Unit 2** ZONE MAP/DRG. FILE #: **J - 9 - Z**
DRB # **95-537** EPC#:_____ WORK ORDER#:_____

LEGAL DESCRIPTION: **The Crossing Subdivision Unit 2**
CITY ADDRESS: **East of Gunnison Place**

ENGINEERING FIRM: **Bohannan Huston Inc** CONTACT: **Kevin Patton**
ADDRESS: **7500 Jefferson Street NE** PHONE: **(505) 823-1000**
CITY, STATE: **Albuquerque, NM** ZIP CODE: **87109**

OWNER: **Westland Development** CONTACT: **Fred Ambrosi**
ADDRESS: **401 Coors Blvd** PHONE: **(505) 831-9600**
CITY, STATE: **Albuquerque, NM** ZIP CODE: **87121**

ARCHITECT:_____ CONTACT:_____
ADDRESS:_____ PHONE:_____
CITY, STATE:_____ ZIP CODE:_____

SURVEYOR:_____ CONTACT:_____
ADDRESS:_____ PHONE:_____
CITY, STATE:_____ ZIP CODE:_____

CONTRACTOR:_____ CONTACT:_____
ADDRESS:_____ PHONE:_____
CITY, STATE:_____ ZIP CODE:_____

CHECK TYPE OF SUBMITTAL:

____ DRAINAGE REPORT
____ DRAINAGE PLAN 1st SUBMITTAL, ***REQUIRES TCL or equal***
____ DRAINAGE PLAN RESUBMITTAL
____ CONCEPTUAL GRADING & DRAINAGE PLAN
____ GRADING PLAN
____ EROSION CONTROL PLAN
__X__ **ENGINEER'S CERTIFICATION (HYDROLOGY)**
____ CLOMR/LOMR
____ TRAFFIC CIRCULATION LAYOUT (TCL)
____ ENGINEERS CERTIFICATION (TCL)
____ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
____ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

__X__ **SIA / FINANCIAL GUARANTEE RELEASE**
____ 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 (PERM.)
____ CERTIFICATE OF OCCUPANCY (TEMP.)
____ GRADING PERMIT APPROVAL
____ PAVING PERMIT APPROVAL
____ WORK ORDER APPROVAL
____ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:
____ YES
____ NO
____ COPY PROVIDED

RECEIVED
OCT 28 2004
HYDROLOGY SECTION

DATE SUBMITTED: 10/28/04 BY:_____

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans:** Required for building permits, grading permits, paving permits and site plans less than five (5) acres.
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

Bohannan ▲ Huston INC.

Courtyard I
7500 Jefferson St. NE
Albuquerque, NM
87109-4335
www.bhinc.com
voice: 505.823.1000
facsimile: 505.798.7988
toll free: 800.877.5332

CLIENT/COURIER TRANSMITTAL

To: Brad Bingham, P.E.
Drainage Section
Municipal Development Department
City of Albuquerque
600 Second Street NW - 2nd Floor West

Requested by: Kevin Patton - am

Date: October 28, 2004

Time Due:
- ☐ **This A.M.**
- ☒ **This P.M.**
- ☐ **Rush** _____
- ☐ **By Tomorrow**

Phone: 924-3986

Job No.: 03 0164 007 JRT

Job Name: The Crossing Subdivision Unit 2

DELIVERY VIA

- ☒ **Courier**
- ☐ **Federal Express**
- ☐ **Mail**
- ☐ **UPS**
- ☐ **Other**

PICK UP

Item: _____

ITEM NO.	QUANTITY	DESCRIPTION
1	1	Letter dated 10/28/04 re: The Crossing Subdivision Unit 2 DRB Project # 95-537.

COMMENTS / INSTRUCTIONS

RECEIVED
OCT 28 2004
HYDROLOGY SECTION

*REC'D BY:*_____ *DATE:*_____ *TIME:*_____

ENGINEERING ▲
SPATIAL DATA ▲
ADVANCED TECHNOLOGIES ▲

Bohannan Huston INC.

Courtyard I
7500 Jefferson St. NE
Albuquerque, NM
87109-4335

www.bhinc.com

voice: 505.823.1000
facsimile: 505.798.7988
toll free: 800.877.5332

October 28, 2004

Brad Bingham, P.E.
Development & Building Services
City of Albuquerque
P O Box 1293
Albuquerque, NM 87103

Re: The Crossing Subdivision Unit 2
DRB Project # 95-537

Dear Brad,

Enclosed is our Engineers Certification of the above referenced subdivision. I did not receive top of wall / bottom of wall elevation from the surveyor; however, I visited the site and walked those areas that required the retaining walls and counted the number of courses of the wall. The heights of the walls seem to follow the approved plan. It is my understanding the SIA for this project has or is about to expire.

Please call if you have questions or if we may be of further assistance to you in your review.

Sincerely,

Kevin G. Patton, P.E.
Vice President
Community Development and Planning

KP/am
Enclosure

RECEIVED
OCT 2 8 2004
HYDROLOGY SECTION

ENGINEERING ▲
SPATIAL DATA ▲
ADVANCED TECHNOLOGIES ▲

P:\030164\cdp\corres\bbingham cert ltr.doc

WILSON
&COMPANY
2600 The American Road SE
Suite 100
Rio Rancho, New Mexico 87124
(505) 898-8021
(505) 898-8501 Fax

Albuquerque
Colorado Springs
Colton
Commerce
Denver
Fort Worth
Houston
Kansas City
Las Cruces
Lenexa
Monterrey, Mex.
Oklahoma City
Panama, Pma.
Phoenix
Rio Rancho
Salina
Santa Fe
Wichita

10 December 2004

Brad Bingham, P.E.
Hydrology Development Division
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

RE: H9/D1A7
COA Project #545383
Unit 3, The Crossing Subdivision

Dear Brad:

As Engineer of record for the above referenced project, I release Grading Plan Certification responsibility for the Grading Plan with Engineer stamp date of 10-22-03 to the Engineer representing Westland Development Company.

If you have any questions or require further information, please contact me.

Wilson & Company,

Brigitte Fuller

Brigitte Fuller, P.E. NMPE #15102
Project Manager

cc: Leroy Chavez, Westland Development Co. Inc.

BRIGITTE FULLER
NEW MEXICO
15102
12/10/04
REGISTERED PROFESSIONAL ENGINEER

CITY OF ALBUQUERQUE

THREE HUNDRED YEARS
1706 * 2006
ALBUQUERQUE
Making History

April 16, 2005

Diane Hoelzer, PE
Mark Goodwin & Assoc.
P.O. 90606
Albuquerque, NM 87199

Re: The Crossing, Unit 3 Subdivision Engineering Certification
Engineer's Stamp dated 3-18-05 (H9/D1A7)

Dear Ms. Hoelzer,

Based on information contained in your submittal dated 3-18-05, the above referenced certification is approved for Release of Financial Guarantee and SIA. **However, the SIA cannot be released until FEMA has approved the LOMR.**

If you have any questions, please contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: Marilyn Maldonado, CPN 545383
file

P.O. Box 1293

Albuquerque

New Mexico 87103

www.cabq.gov

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

PROJECT TITLE: Crossing III
DRB #: _____ EPC#: _____

ZONE MAP/DRG. FILE #: H 9 /D1A7
WORK ORDER#: 545383

LEGAL DESCRIPTION: Crossings Subdivision Unit 3
CITY ADDRESS: NW of Ladera / Unser Blvd Intersection

ENGINEERING FIRM: Mark Goodwin & Associates, PA
ADDRESS: PO Box 90606
CITY, STATE: Albuquerque, NM

CONTACT: Diane Hoelzer, PE
PHONE: 828-2200
ZIP CODE: 87199

OWNER: Westland Development LLC
ADDRESS: 401 Coor Blvd. NW
CITY, STATE: ABQ, NM

CONTACT: Leroy Chavez
PHONE: 831-9600
ZIP CODE: 87121

ARCHITECT: NA
ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE:
ZIP CODE: _____

SURVEYOR: Surv-Tech
ADDRESS: 5643 paradise Blvd. NW
CITY, STATE: Albuquerque, NM

CONTACT: Gary Hugg
PHONE: 897-3366
ZIP CODE: 87114

RECEIVED
MAR 1 , 2005
HYDROLOGY SECTION

CONTRACTOR: Salls Brothers Construction Inc
ADDRESS: 7301 Reading Drive SE
CITY, STATE: Albuquerque, NM

CONTACT: Fred Salls
PHONE: 873-8780
ZIP CODE: 87193

CHECK TYPE OF SUBMITTAL:

- ☐ DRAINAGE REPORT
- ☐ DRAINAGE PLAN 1st SUBMITTAL, ***REQUIRES TCL or equal***
- ☐ DRAINAGE PLAN RESUBMITTAL
- ☐ CONCEPTUAL GRADING & DRAINAGE PLAN
- ☐ GRADING PLAN
- ☐ EROSION CONTROL PLAN
- ☒ ENGINEER'S CERTIFICATION (HYDROLOGY)
- ☐ CLOMR/LOMR
- ☐ TRAFFIC CIRCULATION LAYOUT (TCL)
- ☐ ENGINEERS CERTIFICATION (TCL)
- ☐ ENGINEERS CERTIFICATION (DRB APPR. SITE PLAN)
- ☐ OTHER

CHECK TYPE OF APPROVAL SOUGHT:

- ☒ SIA / FINANCIAL GUARANTEE RELEASE
- ☐ 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 (PERM.)
- ☐ CERTIFICATE OF OCCUPANCY (TEMP.)
- ☐ GRADING PERMIT APPROVAL
- ☐ PAVING PERMIT APPROVAL
- ☐ WORK ORDER APPROVAL
- ☐ OTHER (SPECIFY)

WAS A PRE-DESIGN CONFERENCE ATTENDED:

- ☐ YES
- ☐ NO
- ☐ COPY PROVIDED

DATE SUBMITTED: March 18, 2005

BY: Diane Hoelzer, PE

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature , location and scope ot the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan**: Required for approval of Site Development Plans greater than five (5) acres and Sector Plans.
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5) acres.
3. **Drainage Report**: Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

Find File,
return to
Arbene
and then Brad

Couldn't
find. will
look on
Wed.

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

Re: 3/16/04

May 20, 2004

Brigitte Fuller, PE
Wilson & Company
2600 American Rd, SE, Ste. 100
Rio Rancho, NM 87124

Re: The Crossing, Unit 3 Subdivision Drainage Report Revisions
Engineer's Stamp dated 2-11-04 (H9/D1A7)

Dear Ms. Fuller,

Based on information contained in your submittal dated 3-16-04, the above referenced report is approved for Work Order requirements.

If you have any questions, please contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

H-9/D1A7

(REV. 1/28/2003)

PROJECT TITLE: The Crossing Unit 3 ZONE MAP/DRG. FILE#: H-9-Z

DRB#: 1001939 EPC#: WORK ORDER #: 545383

LEGAL DESCRIPTION: Tract A-1-B, Plat of Cielo Oeste and a Portion of Tract A-1 of Unit 2B

CITY ADDRESS:

ENGINEERING FIRM: Wilson & Company CONTACT: Kristine Susco
ADDRESS: 2600 The American Rd. SE, Suite 100 PHONE: (505) 898-8021
CITY, STATE: Rio Rancho, NM ZIP CODE: 87124

OWNER: WESTLAND DEVELOPMENT CORPORATION, CONTACT: Leroy Chavez
ADDRESS: 401 Coors Boulevard, NW PHONE: (505) 831-9600
CITY, STATE: Albuquerque, NM ZIP CODE: 87121

ARCHITECT: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

SURVEYOR: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

CONTRACTOR: CONTACT:
ADDRESS: PHONE:
CITY, STATE: ZIP CODE:

CHECK TYPE OF SUBMITTAL:

___ DRAINAGE REPORT
___ DRAINAGE PLAN 1st SUBMITTAL. REQUIRES TCL OR EQUAL
___ CONCEPTUAL GRADING & DRAINAGE PLAN
___ GRADING PLAN
___ EROSION CONTROL PLAN
___ ENGINEERS CERTIFICATION (HYDROLOGY)
___ CLOMR\LOMR
___ TRAFFIC CIRCULTAION LAYOUT (TCL)
___ ENGINEERS CERTIFICATION (TCL)
___ ENGINEERS CERTIFICATION (DRB. APPR. SITE PLAN)
X OTHER – Drainage Report Revisions from 2-11-04

CHECK TYPE OF APPROVAL SOUGHT:

___ SIA / FINANCIAL GUARANTEE RELEASE
___ 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
___ CERTIFICATION OF OCCUPANCY (PERM.)
___ CERTIFICATION OF OCCUPANCY (TEMP.)
___ GRADING PERMIT APPROVAL
___ PAVING PERMIT APPROVAL
X WORK ORDER APPROVAL
X OTHER (SPECIFY) For your records
supplemental info

WAS A PRE-DESIGN CONFERENCE ATTENDED:

___ YES
X NO
___ COPY PROVIDED

3/16/04

RECEIVED
MAR 16 2004
HYDROLOGY SECTION

Date Submitted: March 16, 2004 By: Kristine Susco

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5)
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

THE CROSSING SUBDIVISION UNIT 3

DRAINAGE REPORT REVISIONS
02/11/04

BRIGITTE FULLER
NEW MEXICO
15102
2/11/04
REGISTERED PROFESSIONAL ENGINEER

RECEIVED
MAR 16 2004
HYDROLOGY SECTION

COMP. J. Tapia

CK.

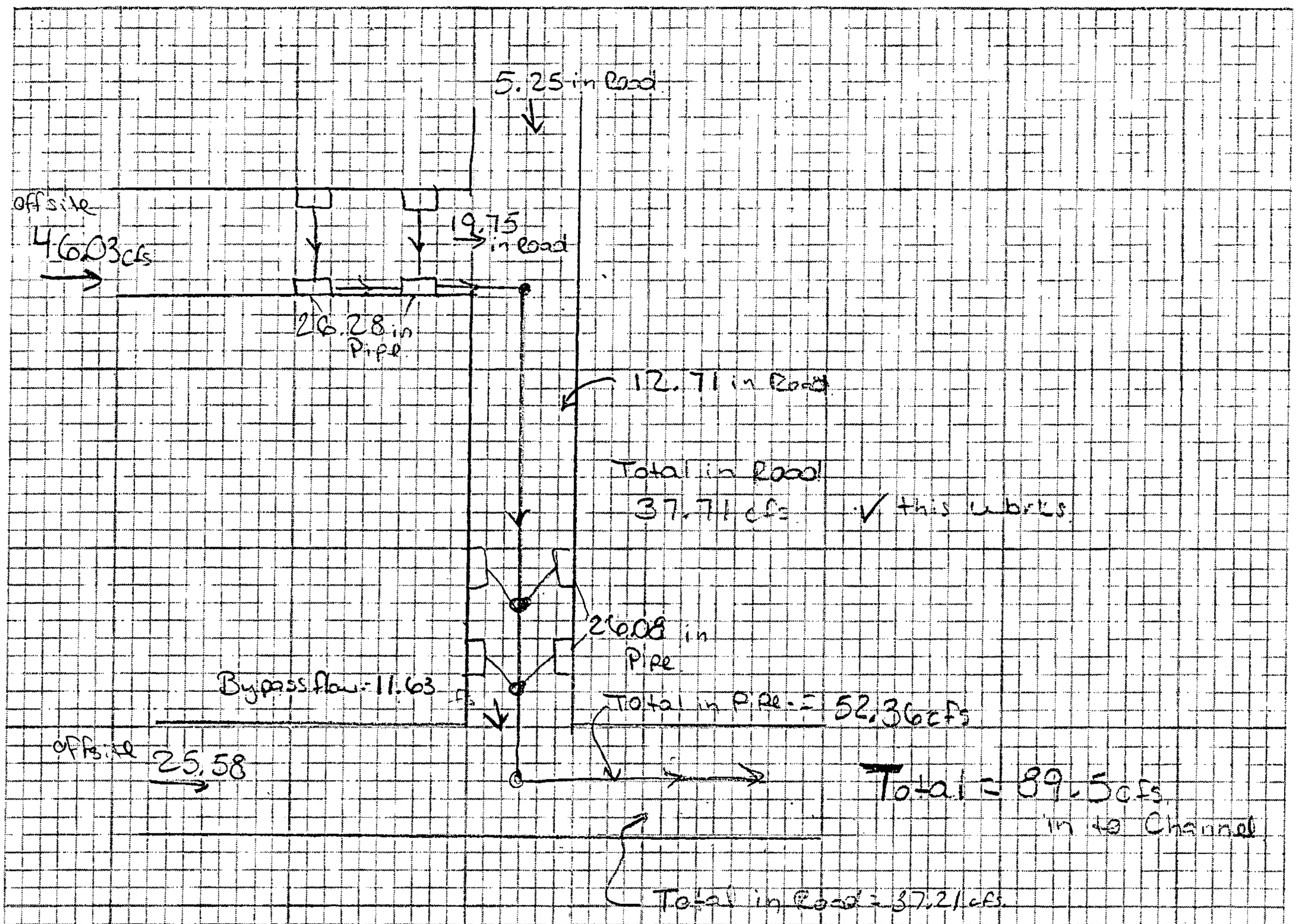
DATE 2/2/04

WILSON & COMPANY

LOC. FILE

PROJ. SHEET

SUBJ. OF



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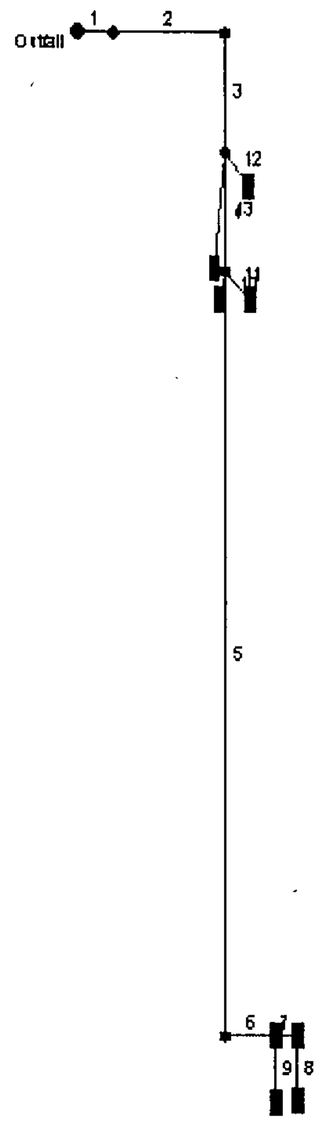
Hydraflow Plan View



Project file: SDdesign_020204.stm	No. Lines: 13	02-02-2004

Hydraflow Storm Sewers 2003

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1	OUTFALL	89.57	36 c	36.3	5219.48	5219.80	0.881	5222.33*	5223.24*	0.37	End
2	EAGLE RIVER ROA	52.36	36 c	110.0	5220.30	5221.30	0.909	5223.61*	5224.52*	0.85	1
3	30 ROARING FORK	52.36	36 c	50.4	5221.40	5221.80	0.794	5225.37*	5225.78*	0.13	2
4	30 ROARING FORK	42.90	30 c	50.4	5221.90	5222.38	0.953	5225.91*	5226.65*	0.18	3
5	30 ROARING FORK	26.28	30 c	324.0	5222.48	5225.70	0.994	5226.83*	5228.60*	0.45	4
6	30 CLARKS FORK	26.28	30 c	50.0	5225.80	5227.25	2.900	5229.04	5229.07	1.10	5
7	24 CLARKS FORK	17.22	24 c	21.7	5227.34	5227.45	0.509	5230.17*	5230.34*	0.70	6
8	Connects DI A CLA	8.61	24 c	26.8	5227.55	5227.69	0.523	5231.04*	5231.09*	0.12	7
9	Connects DI C CLA	4.53	18 c	27.7	5227.34	5227.55	0.758	5230.17*	5230.24*	0.10	6
10	Roaring DI A	8.31	18 c	12.6	5222.48	5222.92	3.492	5226.83*	5226.93*	0.34	4
11	Roaring DI A	8.31	18 c	27.5	5222.48	5225.38	10.545	5226.83*	5227.05*	0.34	4
12	Roaring DI C	4.73	18 c	27.0	5221.90	5224.64	10.149	5225.91	5225.96	0.13	3
13	Roaring DI C	4.73	18 c	50.0	5221.90	5222.40	1.000	5225.91*	5226.05*	0.11	3

Project File: SDdesign_020204.stm | Number of lines: 13 | Run Date: 02-11-2004

NOTES: c = circular; e = elliptical; b = box; Return period = 100 Yrs.; * Indicates surcharge condition.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	36.3	0.00	0.00	0.40	0.00	0.00	0.0	1.9	0.0	89.57	54.25	12.79	36	0.88	5219.80	5219.48	5223.24	5222.33	5226.14	5226.14	OUTFALL
2	1	110.0	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	52.36	55.11	7.41	36	0.91	5221.30	5220.30	5224.52	5223.61	5226.94	5226.14	EAGLE RIVER R
3	2	50.4	0.00	0.00	0.40	0.00	0.00	0.0	1.5	0.0	52.36	51.50	7.41	36	0.79	5221.80	5221.40	5225.78	5225.37	5227.48	5226.94	30 ROARING FO
4	3	50.4	0.00	0.00	0.00	0.00	0.00	0.0	1.4	0.0	42.90	34.69	8.74	30	0.95	5222.38	5221.90	5226.65	5225.91	5228.57	5227.48	30 ROARING FO
5	4	324.0	0.00	0.00	0.40	0.00	0.00	0.0	0.4	0.0	26.28	35.43	5.35	30	0.99	5225.70	5222.48	5228.60	5226.83	5232.90	5228.57	30 ROARING FO
6	5	50.0	0.00	0.00	0.40	0.00	0.00	0.0	0.2	0.0	26.28	60.53	6.12	30	2.90	5227.25	5225.80	5229.07	5229.04	5233.97	5232.90	30 CLARKS FOR
7	6	21.7	0.00	0.00	0.40	0.00	0.00	0.0	0.2	0.0	17.22	13.98	5.48	24	0.51	5227.45	5227.34	5230.34	5230.17	5234.27	5233.97	24 CLARKS FOR
8	7	26.8	0.00	0.00	0.40	0.00	0.00	0.0	0.0	0.0	8.61	14.17	2.74	24	0.52	5227.69	5227.55	5231.09	5231.04	5234.27	5234.27	Connects DI A C
9	6	27.7	0.00	0.00	0.40	0.00	0.00	0.0	0.0	0.0	4.53	7.92	2.56	18	0.76	5227.55	5227.34	5230.24	5230.17	5234.14	5233.97	Connects DI C C
10	4	12.6	0.00	0.00	0.40	0.00	0.00	0.0	0.0	0.0	8.31	17.01	4.70	18	3.49	5222.92	5222.48	5226.93	5226.83	5228.71	5228.57	Roaring DI A
11	4	27.5	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	8.31	29.55	4.70	18	10.55	5225.38	5222.48	5227.05	5226.83	5228.71	5228.57	Roaring DI A
12	3	27.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.73	28.99	2.77	18	10.15	5224.64	5221.90	5225.96	5225.91	5228.04	5227.48	Roaring DI C
13	3	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.73	9.10	2.68	18	1.00	5222.40	5221.90	5226.05	5225.91	5227.97	5227.48	Roaring DI C

Project File: SDdesign_020204.stm

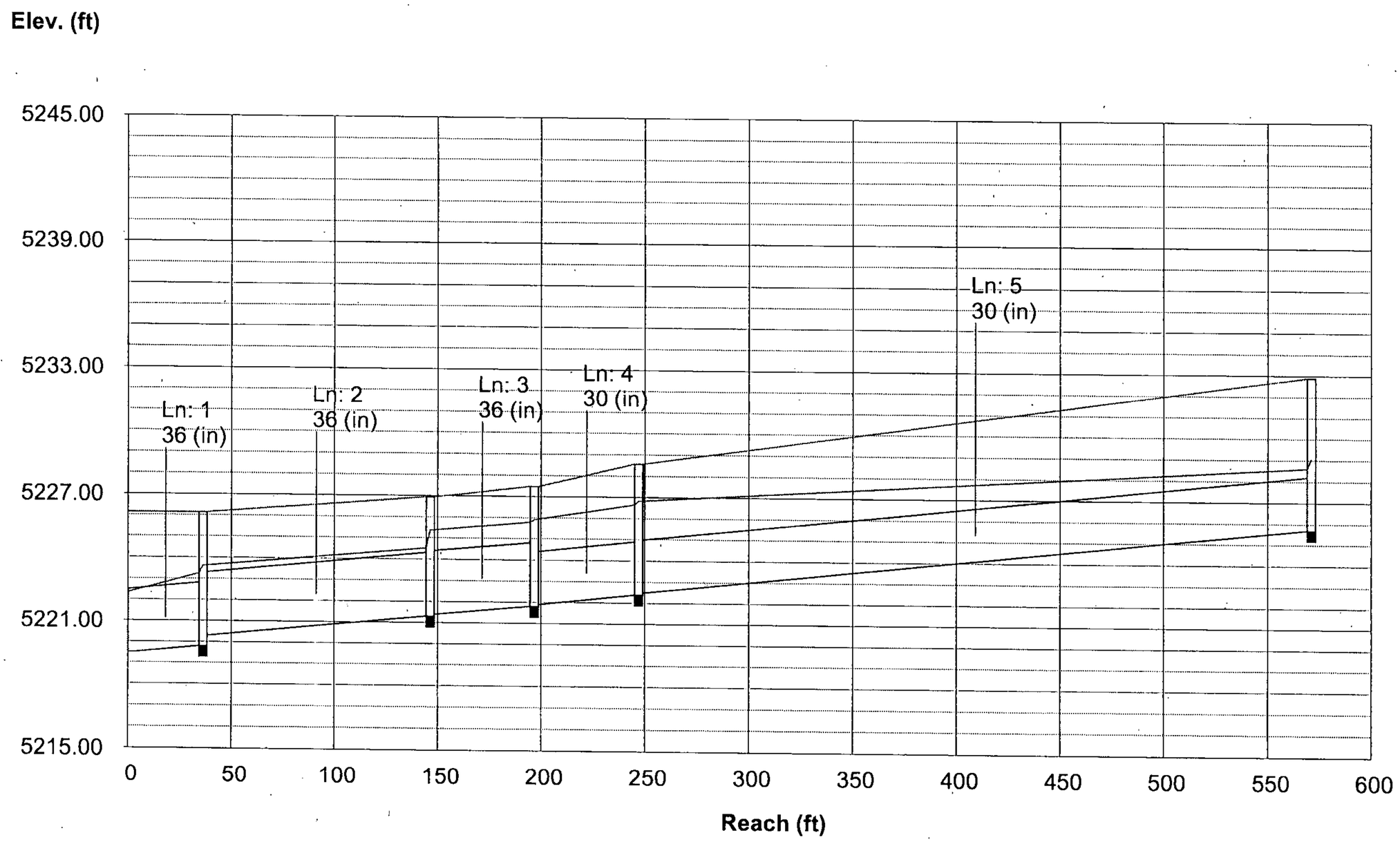
Number of lines: 13

Run Date: 02-11-2004

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs.

Storm Sewer Profile

Proj. file: SDdesign_020204.stm



Storm Sewer Profile

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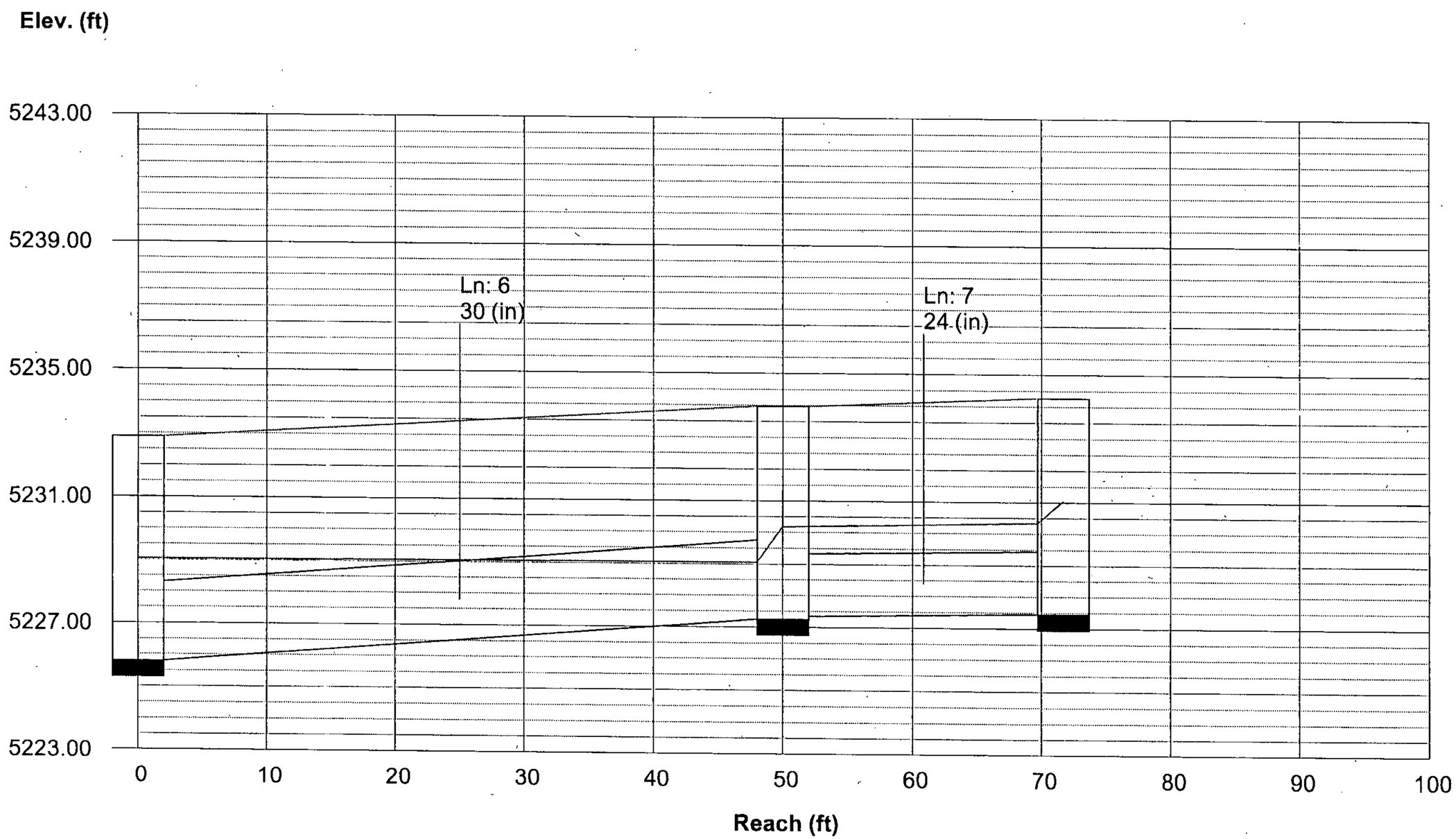

Storm Sewer Profile

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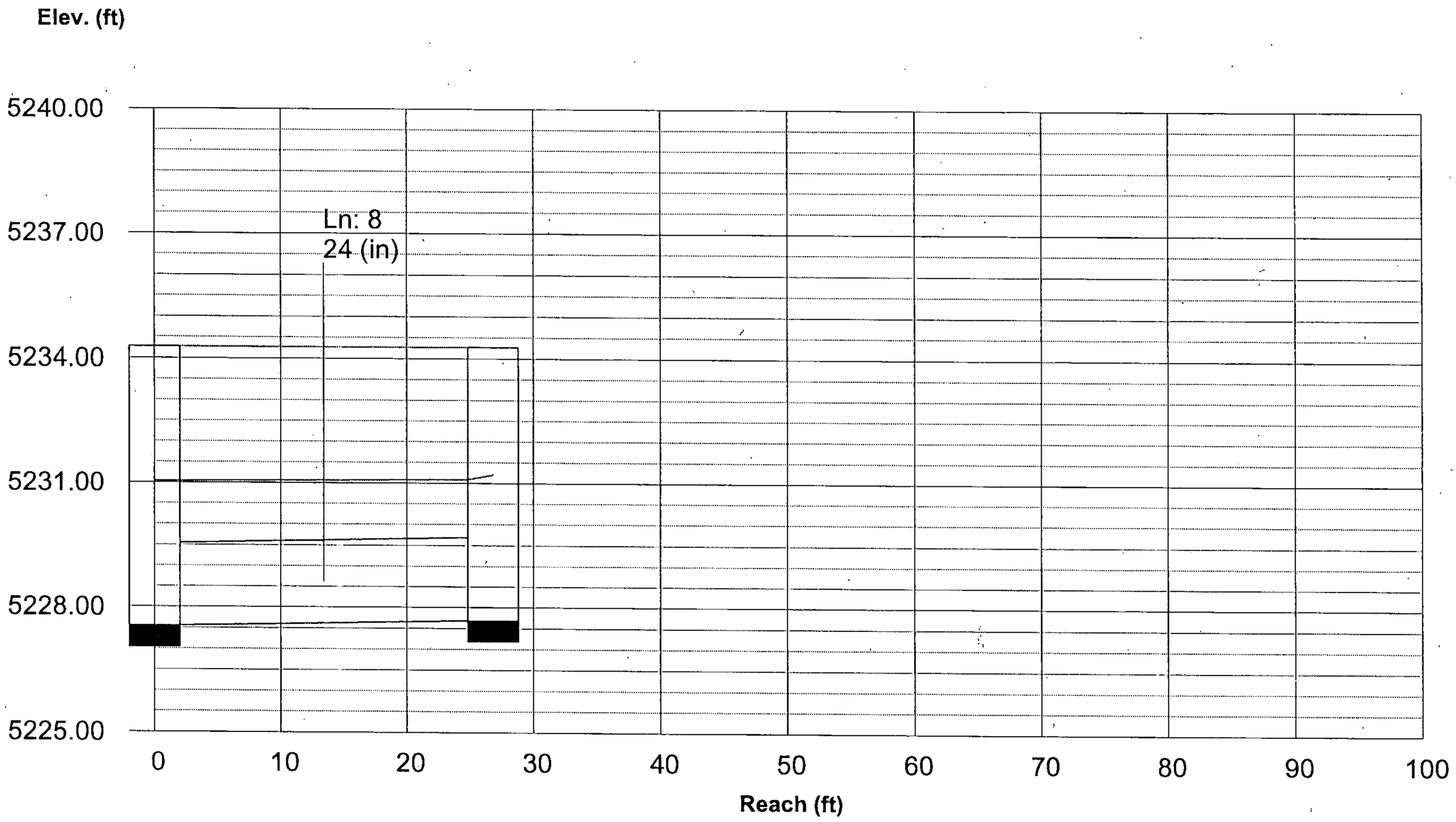

Storm Sewer Profile

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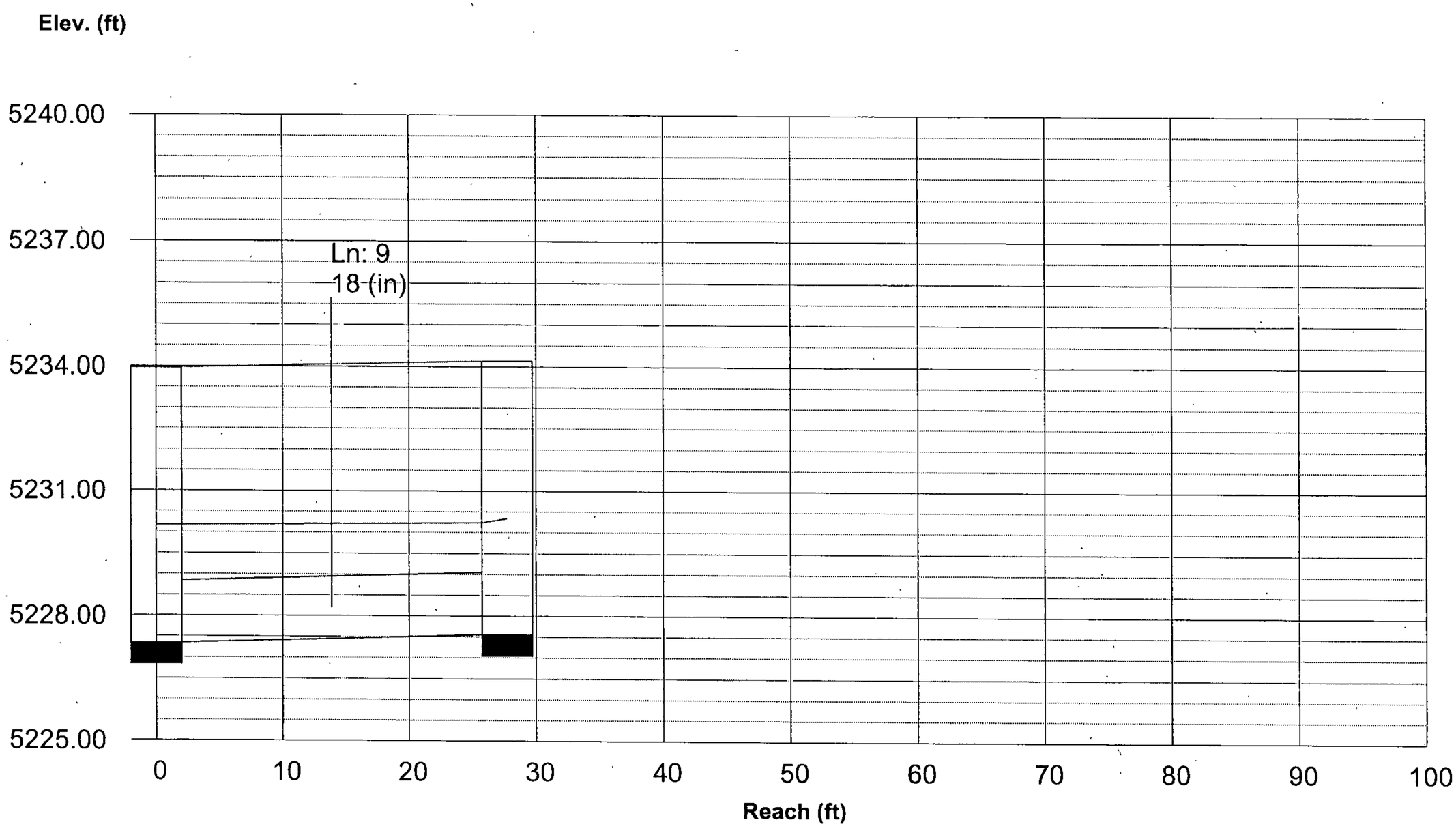

Storm Sewer Profile

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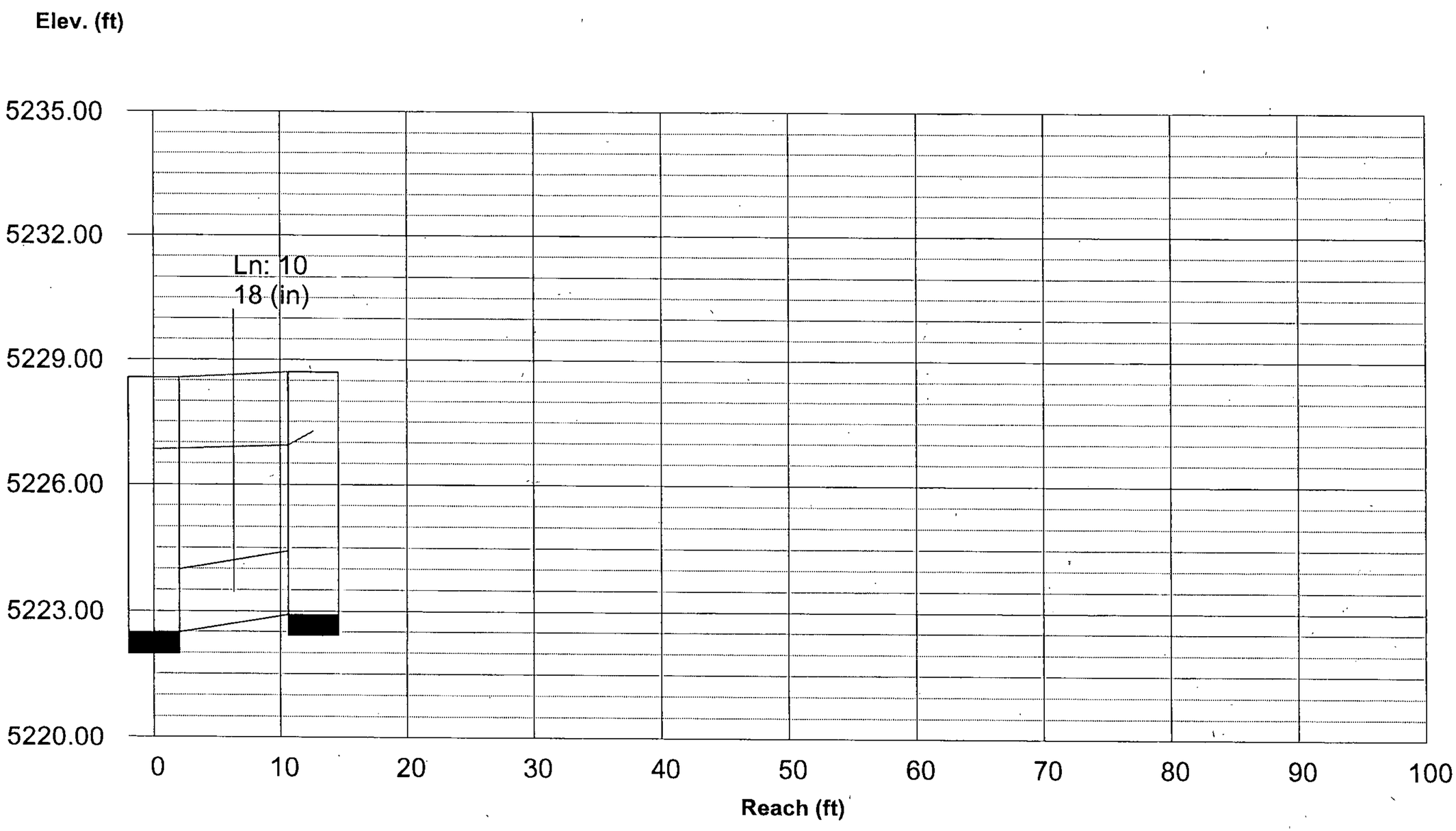

Storm Sewer Profile

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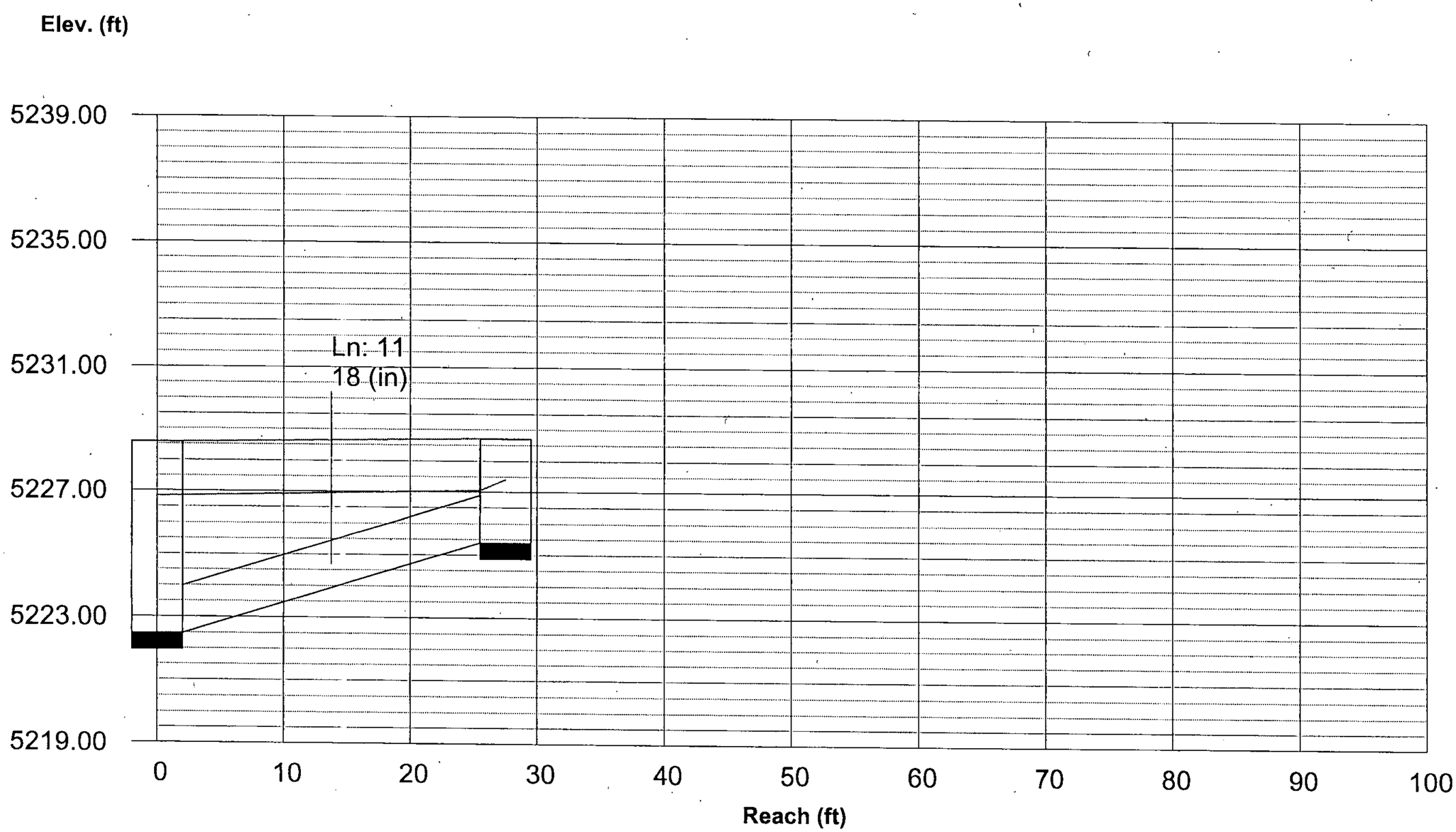

Storm Sewer Profile

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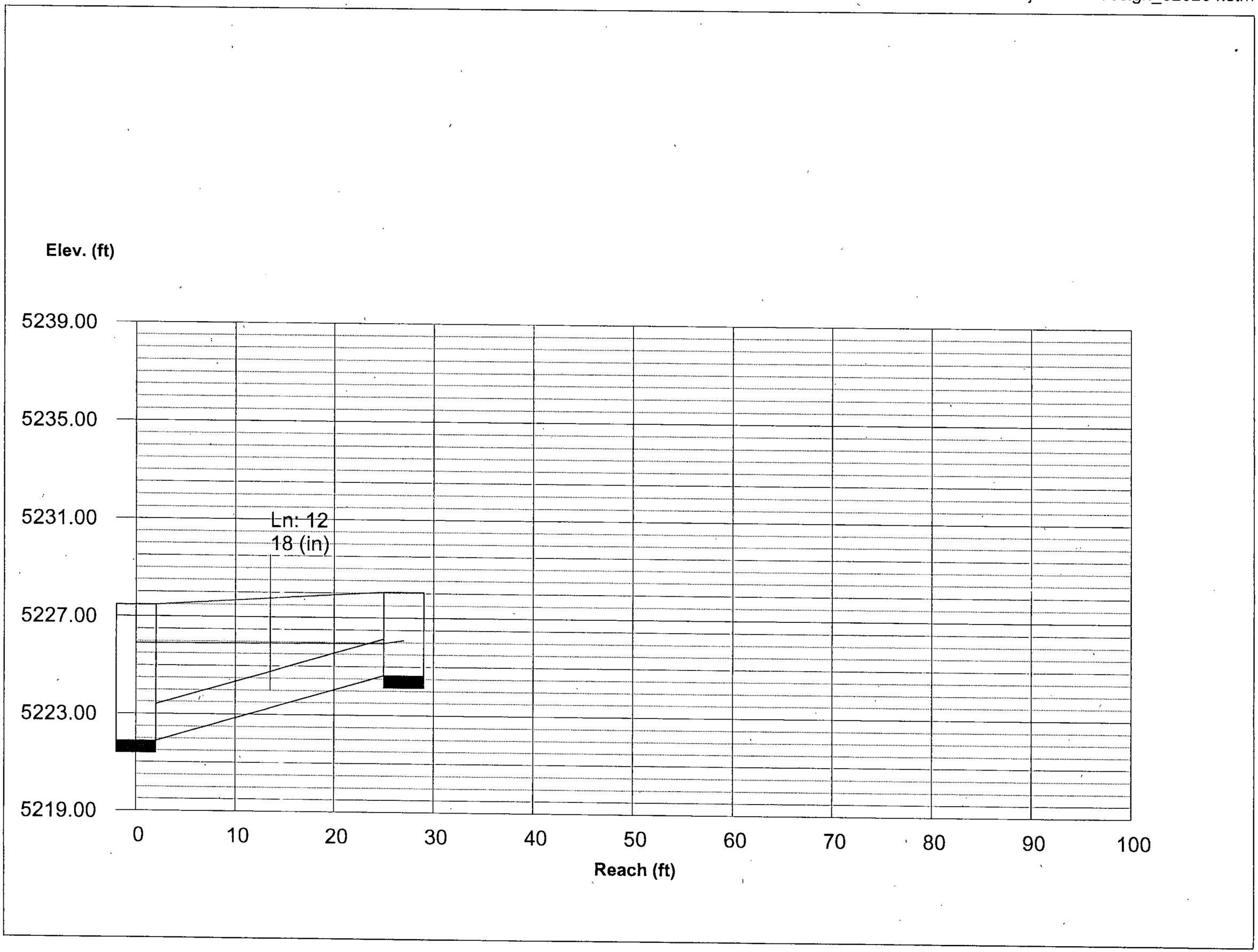

Storm Sewer Profile

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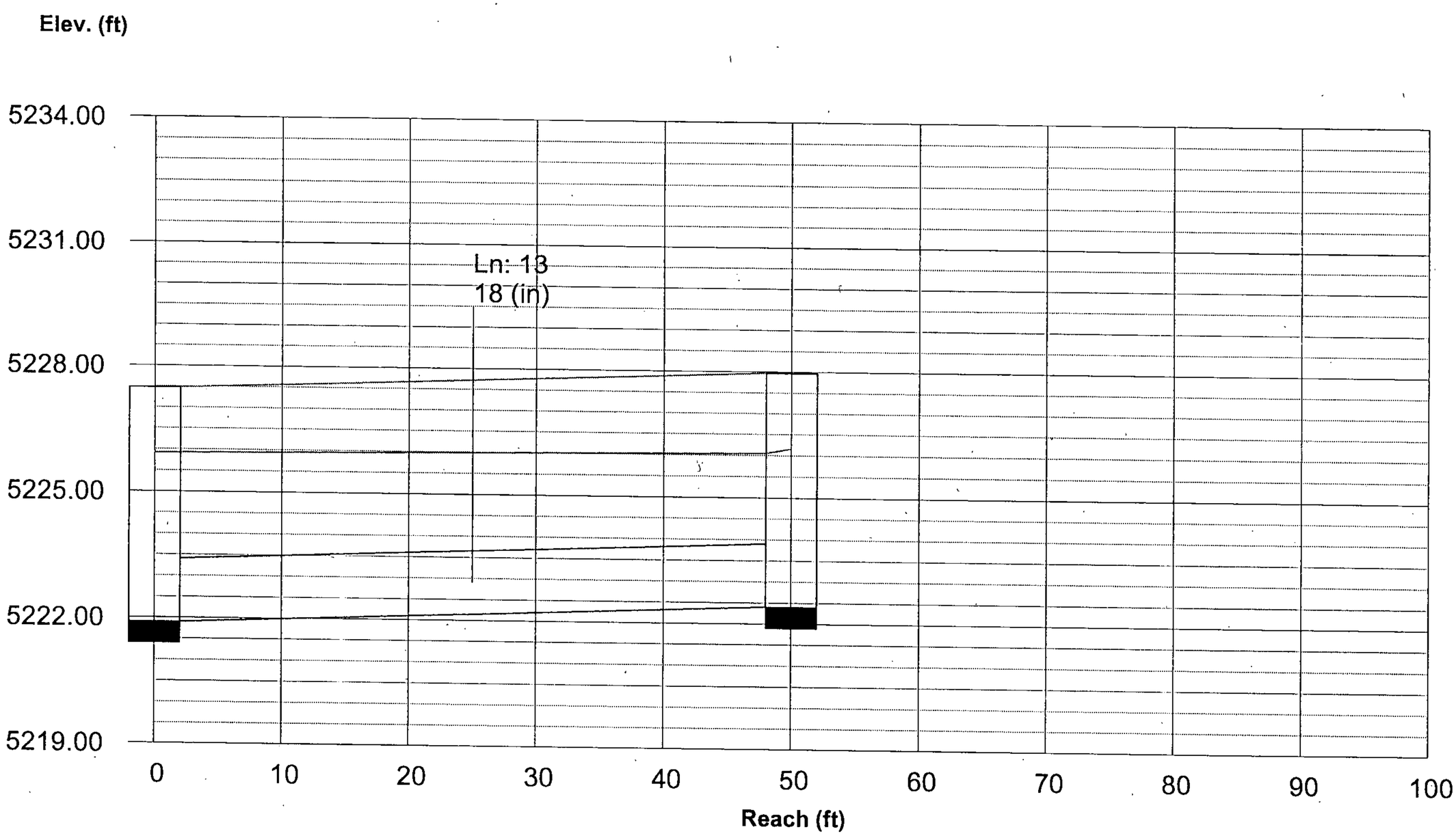


Worksheet
Worksheet for Combination Inlet On Grade

Project Description	
Worksheet	Comb Inlet Type "A" on Clarks
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	12.00	cfs
Local Depression	2.7	in
Local Depression Width	3.33	ft
Slope	0.005000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Curb Opening Length	7.45	ft
Grate Width	2.00	ft
Grate Length	2.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	0.72	
Intercepted Flow	8.61	cfs
Bypass Flow	3.39	cfs
Spread	20.01	ft
Depth	0.42	ft
Flow Area	2.9	ft^2
Gutter Depression	1.0	in
Total Depression	3.7	in
Velocity	2.64	ft/s
Splash Over Velocity	6.93	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.05	
Grate Flow Ratio	0.53	
Equivalent Cross Slope	0.046033	ft/ft
Active Grate Length	1.48	ft
Length Factor	0.22	
Total Interception Length	27.39	ft

Worksheet
Worksheet for Combination Inlet On Grade

Project Description	
Worksheet	Comb Inlet Type "C" on Clarks
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	6.13	cfs
Local Depression	2.7	in
Local Depression Width	3.33	ft
Slope	0.005000	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Curb Opening Length	3.95	ft
Grate Width	2.00	ft
Grate Length	3.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	0.74	
Intercepted Flow	4.53	cfs
Bypass Flow	1.60	cfs
Spread	15.10	ft
Depth	0.38	ft
Flow Area	2.0	ft²
Gutter Depression	1.3	in
Total Depression	4.0	in
Velocity	2.42	ft/s
Splash Over Velocity	8.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.12	
Grate Flow Ratio	0.63	
Equivalent Cross Slope	0.065357	ft/ft
Active Grate Length	1.98	ft
Length Factor	0.12	
Total Interception Length	16.74	ft

Roaring Fork Inlet
Worksheet for Combination Inlet On Grade

Project Description	
Worksheet	Comb Inlet Type "A" on Roaring
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	11.00	cfs
Local Depression	2.7	in
Local Depression Width	3.33	ft
Slope	0.013400	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Curb Opening Length	7.45	ft
Grate Width	2.00	ft
Grate Length	7.90	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	0.76	
Intercepted Flow	8.31	cfs
Bypass Flow	2.69	cfs
Spread	15.68	ft
Depth	0.39	ft
Flow Area	2.2	ft²
Gutter Depression	1.3	in
Total Depression	4.0	in
Velocity	4.03	ft/s
Splash Over Velocity	11.44	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.20	
Grate Flow Ratio	0.61	
Equivalent Cross Slope	0.063804	ft/ft
Active Grate Length	3.95	ft
Length Factor	0.12	
Total Interception Length	29.18	ft

Worksheet
Worksheet for Combination Inlet On Grade

Project Description	
Worksheet	Comb Inlet Type "C" on Roarin
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	6.00	cfs
Local Depression	2.7	in
Local Depression Width	3.33	ft
Slope	0.013400	ft/ft
Gutter Width	2.50	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Curb Opening Length	3.95	ft
Grate Width	2.00	ft
Grate Length	3.95	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	0.79	
Intercepted Flow	4.73	cfs
Bypass Flow	1.27	cfs
Spread	12.16	ft
Depth	0.33	ft
Flow Area	1.4	ft^2
Gutter Depression	1.3	in
Total Depression	4.0	in
Velocity	3.59	ft/s
Splash Over Velocity	8.08	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.06	
Grate Flow Ratio	0.73	
Equivalent Cross Slope	0.074942	ft/ft
Active Grate Length	1.98	ft
Length Factor	0.10	
Total Interception Length	20.54	ft

Roaring Fork - 28' F-F, 1.34% Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	Roaring Fork Gutter Section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012200	ft/ft
Discharge	37.71	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	0.53	ft
Elevation Range	0.00 to 0.67	
Flow Area	8.7	ft²
Wetted Perimeter	29.08	ft
Top Width	28.00	ft
Actual Depth	0.53	ft
Critical Elevation	0.61	ft
Critical Slope	0.006138	ft/ft
Velocity	4.32	ft/s
Velocity Head	0.29	ft
Specific Energy	0.83	ft
Froude Number	1.37	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+28	0.017

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+14	0.37
0+26	0.13
0+28	0.00
0+28	0.67

Eagle River Road to Channel - 32' F-F, 0.5% Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	Eagle River Road to Channel Gutter Sectior
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.006000	ft/ft
Discharge	46.68	cfs

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	0.65	ft
Elevation Range	0.00 to 0.85	
Flow Area	12.9	ft²
Wetted Perimeter	33.31	ft
Top Width	32.00	ft
Actual Depth	0.65	ft
Critical Elevation	0.65	ft
Critical Slope	0.006008	ft/ft
Velocity	3.61	ft/s
Velocity Head	0.20	ft
Specific Energy	0.85	ft
Froude Number	1.00	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+50	0.017

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	0.85
0+09	0.67
0+09	0.00
0+11	0.13
0+25	0.41
0+39	0.13
0+41	0.00
0+41	0.67
0+50	0.85

Proposed Plan

#545381

PNM JOB NO. R1650

96118587

0983

H09/D001A7

PNM Electric Services

Alvarado Square, Albuquerque, New Mexico 87158

EASEMENT ENCROACHMENT AGREEMENT

THIS INFORMATION TO BE PROVIDED BY TITLE COMPANY

This Easement Encroachment Agreement made this 28 day of October, 19 96

by and between (BUYER/BORROWER, OWNER) WESTLAND DEVELOPMENT COMPANY INC.

whose address is 401 Coors Boulevard NW Albuquerque, NM 87121

(hereinafter called "First Party"), (his) (her) (their) (its) heirs, successors and assigns, and PUBLIC SERVICE COMPANY OF NEW MEXICO. A New Mexico Corporation for it's Electric Services Division, (hereinafter called ("PNM") ("Parties").

WITNESSETH:

WHEREAS, PNM is the Grantee of a certain easement within the hereinafter described property.

WHEREAS, First Party desires to encroach upon the Easement as more particularly specified hereinafter, and WHEREAS, PNM has agreed to said encroachment: NOW THEREFORE, for and in consideration of the sum of One and No/100 ($1.00) DOLLAR, in hand paid, and other valuable consideration, the receipt of which is hereby acknowledged, PNM does hereby grant First Party the right to encroach upon the Easement only to the extent of, and for the purposes set forth below:

PNM USE ONLY FOR LEGAL DESCRIPTION

Encroachment of a fifty (50) foot wide Permanent Public Drainage and Temporary Public Access Easement within a sixty (60) foot Public Service Company of New Mexico utility easement within Tract E of the Plat of THE CROSSING, a subdivision, situate in projected Sections 9 and 16, T.10N., R.2E., N.M.P.M., filed for record in the office of the County Clerk in Bernalillo County in Plat Book 96C, Page 302 on July 9, 1996.

Encroachment is more particularly shown on Exhibit "A" attached and made a part of this document.

Easement Encroachment Agreement approved with the understanding that no fill dirt is to be placed in the Easement Encroachment Area.

STATE OF NEW MEXICO
COUNTY OF BERNALILLO
FILED FOR RECORD
96 OCT 30 AM 8:28

By granting the aforesaid right to encroach PNM does not waive or relinquish any rights that it may have under or by reason of the Easement, including, but not limited to the right to build, rebuild, construct, reconstruct, locate, relocate, change, modify, renew, operate and maintain its electric lines (including underground lines), poles, guywires and other electric equipment, fixtures and structures that are now located, or may in the future be located, through, on, within, or under the Easement. First Party, at its sole cost and expense, agrees to remove or relocate its encroachment upon the written request of PNM within 90 days of such written request. First Party appoints PNM its agent to accomplish said removal or relocation at First Party's expense if First Party fails to remove or relocate such encroachment within such time period.

In consideration of PNM granting First Party the right to encroach upon the Easement, First Party hereby agrees to indemnify and hold harmless PNM, its agents and employees, from any and all claims whatsoever for personal injuries or damages to property when such injuries or damages directly or indirectly arise out of the existence, construction, maintenance, repair, condition, use or presence of the encroachment upon the Easement, regardless of the cause of said injuries or damages; provided, however, that notwithstanding anything to the contrary in this paragraph, First Party shall not be required to indemnify PNM for liability, claims, damages, losses or expenses, arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications by PNM, or the agents or employees of PNM; or (b) the giving of or the failure to give directions or instructions by PNM, or the agents or employees of PNM, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

In consideration of PNM permitting First Party to encroach upon the Easement, First Party agrees that PNM shall not be responsible for any damage caused to facilities, equipment, structures or other property of First Party if damaged by reason of PNM's use of Easement.

First Party shall comply with all applicable laws, ordinances, rules and regulations enacted or promulgated by any federal, state or local governmental body having jurisdiction over First Party's encroachment.

The provisions hereof shall inure to the benefit of and bind the heirs, executors, administrators, personal representatives, successors and assigns of the Parties hereto; provided, however, that no such heir, executor, administrator, personal representative, successor or assign of First Party shall have the right to use, alter or modify the encroachment in a manner which will increase the burden of the encroachment on the Easement.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

BUYER/BORROWER, OWNER (First Party):

Barbara Page

BARBARA PAGE, PRESIDENT, WESTLAND DEVELOPMENT CO. INC.

PUBLIC SERVICE COMPANY OF NEW MEXICO

By: _____

ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

This instrument was acknowledged before me on October 28 19 96,

by ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

of the Public Service Company of New Mexico, a New Mexico corporation, for it's Electric Services Division on behalf of said corporation

NOTARY PUBLIC

My Commission Expires: 3-1-97

STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

This instrument was acknowledged before me on October 28 19 96,

by BARBARA PAGE, WESTLAND DEVELOPMENT COMPANY, INC.

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

Grace Rodriguez
NOTARY PUBLIC

My Commission Expires: 7/22/00

FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

THE CROSSING
ALBUQUERQUE, NEW MEXICO
APRIL, 1996

Exhibit "A"

0985

N

SCALE 1" = 200'

TRACT B
50.00000 ACRES

UNPLATTED LANDS

UNIT 1
15.74217 ACRES
(SEE NOTE 2. BELOW)

UNIT 2
13.75100 ACRES
(SEE NOTE 2. BELOW)

Easement Encroachment

"POINT OF BEGINNING"

TRACT D
5.11206 ACRES

TRACT E
13.10055 ACRES

TRACT C
10.27501 ACRES
(SEE NOTE 6 ON SHEET 1)

POND 11
COURT JUDGEMENT
AMAFCA LD-2-1P
Filed September 28, 1978
Vol Misc. 498, Folio 648-683

POND 10
COURT JUDGEMENT
AMAFCA LD-2-1M
Filed September 28, 1978
Vol Misc. 498, Folio 648-683

POND 12
COURT JUDGEMENT
AMAFCA LD-2-1T
Filed: September 28, 1978
Vol. Misc. 498, Folio 648-683

TRACT A
35.29014
(SEE NOTE 6 ON SHEET 1)

TRACT H
29.49706 ACRES
(SEE NOTE 6 ON SHEET 1)

PLAT FOR LAS LOMITAS UNIT 11B
Filed: May 5, 1994 (94C-147)

BLOCK 7

SEE DETAIL "A"

SEE DETAIL "B"

LADERA BOULEVARD N.W.

LADERA DRIVE N.W. (R/W VARIES)

PARKWAY DRIVE N.W.

PARKWAY UNIT 1
Filed: JULY 23, 1992 (92C-157)

PARKWAY UNIT 2
Filed: DEC. 10, 1992 (92C-268)

PARKWAY UNIT 3
Filed APRIL 15, 1993 (93C-105)

PARKWAY UNIT 4
Filed JULY 23, 1993 (93C-218)

PARKWAY UNIT 5
Filed OCT 18, 1993 (93C-339)

PARKWAY UNIT 6
Filed JAN 12, 1994 (94C-11)

BOULEVARD (166' R/W)

ACS Brass Cap stamped "3-H10"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 356,889.72 Y= 1,493,922.98
Ground-to-Grid Factor = 0.99967504
ΔG = -00°16'31"
NGVD 1929 Elevation = 5193.38

Bohannan & Huston Brass Cap stamped "BH-40"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 352,790.66 Y= 1,492,346.53
Ground-to-Grid Factor = 0.99967105
ΔG = -00°16'59"
NGVD 1929 Elevation = 5305.43

0.7651 Acre Public Access and Utility Easement Granted by Document No. 96059284 recorded May 28, 1996 in book 96-14, pages 8832-8835, of the County Records, Bernalillo County, New Mexico

NO fill here

LEGEND

- SUBDIVISION BOUNDARY LINE
- NEW LOT LINE
- ADJOINING PROPERTY LINE
- MONUMENT TIE LINE
- NEW EASEMENT LINE
- EXISTING EASEMENT LINE
- ANNEXATION BOUNDARY LINE
- ▲ CENTERLINE MONUMENT TO BE INSTALLED
- FOUND 5/8" REBAR
- △ CITY OF ALBUQUERQUE SURVEY CONTROL MONUMENT
- ● SET 5/8" CAPPED REBAR STAMPED "WEAVER LS 6544"
- FOUND 5/8" REBAR WITH CAP AS NOTED
- FOUND PK NAIL IN TOP OF CONCRETE WALL

50' Temporary Public Access Easement granted to the City of Albuquerque with the filing of this plat

0.1098 Acre Temporary Public Access Easement Granted by Document No. _____ recorded _____, 1996 in Book ____, Page ____ of the County Records, Bernalillo County, New Mexico

DETAIL "B"
NOT TO SCALE

JOB NO. 95235-A-3010

BOHANNAN-HUSTON INC.

NOTES:

1. WEST BOUNDARY OF "TEMPORARY DRAINAGE EASEMENT GRANTED TO AMAFCA", BETWEEN POINTS (1) & (2), CORRESPONDS TO THE "MAXIMUM LATERAL EROSION LIMIT (PROJECT LINE) ESTABLISHED BY THE LAS LOMITAS UNIT IIB MIREHAVEN ARROYO SCOURWALL ANALYSIS

2. A TEMPORARY BLANKET PUBLIC WATER LINE EASEMENT IS GRANTED TO THE CITY OF ALBUQUERQUE WITHIN "UNIT 1" AND "UNIT 2" WITH THE FILING OF THIS BULK LAND PLAT. SAID EASEMENT SHALL BE [illegible]

Exhibit "A"

930-A

302 BC

545381

PNM JOB NO. R1650

96118588

0986

PNM Electric Services

Alvarado Square, Albuquerque, New Mexico 87158

EASEMENT ENCROACHMENT AGREEMENT

THIS INFORMATION TO BE PROVIDED BY TITLE COMPANY

This Easement Encroachment Agreement made this 28 day of October, 19 96

by and between (BUYER/BORROWER, OWNER) WESTLAND DEVELOPMENT COMPANY INC.

whose address is 401 Coors Boulevard NW Albuquerque, NM 87121

(hereinafter called "First Party"), (his) (her) (their) (its) heirs, successors and assigns, and PUBLIC SERVICE COMPANY OF NEW MEXICO. A New Mexico Corporation for it's Electric Services Division, (hereinafter called ("PNM") ("Parties").

WITNESSETH:

WHEREAS, PNM is the Grantee of a certain easement within the hereinafter described property.

WHEREAS, First Party desires to encroach upon the Easement as more particularly specified hereinafter, and WHEREAS, PNM has agreed to said encroachment: NOW THEREFORE, for and in consideration of the sum of One and No/100 ($1.00) DOLLAR, in hand paid, and other valuable consideration, the receipt of which is hereby acknowledged, PNM does hereby grant First Party the right to encroach upon the Easement only to the extent of, and for the purposes set forth below:

PNM USE ONLY FOR LEGAL DESCRIPTION

Encroachment of water lines and underground storm drainage pipelines into a sixty (60) foot Public Service Company of New Mexico easement within Tract A of the Plat of THE CROSSING, a subdivision situate in projected Sections 9 and 16, T.10N., R.2E., N.M.P.M., filed for record in the office of the County Clerk in Bernalillo County in Plat Book 96C, Page 302 on July 9, 1996

Encroachment is more particularly shown on Exhibit "A" attached and made a part of this document.

Easement Encroachment Agreement approved with the understanding that no fill dirt is to be placed in the Easement Encroachment Area.

STATE OF NEW MEXICO
COUNTY OF BERNALILLO
FILED FOR RECORD

1996 OCT 30 AM 8:28

96-29 982-
JUDY ROMERO
COUNTY CLERK

By granting the aforesaid right to encroach PNM does not waive or relinquish any rights that it may have under or by reason of the Easement, including, but not limited to the right to build, rebuild, construct, reconstruct, locate, relocate, change, modify, renew, operate and maintain its electric lines (including underground lines), poles, guywires and other electric equipment, fixtures and structures that are now located, or may in the future be located, through, on, within, or under the Easement. First Party, at its sole cost and expense, agrees to remove or relocate its encroachment upon the written request of PNM within 90 days of such written request. First Party appoints PNM its agent to accomplish said removal or relocation at First Party's expense if First Party fails to remove or relocate such encroachment within such time period.

In consideration of PNM granting First Party the right to encroach upon the Easement, First Party hereby agrees to indemnify and hold harmless PNM, its agents and employees, from any and all claims whatsoever for personal injuries or damages to property when such injuries or damages directly or indirectly arise out of the existence, construction, maintenance, repair, condition, use or presence of the encroachment upon the Easement, regardless of the cause of said injuries or damages; provided, however, that notwithstanding anything to the contrary in this paragraph, First Party shall not be required to indemnify PNM for liability, claims, damages, losses or expenses, arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications by PNM, or the agents or employees of PNM; or (b) the giving of or the failure to give directions or instructions by PNM, or the agents or employees of PNM, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

In consideration of PNM permitting First Party to encroach upon the Easement, First Party agrees that PNM shall not be responsible for any damage caused to facilities, equipment, structures or other property of First Party if damaged by reason of PNM's use of Easement.

First Party shall comply with all applicable laws, ordinances, rules and regulations enacted or promulgated by any federal, state or local governmental body having jurisdiction over First Party's encroachment.

The provisions hereof shall inure to the benefit of and bind the heirs, executors, administrators, personal representatives, successors and assigns of the Parties hereto; provided, however, that no such heir, executor, administrator, personal representative, successor or assign of First Party shall have the right to use, alter or modify the encroachment in a manner which will increase the burden of the encroachment on the Easement.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

BUYER/BORROWER, OWNER (First Party):

Barbara Page

BARBARA PAGE, PRESIDENT, WESTLAND DEVELOPMENT CO. INC.

PUBLIC SERVICE COMPANY OF NEW MEXICO

By: _____

ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

This instrument was acknowledged before me on October 28 19 96,

by ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

of the Public Service Company of New Mexico, a New Mexico corporation, for it's Electric Services Division on behalf of said corporation

Kenneth Ortiz Barela

NOTARY PUBLIC

My Commission Expires: 3-1-97

STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

This instrument was acknowledged before me on October 28 19 96,

by BARBARA PAGE, WESTLAND DEVELOPMENT COMPANY, INC.

Grace Rodriguez

NOTARY PUBLIC

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

My Commission Expires: 7/22/00

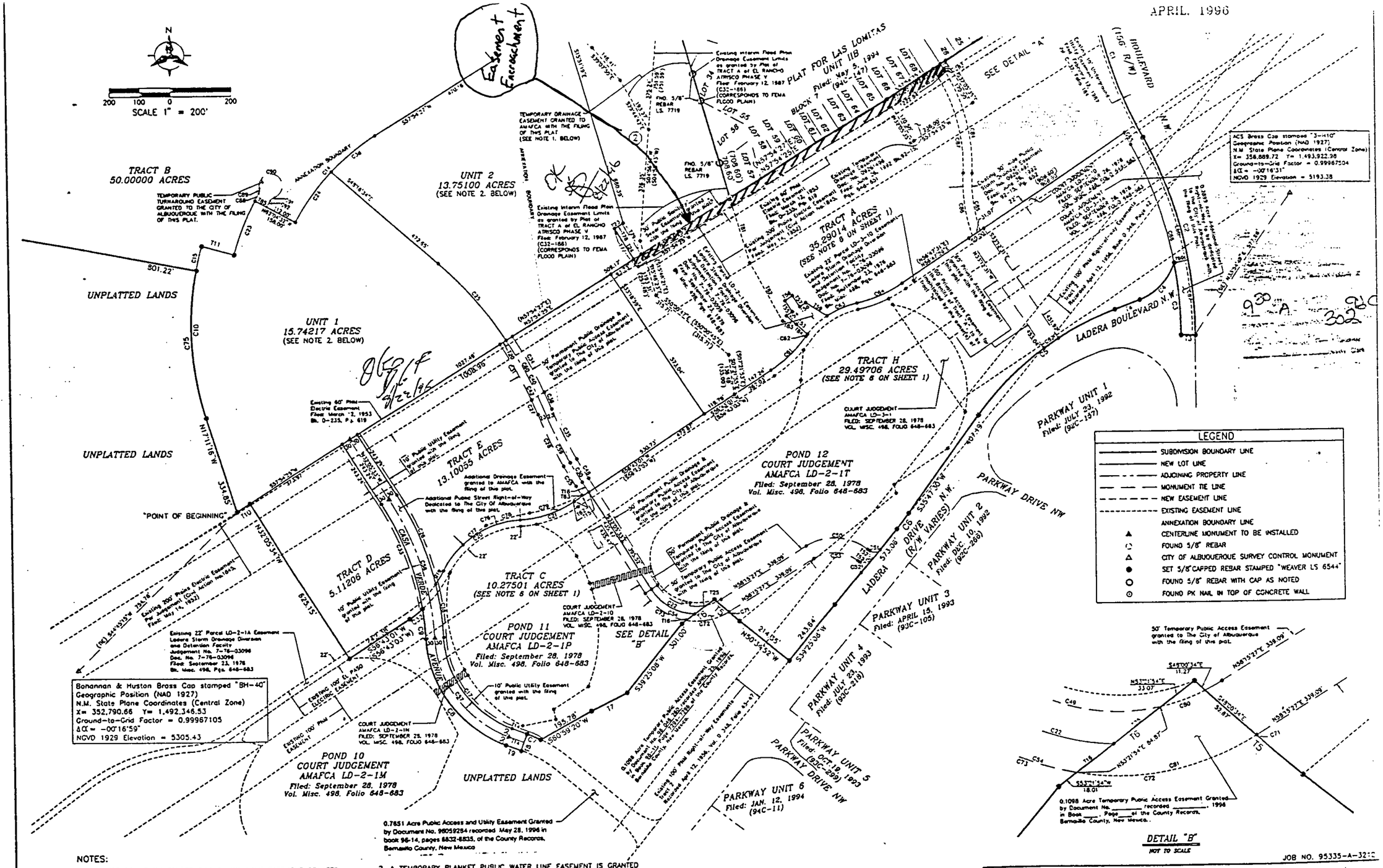
FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

Exhibit "A"

0988

APRIL 1996



NOTES:

1. WEST BOUNDARY OF "TEMPORARY DRAINAGE EASEMENT GRANTED TO AMAFCA", BETWEEN POINTS ① & ② CORRESPONDS TO THE "MAXIMUM LATERAL EROSION LIMIT" (PRUDENT LINE) ESTABLISHED BY *THE LAS LOMITAS UNIT 1B MIREHAVEN ARROYO SCOURWALL ANALYSIS & DESIGN*, PREPARED BY AVID ENGINEERING OCT. 1994.

2. A TEMPORARY BLANKET PUBLIC WATER LINE EASEMENT IS GRANTED TO THE CITY OF ALBUQUERQUE WITHIN "UNIT 1" AND "UNIT 2" WITH THE FILING OF THIS BULK LAND PLAT; SAID EASEMENT SHALL BE FUTHER DEFINED AND CONTAINED WITHIN FUTURE DEDICATED PUBLIC RIGHTS-OF-WAY AND/OR PERMANENT PUBLIC WATER LINE EASEMENT(S) UPON THE RECORDING OF THE FINAL SUBDIVISION PLATS FOR UNITS 1 AND 2 RESPECTIVELY, AT WHICH TIME THE TEMPORARY BLANKET EASEMENT SHALL AUTOMATICALLY EXTINGUISH AS TO EACH RESPECTIVE UNIT.

JOB NO. 95335-A-3210

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

SHEET 3 OF 4

#545381

PNM JOB NO. R1650

96118589

0989

PNM *Electric Services*

Alvarado Square, Albuquerque, New Mexico 87158

EASEMENT ENCROACHMENT AGREEMENT

THIS INFORMATION TO BE PROVIDED BY TITLE COMPANY

This Easement Encroachment Agreement made this 28 day of October, 19 96

by and between (BUYER/BORROWER, OWNER) WESTLAND DEVELOPMENT COMPANY INC.

whose address is 401 Coors Boulevard NW Albuquerque, NM 87121

(hereinafter called "First Party"), (his) (her) (their) (its) heirs, successors and assigns, and PUBLIC SERVICE COMPANY OF NEW MEXICO. A New Mexico Corporation for it's Electric Services Division, (hereinafter called ("PNM") ("Parties").

WITNESSETH:

WHEREAS, PNM is the Grantee of a certain easement within the hereinafter described property.

WHEREAS, First Party desires to encroach upon the Easement as more particularly specified hereinafter, and WHEREAS, PNM has agreed to said encroachment: NOW THEREFORE, for and in consideration of the sum of One and No/100 ($1.00) DOLLAR, in hand paid, and other valuable consideration, the receipt of which is hereby acknowledged, PNM does hereby grant First Party the right to encroach upon the Easement only to the extent of, and for the purposes set forth below:

PNM USE ONLY FOR LEGAL DESCRIPTION

Encroachment of a fifty (50) foot wide Permanent Public Drainage and Temporary Public Access Easement within a sixty (60) foot wide Public Service Company of New Mexico utility easement between Tracts D and E of the Plat of THE CROSSING, a subdivision situate in projected Sections 9 and 16, T.10N., R.2E., N.M.P.M., filed for record in the office of the County Clerk in Bernalillo County in Plat Book 96C, Page 302 on July 9, 1996.

Encroachment is more particularly shown on Exhibit "A" attached and made a part of this document.

Easement Encroachment Agreement approved with the understanding that no fill dirt is to be placed in the Easement Encroachment Area.

STATE OF NEW MEXICO
COUNTY OF BERNALILLO
FILED
1996 OCT 30 AM 8:28
JUDY ... COUNTY CLERK

By granting the aforesaid right to encroach PNM does not waive or relinquish any rights that it may have under or by reason of the Easement, including, but not limited to the right to build, rebuild, construct, reconstruct, locate, relocate, change, modify, renew, operate and maintain its electric lines (including underground lines), poles, guywires and other electric equipment, fixtures and structures that are now located, or may in the future be located, through, on, within, or under the Easement. First Party, at its sole cost and expense, agrees to remove or relocate its encroachment upon the written request of PNM within 90 days of such written request. First Party appoints PNM its agent to accomplish said removal or relocation at First Party's expense if First Party fails to remove or relocate such encroachment within such time period.

In consideration of PNM granting First Party the right to encroach upon the Easement, First Party hereby agrees to indemnify and hold harmless PNM, its agents and employees, from any and all claims whatsoever for personal injuries or damages to property when such injuries or damages directly or indirectly arise out of the existence, construction, maintenance, repair, condition, use or presence of the encroachment upon the Easement, regardless of the cause of said injuries or damages; provided, however, that notwithstanding anything to the contrary in this paragraph, First Party shall not be required to indemnify PNM for liability, claims, damages, losses or expenses, arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications by PNM, or the agents or employees of PNM; or (b) the giving of or the failure to give directions or instructions by PNM, or the agents or employees of PNM, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

In consideration of PNM permitting First Party to encroach upon the Easement, First Party agrees that PNM shall not be responsible for any damage caused to facilities, equipment, structures or other property of First Party if damaged by reason of PNM's use of Easement.

First Party shall comply with all applicable laws, ordinances, rules and regulations enacted or promulgated by any federal, state or local governmental body having jurisdiction over First Party's encroachment.

The provisions hereof shall inure to the benefit of and bind the heirs, executors, administrators, personal representatives, successors and assigns of the Parties hereto; provided, however, that no such heir, executor, administrator, personal representative, successor or assign of First Party shall have the right to use, alter or modify the encroachment in a manner which will increase the burden of the encroachment on the Easement.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

BUYER/BORROWER, OWNER (First Party):

Barbara Page

BARBARA PAGE, PRESIDENT, WESTLAND DEVELOPMENT CO. INC.

PUBLIC SERVICE COMPANY OF NEW MEXICO

By: _____

ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

This instrument was acknowledged before me on October 28 19 96,

by ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

of the Public Service Company of New Mexico, a New Mexico corporation, for it's Electric Services Division on behalf of said corporation

Kenneth Patrick Cordova

NOTARY PUBLIC

My Commission Expires: 3-1-97

STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

This instrument was acknowledged before me on October 28 19 96,

by BARBARA PAGE, WESTLAND DEVELOPMENT COMPANY, INC.

Grace Rodriguez

NOTARY PUBLIC

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

My Commission Expires: 7/22/00

FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

THE CROSSING
ALBUQUERQUE, NEW MEXICO
APRIL, 1996

1660

Exhibit "A"

Easement Encroachment

SCALE 1" = 200'

TRACT B
50.00000 ACRES

UNPLATTED LANDS

UNIT 1
15.74217 ACRES
(SEE NOTE 2. BELOW)

UNIT 2
13.75100 ACRES
(SEE NOTE 2. BELOW)

TRACT A
35.29014 ACRES
(SEE NOTE 6 ON SHEET 1)

TRACT H
29.49706 ACRES
(SEE NOTE 6 ON SHEET 1)

TRACT E
13.10055 ACRES

TRACT D
5.11206 ACRES

TRACT C
10.27501 ACRES
(SEE NOTE 6 ON SHEET 1)

"POINT OF BEGINNING"

POND 12
COURT JUDGEMENT
AMAFCA LD-2-1T
Filed: September 28, 1978
Vol. Misc. 498, Folio 648-683

POND 11
COURT JUDGEMENT
AMAFCA LD-2-1P
Filed September 28, 1978
Vol Misc 498, Folio 648-683

POND 10
COURT JUDGEMENT
AMAFCA LD-2-1M
Filed September 28, 1978
Vol. Misc. 498, Folio 648-683

PLAT FOR LAS LOMITAS UNIT IIB
Filed: May 5, 1994 (94C-147)

BLOCK 7

SEE DETAIL "A"

SEE DETAIL "B"

LADERA BOULEVARD N.W.

LADERA DRIVE (R/W VARIES) N.W.

PARKWAY DRIVE N.W.

PARKWAY UNIT 1
Filed: JULY 23, 1992 (92C-157)

PARKWAY UNIT 2
Filed: DEC. 10, 1992 (92C-268)

PARKWAY UNIT 3
Filed APRIL 15, 1993 (93C-105)

PARKWAY UNIT 4
Filed JULY 23, 1993 (93C-218)

PARKWAY UNIT 5
Filed OCT. 18, 1993 (93C-298)

PARKWAY UNIT 6
Filed JAN. 12, 1994 (94C-11)

UNPLATTED LANDS

0.7651 Acre Public Access and Utility Easement Granted by Document No. 96059284 recorded May 28, 1996 in book 96-14, pages 8832-8835, of the County Records, Bernalillo County, New Mexico

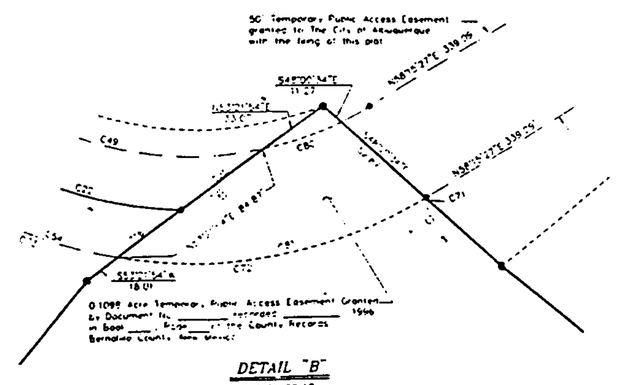
NO Fill here

ACS Brass Cap stamped "J-H10"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 356,888.72 Y= 1,493,922.98
Ground-to-Grid Factor = 0.99967504
ΔG = -00°16'31"
NGVD 1929 Elevation = 5193.38

Bohannan & Huston Brass Cap stamped "BH-40"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 352,190.66 Y= 1,492,346.53
Ground-to-Grid Factor = 0.99967105
ΔG = [illegible]
NGVD 1929 Elevation = 5305.43

LEGEND

- SUBDIVISION BOUNDARY LINE
- NEW LOT LINE
- ADJOINING PROPERTY LINE
- MONUMENT TIE LINE
- NEW EASEMENT LINE
- EXISTING EASEMENT LINE
- ANNEXATION BOUNDARY LINE
- ▲ CENTERLINE MONUMENT TO BE INSTALLED
- FOUND 5/8" REBAR
- △ CITY OF ALBUQUERQUE SURVEY CONTROL MONUMENT
- ● SET 5/8" CAPPED REBAR STAMPED "WEAVER LS 6544"
- FOUND 5/8" REBAR WITH CAP AS NOTED
- FOUND PK NAIL IN TOP OF CONCRETE WALL



DETAIL "B"
NOT TO SCALE

NOTES

1. WEST BOUNDARY OF "TEMPORARY DRAINAGE EASEMENT GRANTED TO AMAFCA", BETWEEN POINTS (1) & (2), CORRESPONDS TO THE "MAXIMUM LATERAL EROSION LIMIT (PROJECT LINE) ESTABLISHED BY THE LAS LOMITAS UNIT IIB MIREHAVEN ARROYO SPOTHWALL ANALYSIS
2. A TEMPORARY BLANKET PUBLIC WATER LINE EASEMENT IS GRANTED TO THE CITY OF ALBUQUERQUE WITHIN "UNIT 1" AND "UNIT 2" WITH THE FILING OF THIS BULK LAND PLAT. SAID EASEMENT SHALL BE [illegible]

JOB NO. 95335-4-3010

BOHANNAN-HUSTON INC.

930-A

302 PSC

Exhibit "A"

545381

PNM JOB NO. R1650

96118590

0992

PNM Electric Services

Alvarado Square, Albuquerque, New Mexico 87158

THIS INFORMATION TO BE PROVIDED BY TITLE COMPANY

EASEMENT ENCROACHMENT AGREEMENT

This Easement Encroachment Agreement made this 28 day of October, 19 96

by and between (BUYER/BORROWER, OWNER) WESTLAND DEVELOPMENT COMPANY INC.

whose address is 401 Coors Boulevard NW Albuquerque, NM 87121

(hereinafter called "First Party"), (his) (her) (their) (its) heirs, successors and assigns, and PUBLIC SERVICE COMPANY OF NEW MEXICO. A New Mexico Corporation for it's Electric Services Division, (hereinafter called ("PNM") ("Parties").

WITNESSETH:

WHEREAS, PNM is the Grantee of a certain easement within the hereinafter described property.

WHEREAS, First Party desires to encroach upon the Easement as more particularly specified hereinafter, and WHEREAS, PNM has agreed to said encroachment: NOW THEREFORE, for and in consideration of the sum of One and No/100 ($1.00) DOLLAR, in hand paid, and other valuable consideration, the receipt of which is hereby acknowledged, PNM does hereby grant First Party the right to encroach upon the Easement only to the extent of, and for the purposes set forth below:

PNM USE ONLY FOR LEGAL DESCRIPTION

Encroachment of a fifty (50) foot wide Permanent Public Drainage and Temporary Public Access Easement within a one-hundred (100) foot wide Public Service Company of New Mexico utility easement within Tract C of the Plat of THE CROSSING, a subdivision, situate in projected Sections 9 and 16, T.10N., R.2E., N.M.P.M., filed for record in the office of the County Clerk in Bernalillo County in Plat Book 96C, Page 302 on July 9, 1996.

Encroachment is more particularly shown on Exhibit "A" attached and made a part of this document.

Easement Encroachment Agreement approved with the understanding that no fill dirt is to be placed in the Easement Encroachment Area.

STATE OF NEW MEXICO
COUNTY OF BERNALILLO
FILED
1996 OCT 30 AM 8:28
BK 992 PG 994
JUDY
CO. CLERK

By granting the aforesaid right to encroach PNM does not waive or relinquish any rights that it may have under or by reason of the Easement, including, but not limited to the right to build, rebuild, construct, reconstruct, locate, relocate, change, modify, renew, operate and maintain its electric lines (including underground lines), poles, guywires and other electric equipment, fixtures and structures that are now located, or may in the future be located, through, on, within, or under the Easement. First Party, at its sole cost and expense, agrees to remove or relocate its encroachment upon the written request of PNM within 90 days of such written request. First Party appoints PNM its agent to accomplish said removal or relocation at First Party's expense if First Party fails to remove or relocate such encroachment within such time period.

In consideration of PNM granting First Party the right to encroach upon the Easement, First Party hereby agrees to indemnify and hold harmless PNM, its agents and employees, from any and all claims whatsoever for personal injuries or damages to property when such injuries or damages directly or indirectly arise out of the existence, construction, maintenance, repair, condition, use or presence of the encroachment upon the Easement, regardless of the cause of said injuries or damages; provided, however, that notwithstanding anything to the contrary in this paragraph, First Party shall not be required to indemnify PNM for liability, claims, damages, losses or expenses, arising out of (a) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications by PNM, or the agents or employees of PNM; or (b) the giving of or the failure to give directions or instructions by PNM, or the agents or employees of PNM, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

In consideration of PNM permitting First Party to encroach upon the Easement, First Party agrees that PNM shall not be responsible for any damage caused to facilities, equipment, structures or other property of First Party if damaged by reason of PNM's use of Easement.

First Party shall comply with all applicable laws, ordinances, rules and regulations enacted or promulgated by any federal, state or local governmental body having jurisdiction over First Party's encroachment.

The provisions hereof shall inure to the benefit of and bind the heirs, executors, administrators, personal representatives, successors and assigns of the Parties hereto; provided, however, that no such heir, executor, administrator, personal representative, successor or assign of First Party shall have the right to use, alter or modify the encroachment in a manner which will increase the burden of the encroachment on the Easement.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

BUYER/BORROWER, OWNER (First Party):

Barbara Page

BARBARA PAGE, PRESIDENT, WESTLAND DEVELOPMENT CO. INC.

PUBLIC SERVICE COMPANY OF NEW MEXICO

By: Rob Roberts

ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

This instrument was acknowledged before me on October 28 19 96,

by ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

of the Public Service Company of New Mexico, a New Mexico corporation, for it's Electric Services Division on behalf of said corporation

NOTARY PUBLIC

My Commission Expires: 3-1-97

STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

This instrument was acknowledged before me on October 28 19 96,

by BARBARA PAGE, WESTLAND DEVELOPMENT COMPANY, INC.

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

Grace Rodriguez
NOTARY PUBLIC

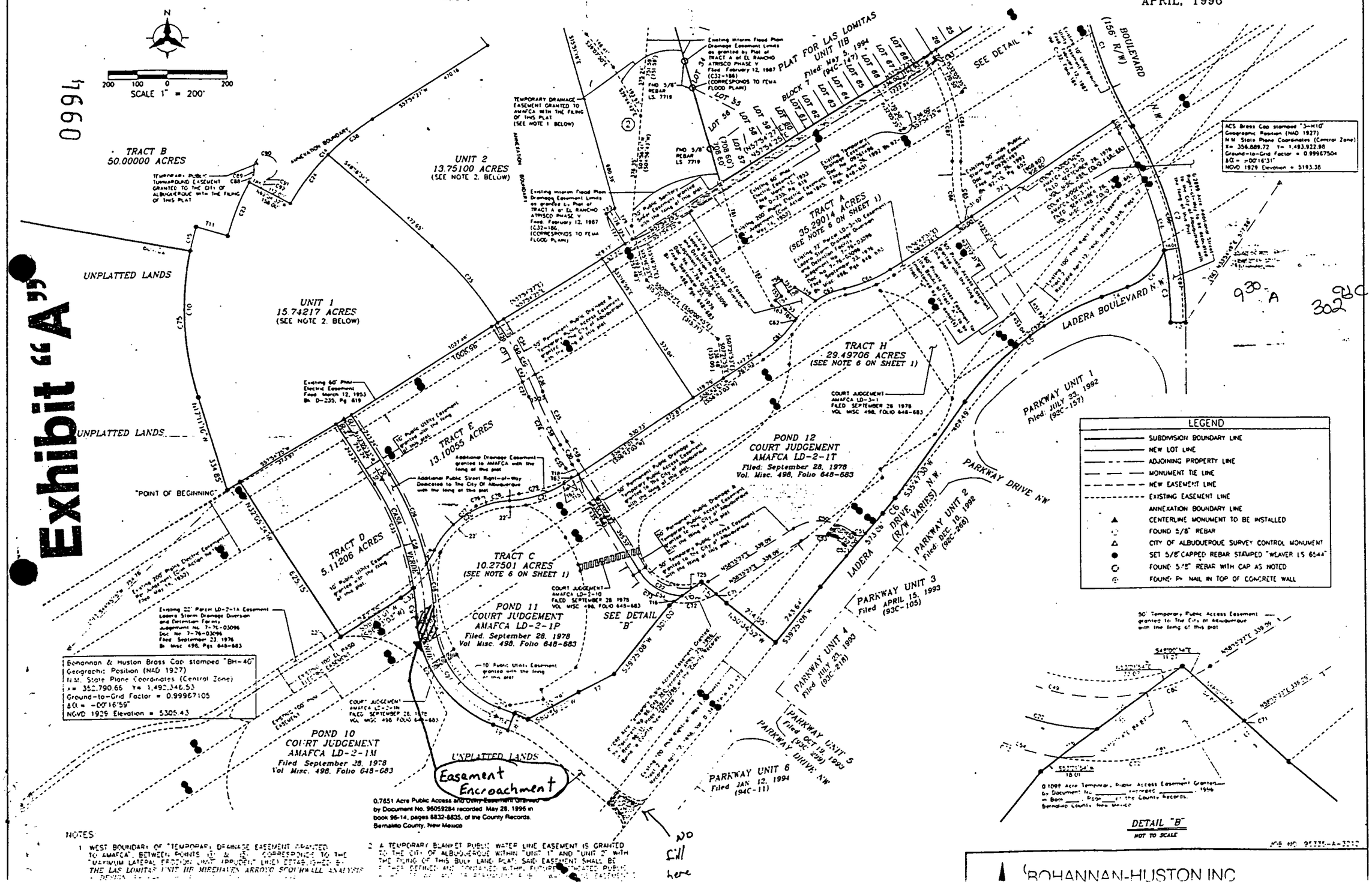
My Commission Expires: 7/22/00

FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

THE CROSSING
ALBUQUERQUE, NEW MEXICO
APRIL, 1996

Exhibit "A"



NOTES:

1. WEST BOUNDARY OF "TEMPORARY DRAINAGE EASEMENT GRANTED TO AMAFCA", BETWEEN POINTS [illegible] & [illegible] CORRESPONDS TO THE "MAXIMUM LATERAL EROSION LIMIT (PROJECT LINE) ESTABLISHED BY THE LAS LOMITAS UNIT IIB MIREHAVEN ARROYO SCOUR WALL ANALYSIS [illegible]

2. A TEMPORARY BLANKET PUBLIC WATER LINE EASEMENT IS GRANTED TO THE CITY OF ALBUQUERQUE WITHIN "UNIT 1" AND "UNIT 2" WITH THE FILING OF THIS BULK LAND PLAT. SAID EASEMENT SHALL BE [illegible]

BOHANNAN-HUSTON INC

JOB NO. 95339-A-3010

0990

930-A

302 PBC

Exhibit "A"

#545381

PNM JOB NO. R1650

96118591

0995

PNM Electric Services

Alvarado Square, Albuquerque, New Mexico 87158

EASEMENT ENCROACHMENT AGREEMENT

THIS INFORMATION TO BE PROVIDED BY TITLE COMPANY

This Easement Encroachment Agreement made this 28 day of October, 19 96

by and between (BUYER/BORROWER, OWNER) WESTLAND DEVELOPMENT COMPANY INC.

whose address is 401 Coors Boulevard NW Albuquerque, NM 87121

(hereinafter called "First Party"), (his) (her) (their) (its) heirs, successors and assigns, and PUBLIC SERVICE COMPANY OF NEW MEXICO. A New Mexico Corporation for it's Electric Services Division, (hereinafter called ("PNM") ("Parties").

WITNESSETH:

WHEREAS, PNM is the Grantee of a certain easement within the hereinafter described property.

WHEREAS, First Party desires to encroach upon the Easement as more particularly specified hereinafter, and WHEREAS, PNM has agreed to said encroachment: NOW THEREFORE, for and in consideration of the sum of One and No/100 ($1.00) DOLLAR, in hand paid, and other valuable consideration, the receipt of which is hereby acknowledged, PNM does hereby grant First Party the right to encroach upon the Easement only to the extent of, and for the purposes set forth below:

PNM USE ONLY FOR LEGAL DESCRIPTION

Encroachment of a fifty (50) foot wide Permanent Public Drainage and Temporary Public Access Easement within a one-hundred (100) foot wide Public Service Company of New Mexico utility easement as shown between Tracts C and H of the Plat of THE CROSSING, a subdivision situate in projected Sections 9 and 16, T.10N., R.2E., N.M.P.M., filed for record in the office of the County Clerk in Bernalillo County in Plat Book 96C, Page 302 on July 9, 1996.

Encroachment is more particularly shown on Exhibit "A" attached and made a part of this document.

Easement Encroachment Agreement approved with the understanding that no fill dirt is to be placed in the Easement Encroachment Area.

STATE OF NEW MEXICO COUNTY OF BERNALILLO FILED

1996 OCT 30 AM 8:28

BK 96-29 PG 995-997

JUDY ... COUNTY CLERK

By granting the aforesaid right to encroach PNM does not waive or relinquish any rights that it may have under or by reason of the Easement, including, but not limited to the right to build, rebuild, construct, reconstruct, locate, relocate, change, modify, renew, operate and maintain its electric lines (including underground lines), poles, guywires and other electric equipment, fixtures and structures that are now located, or may in the future be located, through, on, within, or under the Easement. First Party, at its sole cost and expense, agrees to remove or relocate its encroachment upon the written request of PNM within 90 days of such written request. First Party appoints PNM its agent to accomplish said removal or relocation at First Party's expense if First Party fails to remove or relocate such encroachment within such time period.

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IN WITNESS WHEREOF, the Parties have executed this Agreement on the day and year first above written.

BUYER/BORROWER, OWNER (First Party):

Barbara Page

BARBARA PAGE, PRESIDENT, WESTLAND DEVELOPMENT CO. INC.

PUBLIC SERVICE COMPANY OF NEW MEXICO

By: _____

ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

This instrument was acknowledged before me on October 28 19 96,

by ROB ROBERTS, MANAGER, RIGHT OF WAY DEPARTMENT

of the Public Service Company of New Mexico, a New Mexico corporation, for it's Electric Services Division on behalf of said corporation

Kenneth Schulhoefer

NOTARY PUBLIC

My Commission Expires: 3-1-97

STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

This instrument was acknowledged before me on October 28 19 96,

by BARBARA PAGE, WESTLAND DEVELOPMENT COMPANY, INC.

Grace Rodriguez

NOTARY PUBLIC

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

My Commission Expires: 7/22/00

FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

THE CROSSING
ALBUQUERQUE, NEW MEXICO
APRIL, 1996

0997

Exhibit "A"

N

SCALE 1" = 200'

TRACT B
50.00000 ACRES

UNPLATTED LANDS

UNIT 1
15.74217 ACRES
(SEE NOTE 2. BELOW)

UNIT 2
13.75100 ACRES
(SEE NOTE 2. BELOW)

Easement Encroachment

"POINT OF BEGINNING"

TRACT D
5.11206 ACRES

TRACT E
13.10055 ACRES

TRACT C
10.27501 ACRES
(SEE NOTE 6 ON SHEET 1)

POND 11
COURT JUDGEMENT
AMAFCA LD-2-1P
Filed: September 28, 1978
Vol. Misc. 498, Folio 648-683

POND 10
COURT JUDGEMENT
AMAFCA LD-2-1M
Filed September 28, 1978
Vol. Misc. 498, Folio 648-683

POND 12
COURT JUDGEMENT
AMAFCA LD-2-1T
Filed: September 28, 1978
Vol. Misc. 498, Folio 648-683

TRACT A
35.29014 ACRES
(SEE NOTE 6 ON SHEET 1)

TRACT H
29.49706 ACRES
(SEE NOTE 6 ON SHEET 1)

BLOCK 7
PLAT FOR LAS LOMITAS
UNIT 11B
Filed May 5, 1994
(94C-147)

SEE DETAIL "A"

SEE DETAIL "B"

LADERA BOULEVARD N.W.

PARKWAY DRIVE N.W.

PARKWAY UNIT 1
Filed: JULY 23, 1992
(92C-157)

PARKWAY UNIT 2
Filed: DEC. 10, 1992
(92C-260)

PARKWAY UNIT 3
Filed APRIL 15, 1993
(93C-105)

PARKWAY UNIT 4
Filed JULY 23, 1993
(93C-216)

PARKWAY UNIT 5
Filed OCT 18, 1993
(93C-299)

PARKWAY UNIT 6
Filed JAN 12, 1994
(94C-11)

UNPLATTED LANDS

0.7651 Acre Public Access and Utility Easement Granted by Document No. 96059284 recorded May 28, 1996 in book 96-14, pages 8832-8835, of the County Records, Bernalillo County, New Mexico

NO fill here

930-A

302 PC

Bohannan & Huston Brass Cap stamped "BH-40"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 352,790.66 Y= 1,492,346.53
Ground-to-Grid Factor = 0.99967105
ΔG = -00°16'59"
NGVD 1929 Elevation = 5305.43

ACS Brass Cap stamped "3-H10"
Geographic Position (NAD 1927)
N.M. State Plane Coordinates (Central Zone)
X= 356,889.72 Y= 1,493,922.98
Ground-to-Grid Factor = 0.99967504
ΔG = -00°16'31"
NGVD 1929 Elevation = 5193.38

LEGEND

- SUBDIVISION BOUNDARY LINE
- NEW LOT LINE
- ADJOINING PROPERTY LINE
- MONUMENT TIE LINE
- NEW EASEMENT LINE
- EXISTING EASEMENT LINE
- ANNEXATION BOUNDARY LINE
- ▲ CENTERLINE MONUMENT TO BE INSTALLED
- FOUND 5/8" REBAR
- △ CITY OF ALBUQUERQUE SURVEY CONTROL MONUMENT
- ● SET 5/8" CAPPED REBAR STAMPED "WEAVER LS 6544"
- ○ FOUND 5/8" REBAR WITH CAP AS NOTED
- FOUND P-K NAIL IN TOP OF CONCRETE WALL

DETAIL "B"
NOT TO SCALE

NOTES:

1. WEST BOUNDARY OF "TEMPORARY DRAINAGE EASEMENT GRANTED TO AMAFCA", BETWEEN POINTS [illegible] & [illegible] CORRESPONDS TO THE "MAXIMUM LATERAL EROSION LIMIT PROBABLE LINE" ESTABLISHED BY THE LAS LOMITAS UNIT 11B MIREHAVEN ARROYO SPOURWALL ANALYSIS & DESIGN [illegible]

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JOB NO. 95335-4-3010

BOHANNAN-HUSTON INC

Exhibit "A"

#545381

PNM JOB NO. R1650

96118592

0998

PNM Electric Services

Alvarado Square, Albuquerque, New Mexico 87158

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STATE OF NEW MEXICO COUNTY OF BERNALILLO FILED

1996 OCT 30 AM 8:28

96-29 998-1000

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PUBLIC SERVICE COMPANY OF NEW MEXICO

By: _____

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PNM USE ONLY

STATE OF NEW MEXICO

COUNTY OF Bernalillo } SS

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Kenneth Allen Cordova

NOTARY PUBLIC

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STATE OF NEW MEXICO

COUNTY OF BERNALILLO } SS

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Grace Rodriguez

NOTARY PUBLIC

OFFICIAL SEAL
Grace Rodriguez
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires: 7/22/00

My Commission Expires:

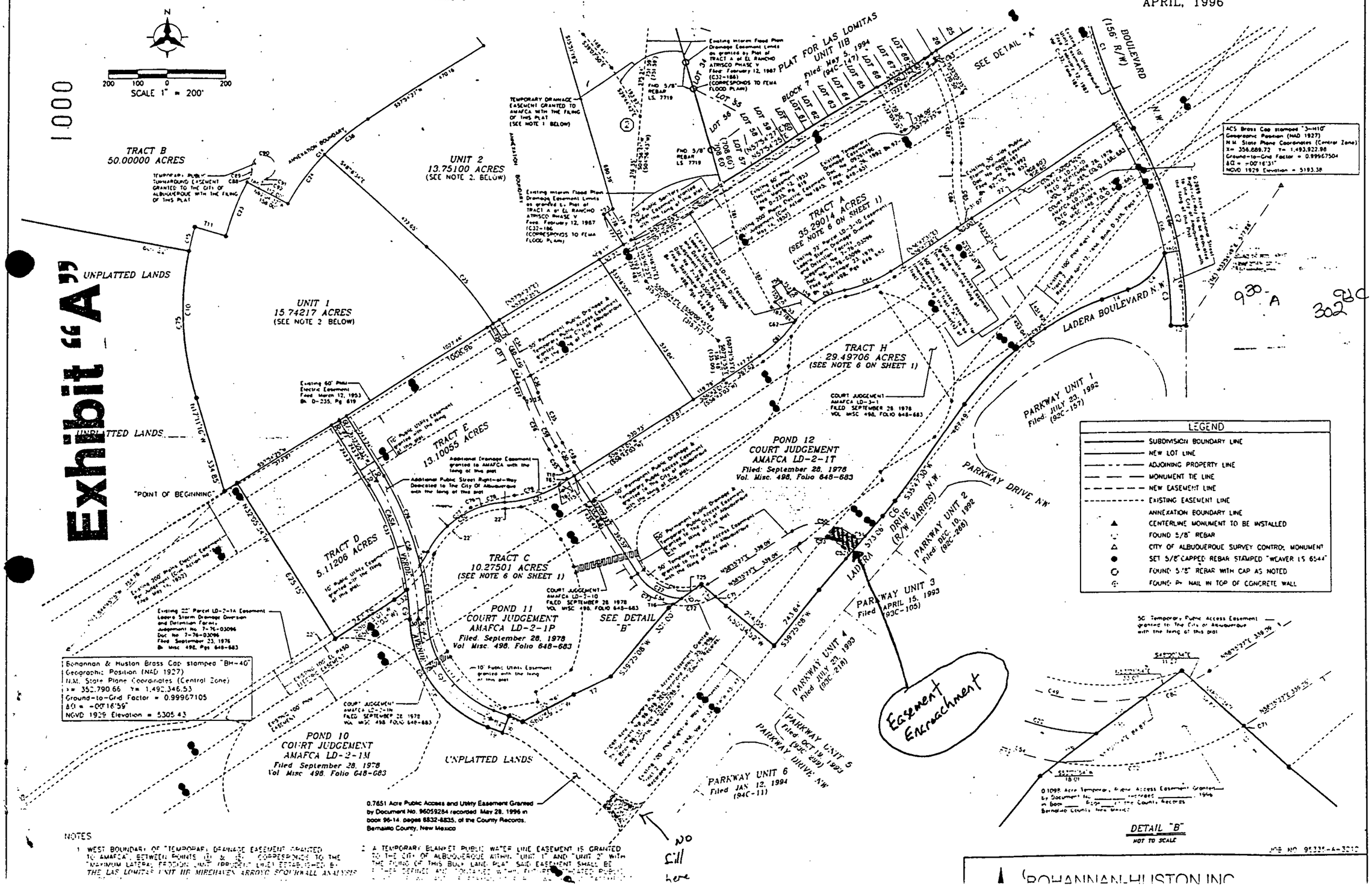
FOR RECORDER'S USE ONLY

PNM REFERENCE NUMBER

THE CROSSING
ALBUQUERQUE, NEW MEXICO
APRIL, 1996

1000

Exhibit "A"



NOTES

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2. A TEMPORARY BLANKET PUBLIC WATER LINE EASEMENT IS GRANTED TO THE CITY OF ALBUQUERQUE WITHIN "UNIT 1" AND "UNIT 2" WITH THE FILING OF THIS BULK LAND PLAT. SAID EASEMENT SHALL BE FURTHER DEFINED AND CONTAINED WITHIN THE PREVIOUSLY DEDICATED PUBLIC

Exhibit "A"

SITE

LEGAL DESC. & VICINITY MAP, THIS PLATE

NORTHWEST MESA ESCARPMENT PLAN IMPACT AND VIEW BOUNDARY

LAS LOMITAS (UNIT 2A)

LAS LOMITAS (UNIT 2B)

LAS LOMITAS (UNIT 1)

98TH

UNSER

LADERA

VISTA ORIENTE

INDUSTRIAL CENTER

SU-1 LIGHT INDUST

LADERA CHANNEL

TOWN OF ATRISCO GRANT

UNPLATTED

R-D

PHASE 5

PARKWAY

EL RANCHO ATRISCO

PHASE 3

TOWN OF ATRISCO GRANT

15 DU/A

BLVD

FRWY

I 140

DAYTONA

A-1

IP

BUSINESS PARK (UNIT 2)

(UNIT 5)

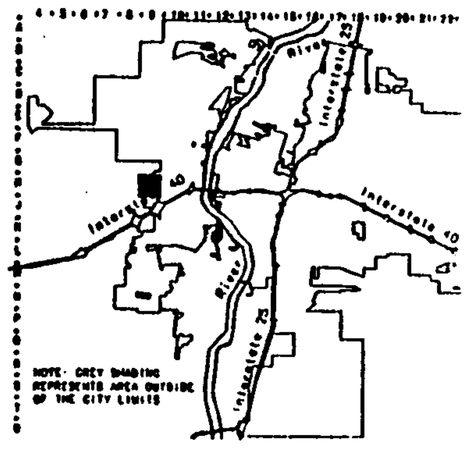
CITY OF Albuquerque

A Albuquerque G Geographic I Information S System

PLANNING DEPARTMENT

©Copyright 1995

Map Amended through September 01,



LEGAL DESCRIPTION

T10N

R2E

SEC 9

UNIFORM PROPERTY CODE

1-009-069

H-9-Z

GRAPHIC SCALE IN FEET

250 0 500

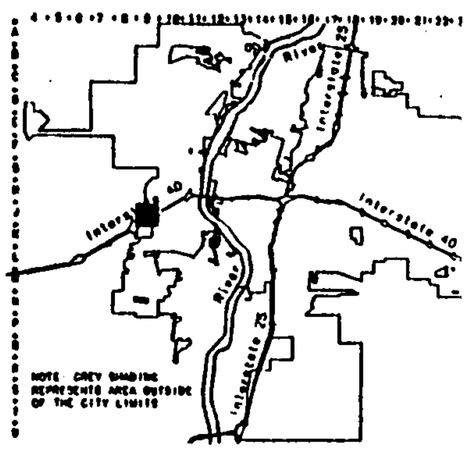
CITY OF Albuquerque

A Albuquerque G Geographic I Information S System

PLANNING DEPARTMENT

©Copyright 1995

Map Amended through September 01,



LEGAL DESCRIPTION

T10N

R2E

SEC 10

UNIFORM PROPERTY CODE

1-009-068

J-9-Z

10/24/03

THE CROSSING SUBDIVISION, UNIT 3

DRAINAGE REPORT

OCTOBER 2003

Prepared For:

WESTLAND DEVELOPMENT CO. INC.
401 COORS BLVD. NW
ALBUQUERQUE, NM 87121

RECEIVED
OCT 24 ...
DEVELOPMENT & BUILDING SERVICES

Prepared By:

Wilson & Company
2600 American Rd. SE, Suite 100
Rio Rancho, NM 87124
(505) 898-8021

WCEA PROJECT NO: X3218008

WILSON
& COMPANY

The Southern
Clinic
I & A

A Transmittal From

Isaacson & Arfman, P.A.

Consulting Engineering Associates

TO: Stephen Woodall, DRC Chair
City of Albuquerque, One Stop

DATE: 16 April 2013
JOB NO: 1823

FROM: Genny Donart

REFERENCE: Mirehaven Arroyo (CPN#691584)

WE ARE SENDING YOU ATTACHED THE FOLLOWING ITEMS:
Figures 7, 8, & 21
Replacement Mylar for Sheet 28

RECEIVED
APR 16 2013
DESIGN REVIEW

THIS INFORMATION IS TRANSMITTED:	
☐ As per your request	☐ For your files
☒ For your review and approval	☐ For your use
☐ For your information	☐ Please review and return
☐ For your attention	☐ For return to your files
☐ For your signature	☐ Please advise
☐ for scheuduling of final review session	☐

COMMENTS:

Thanks very much!
Genny

COPIES TO:

128 Monroe St. N.E. • Albuquerque, NM 87108 • (505) 268-8828 • Fax: (505) 268-2632 • www.iacivil.com

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

November 11, 2003

Brigitte Fuller, PE
Wilson & Company
2600 American Rd, SE, Ste. 100
Rio Rancho, NM 87124

Re: The Crossing, Unit 3 Subdivision Drainage Report
Engineer's Stamp dated 10-22-03 (H9/D1A7)

Dear Ms. Fuller,

Based on information contained in your submittal dated 10-24-03, the above referenced report is approved for Preliminary Plat action by the DRB. Once that board approves the plan, please submit a mylar copy of the plan for my signature in order to obtain a Grading Permit.

This project requires a National Pollutant Discharge Elimination System (NPDES) permit. Refer to the attachment that is provided with this letter for details. If you have any questions please feel free to call the Public Works Hydrology section at 768-3654 (Charles Caruso) or 768-3645 (Brian Wolfe).

If you have any questions, please contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Sr. Engineer, Planning Dept.
Development and Building Services

C: Lynn Mazur, AMAFCA
Chuck Caruso, CoA
file

THE CITY OF ALBUQUERQUE IS AN EQUAL OPPORTUNITY/REASONABLE ACCOMMODATION EMPLOYER

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003)

PROJECT TITLE: Unit 3, The Crossing Subdivision ZONE MAP/DRG. FILE#: H-9-Z

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

LEGAL DESCRIPTION: Tract A-1-B, Plat of Cielo Oeste, Albuquerque, NM

CITY ADDRESS: _____

ENGINEERING FIRM: Wilson & Company CONTACT: Brigitte Fuller

ADDRESS: 2600 The American Rd. SE, Suite 100 PHONE: (505) 898-8021

CITY, STATE: Rio Rancho, NM ZIP CODE: 87124

OWNER: WESTLAND DEVELOPMENT CORPORATION, CONTACT: Leroy Chavez

ADDRESS: 401 Coors Boulevard, NW PHONE: (505) 831-9600

CITY, STATE: Albuquerque, NM ZIP CODE: 87121

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CITY, STATE: _____ ZIP CODE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CITY, STATE: _____ ZIP CODE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CITY, STATE: _____ ZIP CODE: _____

CHECK TYPE OF SUBMITTAL:

- ✓ DRAINAGE REPORT
- ___ DRAINAGE PLAN 1st
- ✓ CONCEPTUAL GRADING &
- ✓ GRADING PLAN
- ___ EROSION CONTROL PLAN
- ___ ENGINEERS CERTIFICATION
- ___ CLOMR\LOMR
- ___ TRAFFIC CIRCULTAION
- ___ ENGINEERS CERTIFICATION
- ___ ENGINEERS CERTIFICATION
- ___ OTHER

CHECK TYPE OF

- ___ SIA / FINANCIAL
- ✓ PRELIMINARY PLAT
- ___ S. DEV. PLAN FOR
- ___ S. DEV. PLAN FOR
- ___ SECTOR PLAN
- ___ FINAL PLAT APPROVAL
- ___ FOUNDATION PERMIT
- ___ BUILDING PERMIT
- ___ CERTIFICATION OF
- ___ CERTIFICATION OF
- ✓ GRADING PERMIT
- ___ PAVING PERMIT
- ___ WORK ORDER
- ___ OTHER (SPECIFY)

WAS A PRE-DESIGN

- ✓ YES
- ___ NO
- ___ COPY PROVIDED

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Date Submitted: 10/23/03 By: Brigitte Fuller

Requests for approvals of Site Development Plans and/or Subdivision Plats shall be accompanied by a drainage submittal. The particular nature, location and scope of the proposed development defines the degree of drainage detail. One or more of the following levels of submittal may be required based on the following:

1. **Conceptual Grading and Drainage Plan:** Required for approval of Site Development Plans greater than five
2. **Drainage Plans**: Required for building permits, grading permits, paving permits and site plans less than five (5)
3. **Drainage Report:** Required for subdivisions containing more than ten (10) lots or constituting five (5) acres or more.

Tim Eichenberg, Chair
Linda Stover, Vice-Chair /
Asst. Secretary-Treasurer
Ronald D Brown, Secretary-Treasurer
Daniel Hernandez, Director
Daniel Lyon, Director

John P. Kelly, P.E.
Executive Engineer

Albuquerque
Metropolitan
Arroyo
Flood
Control
Authority

2600 PROSPECT N.E. • ALBUQUERQUE, NM 87107
TELEPHONE (505) 884-2215 FAX (505) 884-0214

Post-it® Fax Note 7671	Date 10-28	# of pages ▶ 3
To BRAD BINGHAM	From LYNN MAZUR	
Co./Dept. HYDROLOGY	Co. AMAFCA	
Phone #	Phone #	
Fax #	Fax #	

October 28, 2003

Ms. Brigitte Fuller, P.E.
Wilson & Company
2600 American Road SE, Ste. 100
Rio Rancho, NM 87124

Re: Drainage Report for The Crossing, Unit 3 Subdivision, ZAP H-9
Engineer's Stamp Dated October 22, 2003.

Dear Ms. Fuller:

AMAFCA previously reviewed and commented on the drainage report. I reference your response letter dated June 10, 2003, Comment 5, regarding elimination of the storm drain. You show approximately 90 cfs discharging to the Mirehaven Arroyo through a surface rundown at the end of Eagle River Road (formerly Platte Court). It is not desirable to have a surface rundown for a large amount of runoff. Even with the proposed riprap, a surface rundown will set up a potential point of turbulence in the channel. Please provide a storm drain outfall with an appropriate stilling basin.

AMAFCA will approve Preliminary Plat provided that the following items are included on the Infrastructure List:

- Channel improvements in the Mirehaven Arroyo along the length of The Crossing, Unit 3
- AMAFCA Turnkey Agreement for construction of the channel improvements
- FEMA Letter of Map Revision

The turnkey agreement and the release of easement will require action by the AMAFCA Board of Directors. We may be able to include this item on the November Board meeting agenda.

If you have any questions, please call me at 884-2215.

Sincerely,
AMAFCA

Lynn M. Mazur

Lynn M. Mazur, P.E.
Development Review Engineer

Cc: Brad Bingham, City Hydrology

WILSON & COMPANY

2600 American Rd. SE
Suite 100
Rio Rancho, NM 87124
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505-898-8501 Fax

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JUN 13 2003

10 June, 2003

Lynn Mazur, P.E.
Development Review Engineer
Planning Department
AMAFCA
2600 Prospect N.E.
Albuquerque, NM 87107

RE: Drainage Report for The Crossing, Unit 3 Subdivision, ZAP H-9
Engineer's Stamp Dated June 6, 2003.

Dear Ms. Mazur:

This letter is being written in response to the comments dated May 8, 2003 for the drainage report for the above referenced project.

The comments have been addressed as follows:

1. The drainage report mentions the improved Mirehaven Arroyo will be maintained by AMAFCA and a LOMR will be submitted to FEMA to revise the existing floodplain in Section VII.

2. A HEC-RAS summary report is provided in Appendix B with an exhibit showing river stations compared to the arroyo stationing.

3. Bank stations on the HEC-RAS cross sections have been corrected.

4. Levee station/elevations have been provided at these cross sections.

5. The storm drain has been eliminated and an inverted street section will be provided on Eagle River Road (formerly Platte Court) from the intersection with Roaring Fork Place to the arroyo. Stormwater will be conveyed to the arroyo through a concrete rundown. The developed flow at this point is 89.55 cfs with a velocity of 4.45 f/s in Eagle River Road. Riprap armoring will be provided in the channel at the concrete rundown and up the east bank for four feet. This will be detailed on the construction plans.

6. Storm drain has been eliminated and a concrete rundown is provided.

7. Existing and Proposed water line and sanitary sewer crossings are shown on the Mirehaven Arroyo plan and profile sheets.

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&COMPANY

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Suite 100
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505-898-8021
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8. AMAFCA's standard notes and signature block will be added to construction plans. AMAFCA's signature will be obtained on Final Plat and work order plans.

A hearing with the AMAFCA board will need to be rescheduled for the release of easement and approval of agreement.

If you have any questions or require further information, please contact me.

Wilson & Company,

Brigitte Fuller

Brigitte Fuller, P.E.
Project Manager

Enclosures
cc: Leroy Chavez, Westland Development Co. Inc.

****
*** RX REPORT ***
****

RECEPTION OK

TX/RX NO	7522
CONNECTION TEL	8840214
SUBADDRESS	
CONNECTION ID	
ST. TIME	10/28 16:53
USAGE T	00'59
PGS.	3
RESULT	OK

DRAINAGE REPORT

THE CROSSING SUBDIVISION, UNIT 3

OCTOBER 2003

Prepared For:

WESTLAND DEVELOPMENT CO. INC.
401 COORS BLVD. NW
ALBUQUERQUE, NM 87121

I, Brigitte Fuller, do hereby certify that this report was prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of the New Mexico.

Brigitte Fuller

Brigitte Fuller, P.E
NM NO. 15102

10/22/03
Date

BRIGITTE FULLER
NEW MEXICO
15102
REGISTERED PROFESSIONAL ENGINEER

TABLE OF CONTENTS

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II. Project Location 2

III. Previous Drainage Studies 2

IV. Methodologies 3

V. Existing Drainage Conditions 3

VI. Proposed Drainage Conditions 4

VII. Mirehaven Arroyo 4

VIII. Conclusion 5

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Figure 2. Site Map

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Exhibit 1. Soils Map
Exhibit 2. FEMA Map
Exhibit 3. Existing Basin Map Unit 2 into Unit 3
Exhibit 4. Existing Conditions Basin Map
Exhibit 5. Proposed Conditions Basin Map
Exhibit 6. Future Developed Conditions Basin Map
Exhibit 7-9. Mirehaven Arroyo
Exhibit 10. Channel Cross Section

CALCULATIONS

AHYMO input & output
FlowMaster output
HecRas

I. Introduction

Wilson & Company was contracted by Westland Development Company Inc. to provide a drainage analysis for The Crossing Unit 3 Subdivision. Wilson & Company will also design improvements to the Mirehaven Arroyo and provide analysis of all the structures associated with the arroyo.

The Crossing Subdivision consists of three Units. Unit 1 is currently under construction and Unit 2 is approved by the City of Albuquerque. Unit 3 Subdivision will consist of 36 lots.

II. Project Location

The subdivision project site is approximately 8.17 acres and is located on the west side of Albuquerque, north of I-40, east of the Petroglyph National Monument, and extends to just west of Unser Boulevard. The site is located within Zone Atlas map H-9 (See Figures 1 and 2).

Currently, the site is undeveloped and slopes from northwest to southeast. The soils consist mainly of Sandy Loam with some vegetation. The site is located on map number 30 of the SCS Bernalillo County Soil Survey, the map shows the majority of the soil type is BCC, Bluepoint loamy fine sand 1 to 9 percent slope (See Exhibit 1). The Mirehaven Arroyo runs along the entire east side of the site. The arroyo is made up of three principal branches that converge at Tierra Pintada Street. The arroyo is unlined with some vegetation growing on the arroyo bottom.

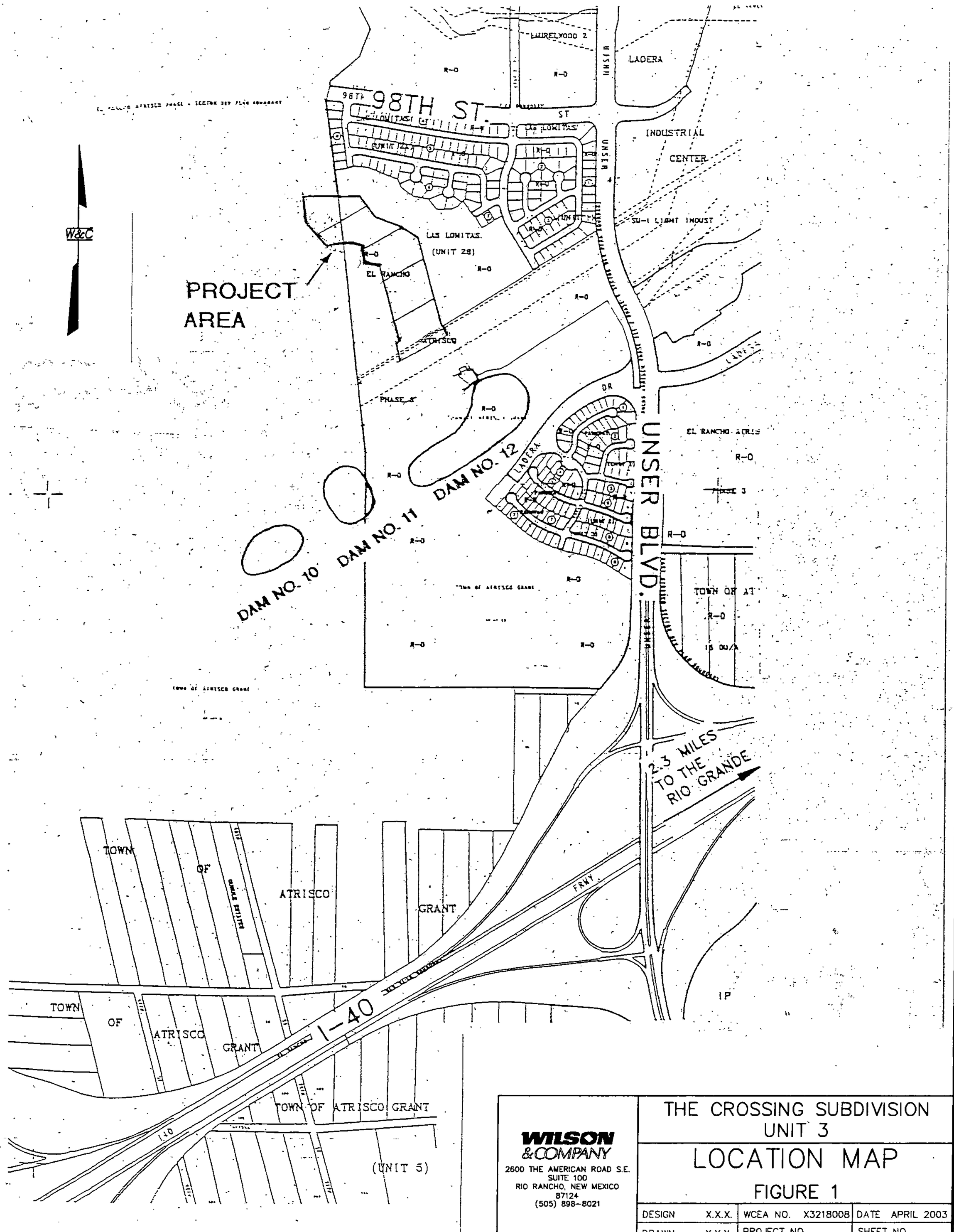
The site is located in flood zones X and AO of the FEMA classified flood zones according to Map #35001C0326 D (Modified 10/20/96) (See Exhibit 2).

III. Previous Drainage Studies

Several drainage studies for this area have been published. This report references the following studies.

Drainage Report for Westland Revised Drainage Report for the Crossing, Unit 1 & 2 (Including Addendum #1) – by Bohannan-Huston Inc (BHI) in October 1996. This report used AHYMO to model the flows upstream of and within Unit 1,2& 3.

Westland Sector Development Plan Appendix D – Drainage (WSDP)-by Bohannan-Huston Inc. (BHI) in June 1995 serves as the basis for offsite drainage analysis. The WSDP provides a conceptual plan for development of the area.



WILSON & COMPANY
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SUITE 100
RIO RANCHO, NEW MEXICO
87124
(505) 898-8021

THE CROSSING SUBDIVISION
UNIT 3

LOCATION MAP

FIGURE 1

DESIGN X.X.X.	WCEA NO. X3218008	DATE APRIL 2003	
DRAWN X.X.X.	PROJECT NO. N/A	SHEET NO. 1 OF 1	
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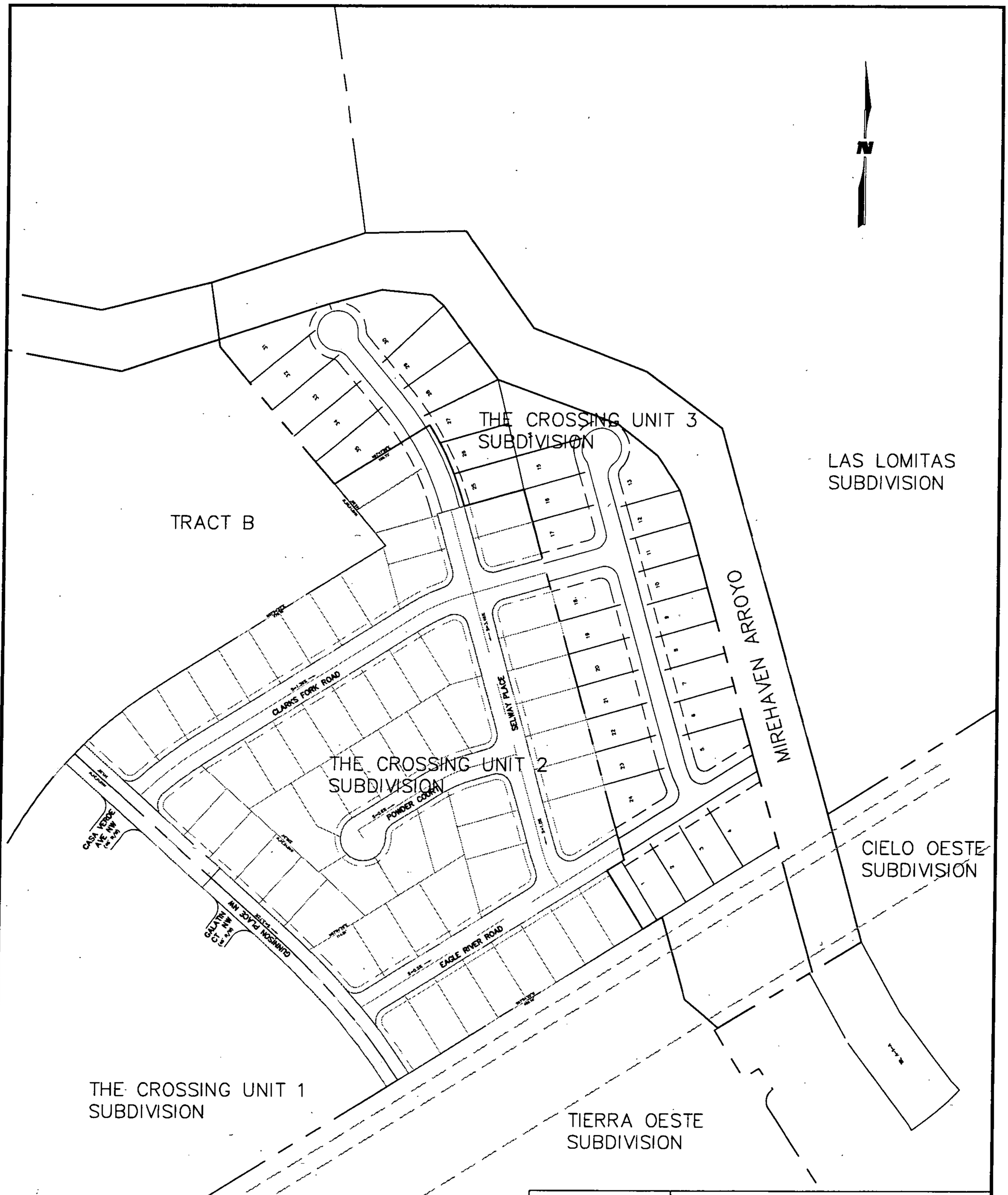

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SITE MAP

Figure 2

DESIGN X.X.X.	WCEA NO. X3218008	DATE APRIL 2003	
DRAWN X.X.X.	PROJECT NO. N/A	SHEET NO. 1 OF 1	
CHECK X.X.X.			

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Las Lomitas Unit 2B Mirehaven Arroyo Scourwall Analysis and Design –by Avid Engineering- October 1994. This report calculated the flowrate in the Mirehaven Arroyo for the 100-year storm to be 1677cfs.

Amended Drainage Study for Cielo Oeste Subdivision – by Bohannan-Huston Inc. (BHI) in August 2002. This report was used in the design of the channel downstream from Unit 3.

IV. Methodologies

Hydrologic analysis in this report was determined using Section 22.2, Hydrology, of the Development Process Manual, Design Criteria for the City of Albuquerque, New Mexico (COA DPM). The 100-year 6-hour event was used in design of this project.

AHYMO computer model was used for drainage analysis of existing conditions plus Unit 3. Existing conditions refer to the developed offsite flows from Unit 2 and undeveloped offsite flows. Hydrologic modeling for the Mirehaven Arroyo was performed using Haestad FlowMaster and HEC-RAS (version 3.0) to analyze the existing flow through the designed channel cross section.

Existing and developed conditions for flows in Mirehaven Arroyo area have been analyzed by several reports and the discharge rates varied between reports. The most current report is the *West I-40 Diversion Drainage Management Plan (I-40 DMP)*. That report calculated a flow of 1316 cfs, under existing conditions. This flow is considerably less then the 2600 cfs that was calculated in the *Drainage Report for Westland Phase 1 Subdivision*. This flowrate of 2600 cfs was calculated using USGS quad map topography, which resulted in a larger drainage area, current more accurate mapping indicates a smaller area. *Las Lomitas Unit 2B Mirehaven Arroyo Scourwall Analysis and Design* report calculated the flowrate in the Mirehaven Arroyo for the 100-year storm to be 1677cfs.

In order to remain consistent with the down stream Mirehaven Arroyo improvements already made by Cielo Oeste Subdivision we will use the flow of 1677 cfs. This flow is also more conservative compared to the 1316 cfs computed by the I-40 DMP.

V. Existing Drainage Conditions

The existing drainage basin and flow patterns were analyzed for the Unit 3 site. The existing site drains to the east via shallow concentrated flows into the Mirehaven Arroyo then to Dam 12 in the Ladera Drainage System. Offsite flows were used from the drainage report The Crossing Unit 1 & 2 by BHI (See Exhibit 3).

Offsite drainage flows enter the site from the west on Clarks Fork Road and Eagle River Road (See Exhibit 4). These flows combined with the existing site flows discharge into the Mirehaven Arroyo, which carries the flows to Dam 12.

VI. Proposed Drainage Conditions

The existing Basin 17 is separated into three proposed basins: Basin 201 includes the northern parcel. Basin 202 is located to the north west of the arroyo, and Basin 203 south west of the arroyo (See Exhibit 5). Future developed flows from Basin O6 entering on Henry Fork Road were included in the analysis (See Exhibit 6). Basin 201 and Unit 2 flows enter at two points. The first enters Unit 3 just east of the intersection of Selway and Clarks Fork, and the second flow enters the site just east of the intersection of Selway and Eagle River Road.

Street capacities were calculated and analyzed using the computer program Flowmaster. A 30" storm drain in Roaring Fork Place and Eagle River Road will convey flows to Mirehaven Arroyo. A concrete rundown located at the end of Eagle River Road will carry the storm runoff from the street into the arroyo. The storm drain will carry 42.62 cfs and the flow in the concrete rundown is 46.95 cfs, The outlet velocity of the storm drain is 8.68 ft/s. Riprap lining at the bottom of the rundown will dissipate the discharged runoff. Unit 3 developed flows will then discharge into Ladera Dam 12 (See Calculations).

In the I-40 DMP report the option of enlarging Dam 12 to store 100-yr developed flows was considered but eliminated because of concerns over extensive construction activity within the Petroglyph National Monument. Instead Dam 5 & 11 will be expanded to accept diverted upstream flows. This will allow Unit 3 developed flows to discharge into Dam 12 with out exceeding its capacity.

Under proposed conditions the offsite drainage to the northwest will be collected and retained in a temporary retention pond (See Exhibit 5). See calculations in appendix.

VII. Mirehaven Arroyo

The site is bounded on the east side by the Mirehaven Arroyo that discharges to Dam # 12 of the Ladera System. Easterling & Associates, Inc. completed a prudent line study in 1988 that determined the setback for lots along the arroyo.

In 1993, the arroyo had begun to encroach on the prudent line and an additional study was needed. The study was completed by Avid Engineering Inc. in 1994 and resulted in the construction of a 1,300-foot long soil cement scour wall on the east bank of the arroyo to provide erosion protection for the Las Lomitas

Subdivision. Cielo Oeste Subdivision has made improvements to the mouth of the arroyo just before it discharges into Dam 12. These improvements include a 55-foot wide natural bottom, grade control structures, and riprap lining. (See Exhibit 10)

The Mirehaven Arroyo is divided into two phases; Phase I will be completed with Unit 3, and Phase II will be completed during future development of the uplands. Phase I starts at station 2+00 and ends at station 23+00, Phase II begins at station 21+50 and ends at station 33+31 (See Exhibit 7-9). Once the improvements are completed, AMAFCA will maintain the Mirehaven Arroyo. A LOMR will also be submitted to FEMA to revise the existing floodplain.

During the construction of Unit 3 the arroyo will be improved by redefining into a 50-ft wide channel with side slopes of 2:1. The Mirehaven Arroyo channel will tie into the existing channel section located just south of Unit 3. The design of the channel will include grade control structures placed approximately every 200 feet with an equilibrium slope of 0.35% to prevent erosion (See Exhibits 7–9). The equilibrium slope is the same throughout the arroyo to remain consistent. Mirehaven Arroyo will tie into the existing 1300 feet of soil cement scour wall located on the east bank of the arroyo. This scour wall will serve as the east arroyo wall at a slope of 1.5:1. The arroyo cross section will vary along the arroyo due to the existing scour wall. The arroyo's west bank will be stabilized with buried, dumped rip-rap sloping to the top at 2:1 along the entire length of the arroyo. A 15-foot wide access road will be constructed on the west bank of the arroyo. Access to the road will be provided at Eagle River Road NW. This maintenance road will also tie into the access road built by Cielo Oeste Subdivision downstream.

The flow of 1677cfs in the Mirehaven Arroyo is subcritical with velocities of 7.21ft/s at a depth of 4.0 ft. The arroyo will have a minimum freeboard of 3 ft. A combined Manning's number of 0.028 was used for the buried rip-rap, natural bottom, and soil cement. (See Calculations)

Three public utility lines cross the Mirehaven Arroyo at separate locations. The fist two, an existing 20" ductile iron and a proposed 6" PVC waterline, cross the arroyo north of Selway at station 19+83.62. Both of these water lines are located in a 50' public water line easement. The third is a 12" PVC sanitary sewer line (encased in concrete), located in an existing 30' public sanitary sewer easement at station 4+48.84. The "Heggen's method" scour analysis for these crossings have already been issued for both crossings. (Drainage Report for the Crossing, Unit 1 & 2 (Including Addendum #1) – by BHI)

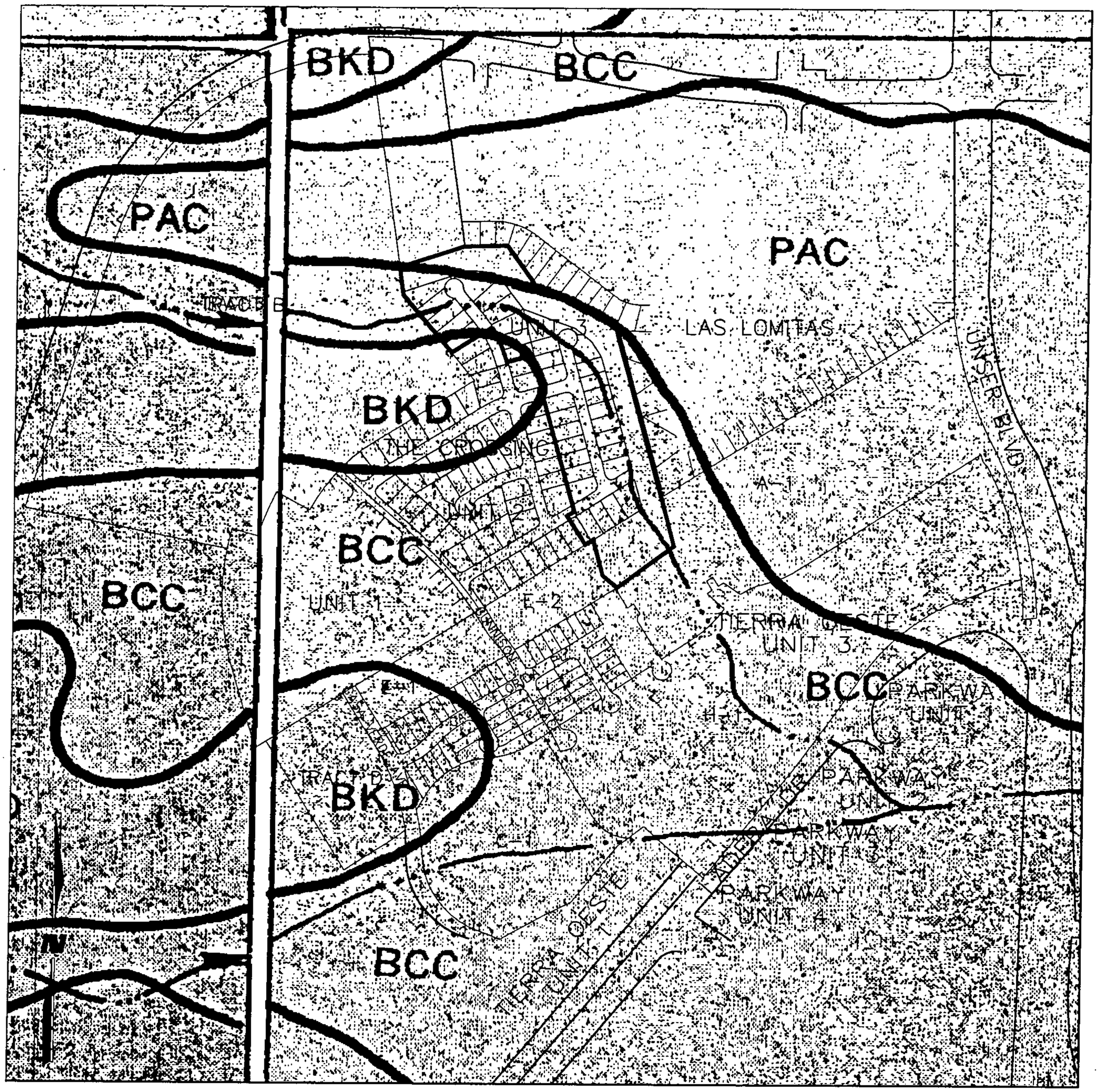
VII. Conclusion

The analysis in this drainage report demonstrates that the developed flows and street capacities are adequate for the proposed Unit 3 of The Crossing Subdivision.

This report adheres to the I-40 DMP and the proposed improvements are adequately designed to manage the flows generated by the site to the Mirehaven Arroyo.

APPENDIX A

EXHIBITS



SOILS MAP

SCS BERNALILLO COUNTY SOIL SURVEY
SHEET NOS. 19, 20, 29, 30

WILSON & COMPANY
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SUITE 100
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87124
(505) 898-8021

THE CROSSING SUBDIVISION
UNIT 3

SOILS MAP

EXHIBIT 1

DESIGN X.X.X.	WCEA NO. X3218008	DATE APRIL 2003	
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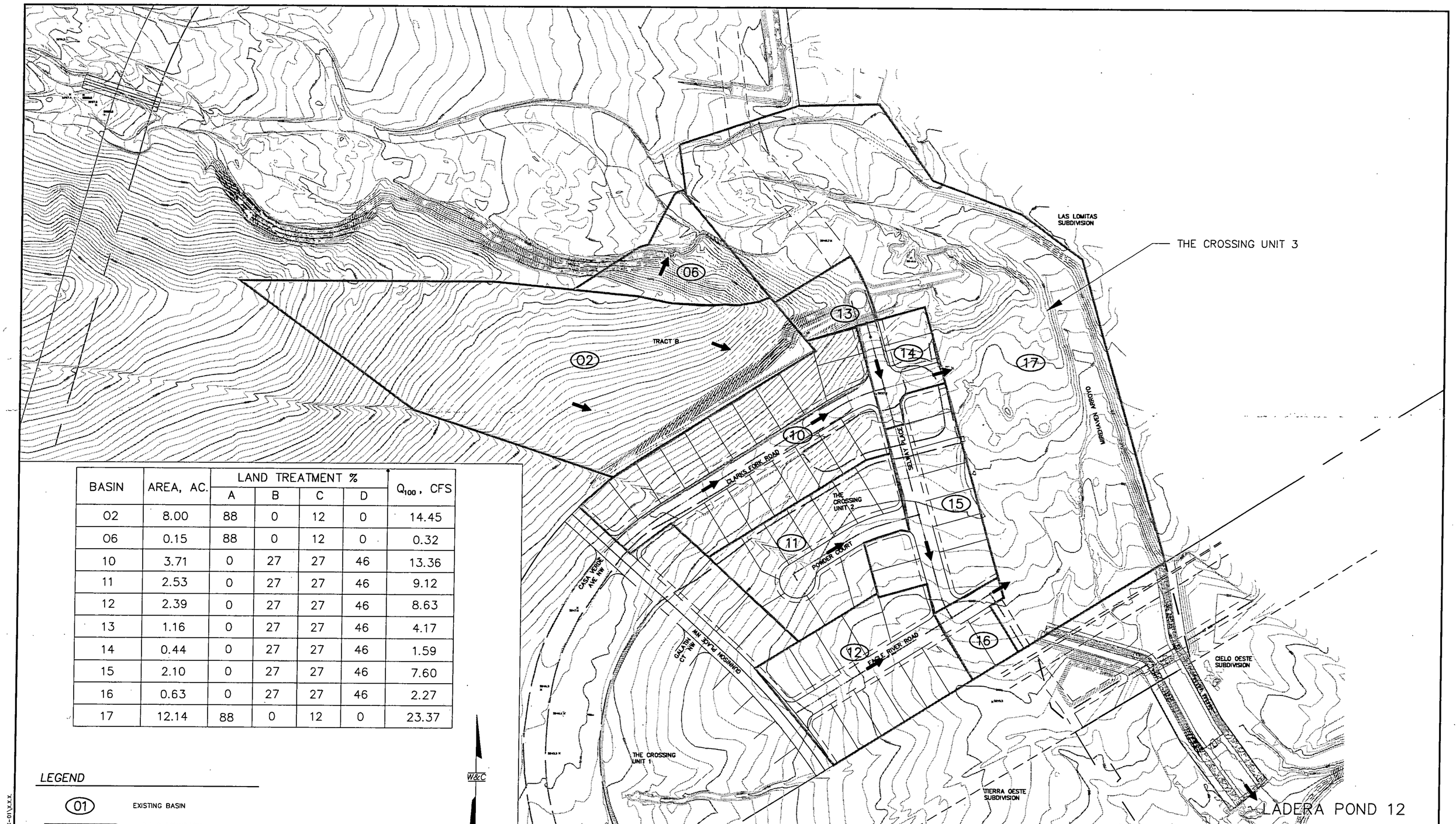

BASIN	AREA, AC.	LAND TREATMENT %				Q_{100}, CFS
		A	B	C	D	
02	8.00	88	0	12	0	14.45
06	0.15	88	0	12	0	0.32
10	3.71	0	27	27	46	13.36
11	2.53	0	27	27	46	9.12
12	2.39	0	27	27	46	8.63
13	1.16	0	27	27	46	4.17
14	0.44	0	27	27	46	1.59
15	2.10	0	27	27	46	7.60
16	0.63	0	27	27	46	2.27
17	12.14	88	0	12	0	23.37

LEGEND

(01) EXISTING BASIN

EXISTING BOUNDARY

DRAINAGE FLOW ARROW

W&C

GRAPHIC SCALE

200 0 100 200 400 1200

(IN FEET)
1 inch = 200 ft.

WILSON & COMPANY
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THE CROSSING SUBDIVISION
UNIT 3

EXISTING CONDITIONS BASIN MAP

DESIGN	JMT	WCEA NO. X3218008	DATE APRIL 2003
DRAWN	JMT	EXHIBIT 4	SHEET NO. 1 OF 1
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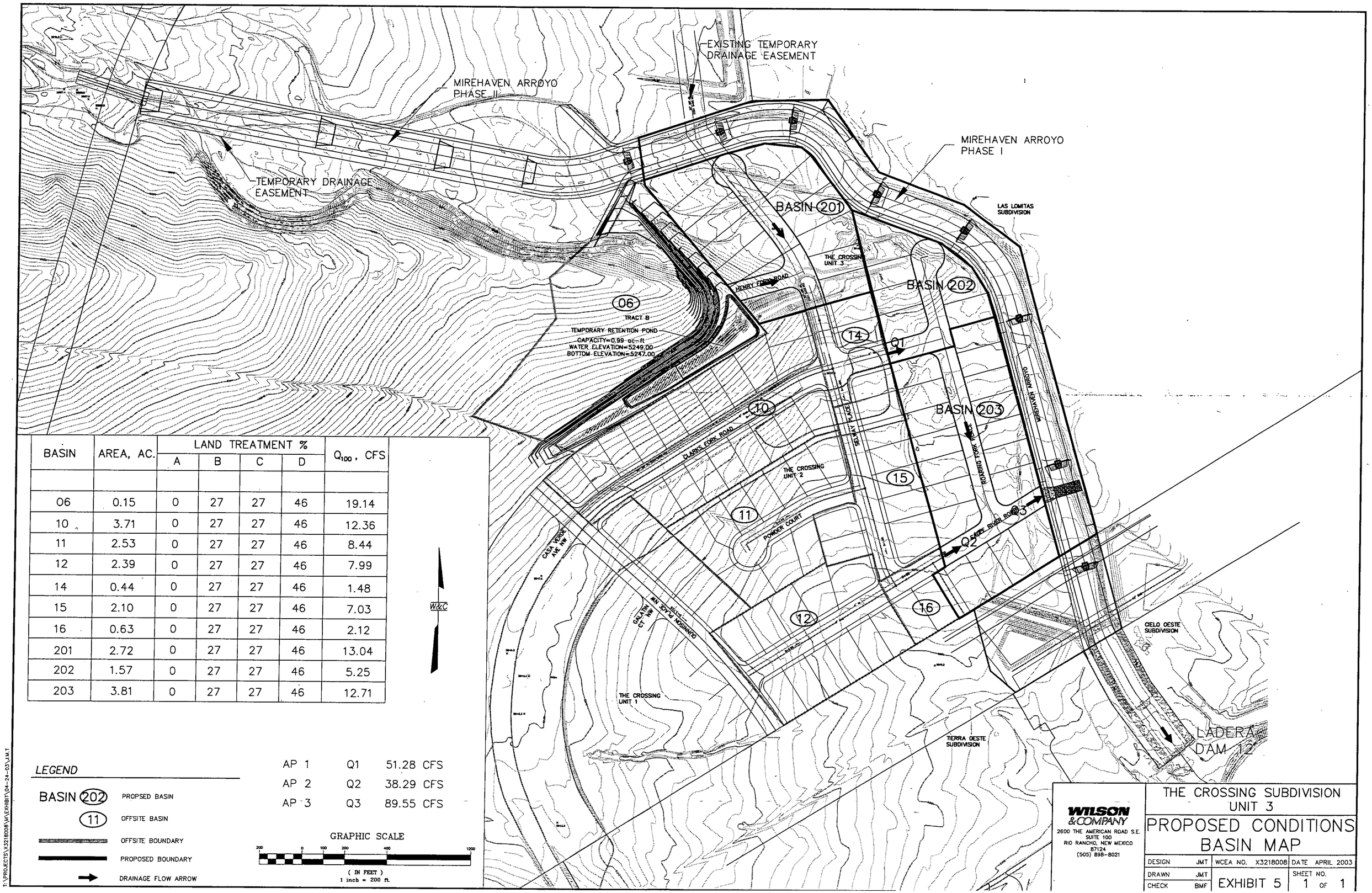

BASIN	AREA, AC.	LAND TREATMENT %				Q_{100}, CFS
		A	B	C	D	
06	0.15	0	27	27	46	19.14
10	3.71	0	27	27	46	12.36
11	2.53	0	27	27	46	8.44
12	2.39	0	27	27	46	7.99
14	0.44	0	27	27	46	1.48
15	2.10	0	27	27	46	7.03
16	0.63	0	27	27	46	2.12
201	2.72	0	27	27	46	13.04
202	1.57	0	27	27	46	5.25
203	3.81	0	27	27	46	12.71

AP 1	Q1	51.28 CFS
AP 2	Q2	38.29 CFS
AP 3	Q3	89.55 CFS

LEGEND

- BASIN 202 — PROPSED BASIN
- 11 — OFFSITE BASIN
- OFFSITE BOUNDARY
- PROPOSED BOUNDARY
- DRAINAGE FLOW ARROW

GRAPHIC SCALE

200 0 100 200 400 1200

(IN FEET)
1 inch = 200 ft.

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THE CROSSING SUBDIVISION UNIT 3

PROPOSED CONDITIONS BASIN MAP

DESIGN	JMT	WCEA NO. X3218008	DATE APRIL 2003
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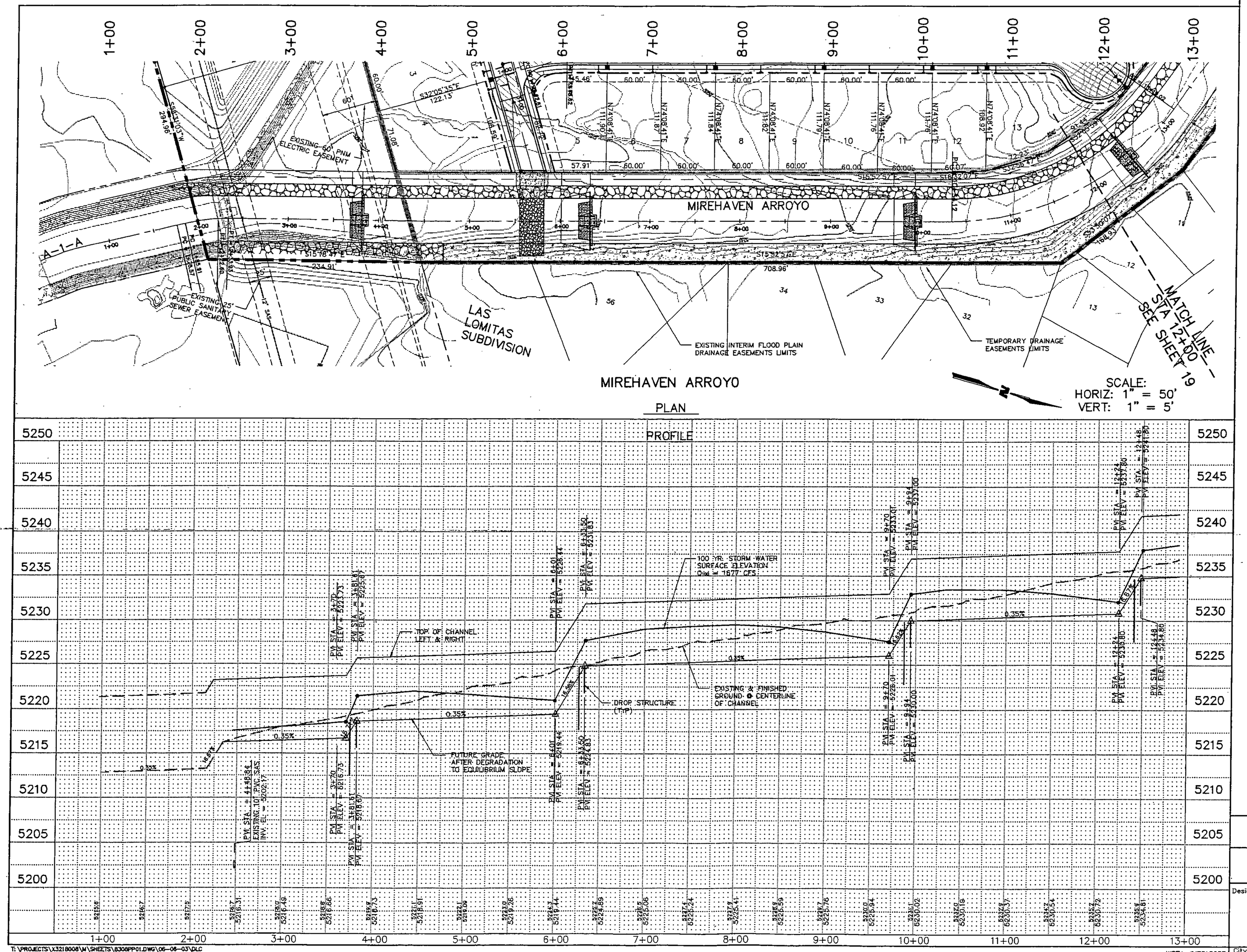

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WCEA #X3218008
APRIL 2003

WILSON & COMPANY

AS-BUILT INFORMATION

CONTRACTOR
WORK STAKED BY
INSPECTOR
DATE
FIELD BOOK
FIELD VERIFICATION BY
DATE
DRAWINGS CORRECTED BY
DATE

MICRO-FILM INFORMATION
RECORDED BY
DATE
NO.

BENCH MARKS

A.C.S. Aluminum Tablet Stamped "BH-40" Data:
New Mexico State Plane Grid Coordinates (Central Zone)
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A.C.S. Aluminum Tablet Stamped "BH-41" Data:
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NAD 1927 X=351,455.56 Y=1,496,546.13
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Delta Alpha = (-)00'17'08"

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

REVISIONS

WILSON & COMPANY, ENGINEERS & ARCHITECTS

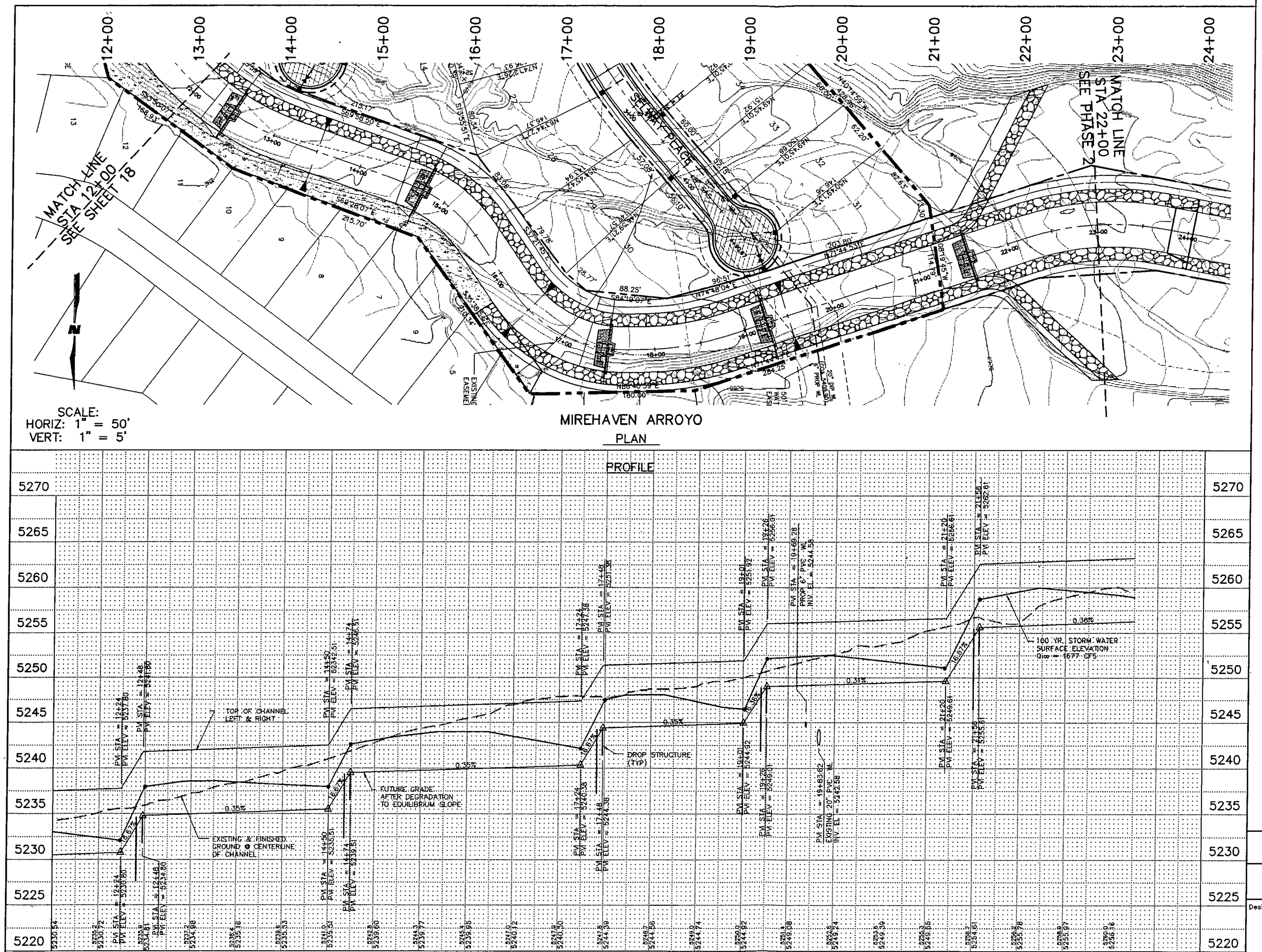
DESIGNED BY JMT DATE APRIL 2003
DRAWN BY DLC DATE APRIL 2003
CHECKED BY BMS DATE APRIL 2003

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

THE CROSSING SUBDIVISION UNITT 3
MIREHAVEN ARROYO PLAN & PROFILE
STATION 1+00 TO STATION 12+00

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet	Of
XXXX.XX	H-9-Z	EXHIBIT 7	



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WCEA #X3218008
JUNE 2003

AS-BUILT INFORMATION

CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
DATE
FIELD VERIFICATION BY
DATE
DRAWINGS CORRECTED BY
DATE

MICRO-FILM INFORMATION

RECORDED BY
DATE
NO.

BENCH MARKS

A.C.S. Aluminum Tablet Stamped "BH-40" Data:
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Ground to grid factor = 0.99996105
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NAD 1927 X=351,455.56 Y=1,496,546.13
Ground to grid factor = 0.99996704
Delta Alpha = (-)00°17'08"

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

REVISIONS

WILSON & COMPANY, ENGINEERS & ARCHITECTS

DESIGNED BY	JMT	DATE APRIL 2003
DRAWN BY	DLC	DATE APRIL 2003
CHECKED BY	BMS	DATE APRIL 2003

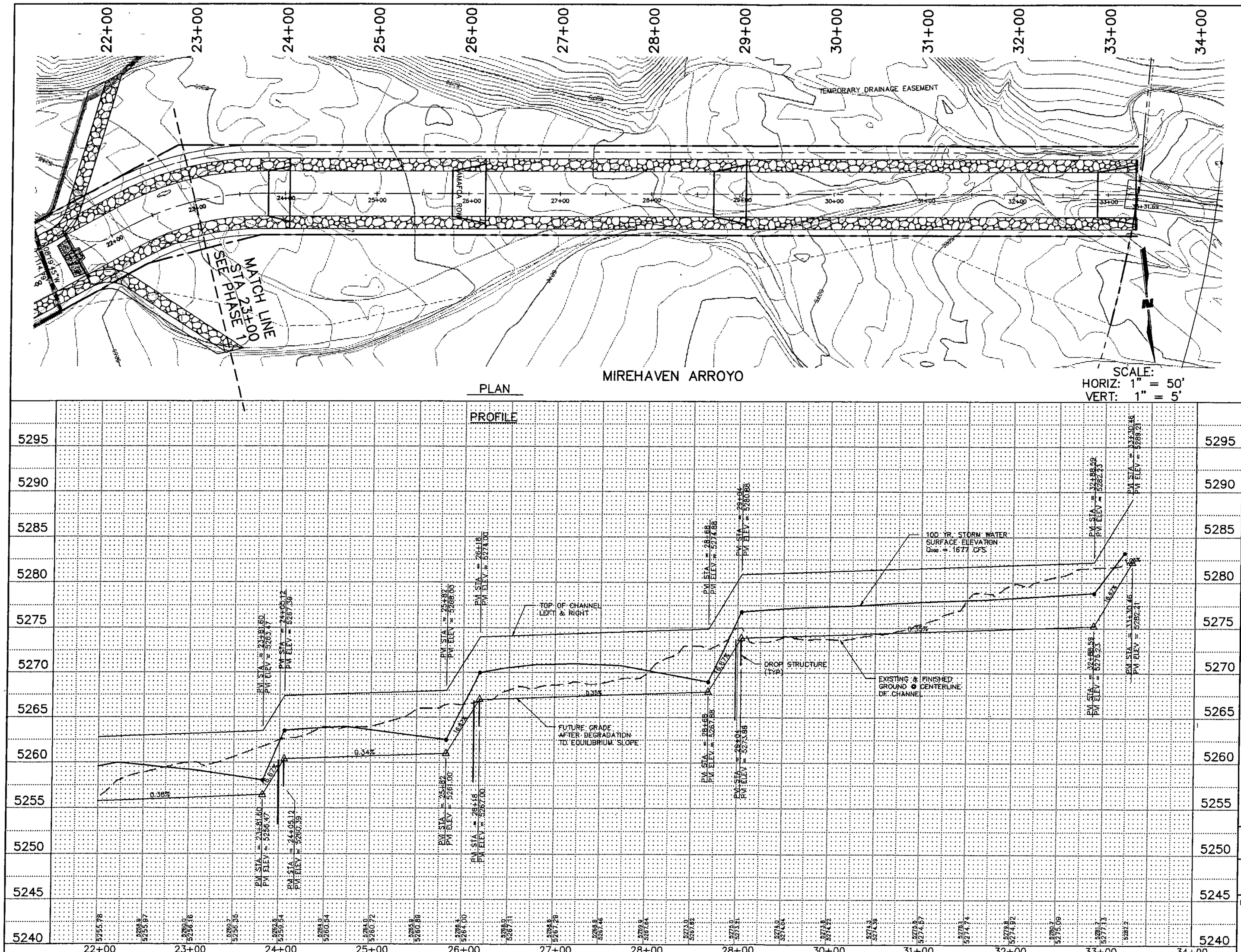
CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

THE CROSSING SUBDIVISION UNIT 3
MIREHAVEN ARROYO PLAN & PROFILE
STATION 12+00 TO STATION 22+00

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet
	H-9-Z	EXIHBIT 8

WILSON & COMPANY



T:\PROJECTS\X3218008\M\SHEETS\8308PP03_PH2.DWG\06-06-03\DLC

WCEA #X3218008
JUNE 2003

AS-BUILT INFORMATION	
CONTRACTOR	
WORK STAKED BY	DATE
INSPECTED BY	
ACCEPTANCE BY	DATE
STAKED BY	
VERIFICATION BY	DATE
CAD BY	
CHK REVISED BY	DATE
MICRO-FILM INFORMATION	
RECORDED BY	DATE
MFL	

BENCH MARKS	
A.C.S. Aluminum Tablet Stamped "BH-40" Data:	
New Mexico State Plane Grid Coordinates (Central Zone)	
NAD 1927 X=352,790.66 Y=1,492,346.53	
Ground to grid factor = 0.9996105	
Delta Alpha = (-)00°16'59"	
A.C.S. Aluminum Tablet Stamped "BH-41" Data:	
New Mexico State Plane Grid Coordinates (Central Zone)	
NAD 1927 X=351,455.56 Y=1,496,546.13	
Ground to grid factor = 0.9996704	
Delta Alpha = (-)00°17'08"	

SURVEY INFORMATION		
FIELD NOTES		
NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY
REVISIONS			

WILSON & COMPANY, ENGINEERS & ARCHITECTS

DESIGNED BY	JMT	DATE APRIL 2003
DRAWN BY	DLC	DATE APRIL 2003
CHECKED BY	BMS	DATE APRIL 2003

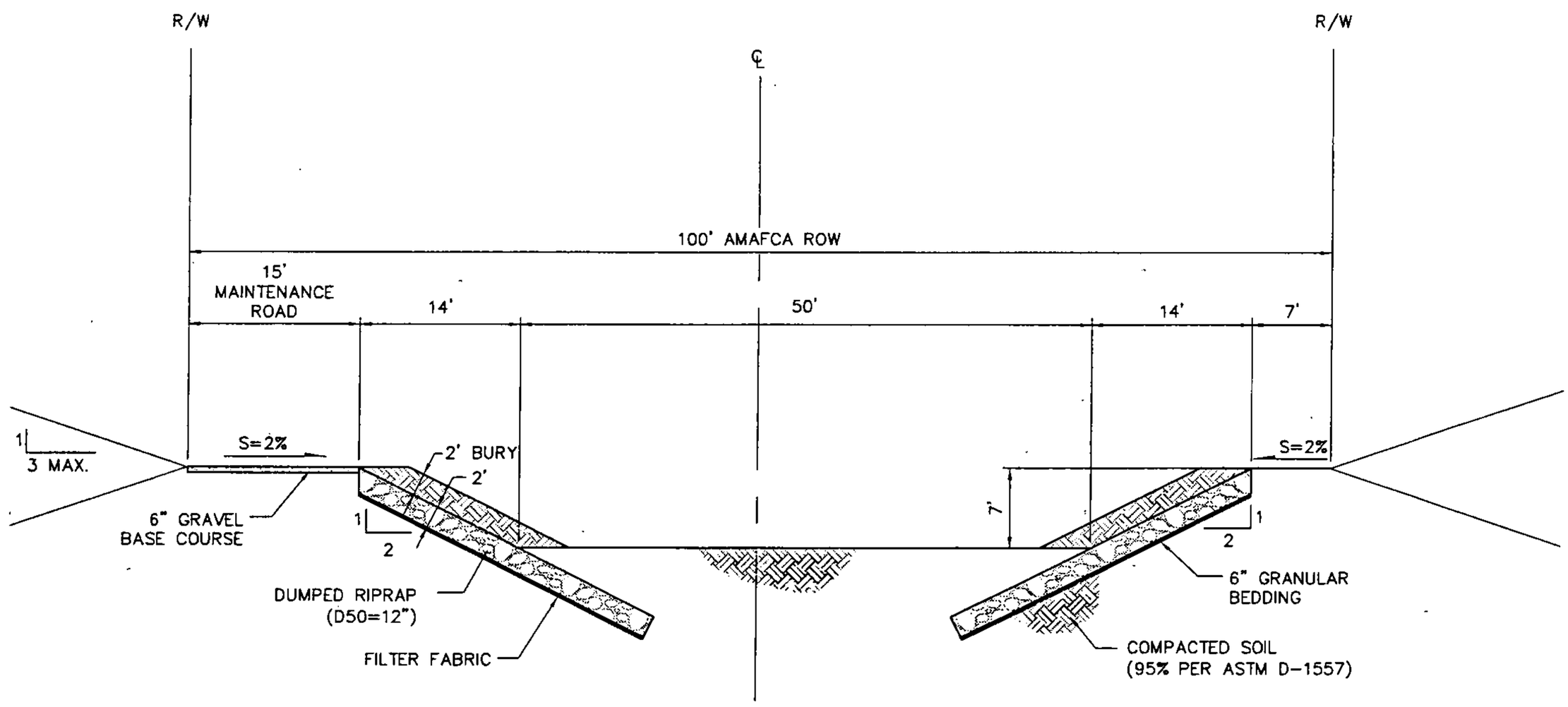
CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

THE CROSSING SUBDIVISION UNIT 3
MIREHAVEN ARROYO PLAN & PROFILE PHASE 2
STATION 22+00 TO STATION 33+36.84

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet
	H-9-Z	EXHIBIT 9

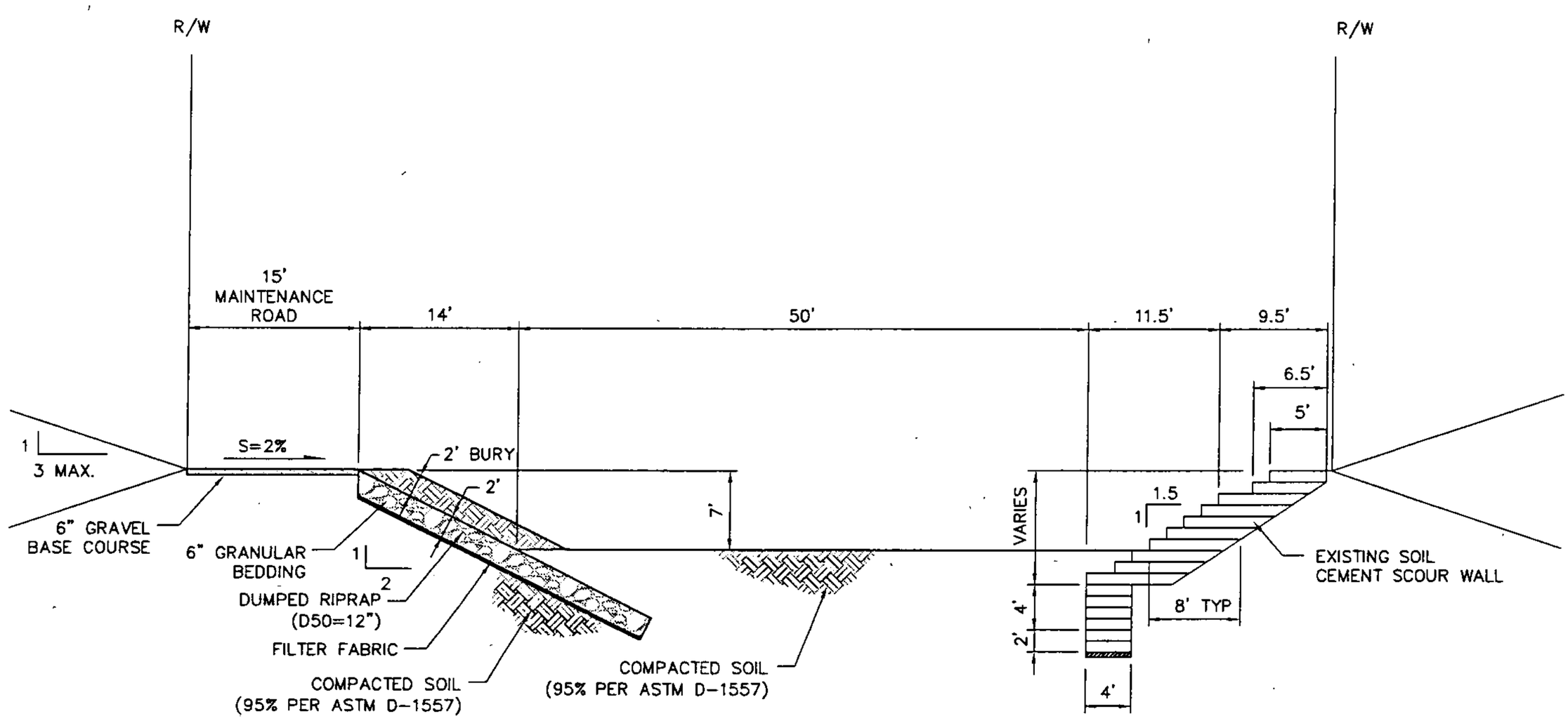
WILSON & COMPANY



TRAPEZOIDAL ARROYO SECTION

SCALE 1" = 10'

MIREHAVEN ARROYO
STA 2+00 TO STA 4+72
STA 16+97 TO STA 21+20



TRAPEZOIDAL ARROYO SECTION

SCALE 1" = 10'

MIREHAVEN ARROYO
STA 4+72 TO STA 16+97

WILSON & COMPANY
2600 THE AMERICAN ROAD S.E.
SUITE 100
RIO RANCHO, NEW MEXICO
87124
(505) 898-8021

THE CROSSING SUBDIVISION
UNIT 3

CHANNEL SECTION

EXHIBIT 10

DESIGN X.X.X.	WCEA NO. X3218008	DATE MAY 2003	
DRAWN X.X.X.	PROJECT NO. N/A	SHEET NO. 1 OF 1	
CHECK X.X.X.			

T:\PROJECTS\X3218008\FILE.DWG\04-28-03\JMT

APPENDIX B

CALCULATIONS

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =06/02/2003
INPUT FILE = T:\Projects\X3218008\Eng\Ahymo\propq.txt USER NO.= AHYMO-C-9803c01UNMLIB-AH

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										
*S 100YR - 6HR DESIGN STORM										TIME= .00
*S FOR STREET CAPACITIES										
RAINFALL TYPE= 1										RAIN6= 2.200
COMPUTE NM HYD	201.00	-	1	.00611	13.04	.438	1.34459	1.500	3.335	PER IMP=46.00
COMPUTE NM HYD	6.00	-	4	.00897	19.14	.643	1.34459	1.500	3.334	PER IMP=46.00
ADD HYD	302.00	1& 4	5	.01508	32.18	1.081	1.34455	1.500	3.334	
COMPUTE NM HYD	14.00	-	6	.00069	1.48	.049	1.34459	1.500	3.368	PER IMP=46.00
ADD HYD	303.00	5& 6	7	.01577	33.66	1.131	1.34453	1.500	3.335	
COMPUTE NM HYD	10.00	-	8	.00579	12.36	.415	1.34459	1.500	3.335	PER IMP=46.00
ADD HYD	304.00	7& 8	9	.02156	46.02	1.546	1.34453	1.500	3.335	
COMPUTE NM HYD	202.00	-	10	.00246	5.25	.176	1.34459	1.500	3.341	PER IMP=46.00
*S FLOW ENTERING ON CLARKS FORK ROAD										
ADD HYD	Q1	9&10	11	.02401	51.27	1.722	1.34453	1.500	3.336	
COMPUTE NM HYD	11.00	-	12	.00395	8.44	.283	1.34459	1.500	3.337	PER IMP=46.00
COMPUTE NM HYD	15.00	-	13	.00329	7.03	.236	1.34459	1.500	3.338	PER IMP=46.00
ADD HYD	305.00	12&13	14	.00724	15.46	.519	1.34450	1.500	3.338	
COMPUTE NM HYD	12.00	-	15	.00374	7.99	.268	1.34459	1.500	3.338	PER IMP=46.00
ADD HYD	306.00	14&15	16	.01098	23.46	.787	1.34451	1.500	3.338	
COMPUTE NM HYD	16.00	-	17	.00099	2.12	.071	1.34459	1.500	3.356	PER IMP=46.00
ADD HYD	307.00	16&17	18	.01197	25.57	.858	1.34449	1.500	3.339	
COMPUTE NM HYD	203.00	-	19	.00596	12.71	.427	1.34459	1.500	3.335	PER IMP=46.00
*S FLOW ENTERING ON EAGLE RIVER ROAD										
ADD HYD	Q2	18&19	20	.01792	38.29	1.285	1.34451	1.500	3.338	
*S FLOW ENTERING THE ARROYO										
ADD HYD	Qtotal	11&20	21	.04194	89.55	3.007	1.34452	1.500	3.337	
FINISH										

```
***  Westland The Crossing Unit 3      ***
***  PROPOSED CONDITIONS RUNOFF MODEL ***

*****************************************************************************
***  DESIGN STORM IS THE 100 YEAR - 6 HOUR STORM
***For street capacity including future conditions
*****************************************************************************

START                    TIME = 0

*S 100YR - 6HR DESIGN STORM
*S FOR STREET CAPACITIES

*****************************************************************************
**********
***                                COMPUTING RAINFALL
        ***
*****************************************************************************
**********
RAINFALL                 TYPE = 1
                                   RAIN QUARTER = 0.00 INCHES
                                   RAIN ONE     = 1.87
                                   RAIN SIX     = 2.20
                                   RAIN DAY     = 0
                                   DT  =  0.03333     HOURS

*****************************************************************************
**********
***          COMPUTING HYD FOR BASIN 201 (TP MIN VALUE=0.133)          ***
*****************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP 201

COMPUTE NM HYD           ID=1       HYDNO=201  DA=0.00611  SQ MI
                                     PERCENT A=0 B=27 C=27 D=46
                                     TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD                ID=1       CODE=5

*****************************************************************************
**********
***    COMPUTING HYD FOR BASIN PHASE 1 & 2 D6 (TP MIN VALUE=0.133)        ***
*****************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP

COMPUTE NM HYD           ID=4       HYDNO=D6  DA=0.00897  SQ MI
                                     PERCENT A=0 B=27 C=27 D=46
                                     TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD                ID=4       CODE=5

*****************************************************************************
**********
*ADD HYDROGRAPHS FOR 201 AND D6
ADD HYD                  ID=5       HYD=302 ID=1    ID=4

*PRINT HYD               ID=5       CODE=1

*****************************************************************************
```

```
**********
***    COMPUTING HYD FOR BASIN PHASE 1 & 2 14 (TP MIN VALUE=0.133)          ***
**************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP

COMPUTE NM HYD          ID=6        HYDNO=14  DA=0.000687  SQ MI
                                    PERCENT A=0 B=27 C=27 D=46
                                    TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=6        CODE=5

**************************************************************************************
**********
*ADD HYDROGRAPHS FOR 14 AND 302
ADD HYD                 ID=7       HYD=303 ID=5    ID=6

*PRINT HYD              ID=7       CODE=1

**************************************************************************************
**********
***COMPUTING HYD FOR BASIN PHASE 1 & 2 10 (TP MIN VALUE=0.133)    ***
**************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP

COMPUTE NM HYD          ID=8        HYDNO=10  DA=0.00579  SQ MI
                                    PERCENT A=0 B=27 C=27 D=46
                                    TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=8        CODE=5

**************************************************************************************
**********
*ADD HYDROGRAPHS FOR 10 AND 303
ADD HYD                 ID=9       HYD=304 ID=7    ID=8

*PRINT HYD              ID=9       CODE=1

**************************************************************************************
**********
***         COMPUTING HYD FOR BASIN 202 (TP MIN VALUE=0.133)          ***
**************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP 202

COMPUTE NM HYD          ID=10       HYDNO=202  DA=0.002455  SQ MI
                                    PERCENT A=0 B=27 C=27 D=46
                                    TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=10       CODE=5

*S FLOW ENTERING ON CLARKS FORK ROAD
**************************************************************************************
**********
*ADD HYDROGRAPHS FOR 202 AND 304
ADD HYD                 ID=11      HYD=Q1 ID=9     ID=10

*PRINT HYD              ID=11      CODE=1
```

```
**********************************************************************************************
**********
***     COMPUTING HYD FOR BASIN PHASE 1 & 2 11 (TP MIN VALUE=0.133)          ***
**********************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP
COMPUTE NM HYD          ID=12        HYDNO=11  DA=0.00395  SQ MI
                                   PERCENT A=0 B=27 C=27 D=46
                                   TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=12        CODE=5


**********************************************************************************************
**********
***     COMPUTING HYD FOR BASIN PHASE 1 & 2 15 (TP MIN VALUE=0.133)          ***
**********************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP

COMPUTE NM HYD          ID=13        HYDNO=15  DA=0.00329  SQ MI
                                   PERCENT A=0 B=27 C=27 D=46
                                   TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=13        CODE=5

**********************************************************************************************
**********
*ADD HYDROGRAPHS FOR 11 AND 15
ADD HYD                 ID=14      HYD=305 ID=12   ID=13

*PRINT HYD              ID=14      CODE=1



**********************************************************************************************
**********
***     COMPUTING HYD FOR BASIN PHASE 1 & 2 12 (TP MIN VALUE=0.133)          ***
**********************************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP

COMPUTE NM HYD          ID=15        HYDNO=12  DA=0.003742  SQ MI
                                   PERCENT A=0 B=27 C=27 D=46
                                   TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=15        CODE=5


**********************************************************************************************
**********
*ADD HYDROGRAPHS FOR 305 AND 12
ADD HYD                 ID=16      HYD=306 ID=14   ID=15

*PRINT HYD              ID=16      CODE=1


**********************************************************************************************
**********
***     COMPUTING HYD FOR BASIN PHASE 1 & 2 16 (TP MIN VALUE=0.133)          ***
**********************************************************************************************
```

```
**********
***  COMPUTING HYD FOR BASIN prop

COMPUTE NM HYD          ID=17       HYDNO=16  DA=0.000985  SQ MI
                                   PERCENT A=0 B=27 C=27 D=46
                                   TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=17       CODE=5


*****************************************************************************
**********
*ADD HYDROGRAPHS FOR 306 AND 16
ADD HYD                 ID=18     HYD=307 ID=16   ID=17

*PRINT HYD              ID=18     CODE=1


*****************************************************************************
**********
***        COMPUTING HYD FOR BASIN 203 (TP MIN VALUE=0.133)          ***
*****************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP 203

COMPUTE NM HYD          ID=19       HYDNO=203 DA=0.005956  SQ MI
                                   PERCENT A=0 B=27 C=27 D=46
                                   TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD               ID=19       CODE=5

*S FLOW ENTERING ON EAGLE RIVER ROAD
*****************************************************************************
**********
*ADD HYDROGRAPHS FOR 307 AND 203
ADD HYD                 ID=20     HYD=Q2 ID=18    ID=19

*PRINT HYD              ID=20     CODE=1

*****************************************************************************
**********
*S FLOW ENTERING THE ARROYO
*****************************************************************************
**********
*ADD HYDROGRAPHS FOR Q 1 AND Q 2
ADD HYD                 ID=21     HYD=Qtotal ID=11        ID=20

*PRINT HYD              ID=21     CODE=1

*****************************************************************************
**********


FINISH
```

Ahymo

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02c RUN DATE (MON/DAY/YR) =04/22/2003
INPUT FILE = T:\Projects\X3218008\Eng\Ahymo\propJMT.txt USER NO.= AHYMO-C-9803c01UNMLIB-AH

1

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PAGE = PER ACRE NOTATION
START									
RAINFALL TYPE= 1									
COMPUTE NM HYD	06 ~~4.00~~	-	1	.00023	.30	.008	.67469	1.500	1.980
COMPUTE NM HYD	02 ~~5.00~~	-	2	.01250	15.41	.450	.67469	1.500	1.926
ADD HYD	A	1& 2	3	.01273	15.70	.458	.67468	1.500	1.927
ROUTE RESERVOIR	101.00	3	4	.01273	30.50	.497	.73121	1.733	3.743
FINISH									

For Pond Size,

$Q_{100:24hr} \times 2 = .497_{AC-FT} \times 2 = .994_{AC-FT}$.

```
***  Westland The Crossing Unit 3      ***
***  PROPOSED CONDITIONS RUNOFF MODEL  ***

*****************************************************************************
***  DESIGN STORM IS THE 100 YEAR - 24 HOUR STORM
***
*****************************************************************************


START                    TIME = 0

*****************************************************************************
**********
***                                COMPUTING RAINFALL
        ***
*****************************************************************************
**********

RAINFALL                 TYPE = 1
                                   RAIN QUARTER = 0.00        INCHES
                                   RAIN ONE     = 1.900
                                   RAIN SIX     = 2.650
                                   DT   =  0.03333     HOURS


*****************************************************************************
**********
***         COMPUTING HYD FOR BASIN 06 (TP MIN VALUE=0.133)          ***
*****************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP 06

COMPUTE NM HYD           ID=1      HYDNO=06  DA=0.00023  SQ MI
                                     PERCENT A=88 B=0 C=12 D=0
                                     TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD                ID=1      CODE=5


*****************************************************************************
**********
***       COMPUTING HYD FOR BASIN 02 (TP MIN VALUE=0.133)          ***
*****************************************************************************
**********
***  COMPUTING HYD FOR BASIN PROP 02

COMPUTE NM HYD           ID=2      HYDNO=02  DA=0.01172  SQ MI
                                     PERCENT A=88 B=0 C=12 D=0
                                     TP=0.133 HOURS   MASSRAIN=-1

PRINT HYD                ID=2      CODE=5

*****************************************************************************
**********
*ADD HYDROGRAPHS FOR 06 AND 02
ADD HYD                  ID=3      HYD=A          ID=1    ID=2

*PRINT HYD               ID=3      CODE=1
*****************************************************************************
**********
***

ROUTE RESERVOIR     ID=4        HYD NO=pond   INFLOW ID=3   CODE=5
```

OUTFLOW (CFS)	STORAGE (AC FT)	ELEV (FT)
0	0.4362	5260
10	0.3106	5259
15	0.2000	5258

FINISH

Eagle River Road - 32' F-F, 0.5% Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	Eagle River Road Gutter S
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	005000	ft/ft
Discharg	38.29	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.017	
Water Surface Elev	0.62	ft
Elevation Range	.00 to 0.85	
Flow Area	12.1	ft²
Wetted Perimeter	33.26	ft
Top Width	32.00	ft
Actual Depth	0.62	ft
Critical Elevation	0.60	ft
Critical Slope	0.006253	ft/ft
Velocity	3.16	ft/s
Velocity Head	0.15	ft
Specific Energy	0.78	ft
Froude Number	0.90	
Flow Type	Subcritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+50	0.017

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	0.85
0+09	0.67
0+09	0.00
0+11	0.13
0+25	0.41
0+39	0.13
0+41	0.00
0+41	0.67
0+50	0.85

Roaring Fork
Worksheet for Grate Inlet On Grade

Project Description	
Worksheet	Grate Inlet - 1
Type	Grate Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	51.28	cfs
Slope	0.005000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Grate Width	2.00	ft
Grate Length	7.45	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	0.5	%

Options
Grate Flow Option Exclude None

Results			
Efficiency	0.58		
Intercepted Flow	29.89	cfs	flow in pipe
Bypass Flow	21.39	cfs	flow into Roaring fork
Spread	34.88	ft	
Depth	0.78	ft	
Flow Area	12.3	ft²	
Gutter Depression	1.0	in	
Total Depression	1.0	in	
Velocity	4.18	ft/s	
Splash Over Velocity	19.07	ft/s	
Frontal Flow Factor	1.00		
Side Flow Factor	0.50		
Grate Flow Ratio	0.16		
Active Grate Length	7.41	ft	

Roaring Fork - 28' F-F, 1.34% Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	Roaring Fork Gutter Section
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.012200	ft/ft
Discharge	21.39	cfs

flow into Roaring Fork

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	0.44	ft
Elevation Range	0.00 to 0.67	
Flow Area	6.2	ft²
Wetted Perimeter	28.90	ft
Top Width	28.00	ft
Actual Depth	0.44	ft
Critical Elevation	0.49	ft
Critical Slope	0.006886	ft/ft
Velocity	3.46	ft/s
Velocity Head	0.19	ft
Specific Energy	0.63	ft
Froude Number	1.30	
Flow Type	Supercritical	

– < 0.87 ft ✓

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+28	0.017

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.00
0+02	0.13
0+14	0.37
0+26	0.13
0+28	0.00
0+28	0.67

Worksheet
Worksheet for Grate Inlet On Grade

Project Description	
Worksheet	Grate Inlet - 2
Type	Grate Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	21.39	cfs
Slope	0.012200	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.062500	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.015	
Grate Width	2.00	ft
Grate Length	7.45	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	0.5	%

Options
Grate Flow Option Exclude None

Results		
Efficiency	0.60	
Intercepted Flow	12.73	cfs
Bypass Flow	8.66	cfs
Spread	21.06	ft
Depth	0.51	ft
Flow Area	4.5	ft²
Gutter Depression	1.0	in
Total Depression	1.0	in
Velocity	4.73	ft/s
Splash Over Velocity	19.07	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.45	
Grate Flow Ratio	0.27	
Active Grate Length	7.41	ft

flow in pipe
flow in to Eagle River Road

Eagle River Road to Channel - 32' F-F, 0.5% Slope
Worksheet for Irregular Channel

Project Description	
Worksheet	Eagle River Road to Channel Gutter Sectior
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	0.005000	ft/ft
Discharge	46.95	cfs

into rundown.

Options	
Current Roughness Method	Improved Lotter's Method
Open Channel Weighting Metho	Improved Lotter's Method
Closed Channel Weighting Meth	Horton's Method

Results		
Mannings Coefficient	0.017	
Water Surface Elevation	0.68	ft
Elevation Range	0.00 to 0.85	
Flow Area	13.8	ft²
Wetted Perimeter	34.03	ft
Top Width	32.68	ft
Actual Depth	0.68	ft
Critical Elevation	0.65	ft
Critical Slope	0.006001	ft/ft
Velocity	3.39	ft/s
Velocity Head	0.18	ft
Specific Energy	0.86	ft
Froude Number	0.92	
Flow Type	Subcritical	

<.87ft ✓

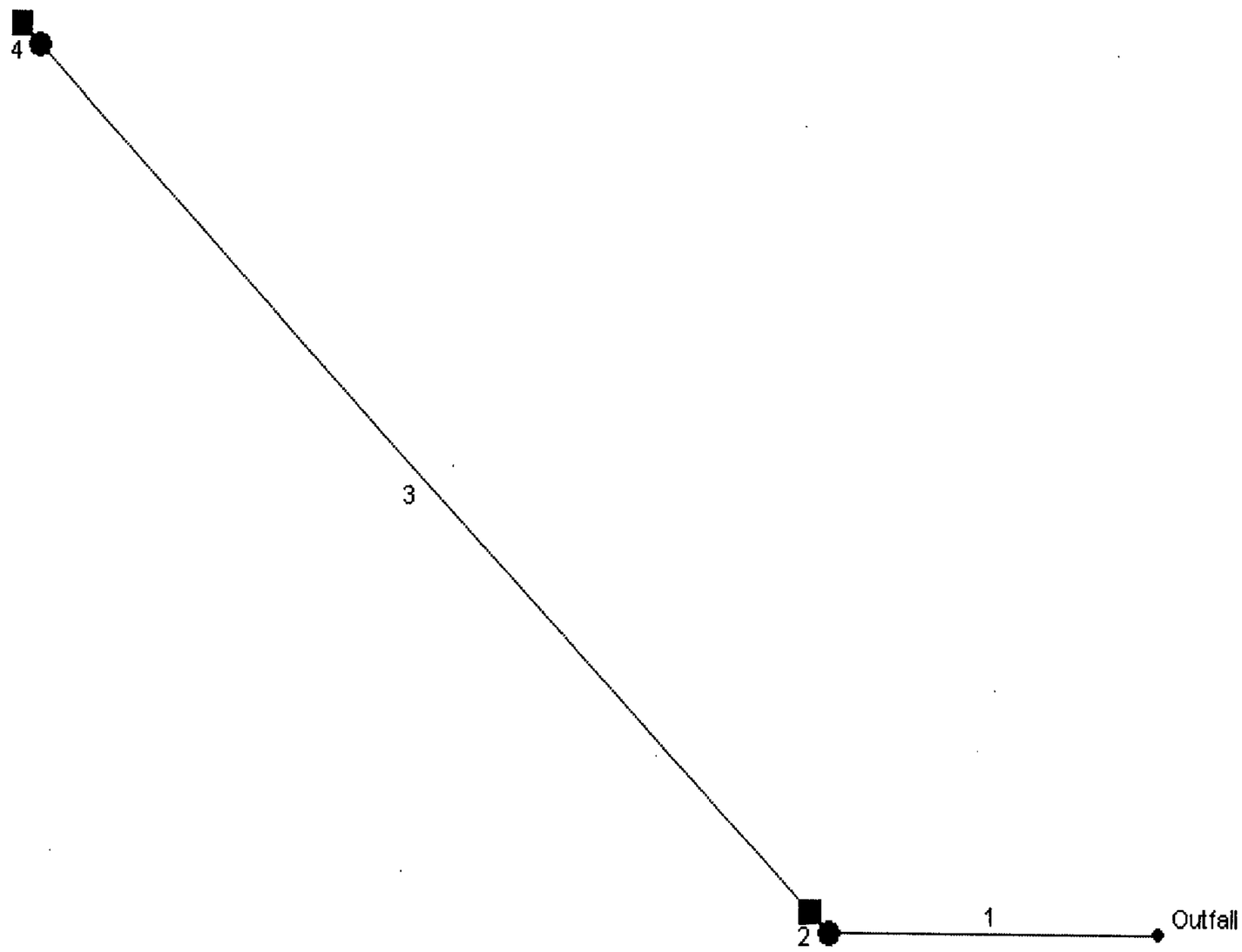
Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+50	0.017

Natural Channel Points

Station (ft)	Elevation (ft)
0+00	0.85
0+09	0.67
0+09	0.00
0+11	0.13
0+25	0.41
0+39	0.13
0+41	0.00
0+41	0.67
0+50	0.85

Hydraflow Plan View

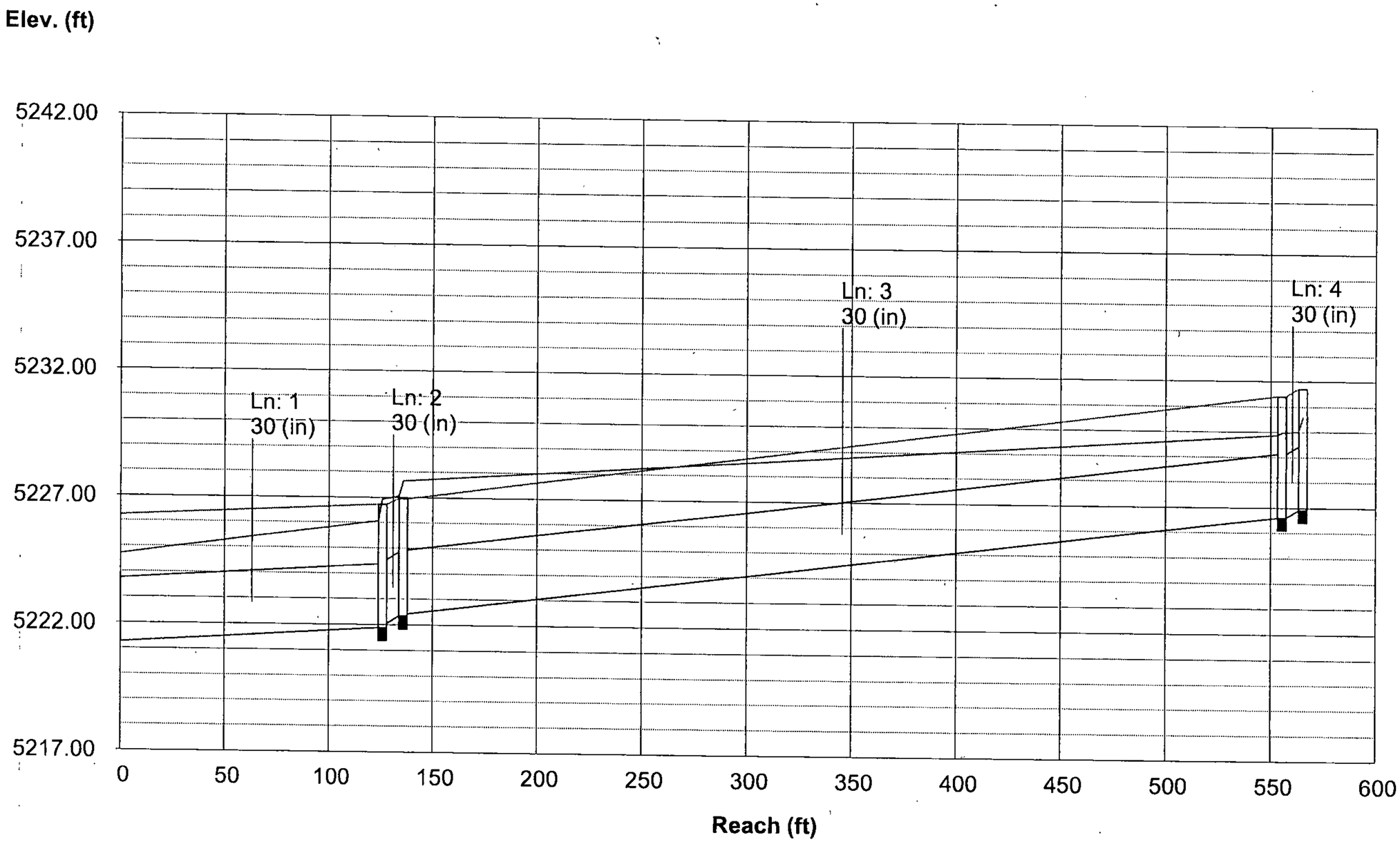


Project file: SDdesign_102103.stm	No. Lines: 4	10-22-2003

Hydraflow Storm Sewers 2003

Storm Sewer Profile

Proj. file: SDdesign_102103.stm



Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	126.0	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	42.62	29.00	8.68	30	0.50	5221.88	5221.25	5226.06	5224.70	5226.74	5226.24	Inserted Line
2	1	10.0	0.00	0.00	0.00	0.00	0.00	0.0	1.2	0.0	42.62	71.01	8.68	30	3.00	5222.34	5222.04	5227.05	5226.94	5226.96	5226.74	Line 1
3	2	419.3	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	29.89	41.00	6.09	30	1.00	5226.61	5222.42	5229.86	5227.64	5231.41	5226.96	Line 2
4	3	10.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	29.89	71.07	6.09	30	3.00	5226.91	5226.61	5230.00	5229.95	5231.71	5231.41	Line 3

Project File: SDdesign_102103.stm

Number of lines: 4

Run Date: 10-22-2003

NOTES: Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period = 10 Yrs.

Mirehaven Arroyo
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Mirehaven Arroyo
Flow Element	Trapezoidal Channe
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.028	
Slope	0.003500	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	1.50	H : V
Bottom Width	50.00	ft
Discharge	1,677.00	cfs

Results		
Depth	4.06	ft
Flow Area	232.0	ft²
Wetted Perimeter	66.41	ft
Top Width	64.22	ft
Critical Depth	3.15	ft
Critical Slope	0.008345	ft/ft
Velocity	7.23	ft/s
Velocity Head	0.81	ft
Specific Energy	4.87	ft
Froude Number	0.67	
Flow Type	Subcritical	

HEC-RAS ANALYSIS POINTS

1	STA. 3+70
2	STA. 3+82
3	STA. 6+01
4	STA. 6+34
5	STA. 9+70
6	STA. 9+94
7	STA. 10+34
8	STA. 12+24
9	STA. 12+48
10	STA. 13+19
11	STA. 14+50
12	STA. 14+56
13	STA. 14+74
14	STA. 15+51
15	STA. 16+21
16	STA. 17+24
17	STA. 17+60
18	STA. 17+70
19	STA. 17+91
20	STA. 18+79
21	STA. 19+01
22	STA. 19+26
23	STA. 21+20
24	STA. 21+56
25	STA. 23+81.5
26	STA. 24+05.5
27	STA. 25+82
28	STA. 26+18
29	STA. 28+68
30	STA. 29+04
31	STA. 32+88

WILSON & COMPANY
2600 THE AMERICAN ROAD S.E.
SUITE 100
RIO RANCHO, NEW MEXICO
87124
(505) 898-8021

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING GROUP

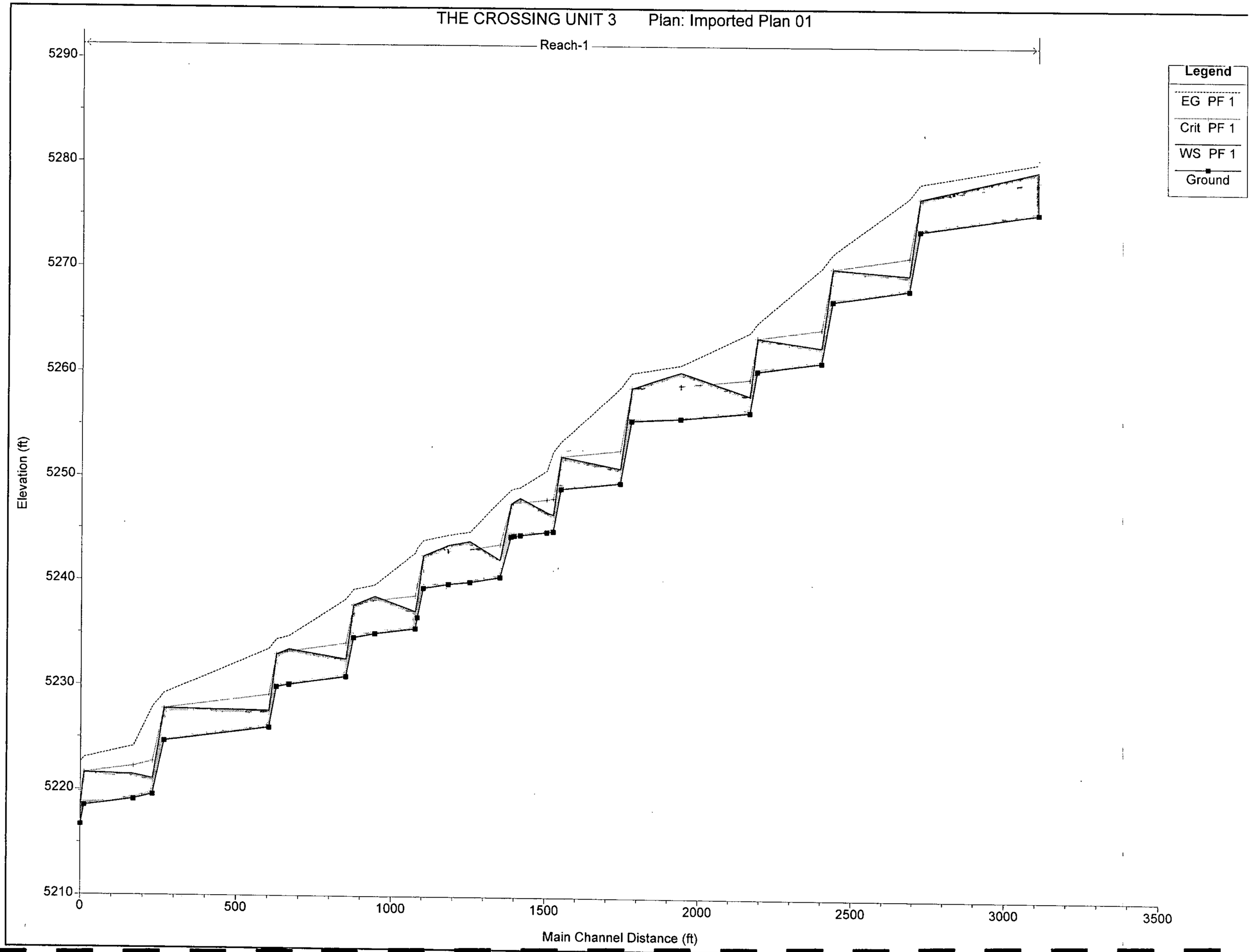
THE CROSSING SUBDIVISION UNIT 3
MIREHAVEN ARROYO
ANALYSIS POINTS

Design Review Committee	City Engineer Approval	Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

City Project No.	Zone Map No.	Sheet	Of
XXXX.XX	H-9-Z	1	1

WCEA #X3218008
APRIL 2003

T:\PROJECTS\X3218008\H\SHEETS\EXHIBIT-8308GD01.DWG\04-30-03\DLC

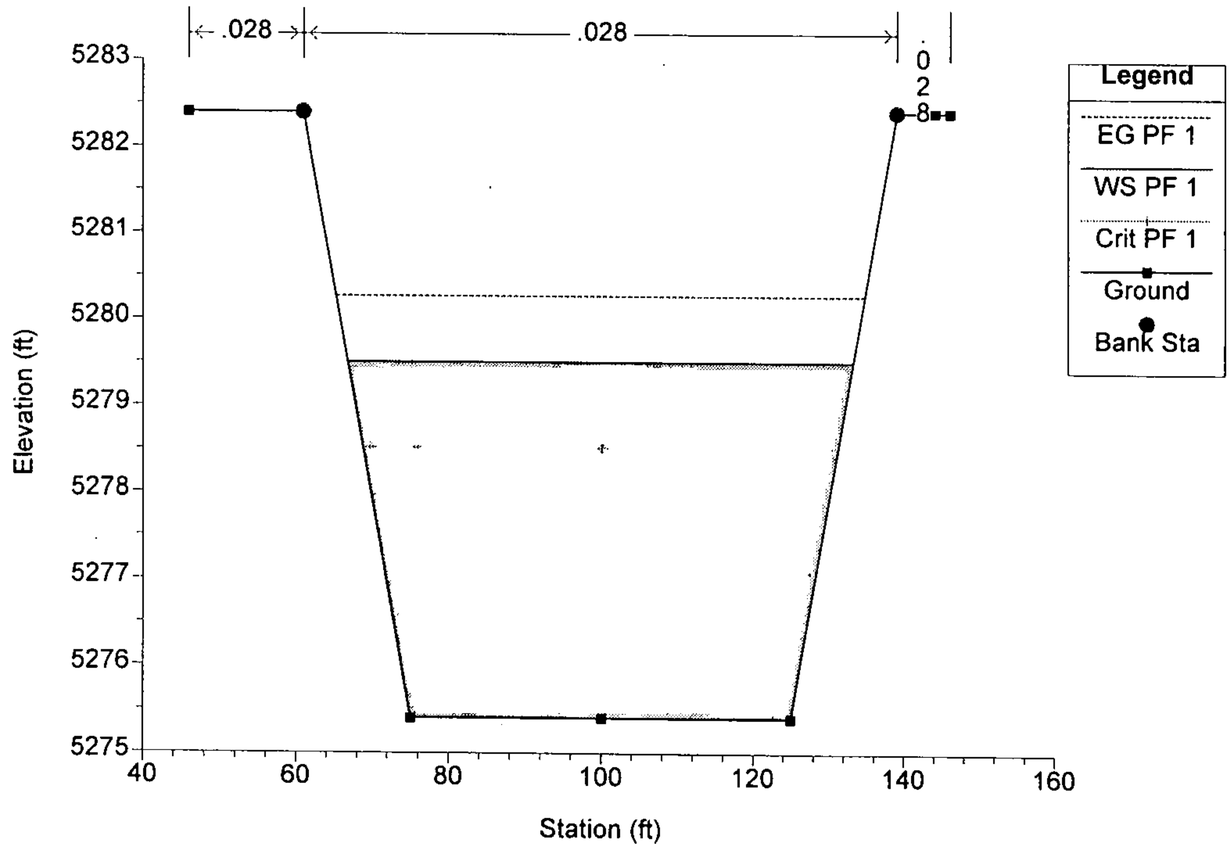

THE CROSSING UNIT 3 Plan: Imported Plan 01
Reach-1
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Elevation (ft)
5290
5280
5270
5260
5250
5240
5230
5220
5210
0
500
1000
1500
2000
2500
3000
3500
Main Channel Distance (ft)

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	31	1677.00	5275.40	5279.50	5278.52	5280.27	0.003308	7.03	238.69	66.40	0.65
Reach-1	30	1677.00	5273.70	5276.85	5276.85	5278.27	0.008475	9.57	175.27	62.47	1.01
Reach-1	29	1677.00	5268.08	5269.54	5271.21	5276.93	0.112026	21.81	76.88	55.80	3.28
Reach-1	28	1677.00	5267.00	5270.12	5270.12	5271.54	0.008434	9.55	175.54	62.48	1.00
Reach-1	27	1677.00	5261.20	5262.65	5264.33	5270.17	0.115368	22.01	76.18	55.77	3.32
Reach-1	26	1677.00	5260.39	5263.52	5263.52	5264.93	0.008384	9.54	175.87	62.51	1.00
Reach-1	25	1677.00	5256.47	5258.08	5259.60	5264.02	0.079056	19.55	85.79	56.45	2.79
Reach-1	24.5	1677.00	5255.86	5260.25	5258.99	5260.91	0.002606	6.49	258.35	67.58	0.59
Reach-1	24	1677.00	5255.61	5258.74	5258.74	5260.15	0.008371	9.53	175.96	62.51	1.00
Reach-1	23	1677.00	5249.61	5251.03	5252.73	5258.76	0.120140	22.31	75.16	55.58	3.38
Reach-1	22	1677.00	5249.01	5252.14	5252.14	5253.55	0.008375	9.53	175.93	62.51	1.00
Reach-1	21	1677.00	5244.92	5246.51	5248.05	5252.60	0.082284	19.80	84.71	56.37	2.85
Reach-1	20	1677.00	5244.83	5246.77	5247.96	5250.77	0.042327	16.04	104.52	57.76	2.10
Reach-1	19	1677.00	5244.53	5248.11	5247.66	5249.15	0.005293	8.20	204.42	64.31	0.81
Reach-1	18	1677.00	5244.46	5247.76	5247.58	5249.01	0.006998	8.99	186.55	63.19	0.92
Reach-1	17	1677.00	5244.38	5247.51	5247.51	5248.92	0.008408	9.54	175.71	62.50	1.00
Reach-1	16	1677.00	5240.50	5242.17	5243.65	5247.84	0.072619	19.12	87.69	55.82	2.69
Reach-1	15	1677.00	5240.00	5243.93	5243.15	5244.81	0.003958	7.53	222.82	63.71	0.71
Reach-1	14	1677.00	5239.78	5243.52	5242.93	5244.50	0.004658	7.94	211.23	63.08	0.76
Reach-1	13	1677.00	5239.38	5242.52	5242.52	5243.96	0.008377	9.61	174.49	61.00	1.00
Reach-1	12	1677.00	5236.58	5238.36	5239.72	5243.28	0.057736	17.80	94.24	56.21	2.42
Reach-1	11	1677.00	5235.50	5237.18	5238.64	5242.77	0.070951	18.99	88.33	55.84	2.66
Reach-1	10	1677.00	5235.00	5238.58	5238.17	5239.68	0.005598	8.43	198.93	62.38	0.83
Reach-1	9	1677.00	5234.60	5237.73	5237.73	5239.18	0.008475	9.65	173.85	60.97	1.01
Reach-1	8	1677.00	5230.90	5232.58	5234.06	5238.29	0.073384	19.19	87.40	55.79	2.70
Reach-1	7	1677.00	5230.10	5233.49	5233.27	5234.73	0.006709	8.94	187.55	61.75	0.90
Reach-1	6	1677.00	5229.87	5232.99	5232.99	5234.41	0.008441	9.56	175.47	62.46	1.00
Reach-1	5	1677.00	5226.00	5227.63	5229.13	5233.50	0.077834	19.45	86.21	56.48	2.77
Reach-1	4	1677.00	5224.66	5227.79	5227.79	5229.21	0.008422	9.55	175.61	62.49	1.00
Reach-1	3	1677.00	5219.57	5221.08	5222.70	5227.93	0.099212	21.00	79.86	56.01	3.10
Reach-1	2.5	1677.00	5219.12	5221.45	5222.25	5224.15	0.022923	13.19	127.10	59.30	1.59
Reach-1	2	1677.00	5218.49	5221.61	5221.61	5223.03	0.008436	9.55	175.52	62.48	1.00
Reach-1	1	1677.00	5216.70	5218.68	5219.85	5222.60	0.041011	15.88	105.59	57.84	2.07

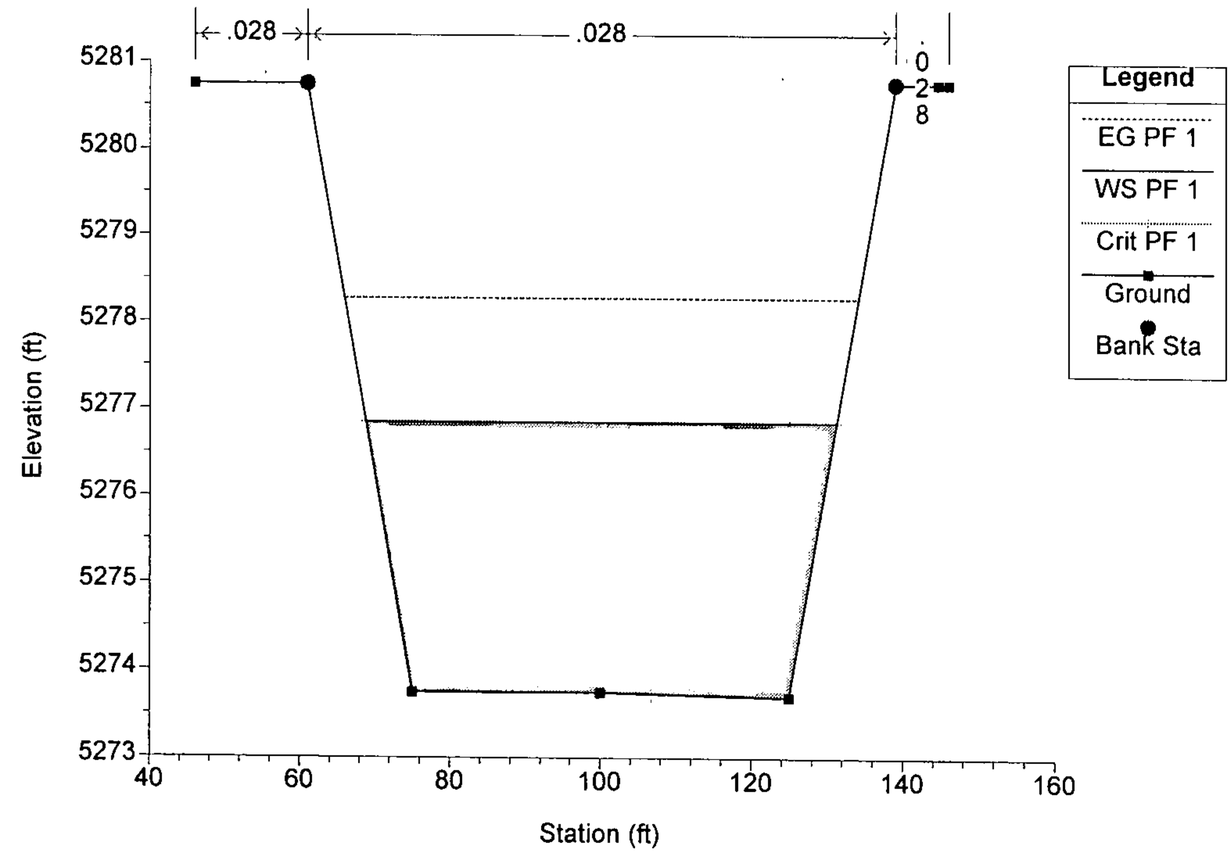
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 31 33+30



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 30 29+04



THE CROSSING UNIT 3 Plan: Imported Plan 01

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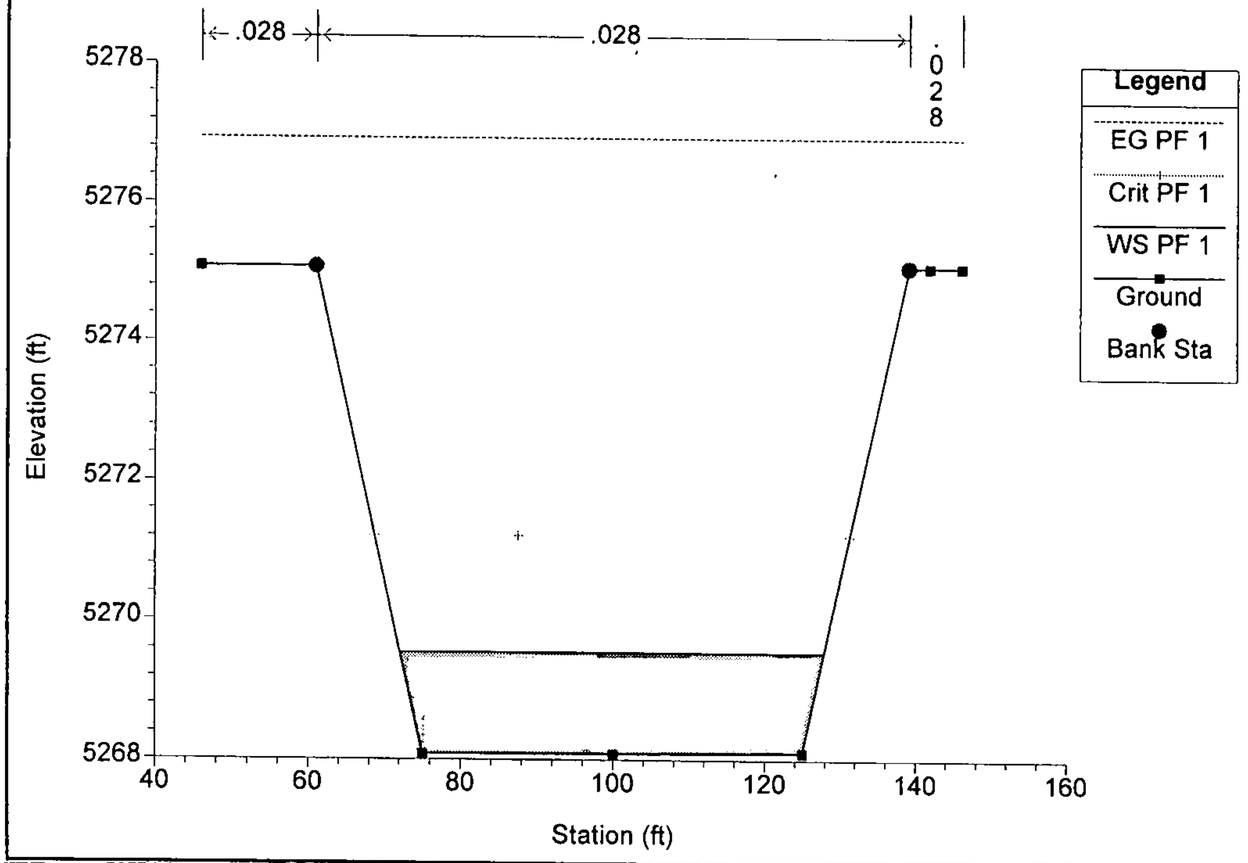

THE CROSSING UNIT 3 Plan: Imported Plan 01

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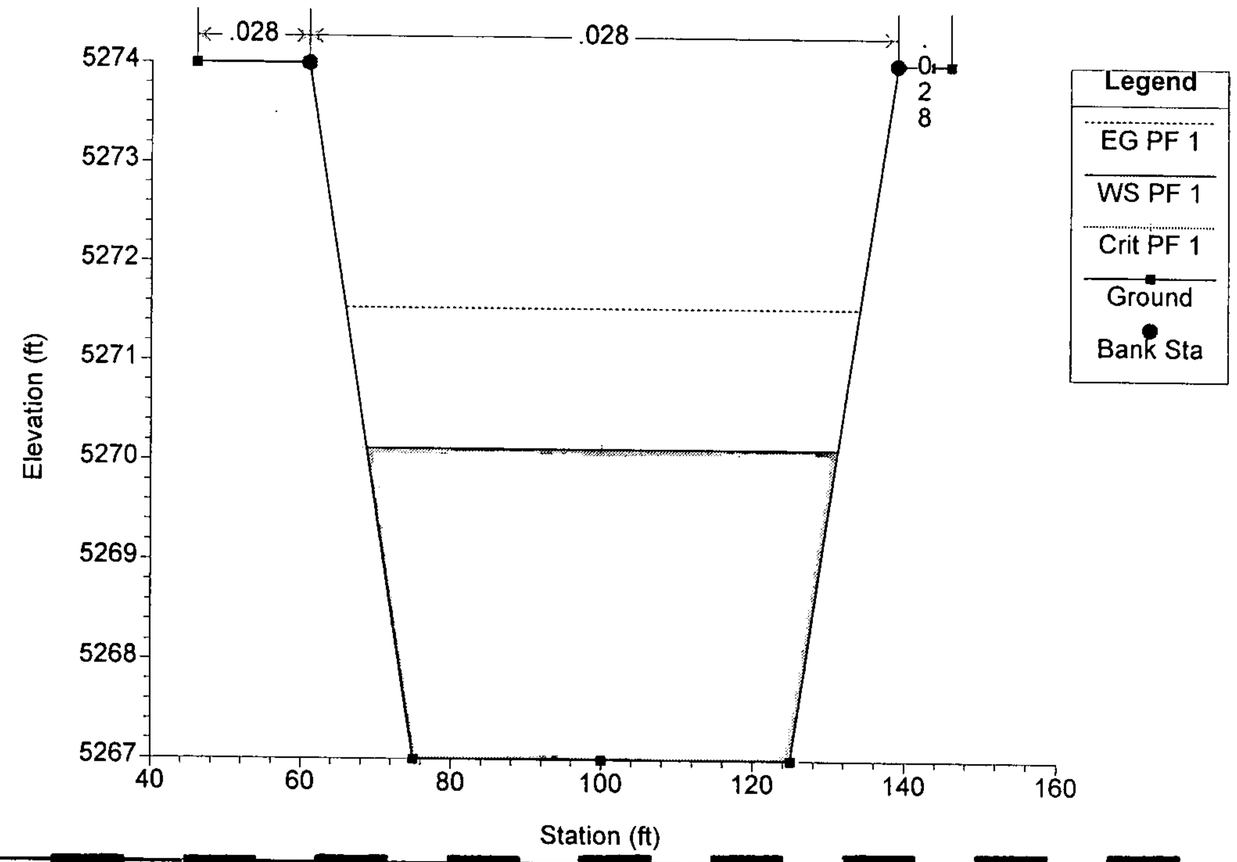

THE CROSSING UNIT 3 Plan: Imported Plan 01

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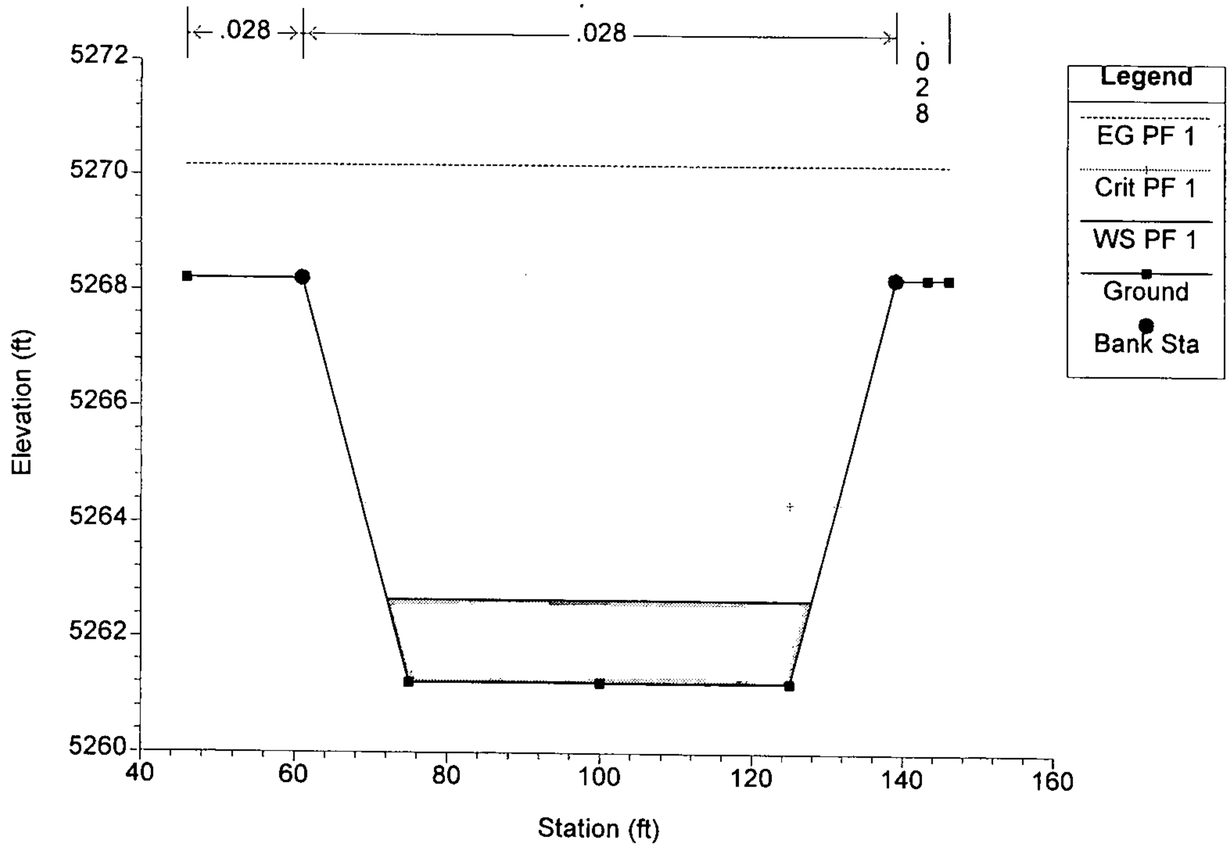

THE CROSSING UNIT 3 Plan: Imported Plan 01

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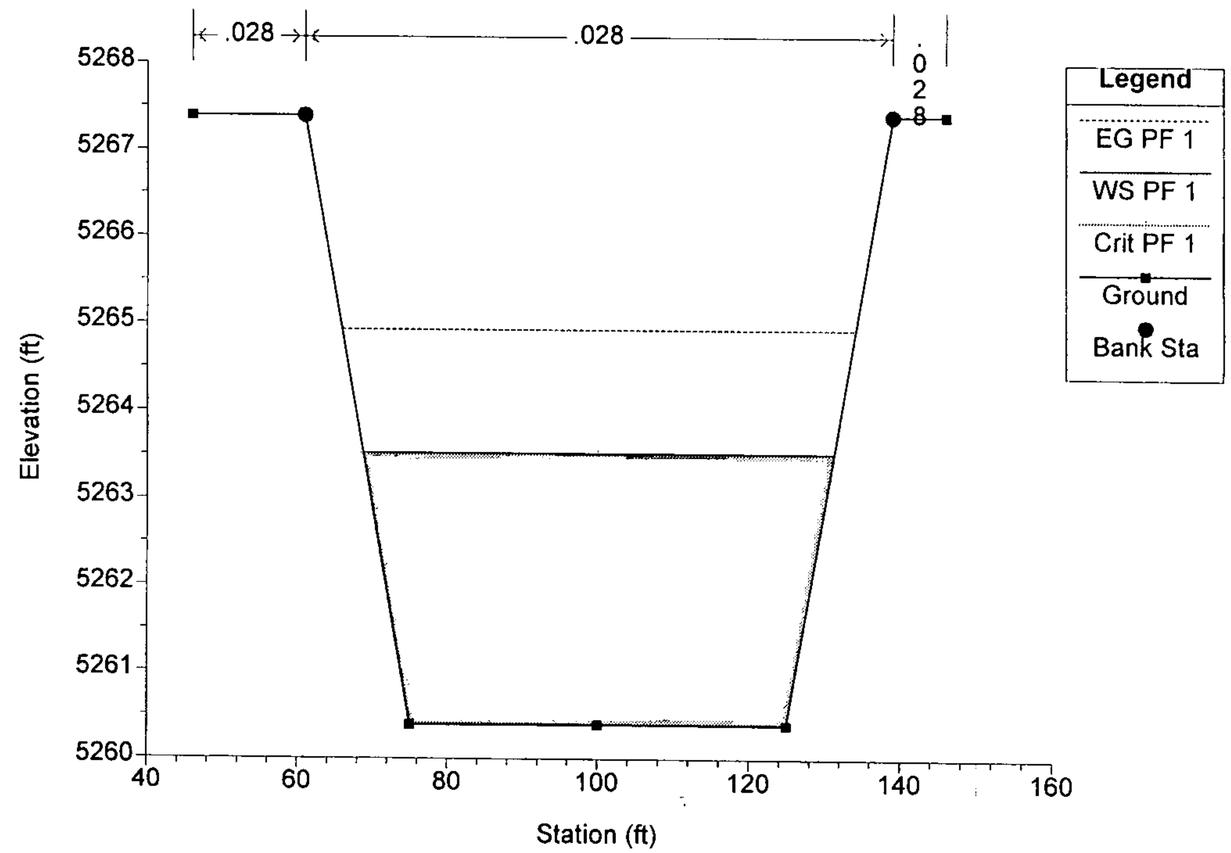
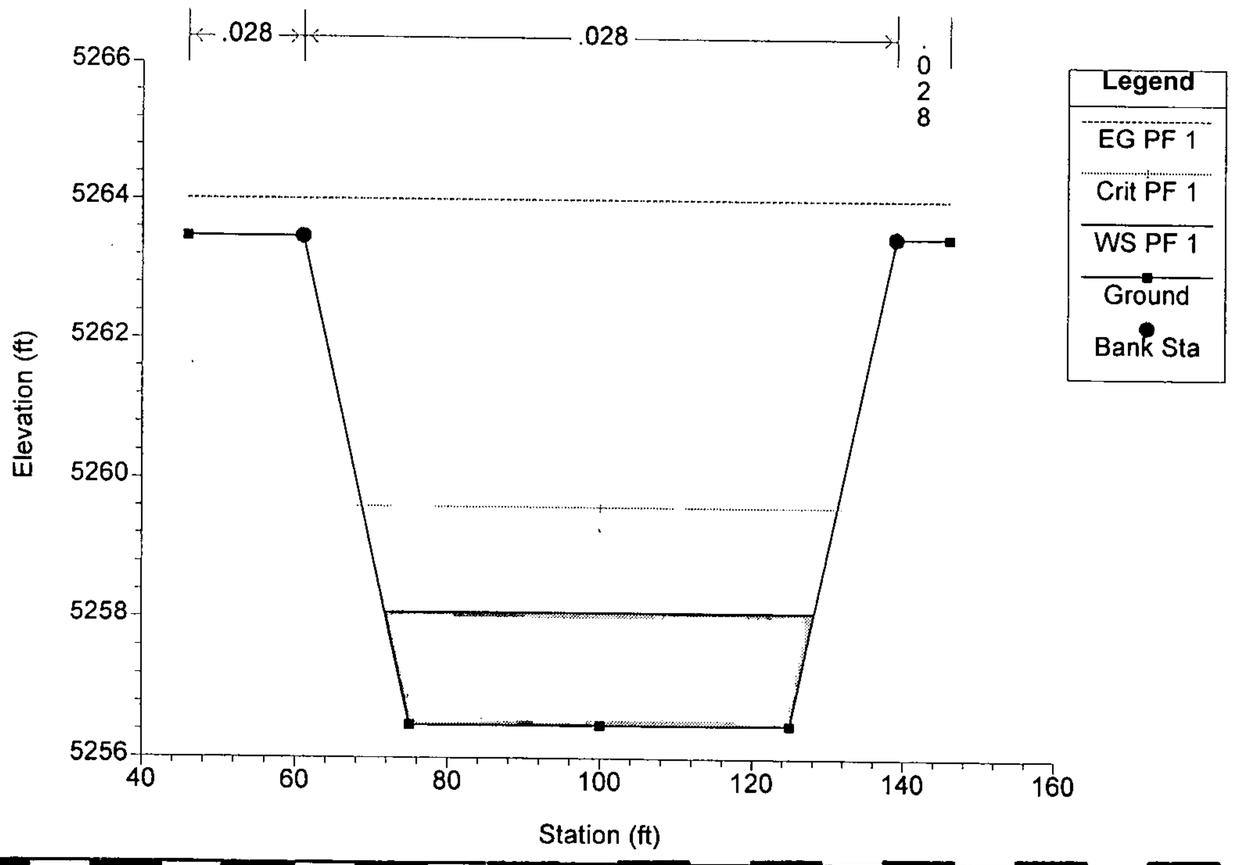


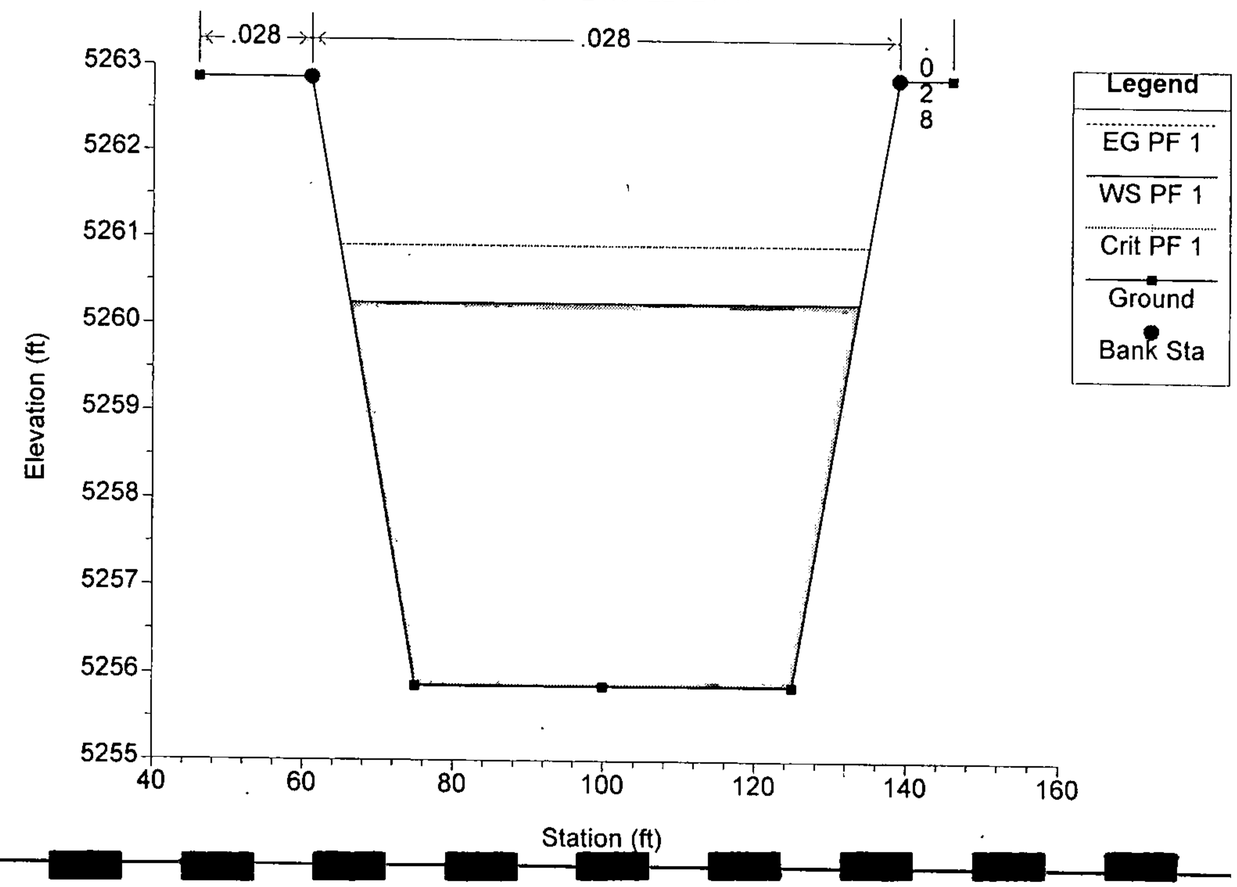
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 25 23+81.5



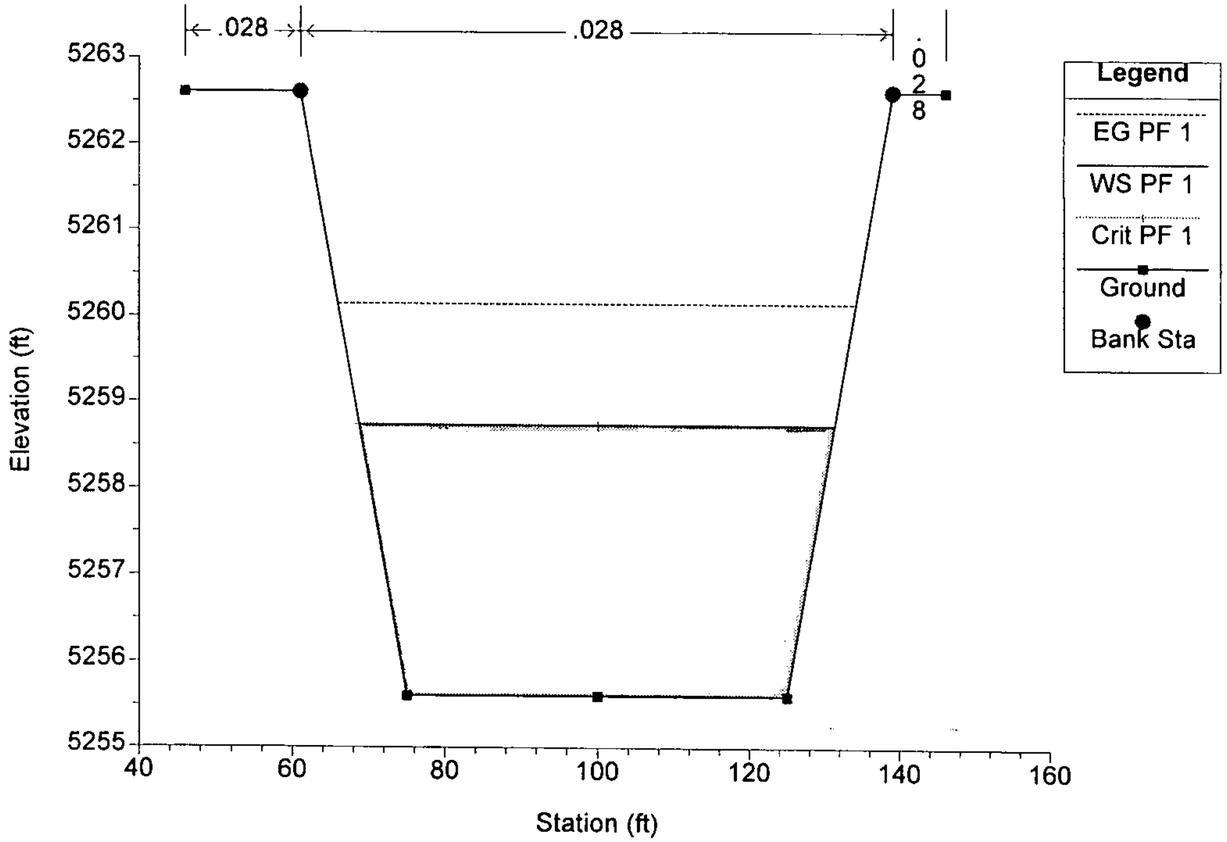
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 24.5 22+21.47



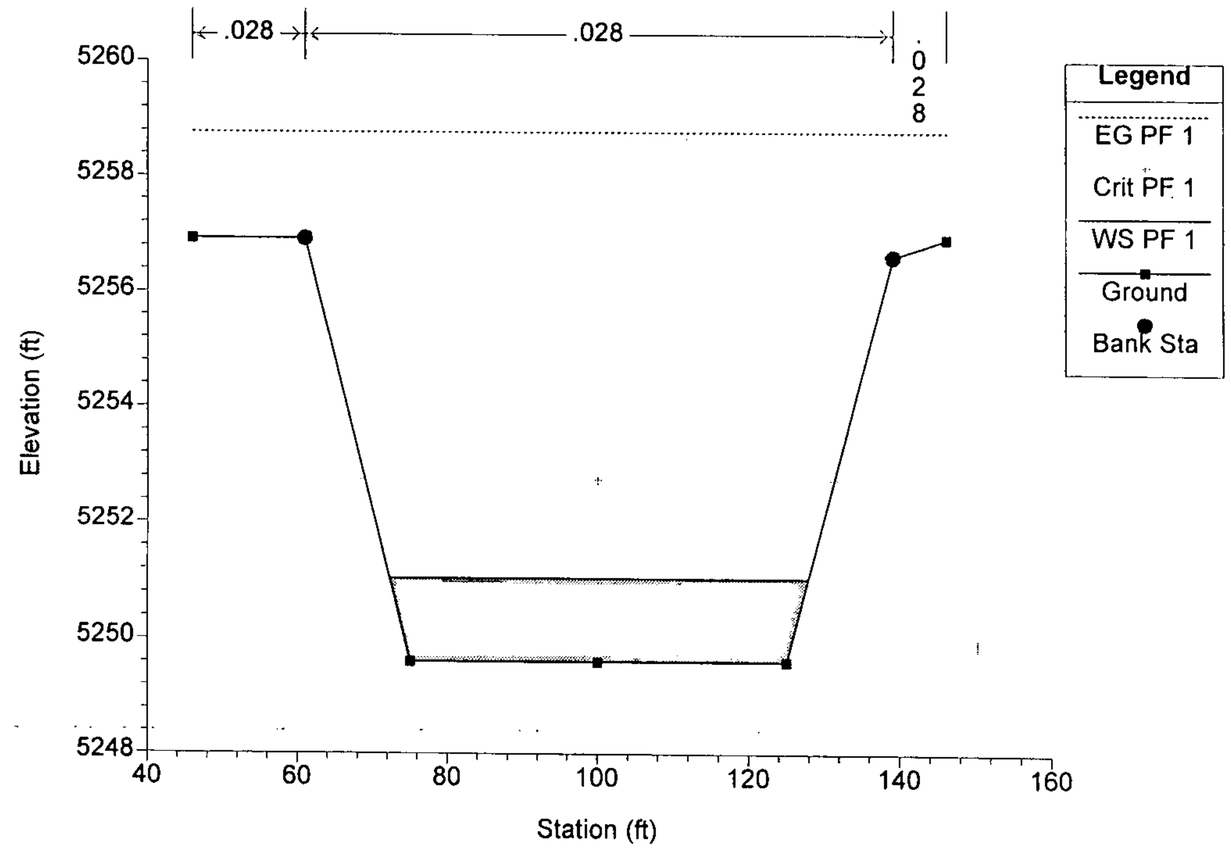
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 24 21+56



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 23 21+20



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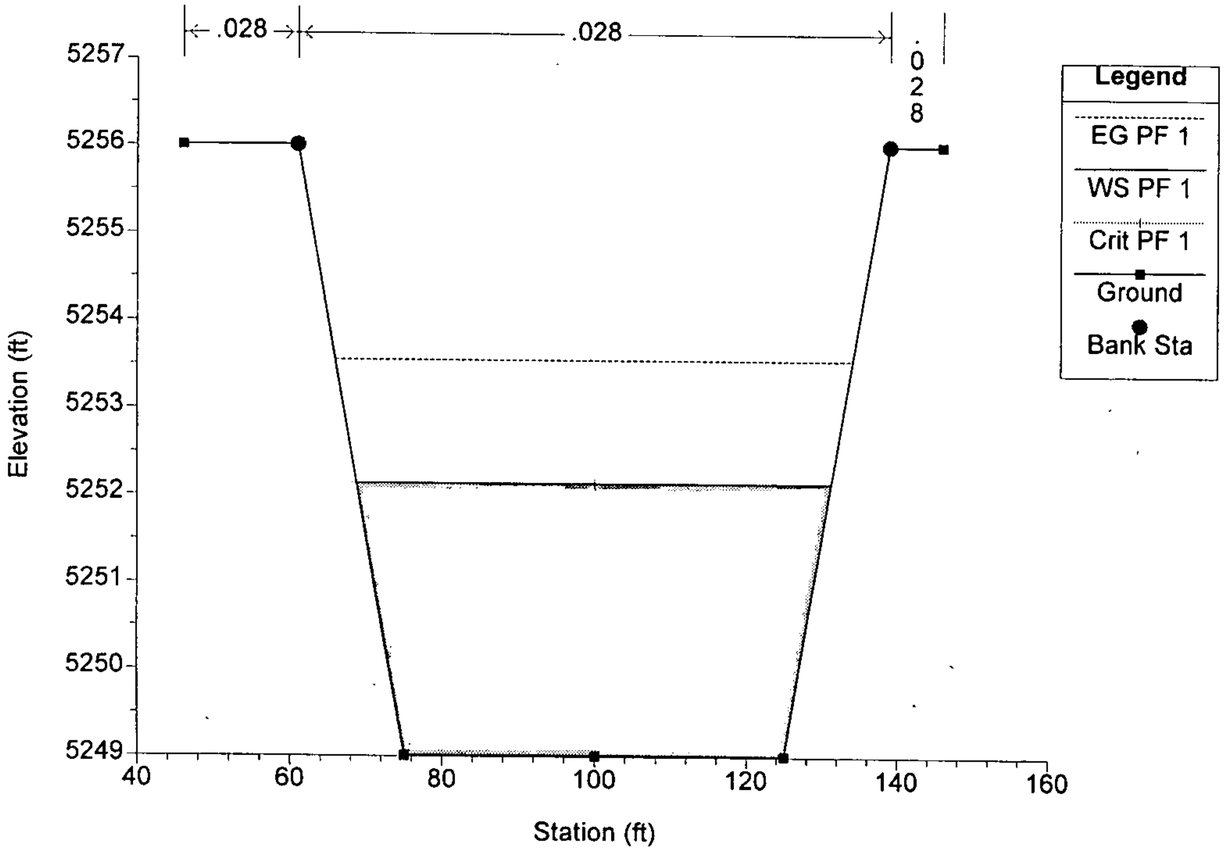
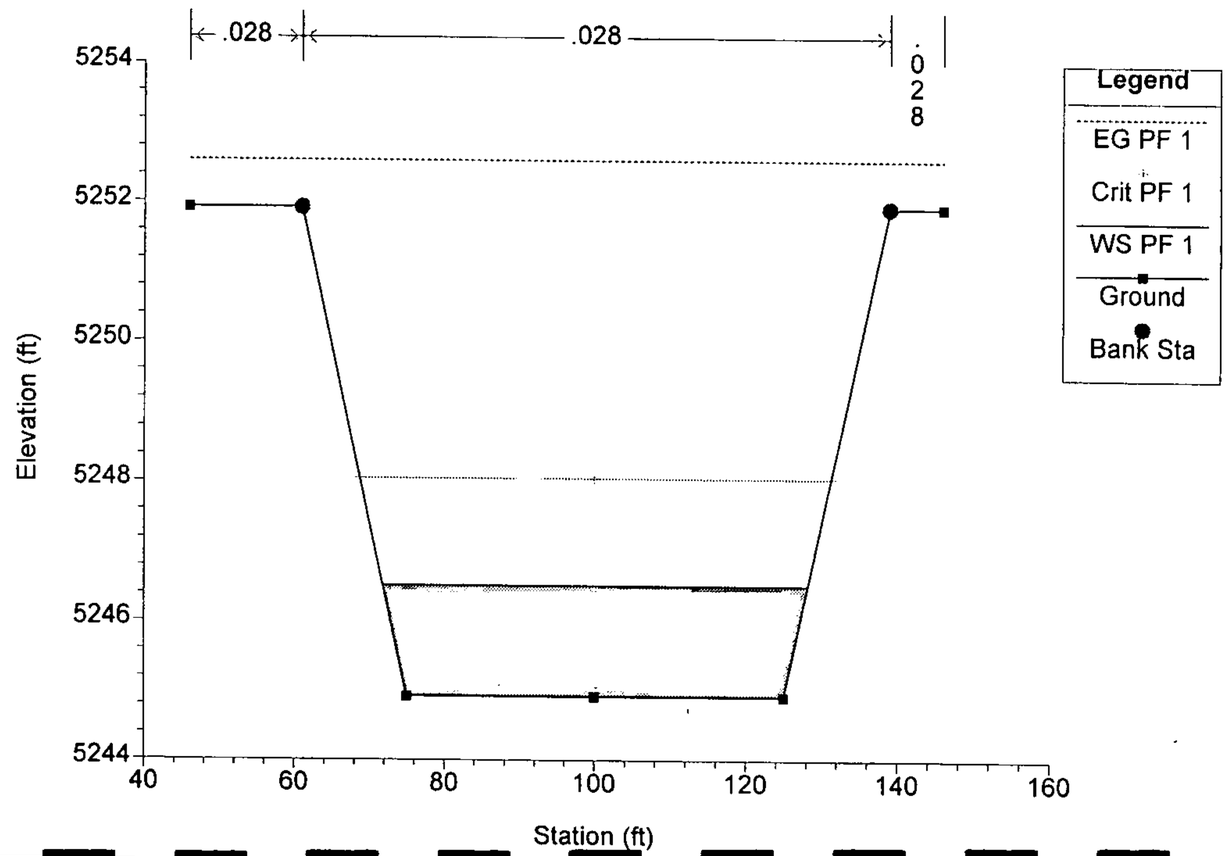
RS = 22 19+26



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 21 19+01



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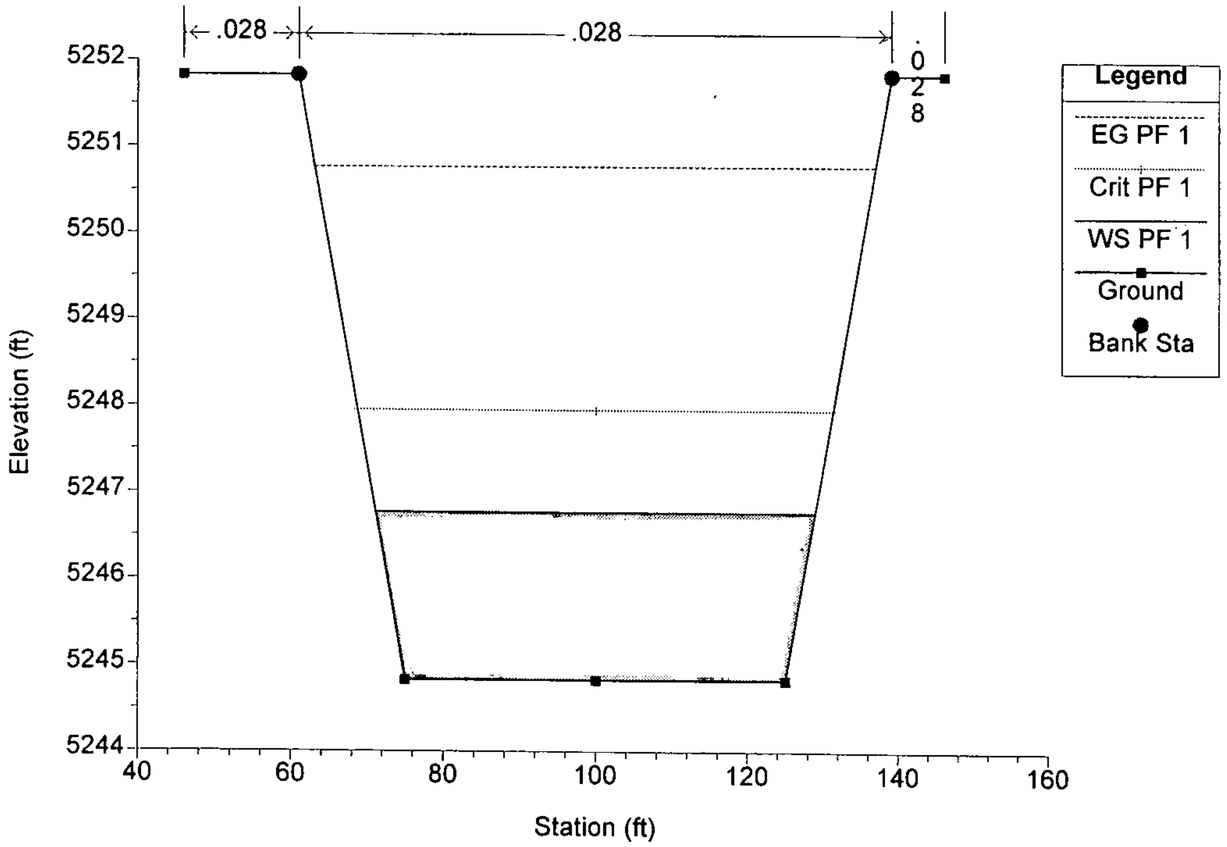
RS = 20 18+80



THE CROSSING UNIT 3 Plan: Imported Plan 01

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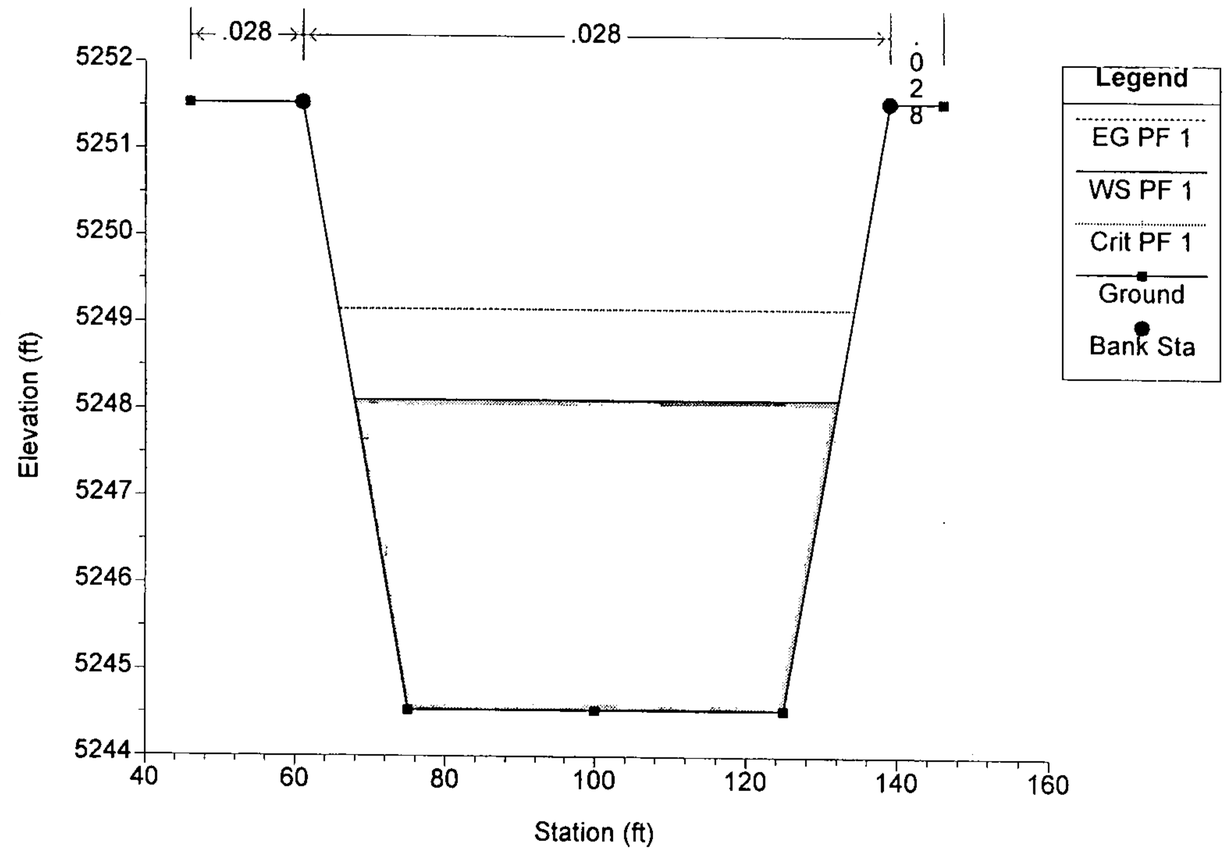

THE CROSSING UNIT 3 Plan: Imported Plan 01

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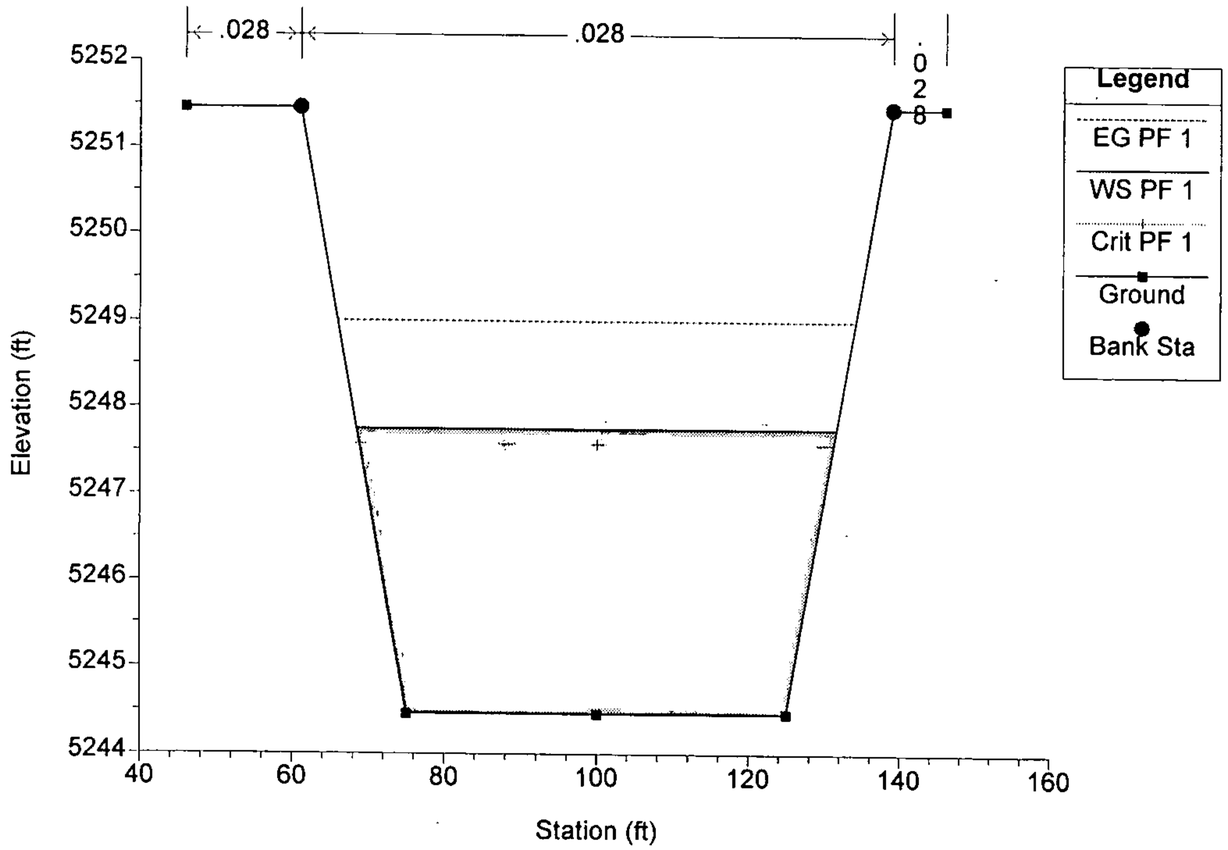

THE CROSSING UNIT 3 Plan: Imported Plan 01

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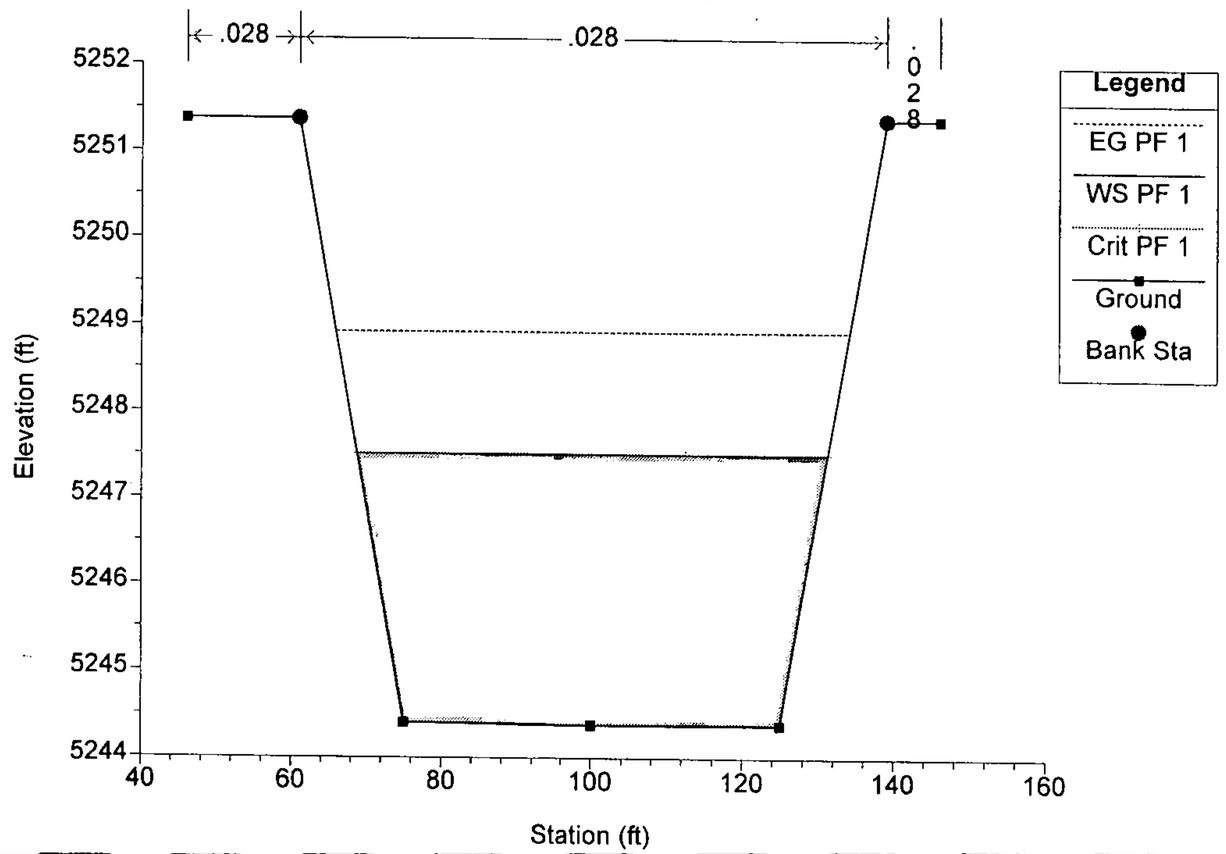

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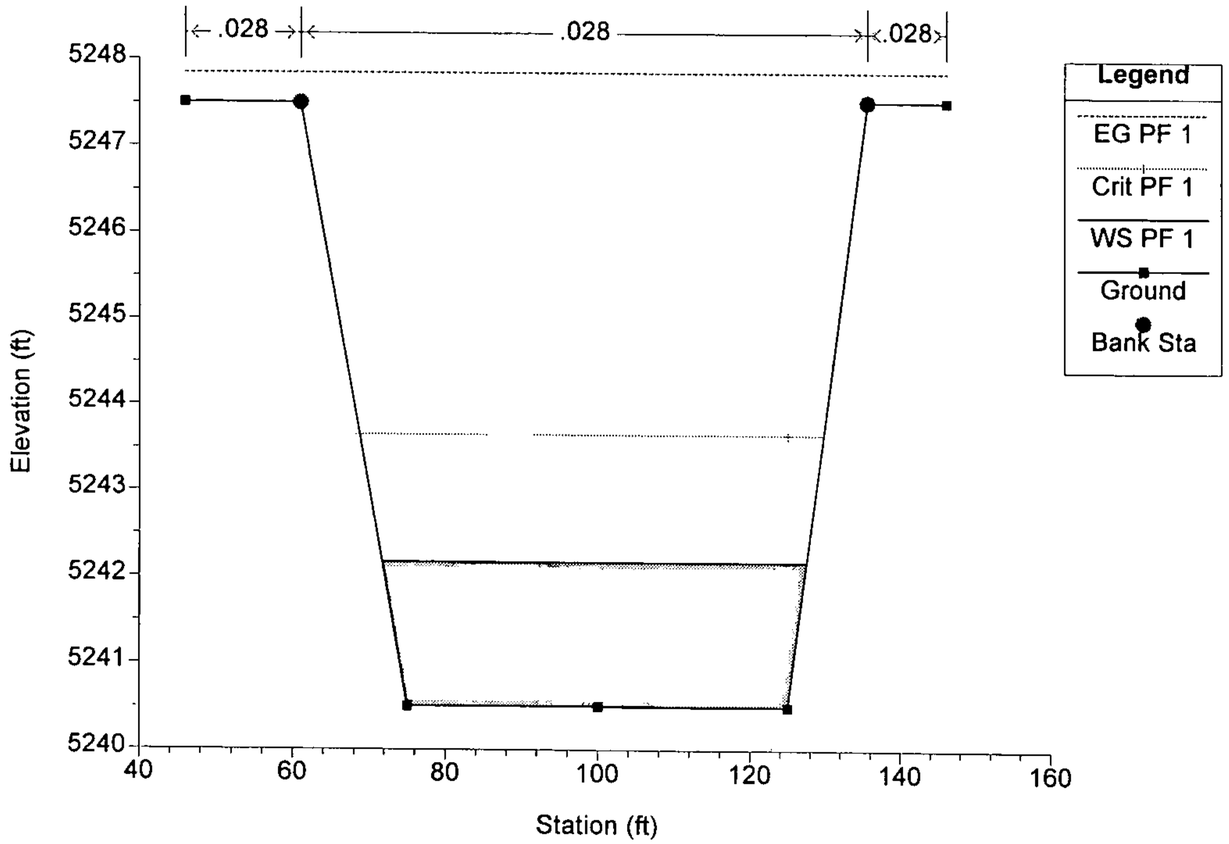

THE CROSSING UNIT 3 Plan: Imported Plan 01

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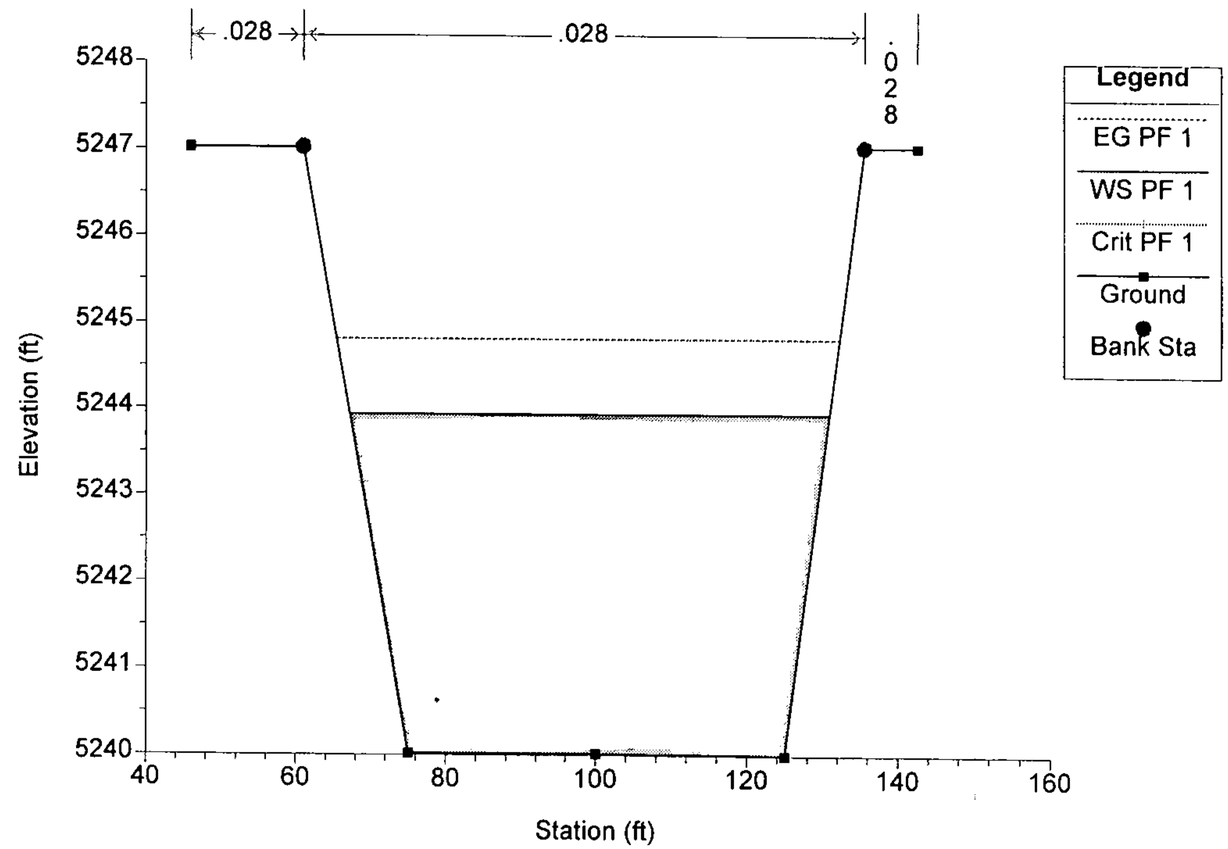

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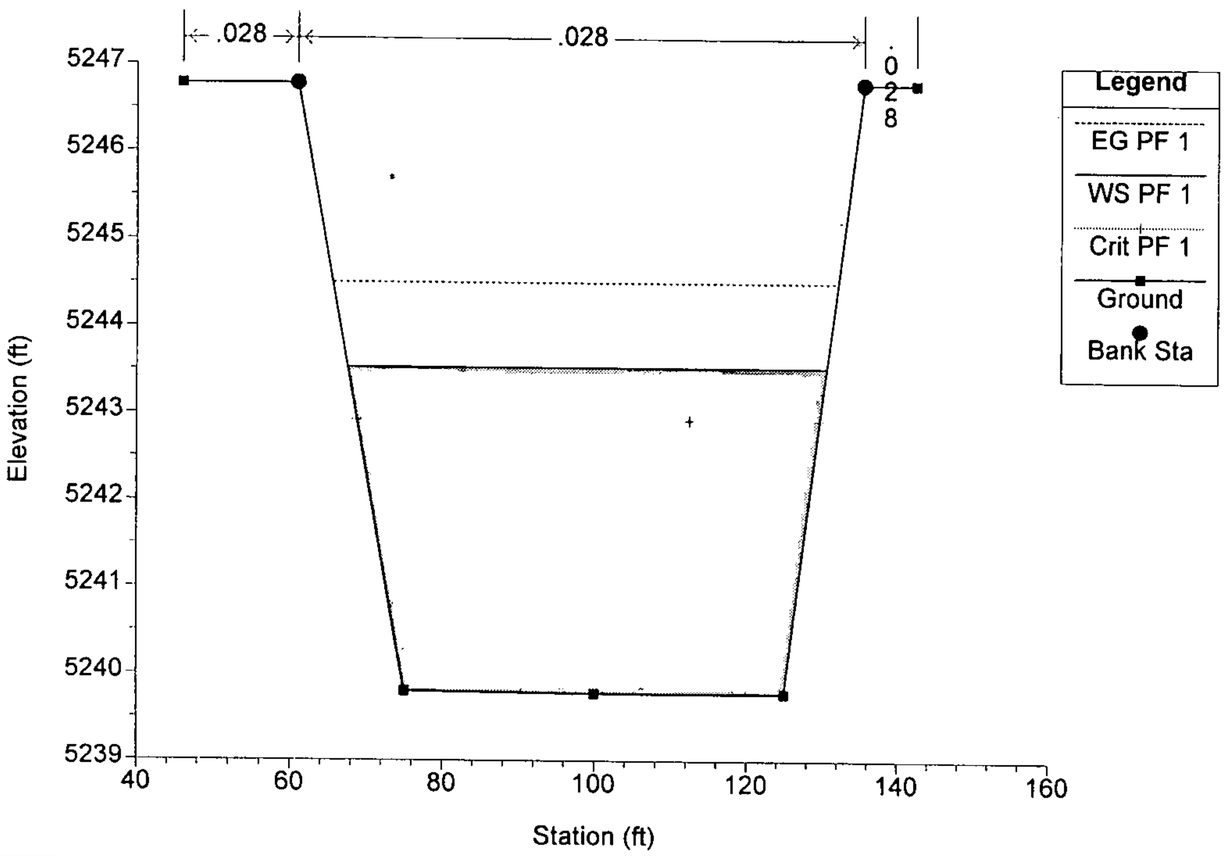

THE CROSSING UNIT 3 Plan: Imported Plan 01

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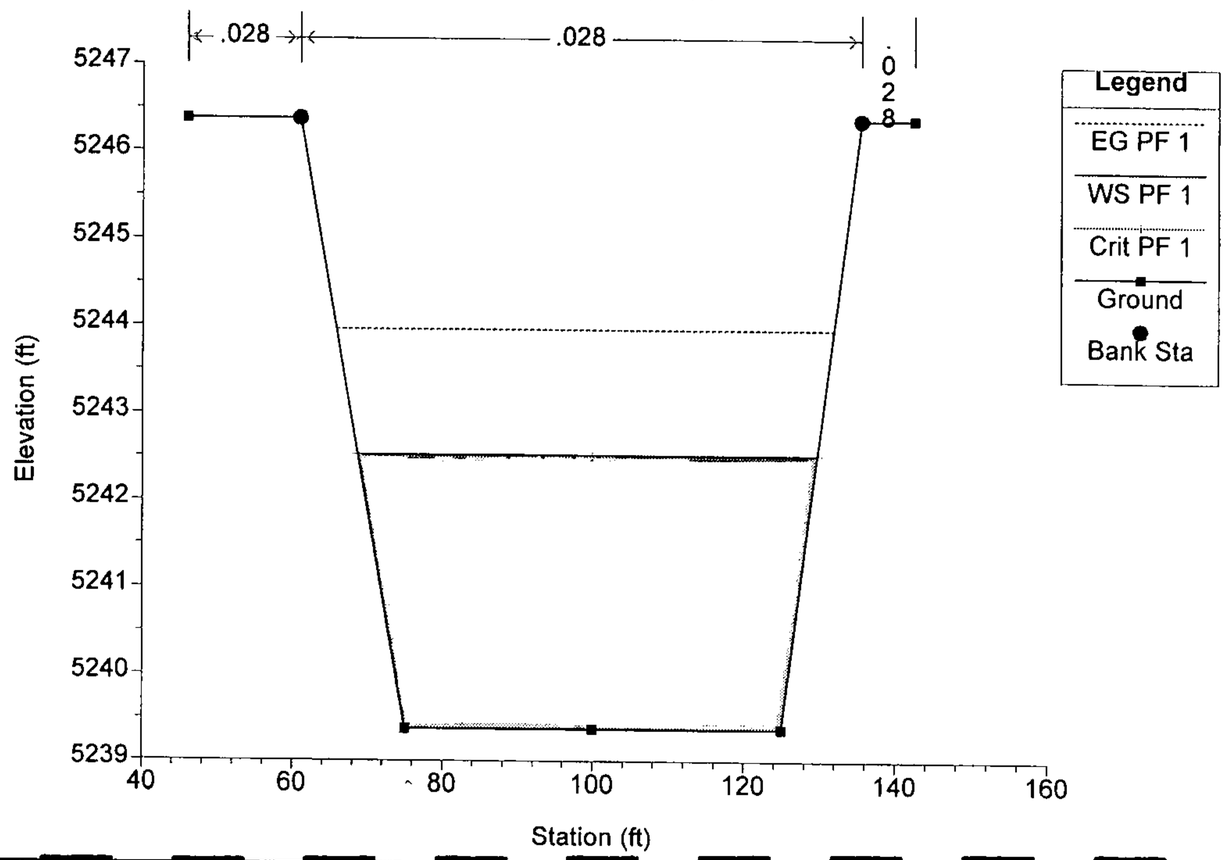
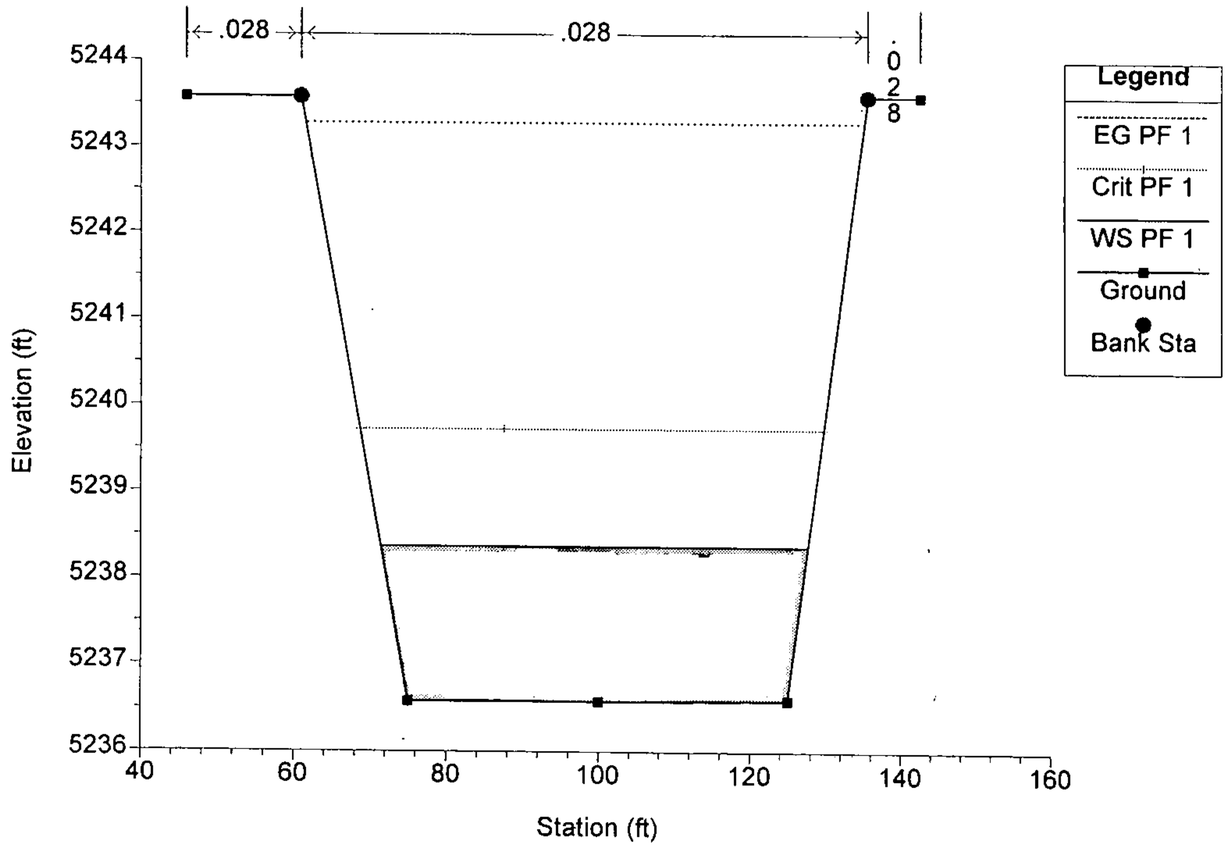


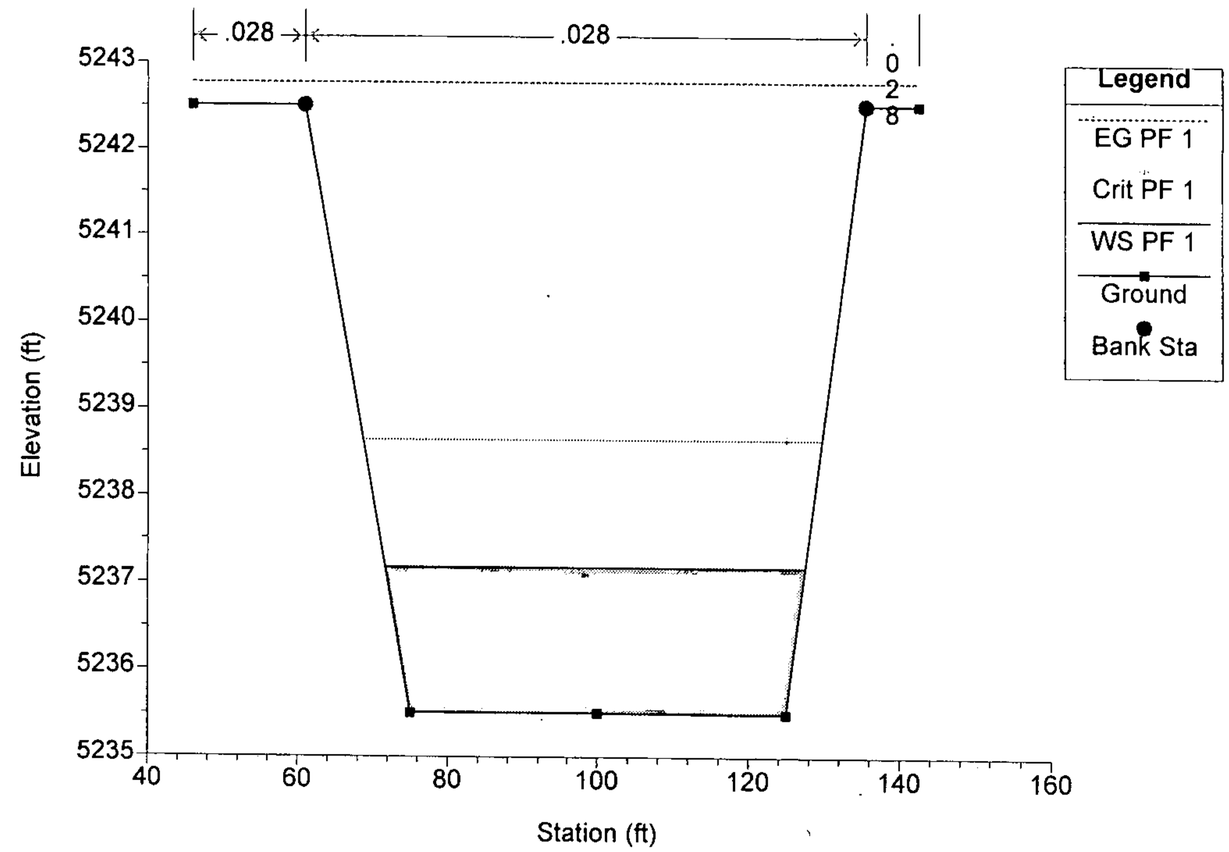
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 12 14+56



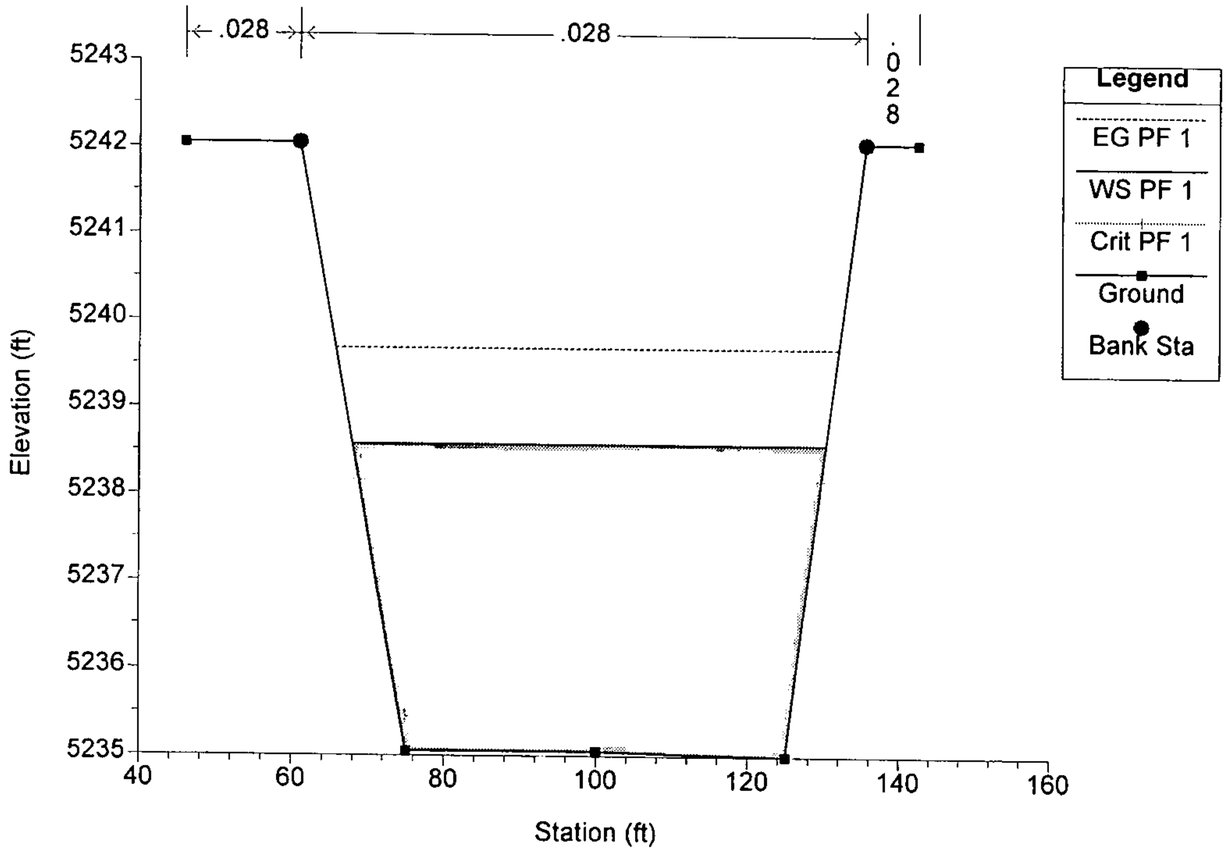
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 11 14+50



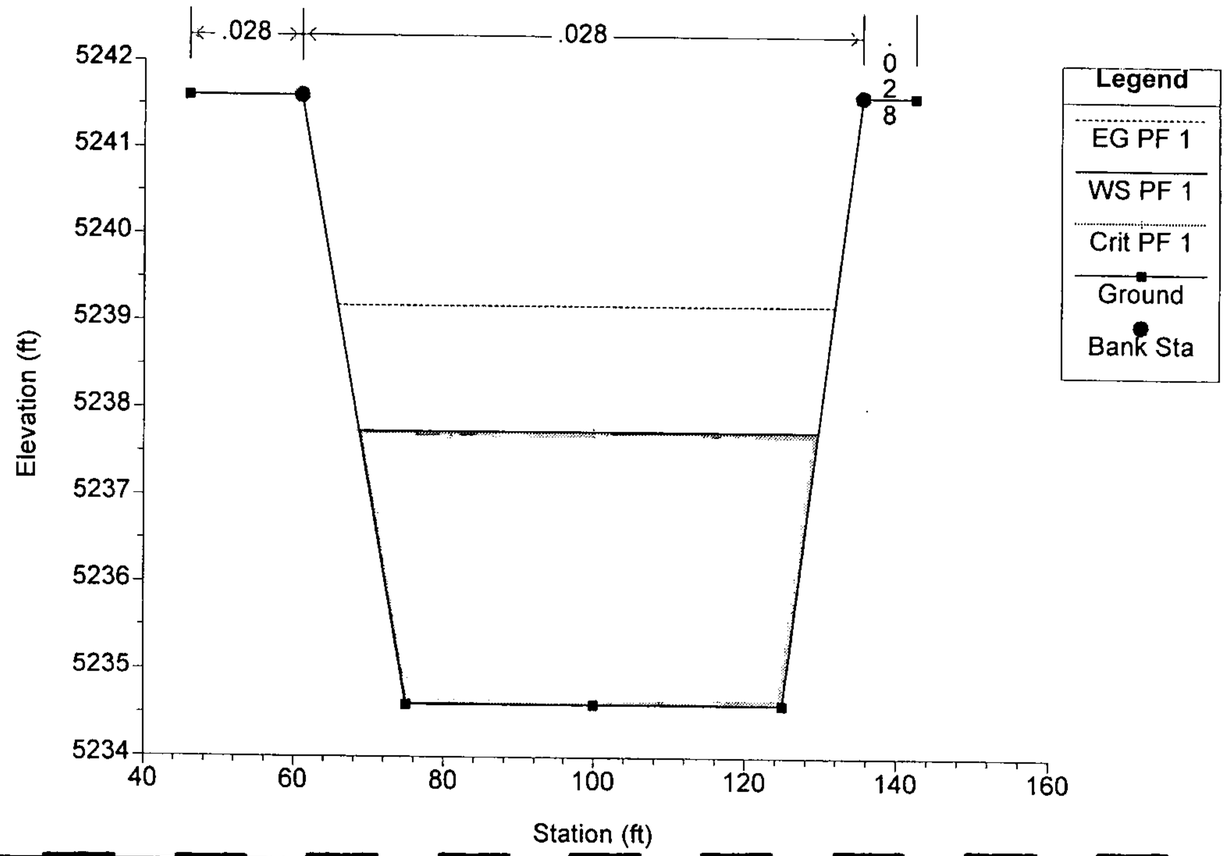
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 10 13+19



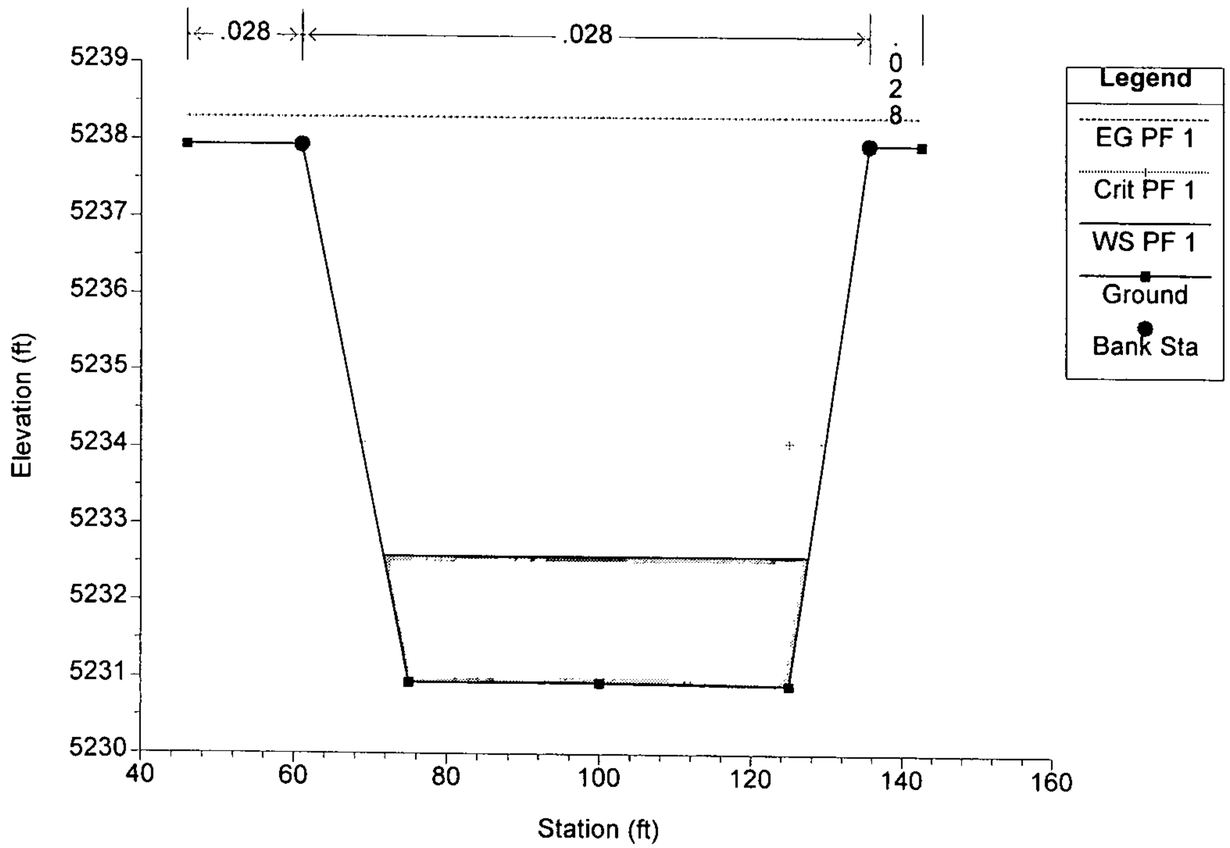
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 9 12+48



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 8 12+24



THE CROSSING UNIT 3 Plan: Imported Plan 01

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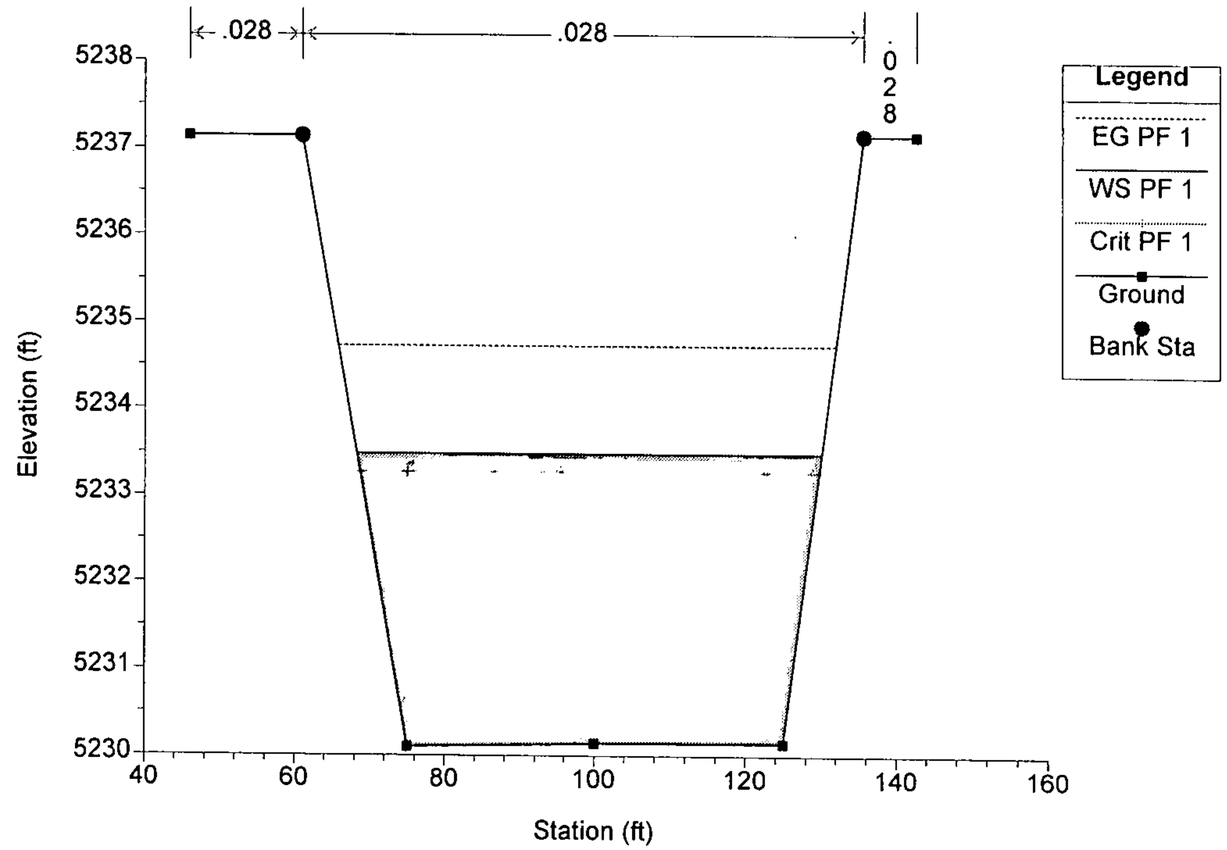

THE CROSSING UNIT 3 Plan: Imported Plan 01

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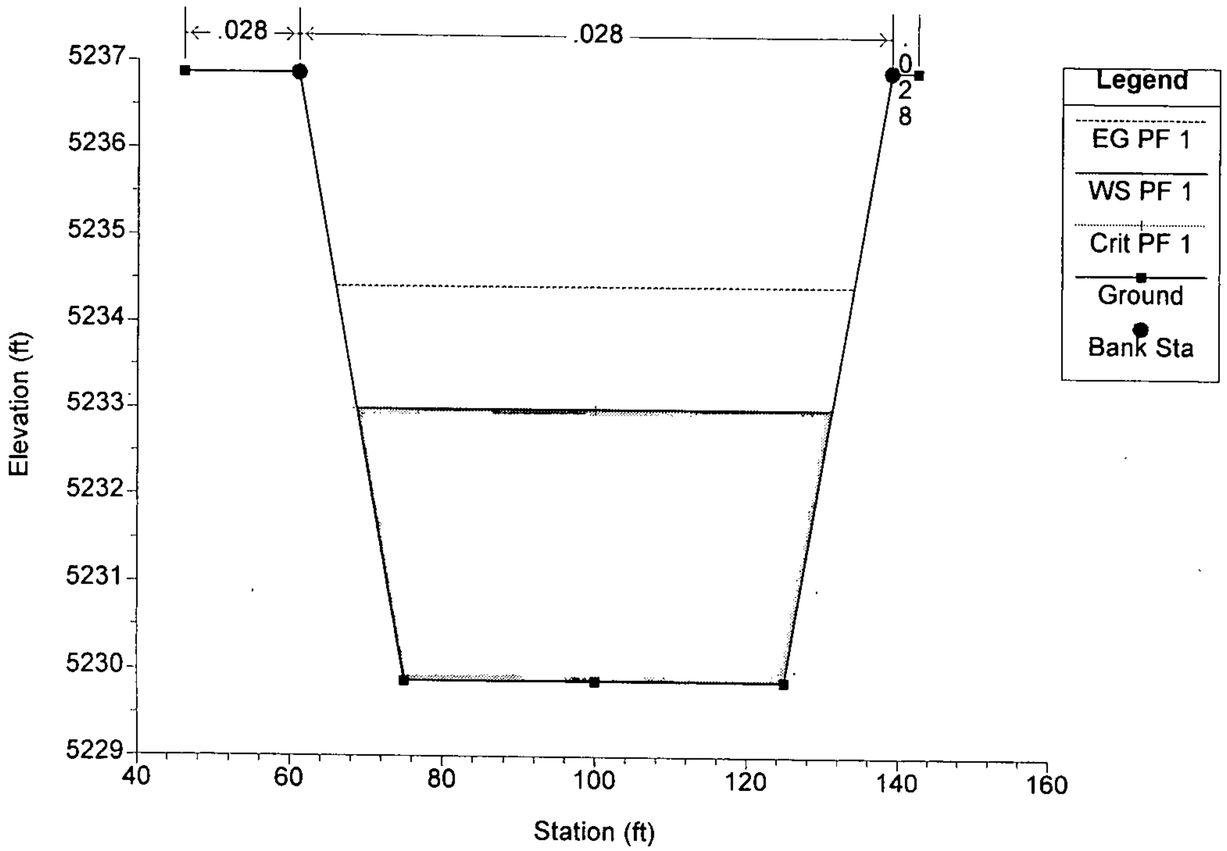
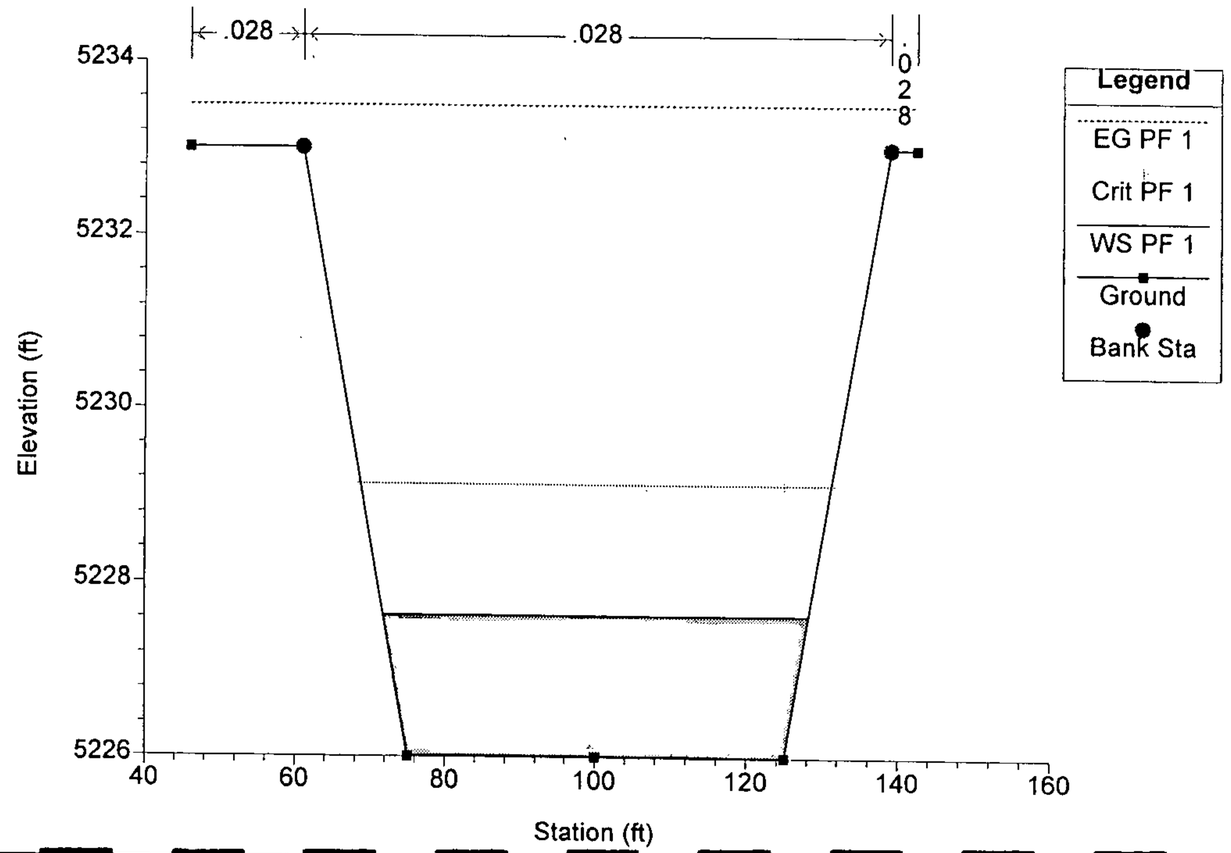


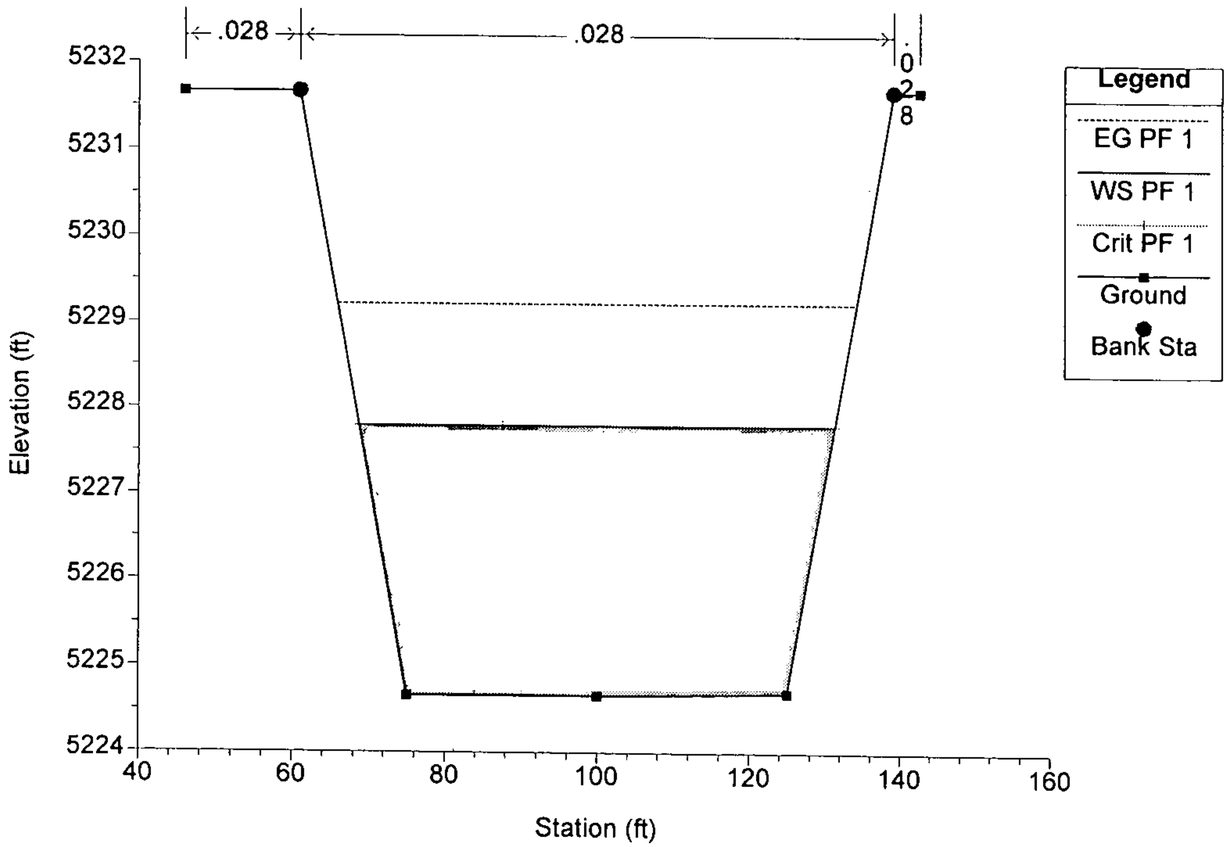
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 5 9+70



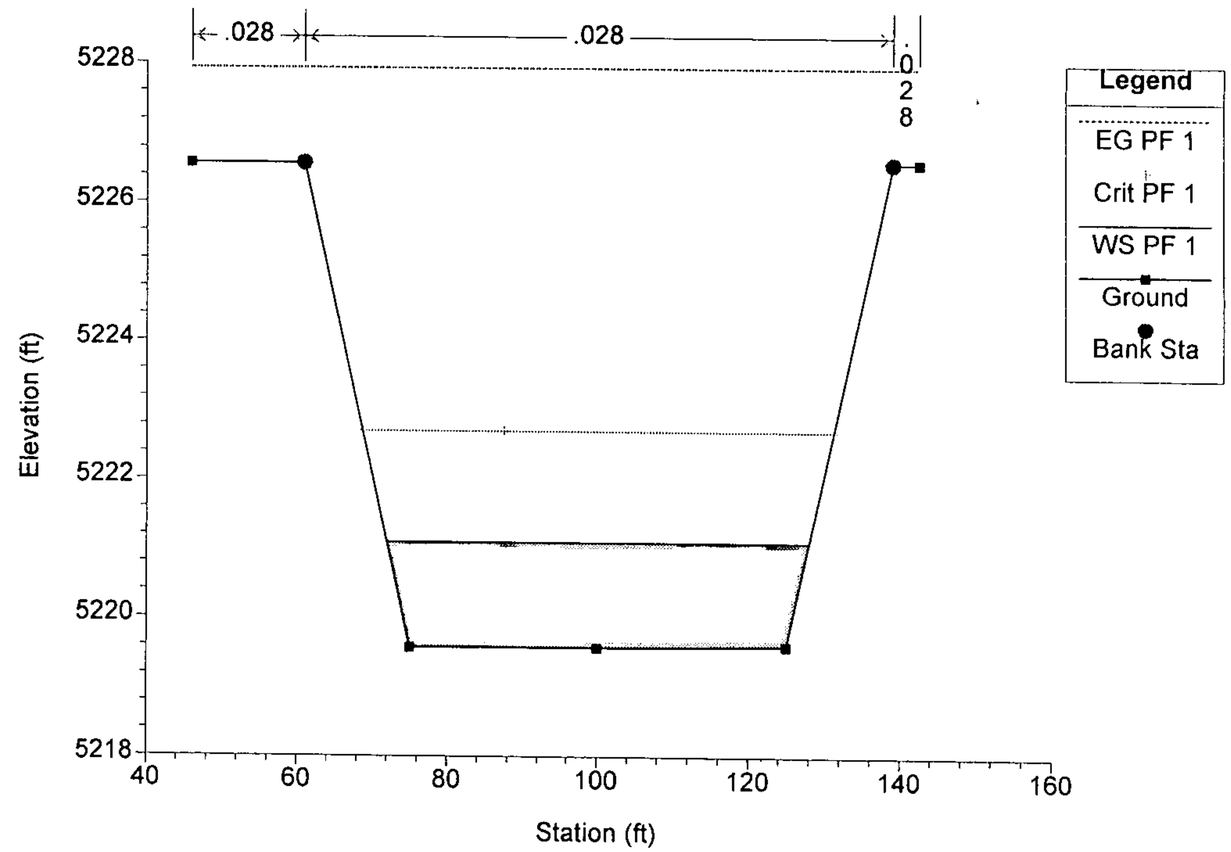
THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 4 6+34



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 3 6+01



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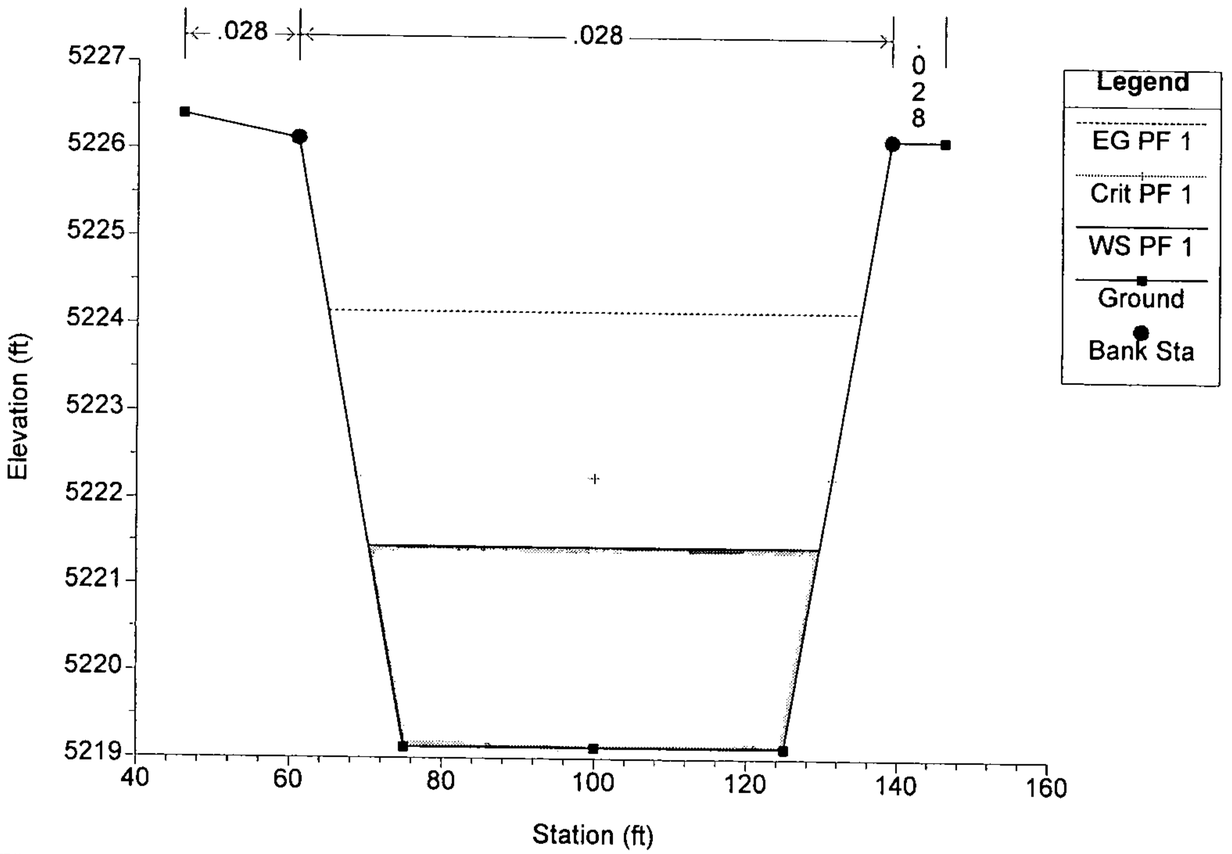
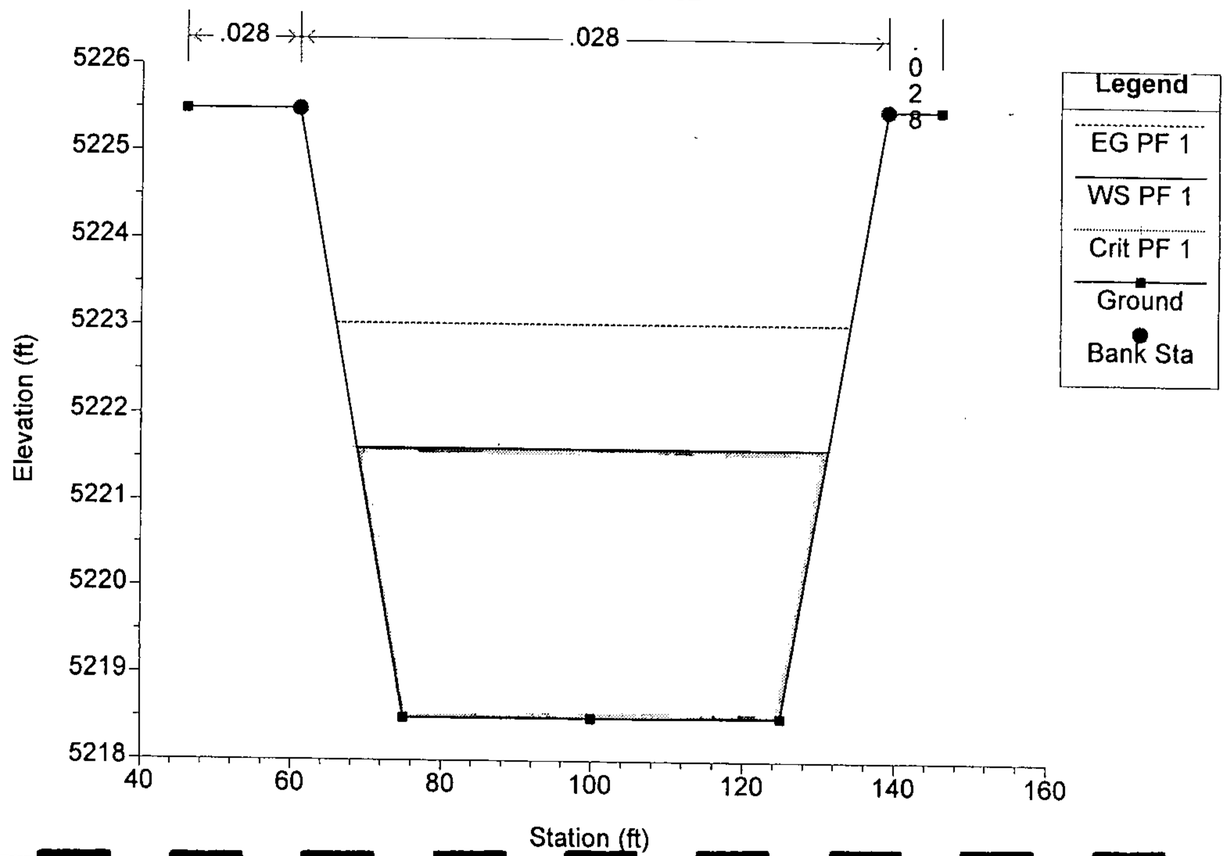
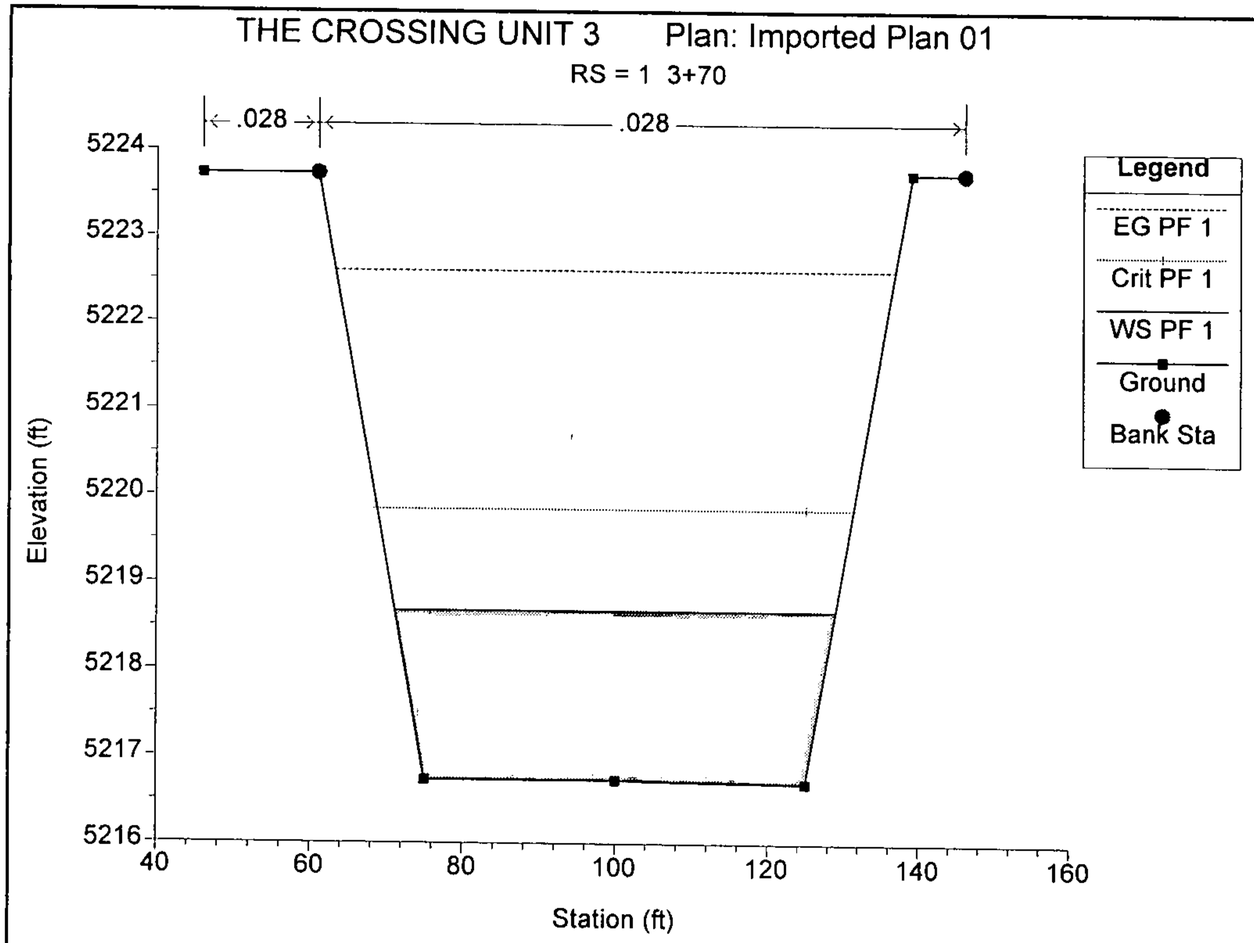
RS = 2.5 5+40.28



THE CROSSING UNIT 3 Plan: Imported Plan 01

RS = 2 3+82




THE CROSSING UNIT 3 Plan: Imported Plan 01
RS = 1 3+70
.028
.028
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
5224
5223
5222
5221
5220
5219
5218
5217
5216
40
60
80
100
120
140
160
Station (ft)

4/5/96

PRINCIPALS

LARRY W. HUSTON, C.P.
MICHIAL M. EMERY, P.E.
BRIAN G. BURNETT, P.E.
KERRY L. DAVIS, P.E.
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BOHANNAN-HUSTON INC.

COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

April 4, 1996

Mr. Fred Aguirre
Hydrology Division
Public Works Department
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Re: Drainage Report for The Crossing Units, 1 and 2 (DRB# 95-537)

Dear Fred:

The purpose of this letter is to transmit to you the Drainage Report for Units 1 and 2 of The Crossing. The Crossing is a residential subdivision located near the northwest corner of Ladera Drive and Unser Boulevard. This drainage report is submitted to support Preliminary Plat and Rough Grading approvals. A Bulk Land Plat, and a Preliminary Plat have been submitted to the D.R.B. in association with this development.

Units 1 and 2 of The Crossing Subdivision consist of 128 Single-Family Homes on approximately 29.5 acres. The site is bounded on the east by the Mirehaven Arroyo and the Ladera Drainage System lies just south of the site. The attached report proposes to freely discharge storm water runoff from the subdivision to the Ladera Drainage System Ponds 10, 11 and 12, and to the Mirehaven Arroyo. The majority of the runoff from the subdivision will be conveyed in the streets, with the balance to be carried in underground storm drains. The report also proposes to intercept upstream runoff through the use of 2 temporary diversion swales. If I can provide any further information or answer any questions regarding the enclosed drainage report, please call.

Sincerely,

Bruce Stidworthy

Bruce Stidworthy, E.I.
Community Development and Planning Group

BJS/kc
Enclosures

cc: Leroy Chavez, Westland Development Co. Inc.
Fred Ambrogi, Westland Development Co. Inc.
James Topmiller, Bohannan-Huston Inc.

APR - 5 1996.

F:\CDP\95335\A2417\AGUIRRE.LTR-4/4/96

DRAINAGE INFORMATION SHEET

4/5/96

PROJECT TITLE: THE CROSSING UNITS 1&2 ZONE ATLAS/DRNG. FILE # H-9 / D17

DRB #: 95-347 EPC #: _____ WORK ORDER #: _____

LEGAL DESCRIPTION: Plat of THE CROSSING, Abq. NM, UNITS 1&2

CITY ADDRESS: NEAR THE NW CORNER OF UNSER BLVD & LADERA DR.

ENGINEERING FIRM: BOHANNAN HUSTON, INC. CONTACT: BRUCE STIDWORTHY

ADDRESS: 7500 JEFFERSON NE, ALB. NM 87109 PHONE: 823-1000

OWNER: WESTLAND DEVELOPMENT CO. INC CONTACT: LEROY

ADDRESS: 401 COORS BLVD NW Abq. 87121 PHONE: 831-9600

ARCHITECT: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

SURVEYOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

CONTRACTOR: _____ CONTACT: _____

ADDRESS: _____ PHONE: _____

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 (ROUGH)

___ PAVING PERMIT APPROVAL

___ S.A.D. DRAINAGE REPORT

___ DRAINAGE REQUIREMENTS

___ OTHER _____ (SPECIFY)

APR - 5 1996

DATE SUBMITTED: _____

BY: _____

DEVELOPMENT & BUILDING SERVICE CENTER
ONE STOP SHOP
600 SECOND ST. N.W.

ATTENTION: _____

505-924-3900

Records Withdrawal Form

Project No. H9/D1A7 **Date:** 8/10/06

Project Title: The Crossings Units 1 & 2

a. File b. Mylars c. Redlines/Comments
(d.) Other Report

Requested by: Shahab / Advanced Eng. **Phone No.:** 899-5570
Name and Company

Comments:

_____

_____

_____

Anticipated Return Date: 8/17/06

I hereby accept full responsibility for the security of the above noted records/plans until return receipt acknowledgement is completed. Records/plans will be returned to the Development and Building Services Center on or before the indicted anticipated return date.

Delivery Picked Up By:

Name: _____ **Organization:** Academy Repro
Print

Signed: [signature] **Date:** 08-11-06
Academy Repro

Office Use Only

Return Acknowledged:

Received By: Sandy Handley **Date:** 08/14/06
Print

PO Box 1293

Albuquerque

NM 87103

RESOLUTION/COMMENTS:

www.cabq.gov

the public storm drain will be required at Building Permit.

A permanent cross-lot drainage easement is required for Tract 2 to drain across Tract 1 and a 20 foot public storm drain easement is required to drain Tract 4 across Tract 3.

SIGNED:
Curtis Cherne
Hydrology Section
City Engineer Designee
AMAFCA Designee
924-3968

DATE: 11-30-11

1. X43863 [illegible] 567-9532

Donna Swanson
issue at home
home is settling
westland → suncal

H091000147

Leak detection squad
Lot 17-P1 of the crossing - unit 1A
BHI James Topmiller 823-1000

12-20-11
Home owner called - home is settling
A Tri Bowers told her there is a sub surface flow
and she should build 15' piers

10/22/96

BOHANNAN - HUSTON INC.

H9/D1A7

REVISED
DRAINAGE REPORT FOR
THE CROSSING,
UNITS 1 & 2
(INCLUDING ADDENDUM #1)

OCTOBER 1996

REVISED DRAINAGE REPORT FOR THE CROSSING, UNITS 1 & 2 (INCLUDING ADDENDUM #1)

Prepared for:

WESTLAND DEVELOPMENT CO. INC.
401 Coors Blvd. NW
Albuquerque, NM 87121

Job. No. 95335A2417

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
COURTYARD I, 7500 JEFFERSON NE, ALBUQUERQUE, NM 87109 TEL (505) 823-1000 FAX (505) 821-0892
ALBUQUERQUE LAS CRUCES SANTA FE

REVISED
DRAINAGE REPORT
FOR
THE CROSSING, UNITS I & II
(INCLUDING ADDENDUM #1)

OCTOBER 1996

Prepared by:

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET N.E.
ALBUQUERQUE, NM 87109

Prepared for:

WESTLAND DEVELOPMENT CO., INC.
401 COORS BLVD. NW
ALBUQUERQUE, NM 87121

PREPARED BY:

Bruce Stidworthy 10/22/96

Bruce Stidworthy, E.I. Date

UNDER THE SUPERVISION OF:

James R. Topmiller

James Topmiller, P.E. Date 10/22/96

JAMES R. TOPMILLER
NEW MEXICO
9354
REGISTERED PROFESSIONAL ENGINEER

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

E:\CDP\95335\A2417\DrainRpt-10/21/96

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PLATES

GRADING AND DRAINAGE PLAN (1"=100' scale, shows Units I & II)

GRADING AND DRAINAGE PLAN (1"=50' scale, separate sheets showing Units I & II)

EXISTING CONDITIONS BASIN MAP

PROPOSED CONDITIONS BASIN MAP

FULLY DEVELOPED CONDITIONS BASIN MAP

PROPOSED BULK LAND PLAT

I

ADDENDUM #1 TEXT

This document has been prepared in order to comprehensively discuss several topics which were not covered in the original report. An additional appendix entitled "Offsite/AMAFCA Issues" has also been added to the report. If the Addendum #1 text conflicts with the original text of the report, the addendum text controls. Please note that all of the plates contained in this revised report are the most current documents.

A. PLATTING ISSUES AND EASEMENTS

In association with the development of The Crossing Subdivision, Units 1 & 2, a bulk land plat was created and filed (on July 9, 1996 in Vol. 96C and Folio 302). This plat created Units 1 and 2, and Tracts A, B, C, D, E, H, and J. An explanation of each of those tracts, as well as some of the critical easements follows.

The Tracts shown on the new bulk land plat are summarized as follows: Tract A consists of approximately 35.3 acres, and has a temporary blanket drainage easement for the benefit of AMAFCA. Tract B consists of 50.0 acres, and has a municipal lien (held by the City of Albuquerque) on it for the purpose of insuring that the Mirehaven Arroyo is lined in the future. Tract C consists of approximately 10.3 acres, and contains the existing AMAFCA Dam 11 (Dams 10, 11 and 12, mentioned throughout this document are part of the Ladera Drainage System which is owned and maintained by AMAFCA). Tract C has a temporary blanket drainage easement for the benefit of AMAFCA. North of the northern boundary of Tract C, an additional easement on Tract E has been granted over the existing 15' maintenance road around the north edge of Dam 11. Tract D, consisting of 5.11 acres, is slated for future development as a park. Tract E, consisting of 13.1 acres, is slated for future residential development. Tract H consists of 29.5 acres, and contains the existing AMAFCA Dam 12. Tract H also has a temporary blanket drainage easement for the benefit of AMAFCA. Tract J consists of 5.2 acres, and is slated for future residential development. Units 1 and 2 consist of approximately 29.5 acres combined. A 126-home residential subdivision for Units 1 & 2 has been designed and is in the approval process.

There are several easements which are of hydraulic and hydrologic importance. The first is the "Temporary Drainage Easement Granted to AMAFCA" in the Mirehaven Arroyo (granted with the bulk land plat). The boundaries of this easement were determined based on the existing FEMA flood plain and on the prudent line determined by Avid Engineering. The bulk land plat clearly shows which portions of the easement boundary are based on the flood plain and which are based on the prudent line.

The second and third easements of hydraulic importance are the drainage easements granted to the City of Albuquerque over the north and west diversion swales. The second easement also contains the avulsion control berm discussed below. Maintenance of both the north diversion swale and the west diversion swale (and desiltation pond) is the responsibility of Westland Development Company Inc. This is legally established with two separate "covenant and easement" agreements between Westland Development Company Inc. and the City of Albuquerque.

B. THE "AVULSION CONTROL" BERM

The subject berm connects two high points near the northeast corner of Unit 2 and was requested by AMAFCA. The most critical factor in the design of the berm is the 100-year storm flowrate for the arroyo. This flow has been determined by several reports. The most current and most comprehensive report is the *West I-40 Diversion Drainage Management Plan (I-40 DMP).* That report calculated a flow of 1316cfs, under existing conditions. The Hydrology and Hydraulics portion of that report was submitted to AMAFCA for review and comment on June 6, 1996. To date, no comments have been received. This flowrate is substantially less than the flowrate (~2600 cfs) reported by the *Drainage Report for Westland Phase 1 Subdivision* (which is included in its entirety in Appendix A of this report). The flowrate of 2600 cfs comes from the hydrologic model developed for the *Ladera Dam #15 Drainage Report.* That report utilized USGS quad map topography, which resulted in a larger drainage area upstream of existing AMAFCA dams 9-12 than the current, more accurate mapping indicates. A third report which calculated the flowrate in the Mirehaven Arroyo for the 100-year storm is the *Las*

Lomitas Unit IIB Mirehaven Arroyo Scourwall Analysis and Design (Avid Engineering - Oct. 1994). That report computed a flow of 1677 cfs.

Because 1677 cfs is conservative compared to the 1316 cfs computed by the I-40 DMP, it was used in the berm analysis included in Appendix D of this report. That analysis takes 4 cross sections through the arroyo and berm and analyzes the depth and velocity for each section. It is clearly demonstrated that the 100-year storm safely passes in the Mirehaven Arroyo. An additional safety factor for The Crossing Unit II Subdivision is that the arroyo changes direction in the vicinity of the berm, and the berm is on the inside of the curve. This factor was not considered in the enclosed calculations.

Maintenance of the berm will be by Westland Development Company Inc. This has been legally established by a "covenant and easement." A temporary drainage easement over the berm has also been granted to the City of Albuquerque by Westland. This easement has been reviewed and concurred with by AMAFCA.

C. AMAFCA DAM #12

Pages 14 - 17 of Appendix A contain a complete analysis of the required volume of Dam 12. Increased runoff from the development Phase I results in a required expansion of Dam 12 by 3 acre-feet. The construction plans for The Crossing Unit II show a grading detail calling for the removal of 3 acre-feet of soil from the Dam 12 Basin. This will be accomplished by expanding the limits of the basin, no lowering of the basin bottom will be required.

The Dam 12 volume analysis contained in Appendix A assumed that 1500 cfs would be diverted from the Ladera Drainage System to the West Bluff Outfall. A sensitivity analysis relating the amount of flow diverted from the Ladera Drainage System to the Required Storage Volume of Dam #12 has been performed. Three scenarios were analyzed. For each scenario varying flow rates to be diverted from the Ladera System at Dam #12 to the proposed I-40 Diversion Channel were considered.

Diversions of 500, 1000, and 1500 cfs were studied. The resulting impacts on the required dam storage volume for the 100-year storm for fully developed conditions were determined. A summary of these findings is provided in a table found in Appendix D of this report.

Based on this analysis, the expansion for Dam #12 as outlined in Appendix A is sufficient (within Tracts A and H on the bulk land plat). However, depending on the magnitude of the diverted flow rate, modifications to the emergency spillway may be required. If only 500 cfs are diverted to the I-40 Diversion Channel, then the dam spillway crest must be raised 1.2'. Similarly, if 1000 cfs are diverted, the spillway crest must be raised 0.7'. Finally, if the full 1,500 cfs recommended in the *Ladera Dam #15 Drainage Report* are diverted, no increase in the spillway height is required. Diversion of flows was modeled in the same manner as in the *Ladera Dam #15 Drainage Report.*

These possible increases in the emergency spillway crest elevation do not necessarily translate directly to an equivalent increase in the top of dam elevation. With adjustments to the spillway elevation, the length of the spillway can also be increased, potentially eliminating the need to raise the height of the dam. The present top of dam elevation is 5217'.

D. MISCELLANEOUS OUTFALL STRUCTURES

Several outfall structures will be constructed in conjunction with the development of The Crossing Units I & II. These outfalls convey developed flows from the subdivision and undeveloped flows from upstream and downstream of the subdivision to the Mirehaven Arroyo and to the Ladera Drainage System.

The first outfall structure is a soil cement plunge pool which conveys flows from the north diversion swale to Pond #10 in the Ladera Drainage System. This plunge pool design was based on FWHA HEC 14 (*Hydraulic Design of Energy Dissipaters for Culverts and Channels*). The 100-year storm flow for the plunge pool is 178 cfs; however, the plunge pool was designed for 300 cfs. This approach was taken so that

the plunge pool would be capable of accepting developed flows. The earthen channel which will convey undeveloped flows from upstream of Units I & II is temporary. When development occurs upstream of Units I & II, a permanent facility (underground RCP or lined channel) will have to be constructed to carry those developed flows to Pond 10. If the developed flows are less than 300 cfs, the soil cement plunge pool constructed with Unit I will be suitable (minor modifications may be required if the RCP is chosen to carry developed flows). If the developed flows are greater than 300 cfs, modifications to the plunge pool will most likely be required. Design calculations and details of the plunge pool may be found in Appendix D.

The second type of outfall structure is an impact basin. Two impact basins will be utilized. The first impact basin will accept flows from Casa Verde Avenue and discharge to the Dam 11 basin. These flows are generated primarily in Unit 1. The second impact basin will accept flows from Gunnison Place and discharge to the Dam 12 basin. These flows are generated primarily in Unit 2. As the design calculations and figures in Appendix D indicate, these two impact basins are of identical dimensions. The impact basins were designed in accordance with *Design of Small Canal Structures*, (Bureau of Reclamation) Chapter 6, Part C.

The third type of outfall structure is a soil cement rundown. Soil cement rundowns are being utilized at the east ends of Clark's Fork Place, and at the east end of Platte Court. These rundowns convey flows from the subdivision to the Mirehaven Arroyo. The rundowns were designed to carry the 100-year storm flow in a non-erosive manner to the arroyo. The rip-rap at the end of the rundowns was designed in accordance with the *Urban Storm Drainage Criteria Manual, Vol. 2.* (Wright-McLaughlin Engineers, 1969, Section 5.6.2). These rundowns were originally proposed to be asphalt, they were changed to soil cement at the request of AMAFCA, and new details can be found in Appendix D.

E. MIREHAVEN ARROYO UTILITY CROSSINGS

Two public utility lines cross the Mirehaven Arroyo at separate locations. The first crossing is the 20" ductile iron waterline. The second crossing is a 10" PVC sanitary sewer line (encased in concrete). The "Heggen's method" scour analysis for these crossings is contained in Appendix D. AMAFCA crossing licenses have already been issued for both crossings.

ORIGINAL REPORT TEXT

I. PURPOSE

The purpose of this report is to present existing, proposed and fully developed drainage conditions for the proposed residential development, to be called The *Crossing*. This plan is prepared and submitted to support rough grading, and preliminary plat approvals.

II. METHODOLOGIES

Site conditions are analyzed for a 10-year and 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM) Volume 2, Design Criteria, Section 22.2, Hydrology, for the City of Albuquerque, January 1993.

Part A of the DPM, Section 22.2, Hydrology, January 1993, provides a simplified procedure for projects with sub-basins smaller than 40 acres. The Site as described in the 'Site Location and Characteristics' section below is somewhat less than 40 acres.

For clarity, the following basic terms used in this report are defined below:

"The site" means Units 1 & 2 of the Plat of The Crossing.

"Existing conditions" means the watershed is in its current condition, prior to any proposed or upland development.

"Proposed conditions" means the upland region is under existing conditions, and Units 1 & 2, including the Casa Verde and Gunnison connections to Ladera, are developed.

"Fully developed conditions" refers to ultimate developed conditions, with Units 1 & 2 and surrounding areas developed, and full upland development per the *Westland Sector Development Plan.*

III. SITE LOCATION AND CHARACTERISTICS

Please refer to the vicinity map on the grading and drainage plan enclosed with this report.

Units 1 & 2 contain approximately 29.5 acres and are located on the west side of Albuquerque, north of I-40 and west of Unser Boulevard, within Zone Atlas page H-9. The Proposed Legal Description of the Site is Units 1 & 2, Plat of The Crossing, Albuquerque, New Mexico. The project is bounded on the east by the Mirehaven Channel drainage easement and the Las Lomitas Subdivision, and on the south by 60' and 200' electric easements. An AMAFCA drainage easement containing Ladera Dams #10, #11, and #12 is located south of the electric easements. The north and west limits of Units 1 & 2 are set by the upper water pressure boundary for Zone 2W. Undeveloped land lies to the north and west of Units 1 & 2.

The property is currently undeveloped, and slopes from northwest to southeast. Soils on the site are very sandy. According to the latest FEMA floodplain maps, there are no existing floodplains within the site boundaries. The closest FEMA floodplain is the unlined Mirehaven Arroyo, immediately east of the site. A second FEMA floodplain, the Ladera Drainage System, is located just south of the site.

IV. PREVIOUS DRAINAGE STUDIES

Several drainage studies for the area have been published in recent years. The following studies have been researched and information incorporated into this report.

The *Westland Sector Development Plan Appendix D - Drainage* (WSDP) by Bohannan-Huston Inc. (BHI) in June 1995 serves as the basis for the offsite drainage analysis. The WSDP provides a conceptual plan for development of the area.

The *Drainage Report for Westland Phase I Subdivision (Draft)* - by BHI in November 1995. Phase 1 encompasses the area shown on the Bulk Land Plat of *The Crossing,* Units 1, 2, 3, & 4, and Tracts A, B, C, D, E, F, G, H, & J. This report used AHYMO to model the flows upstream of, and within Phase 1. The flows entering the temporary diversion swales north and west of Units 1 & 2 were taken from this report.

V. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

Please refer to the existing conditions basin map enclosed with this report.

The existing site drains via sheet flow, and shallow concentrated flows (small existing natural arroyos) to the existing Mirehaven Arroyo to the east, and the Ladera Drainage System to the south. Upstream offsite flows are also conveyed through the site by sheet flow and shallow concentrated flows.

VI. PROPOSED HYDRAULIC AND HYDROLOGIC CONDITIONS

Please refer to the Grading and Drainage Plan and the Proposed Conditions Basin Map enclosed with this report.

With the development of Units 1 & 2, two temporary diversion swales will be constructed to divert upstream undeveloped flows safely around the proposed development. The first swale diverts 178 cfs from a large undeveloped offsite basin to the west of the site. The swale carries the flow to The Ladera Drainage System Pond #10. The second diversion swale intercepts 23 cfs from a small undeveloped offsite basin between the north boundary of the site and the Mirehaven Arroyo. The swale then carries the flows to the east into the Mirehaven Arroyo. The flowrates and contributing basins for both diversion swales were determined in the *Drainage Report*

for Westland Phase I Subdivision (Draft). That report is included in Appendix A. AHYMO output can also be found in Appendix A of this report. The exact dimensions, flow velocities and other specific data for each swale can be found in Appendix B.

The flows generated within Units 1 & 2 will exit the site at four distinct points. The first discharge point is at the east end of Casa Verde Avenue. These flows (21.5 cfs @ AP 10) are generated from onsite basins 10, 13, and 14, and undeveloped offsite basin 06. These flows are discharged to the Mirehaven Arroyo via an asphalt rundown (see grading and drainage plan in Appendix B). Because future development is planned for Tract A (the portion between Unit 2 and the Mirehaven Arroyo), the asphalt rundown will be sized for proposed flows only. When Tract A is developed, a storm drain, sized for fully developed flows, will be constructed and will discharge to the concrete lined Mirehaven Arroyo. The Mirehaven Arroyo will be lined prior to developing the above mentioned portion of Tract A.

The second discharge point is at the east end of Platte Court. These flows (30.1 cfs @ AP 12) are generated from onsite basins 11, 12, 15 & 16, as well as a portion of the flow (2.5 cfs @ AP 7) in Gunnison Place at the intersection with Platte Court. Flows from Platte Court are discharged to the Mirehaven Arroyo in the same manner as those from Casa Verde Avenue.

A third point of discharge from the developed site is Casa Verde Avenue along the south boundary of the site. These flows (42.1 cfs @ AP 3) are generated in onsite basins 1, 2, 3, 4 & 5, and offsite basins 03, 04, and 07. Casa Verde carries the flow to a series of inlets located adjacent to the west side of the Ladera Drainage System Pond # 11. These flows then enter the inlets and are transported via underground storm drain to Pond #11. The inlets and storm drain described in this paragraph are sized for fully developed flows.

The last discharge point is Gunnison Place at the south boundary of the site. This discharge (24.4 cfs @ AP 8) comes from onsite basins 6, 7, 8, and 9, and offsite

basin 05. Flows from offsite basin 05 enter Gunnison Place through a small desiltation pond (Desiltation Basin #2, see Appendix B.) This basin will provide some mitigative effect, however, the hydrologic benefit provided by the pond has not been considered. These flows are carried in Gunnison Place to a series of inlets, and ultimately to Pond #12 through an underground storm drain system. (Please see Appendix B for inlet and storm drain calculations.) A small residual flow will pass the inlets and will be conveyed in a small existing swale to Pond #12. The line connecting the above inlets to The Ladera Drainage System Pond #12 has been sized to accept flows from developed offsite basin D13 (please see Fully Developed Conditions Plan).

Because the fully developed flows are greater, detailed calculations verifying the capacity of each element of the storm drain systems described above have not been performed for the proposed condition. These calculations have been performed using the fully developed flows, and are included in Appendix C.

VII. FULLY DEVELOPED HYDRAULIC AND HYDROLOGIC CONDITIONS

Please refer to the Fully Developed Conditions Basin Map enclosed with this report.

Under fully developed conditions, flows exit Units 1 & 2 through the same four streets as under proposed conditions. However, larger flows enter the site from upstream offsite basins. These flows enter the site in Arkansas, Gunnison, and Sellway. Under fully developed conditions, the construction of 98th Street will cut off flows upstream of that point. Calculations verifying the capacity of the internal streets as well as the downstream storm drain system have been provided in Appendix C.

VIII. CONCLUSION

This report has presented a comprehensive drainage management plan for the proposed residential subdivision. The plan provides safe and adequate drainage protection for the proposed development. It is recommended that this plan be approved as presented.

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DRAINAGE REPORT FOR WESTLAND PHASE 1 SUBDIVISION

APPENDIX B
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APPENDIX D
OFFSITE/AMAFCA ISSUES

APPENDIX A

DRAINAGE REPORT FOR WESTLAND PHASE 1 SUBDIVISION

Drainage Report
for
Westland Phase I Subdivision

November 1995

DRAFT

DRAINAGE REPORT FOR WESTLAND PHASE I SUBDIVISION

Prepared for:

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CALCULATIONS TO DETERMINE TREATMENT TYPE PERCENTAGES
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AHYMO SUMMARY TABLES PRINTOUT
- EXISTING PLUS PHASE I
- DEVELOPED

I. INTRODUCTION

Phase I is located in the Ladera Watershed on the west side of Albuquerque. The project is located north of Interstate 40 and west of Unser Boulevard, and is the first subdivision to be developed under the Westland Sector Development Plan.

Westland Development Company Inc. contracted with Bohannan-Huston Inc. (BHI) to provide hydrologic analysis of the Phase I region as well as the upland drainage basins impacting Phase I. The basis of this drainage analysis is:

- the development scenario of the Phase I lot layout plan by BHI, and
- the development scenario provided in the Conceptual Land Use Plan by Westland Development Co.

This study addresses Phase I development flows, as well as offsite flows coming from the watershed above Phase I.

A. Purpose & Scope

This report contains the drainage analysis and recommendations for the Westland Phase I Subdivision on the west side of Albuquerque, New Mexico.

This report is intended to:

- Develop drainage options for upland offsite flows from the west and north.
- Evaluate drainage under existing and developed conditions.
- Evaluate Ladera Dams #10, #11, and #12 for their capacity to accommodate flows for:

- existing conditions plus Phase I, and
- fully developed conditions.

- Provide a conceptual plan for drainage for future development immediately upstream of the Phase I Subdivision to the future 98th Street, considering fully developed watershed conditions.

B. Property Description

Phase I contains approximately 70 acres and is located on the west side of Albuquerque, north of I-40 and west of Unser Boulevard. The project is bounded on the east by the Mirehaven Channel drainage easement and the Las Lomitas Subdivision, and on the south by the AMAFCA drainage easement containing Ladera Dams #10, #11, and #12. The north and west limits of Phase I are set by the upper water pressure boundary for Zone 2W. Undeveloped land lies to the north and west of Phase I (see Location Map, Figure 1).

There are power line easements crossing the Phase I subdivision. A 60-foot wide electric easement and a 200-foot wide electric easement parallel to the Phase I southern boundary cross the subdivision in the southern portion of the site. The existing Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) easement is along the southern boundary of Phase I.

C. Phase I Conceptual Development

This report is based on the Alternate 2 conceptual layout for Phase I (see Conceptual Development Plan, Figure 2). Under this layout there will be approximately 250 lots within Phase I. Planned development of the area is primarily single-family residential homes, with 5.5 dwelling units (du's) per acre, and single-family, shared-wall patio homes. The existing AMAFCA easement and power line easements will remain as such throughout this development. Portions of these easements are proposed to be used for public parks and/or related facilities.

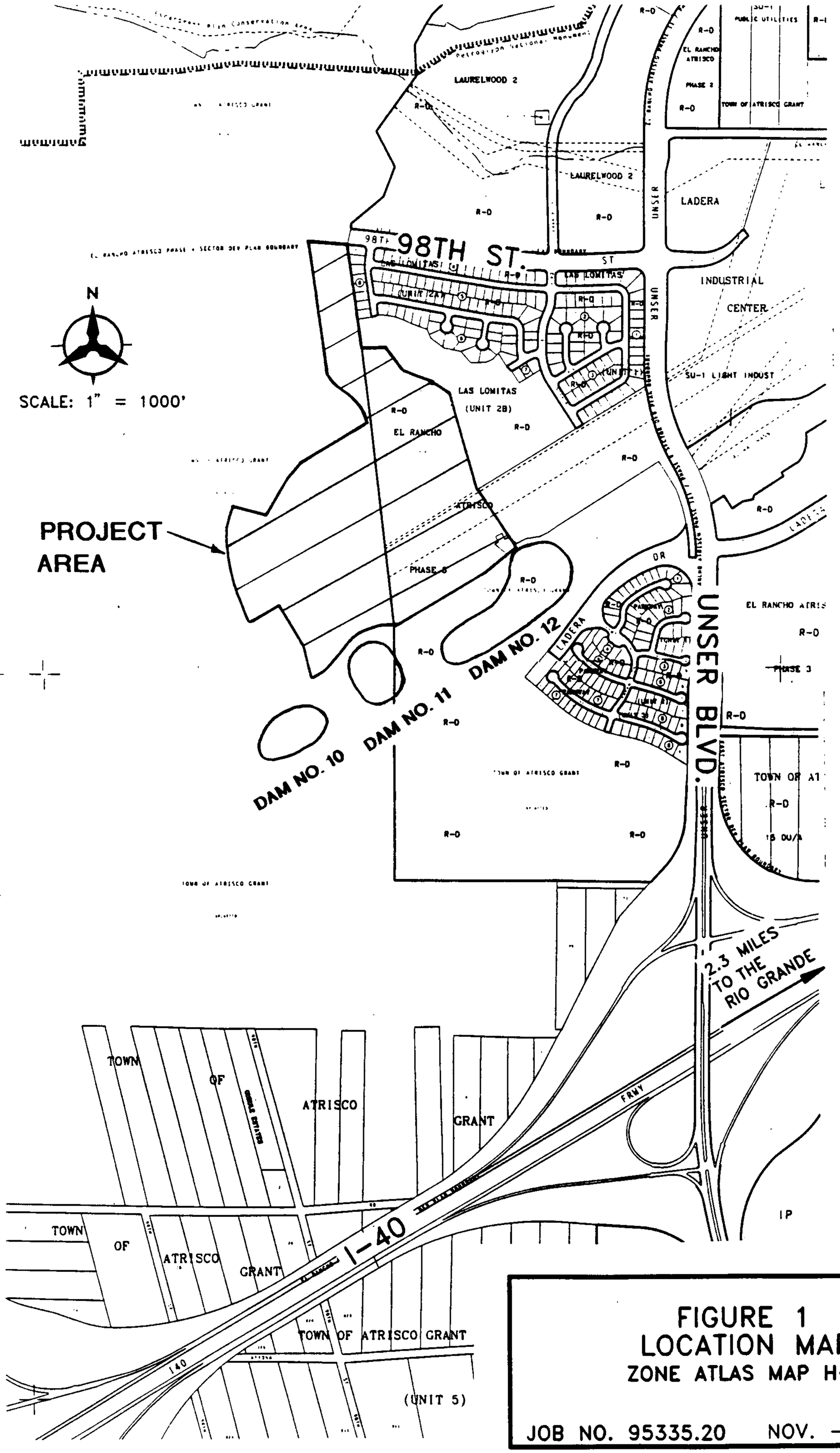

FIGURE 1
LOCATION MAP
ZONE ATLAS MAP H-9

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BOHANNAN HUSTON INC

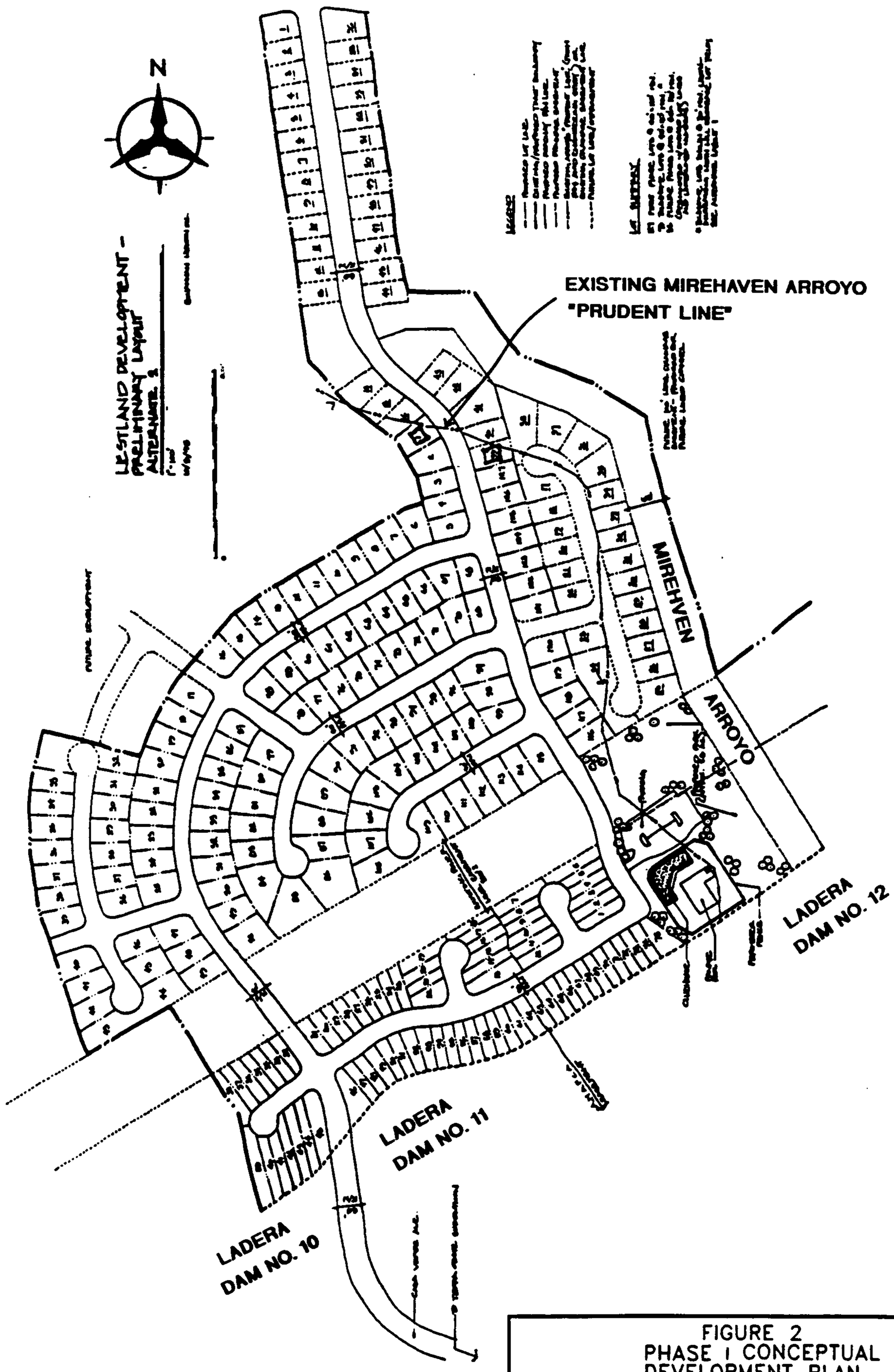

FIGURE 2
PHASE I CONCEPTUAL
DEVELOPMENT PLAN

WESTLAND PHASE I DRAINAGE REPORT

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II. EXISTING DRAINAGE FACILITIES

A. The Mirehaven Arroyo

The Mirehaven Arroyo traverses the east boundary of Phase I and outfalls to Dam #12 of the Ladera System. This arroyo has been shown to have measurable ability to migrate laterally. A prudent line study done in 1988 by Easterling & Associates, Inc. determined the setback for lots along the arroyo.

In 1993, the arroyo had begun to encroach on the prudent line and an additional study was needed. The study was completed by Avid Engineering Inc. in 1994 and resulted in the construction of a 738-foot long soil cement scour wall on the east bank of the arroyo to provide erosion protection for the Las Lomitas Subdivision. This is the only improvement made on the arroyo.

During the first stages of Phase I development (existing plus Phase I conditions), there will be minimum disturbance to Mirehaven Arroyo. Upon completion of Phase I (developed conditions), this segment of the arroyo may be concrete-lined, and the setback area may contain additional lots adjacent to the arroyo.

B. Ladera Dams

The Ladera System of Dam #0 through Dam #12 aligned in series attenuate flows from the upland regions of the watershed. Dams #11 and #12 of the Ladera System are located directly south of Phase I, and receive runoff from Phase I. Flows from the watershed above Phase I are conveyed by the Mirehaven Arroyo to Dam #12.

III. HYDROLOGIC ANALYSIS

A. Previous Drainage Studies

Several drainage studies for the area have been published in recent years. The following studies have been researched and information incorporated into this report.

Ladera Dam #15 Hydrology and Sediment Issues (hereinafter referred to as the Dam #15 report) by BHI in January 1993 analyzed the entire Ladera Dam System. The Dam #15 report provides information on the existing capacity of the system.

The *Westland Sector Development Plan Appendix D - Drainage* (WSDP) by Bohannan-Huston Inc. (BHI) in June 1995 serves as the basis for this drainage analysis. The WSDP provides a conceptual plan for development of the area. A map of the conceptual development plan for the WSDP is in the Appendix.

Ladera Watershed Detention Pond Alternatives (Draft) by BHI in July 1994 has not yet been approved. This document examines alternatives for drainage attenuation in the Ladera Watershed. The study proposes, in six options, various combinations of channel and dam improvements upstream and downstream of Phase I. The possibility of addressing capacity problems in the Ladera Watershed by diverting approximately 2,000 cfs to the West Bluff Outfall was investigated.

B. Hydrologic Model

A modified version of the AHYMO model from the WSDP was used for this report. Basins from the WSDP were subdivided at the proposed location of 98th Street. No attenuation of flows was assumed for this analysis, other than that provided by the Ladera Dams. Routing is identical to the WSDP, except the inclusion of improvements in the subdivided basins below 98th Street. Maps showing the basins for existing and developed conditions are included in the Appendix.

It is important to note the difference between the existing and developed conditions modeled in AHYMO for this report:

"*Existing conditions*" means the watershed is in its current condition, with no Phase I and no upland development.

"*Existing conditions plus Phase I*" means the upland region is under existing conditions, and Phase I is developed.

"*Developed conditions*" refers to ultimate developed conditions, with Phase I and upland full development per the WSDP.

C. Input Parameters Used in the Model

1. Basin Delineation

The original basins from the Westland Sector Development Plan (WSDP) study area were used for this report (see Overall Drainage Basin Map in the Appendix). Basin 7 and 10B were divided at 98th Street. Basin 10B, the basin in which Phase I is located, was further divided so that offsite and onsite flows could be analyzed. Basin division was delineated from 1 inch equal to 400 feet scale contour mapping. The Proposed Improvements maps in the Appendix depict basin mapping under Existing Plus Phase I Conditions, and Developed Conditions.

2. Precipitation

The rainfall from the Dam #15 report was used in this study because it implemented the areal reduction method for large watersheds required by the Albuquerque Development Process Manual (DPM). The 100-year, 24-hour storm was the input precipitation. Because of the variation in precipitation over the large study area, the rainfall is different

in the upper and lower reaches of the study area. (For the rainfall parameters used in the model, see the Appendix.)

3. Time of Concentration

The time of concentration was calculated for each basin based on the procedure from Section 22.2, Hydrology of the DPM. The time of concentration values for this study are the same as in the WSDP, except for the basins that were subdivided for this study (Basins 7 and 10B). Calculations for these basins are in the Appendix.

4. Land Use and Treatment Types

The treatment types used for this study are the same as those in the WSDP. However, because Basins 10B and 7 were subdivided, treatment types for those basins were recalculated for this study. These calculations are based on land usages shown on the Westland Sector Development Plan and their assigned treatment types. The calculations for these composite treatment percentages are in the Appendix.

5. Sediment

An extensive analysis of sediment was performed in the Dam #15 report. The following sediment bulking factors established by the Dam #15 report are used in this analysis:

- no development - 17%;
- full development - 5%;
- undeveloped areas above the escarpment - 0%.

The 80% sediment trapping efficiency of the Ladera System dams established by the Dam #15 report was also used in this analysis.

D. Existing and Developed Conditions Description

The AHYMO model from the WSDP is used for this report, with the above noted modifications. No attenuation of flows is assumed for this analysis, other than that provided by the Ladera Dams. Routing is identical to the WSDP, except in the basins that were subdivided for this analysis. A hydrologic modeling map showing the system of basins for existing and developed conditions is included in the Appendix.

The existing plus Phase I model consists of:

- Existing Ladera Dams #1 through #12.
- Existing undeveloped regions to the north and west of Phase I.
- Phase I subdivision developed up to the Mirehaven Arroyo prudent line.

The developed model consists of:

- Existing Ladera Dams #1 through #10.
- Enlarged Dam #12 (achieved by expanding the dam pool and embankment to the east and north).
- Fully developed regions to the north and west of Phase I.
- Fully developed Phase I subdivision.

As part of this report, Dams #10, #11, and #12 were analyzed for their detention capacity under existing and developed conditions. Dam #10 was excluded from the Dam #15 and WSDP analyses. It is included in this report, however, because upland offsite flows may be diverted to it under improvements proposed in this report.

IV. RESULTS

A. Flowrates

In most cases, the AHYMO developed conditions peak flowrates were over twice the existing plus Phase I conditions flowrates. Table 1 provides a listing of the flowrates at key analysis points in the study area. Key analysis points can be found on the Overall Drainage Basin Map in the Appendix, and Proposed Improvements maps, Exhibits 2A and 2B.

TABLE 1. KEY ANALYSIS POINTS

ANALYSIS POINT I.D.*	DESCRIPTION	EXISTING PLUS PHASE I		DEVELOPED	
		PEAK Q (cfs)	RUNOFF VOL. (ac-ft)	PEAK Q (cfs)	RUNOFF VOL. (ac-ft)
AP4	Ladera Training Dike	2441	221	6122	508
AP5	Mirehaven Arroyo at 98th St.	2558	239	6246	536
AP7	Mirehaven at North Boundary Phase I	2571	244	6294	550
AP9	Mirehaven at South Boundary Phase I	2606	254	6362	561
10B_E	Northwest Boundary Phase I	23	0.6	48	2
TO_DIV	West Boundary of Phase I at Proposed Diversion	178	8	497	21
TO_10	Total into Dam 10	203	54	529	156
TO_11	Total into Dam 11	58	50	124	127
COMB12	Total in Dam 12	2608	294	6367	659

*I.D.'s correspond to analysis points on the Overall Drainage Basin Map in the Appendix and the Proposed Improvements maps, Exhibits 2A and 2B.

The AHYMO output summary tables for existing and developed conditions are included in the Appendix.

B. Watershed Impacts - Existing Conditions

The following describes the impacts on the watershed for the 100-year storm under existing conditions. Under existing conditions, the total flow into Dam #12 is over 2,600 cfs. Dam #12, which receives flows from the Mirehaven Channel, will see flows over the emergency spillway in the 100-year existing conditions event, with no Phase I development. The dams upstream from Dam #12 are adequate for the existing conditions.

C. Watershed Impacts - Existing Plus Phase I Conditions

The following describes the impacts on the watershed for the 100-year storm under existing plus Phase I conditions:

- The flowrate entering the development from the north via the Mirehaven Channel is over 2,570 cfs. The potential impact of this flowrate at the east boundary of Phase I requires that either the prudent line setback be maintained, or additional bank protection be provided.

- The undeveloped basins directly upstream from Phase I to the west and north of Phase I discharge peak flows of 178 cfs and 23 cfs, at analysis points TO_DIV and 10B_E, respectively. (See Proposed Improvements maps, Exhibits 2A and 2B, for these locations.) It is necessary to provide interim protection from offsite flows along the west and north boundaries.

D. Watershed Impacts - Developed Conditions

The following describes the impacts on the watershed for the 100 year storm under developed conditions:

- The flowrate entering the development from the north via the Mirehaven Channel is over 6,300 cfs. This flowrate would cause severe overtopping of Dam #12.

- The developed offsite flow into Phase I at the west boundary is almost 500 cfs. It is necessary to divert this flow away from Phase I. Dam #10 has adequate capacity to accommodate the diverted flows.

- The developed offsite flow from Basin 10B_E into Phase I at the north boundary is almost 50 cfs. This offsite runoff must be conveyed to Dam #12 either by diverting it northeast to the Mirehaven Arroyo or by routing it south through Phase I.

E. Summary of Ladera Dam System Impacts

The existing characteristics of the Ladera Dams are listed in Table 2. By using AHYMO to analyze the flows into the dams under Existing Plus Phase I and Developed Conditions, the need for dam improvements could be determined. On the right side of Table 2, the Ladera Dams AHYMO results are shown.

Ladera Dam #9 receives no runoff from Phase I. Dam #10 receives flows that are diverted upstream from Phase I (see Section 5.1). The AHYMO results show that Dams #10 and #11 have adequate capacity to accommodate fully developed flows. Except for Dam #12, the dams are minimally impacted by the initial build out of Phase I.

One component of this protection is proposed to be an earthen ditch/dike located just outside the property, along the north boundary between the basins PH_1W and 10B_E. Bank protection is to be provided by dumped riprap at the outside of curves (see Figure 3, Proposed Diversion Facilities). There are two options for this protection:

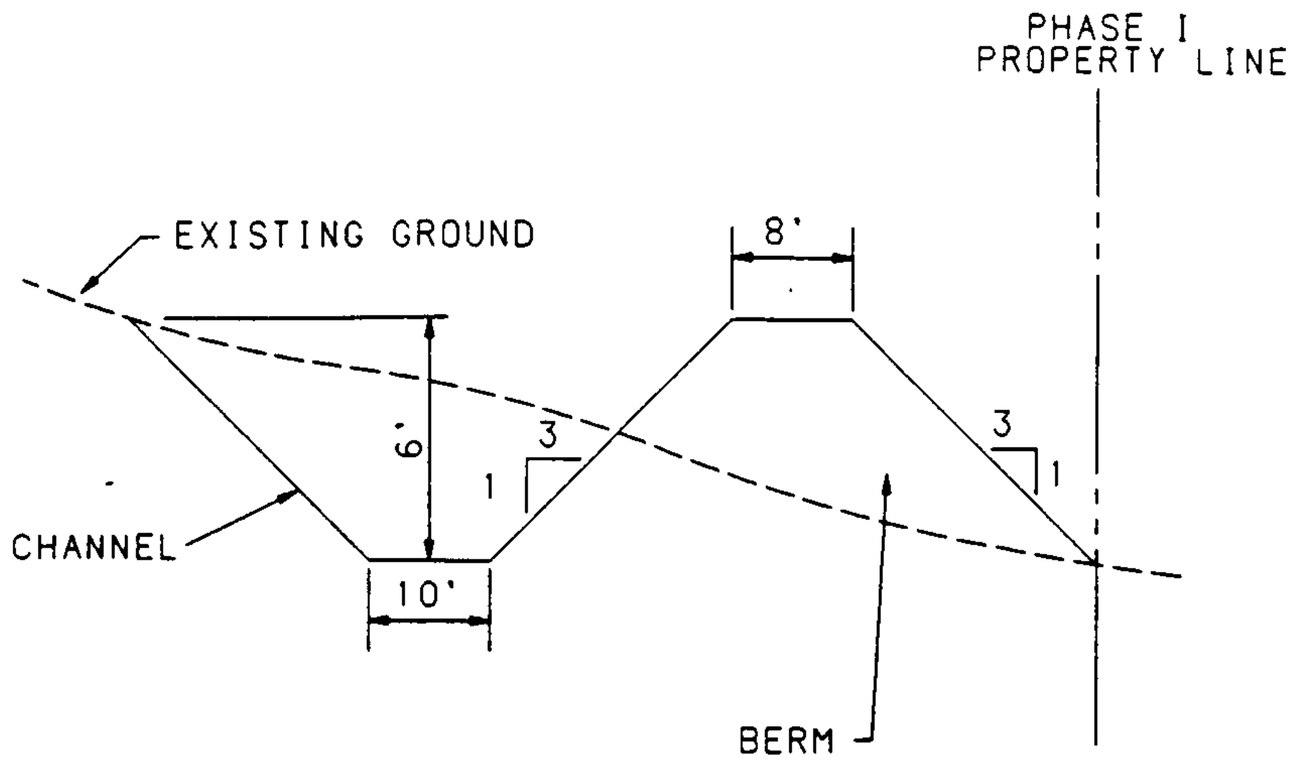
Option 1: Divert undeveloped offsite flows to a desiltation pond using a ditch/dike. The pond discharge would flow overland through Phase I streets. For developed conditions, this pond may be eliminated and flows from basin 10B_E may be routed by storm drain through the Phase I development.

Option 2: Divert undeveloped offsite flows northeast to the Mirehaven Arroyo using a ditch/dike. For developed conditions, the ditch/dike diversion may be replaced by a storm drain to convey offsite flows northeast to the Mirehaven Arroyo.

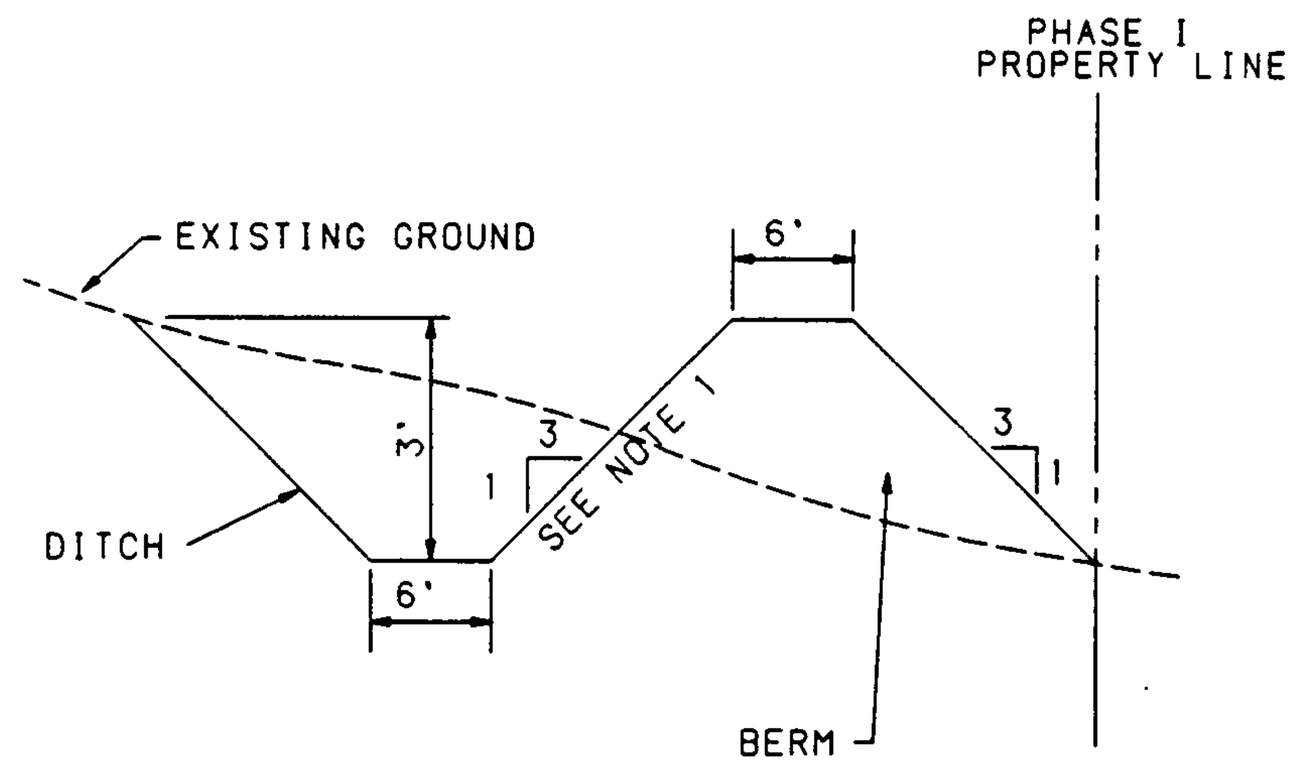
Another component of protection is proposed to be located along the west boundary of Phase I. A diversion channel is proposed to convey flows to Dam #10 that would enter the west side of Phase I if left unchecked. The channel is proposed to be unlined for existing upland conditions. Under full upland development, the channel may either be lined or replaced by storm drain. An inlet structure (see Proposed Improvements, Exhibits 2A and 2B) would be installed in Dam #10 that would serve existing and developed conditions. Dams #10 and #11 have adequate capacity to accommodate fully developed flows from the proposed diversion.

B. Expansion of Existing Dam #12

According to the hydrologic analysis, Dam #12 has inadequate capacity for existing conditions, and will be further impacted by any increase in development. (See Table 3, Required Dam #12 Storage, for comparisons of storage requirements for the 100-year storm event.)



PROFILE OF PROPOSED
EARTHEN DIVERSION CHANNEL
NO SCALE



NOTE:
1. DUMPED RIPRAP SHOULD BE USED TO PROVIDE BANK PROTECTION AT OUTSIDE OF CURVES, PER D.P.M. SECTION 22.3.

PROFILE OF PROPOSED
DITCH/DIKE
NO SCALE

FIGURE 3
PROPOSED DIVERSION FACILITIES

WESTLAND PHASE I DRAINAGE REPORT

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TABLE 2. LADERA DAM SYSTEM SUMMARY: LADERA DAMS #9, #10, #11, #12

TABLE 2. LADERA DAM SYSTEM SUMMARY: LADERA DAMS 9, 10, 11, 12

DAM NO.	EXISTING CHARACTERISTICS OF DAMS 9, 10, 11, 12 (1)						100 YR EVENT - AHYMO RESULTS			
							WSEL		STORAGE (ac-ft)	
	BOTTOM ELEV	TOP ELEV.	EMERG. SPILLWAY ELEV	EMERG. SPILLWAY LENGTH	100 YEAR STORAGE (ac-ft)	PRINCIPAL SPILLWAY	EXISTING PLUS (3)	DEV	EXISTING PLUS (3)	DEV
9	5267	5279	5276	45	20.5	2- 24" x 330 LF	5270.3	5274.7	6.6	18.3
10	5244	5260	5257	50	51.6	1- 24" x 330 LF	5247.6	5255.3	12.5	43.7
11	5226.5	5236.5	5234.7	50	29	1- 24" x 390 LF	5230.2	5234.7	11.6	29
12	5202	5217	5211.3	625	57.5	8- 42" , lengths vary	INSUFFICIENT CAPACITY (2)			

TABLE 2 NOTES:

(1) Existing characteristics information from Ladera System As-builts.

(2) Dam No. 12 has insufficient capacity under existing conditions. See Table 3 for additional analysis.

(3) Conditions are defined as follows:

CONDITION	PHASE I DEVELOPMENT	DEVELOPMENT UPLAND FROM PHASE I
EXISTING	No	No
EXISTING PLUS PHASE I	Yes	No
DEVELOPED	Yes	Yes

V. PROPOSED DRAINAGE IMPROVEMENTS

The results of the hydrologic analysis were used to conceptualize drainage system improvements in the study area. These improvements are intended to protect the Phase I development under existing and developed conditions. The following sections describe these conceptual drainage management plans. Additionally, schematic plans for these improvements can be found in the Proposed Improvements maps, Exhibits 2A and 2B.

A. Diversion Facilities - Protection from Upland Runoff

At the start of construction, Phase I will require protection from upstream offsite flows. Offsite flows presently impact Phase I along two sides of the subdivision. To protect Phase I development from these flows, two separate drainage improvements are proposed. These improvements are shown in the Proposed Improvements, Exhibits 2A and 2B.

TABLE 3. DAM #12 REQUIRED STORAGE

CONDITION (1)	STORAGE INCREASE FACTOR (2)	REQUIRED 100-YEAR STORAGE (ac-ft)
Existing	1.75	100.3
Existing Plus Phase I	1.8	103.3
Developed	3.2 (3)	246

TABLE 3 NOTES:

(1) Conditions are defined as follows:

CONDITION	PHASE I DEVELOPMENT	DEVELOPMENT UPLAND FROM PHASE I
Existing	No	No
Existing Plus Phase I	Yes	No
Developed	Yes	Yes

(2) This is factor applied to each level of existing Dam #12 storage in AHYMO "Route Reservoir" command. Applied an increased factor until WSEL did not exceed elevation of 5211.3.

(3) Includes diversion of 2,000 cfs of the outflow to be diverted south to the West Bluff Diversion.

Dam #12 requirements are given for three conditions: Existing, Existing Plus Phase I, and Developed. Required volumes were obtained through an iterative process. The storage of Dam #12 was increased until the outflow remained below the emergency spillway level (elevation 5211.3) for the prescribed condition of development. Storage expansion factors used in the analysis are listed in Table 3.

For Existing conditions, the required 100-year storage volume is 100.3 acre-feet. The dam currently has 57.5 acre-feet of storage for the 100-year storm. Consequently, the dam pool must be increased by roughly 43 acre-feet to provide adequate capacity for the 100-year storm. The existing easement is large enough to accommodate upsizing Dam #12 to contain this increase of storage.

For Existing Plus Phase I conditions, the required 100-year storage volume is 103.3 acre-feet. The difference in storage, approximately 3 acre-feet, is due to the increased runoff from Phase I initial build out.

For Developed conditions with no upstream attenuation other than the Ladera System, Dam #12 requires a 100-year storage volume of nearly 250 acre-feet. The AMAFCA easement surrounding the dams presently is not large enough to accommodate a structure of this size.

Expansion of Dam #12 to contain runoff from Developed conditions has been examined in a preliminary manner. Beyond the AMAFCA easement, there is adequate vacant land to the south and east of the present dam location to expand it to the requirements of Developed conditions. The decision to expand Dam #12 and the determination of how this expansion is to occur will ultimately be made by the I-40 DMP.

C. Other Improvements

Upstream improvements above 98th Street, such as detention ponds, may be implemented in the future to reduce the peak flows of developed upstream runoff. However, detention facilities above 98th Street have not been analyzed or included in this study.

VI. CONCLUSIONS

This drainage report has identified the maximum flows from offsite and onsite basins of the proposed Phase I development. Improvements are proposed by this drainage report to protect Phase I from offsite flows directly upstream of Phase I under existing and developed conditions. These improvements are shown schematically in the Proposed Improvements maps, Exhibits 2A and 2B.

The west perimeter of Phase I can be protected from offsite flows by diverting offsite flows to Dam #10. The north boundary of Phase I can be protected from offsite flows by two flow diversion options: to a temporary desiltation pond, or to the Mirehaven Arroyo.

Dams #10 and #11 have been found to be adequate under developed conditions with the diversion scenarios described above. The analysis of Dam #12 for this report provides factors for increasing the storage of that facility. Limits of the required storage are sketched in the Proposed Improvements maps, Exhibits 2A and 2B.

Thoroughly addressing the issue of downstream detention improvements (such as the Dam #12 expansion) requires further analysis that is beyond the scope of this report. Fully developed protection will be addressed by the upcoming West I-40 DMP.

APPENDIX

WESTLAND PHASE I DRAINAGE REPORT

CALCULATIONS FOR COMPOSITE TREATMENT TYPE PERCENTAGES

SUBDIVIDED BASINS 10B AND 7

DEVELOPED CONDITIONS (For Existing Conditions, used same treatmts as Westland Sector Dev Plan)

NOTE: LAND USAGE INFORMATION FROM WESTLAND SECTOR DEVELOPMENT PLAN (3/1/95 LAYOUT)

LAND USE	A (%)	B (%)	C (%)	D (%)
O.S.	75	5	10	10
R5	5	34	5	56
R5.5	5	32	5	58
PETROGLYPH NM	80	0	20	0

BASIN 10B_NW

% PETROGLYPH	67	54	0	13	0
% R5	29	0	10	1	16
% O.S.	4	3	0	0	0
COMPOSITE		58	10	15	17

BASIN 10B_NE

% R5.5	24	1	8	1	14
% R5	63	0	21	3	35
% O.S.	13	10	1	1	1
COMPOSITE		12	31	6	51

BASIN 10B_SE

% R5.5	50	3	16	3	29
% R5	50	0	17	3	28
COMPOSITE		4	34	5	57

BASIN 10B_SW

% PETROGLYPH	18	14	0	4	0
% R5	82	0	28	4	46
COMPOSITE		15	29	8	48

BASIN 10B_E

% R5.5	100	5	32	5	58

BASIN 7_W

% PETROGLYPH	26	21	0	5	0
% R5	61	0	21	3	34
% O.S.	13	10	1	1	1
COMPOSITE		32	22	10	36

BASIN 7_E

% R5.5	54	3	17	3	31
% R5	24	0	8	1	13
% O.S.	22	17	1	2	2
COMPOSITE		20	27	6	47

WESTLAND PHASE I DRAINAGE REPORT

CALCULATIONS FOR COMPOSITE TREATMENT TYPE PERCENTAGES

PHASE I SUBDIVISION BASINS

EXISTING AND DEVELOPED CONDITIONS

NOTE: LAND USAGE INFORMATION FROM PHASE I, ALTERNATE 2, PRELIMINARY (10/5/95 LAYOUT)

LAND USAGE	AREA (sq mi)	A (%)	B (%)	C (%)	D (%)
BASIN PH1_E					
R5.5	0.011	5	32	5	58
PAVED	0.008	0	0	10	90
O.S.	0.001	75	5	10	10
PARK	0.006	5	75	13	7
COMPOSITE	0.026	6	31	9	54
BASIN PH1_W					
MULT	0.016	5	20	5	70
R5.5	0.045	5	32	5	58
PAVED	0.001	0	0	10	90
O.S.	0.010	75	5	10	10
PARK	0.001	5	75	13	7
COMPOSITE	0.073	15	26	6	53

WESTLAND PHASE I SUBDIVISION DRAINAGE REPORT
BHI JOB NO 95335.20
Calculation of Time to Peak
Revised DPM procedure

PRIOR PHASE I

EXISTING CONDITIONS

Description	Var.	Unit								
Basin			10B_NW	10B_SW	10B_NE	10B_SE	10B_E	10B_S*	PH_1E	PH_1W
Basin Area		Sq Mi	0.586	0.044	0.124	0.219	0.021	0.058	0.026	0.073
Basin Area		Acres	375	28	79	140	14	37	17	47
Total Reach	L	Feet	7500.0	1800.0	4200.0	3300.0	1000.0	600.0	2200.0	2000.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Overland K	K1		0.7	0.7	0.7	0.7	0.7	0.7	0.7	1
Overland Slope	S1	Percent	2.50	11.25	5.50	7.50	5.50	2.50	1.25	2.50
Adj. Overland Slope	S1'	Percent	2.500	5.946	5.008	5.555	5.008	2.500	1.250	2.500
Gully Reach	L2	Feet	1600.0	1400.0	1600.0	1600.0	600.0	200.0	1600.0	1600.0
Gully K	K2		1	1	1	1	1	1	1	2
Gully Slope	S2	Percent	3.440	4.690	4.130	3.810	5.670	1.000	1.880	2.200
Adj. Gully Slope	S2'	Percent	3.440	4.569	4.125	3.810	5.078	1.000	1.880	2.200
Arroyo Reach	L3	Feet	5500.0	0.0	2200.0	1300.0	0.0	0.0	200.0	0.0
Arroyo K	K3		2	2	2	2	2	2	2	3
Arroyo Slope	S3	Percent	2.070	0.010	2.270	3.230	0.010	0.010	2.000	1.000
Adj. Arroyo Slope	S3'	Percent	2.070	0.010	2.270	3.230	0.010	0.010	2.000	1.000
Lca	Lca	Feet	2800.0	0.0	1900.0	0.0	0.0	0.0	0.0	0.0
Base Discharge	Qb	cfs	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Ground Slope S	S	Percent	2.385	6.148	3.286	4.029	5.602	2.000	1.776	2.260
Adjusted Slope S'	S'	Percent	2.385	5.245	3.286	4.029	5.050	2.000	1.776	2.260
K	K		1.549	0.889	1.316	1.183	0.852	0.756	0.944	1.679
K'	K'		1.549	0.884	1.307	1.155	0.853	0.756	0.944	1.679
K"	K"		2.960	1.996	2.522	2.277	2.034	3.232	3.430	3.041
K"'	K"'		2.029	1.368	1.728	1.561	1.394	2.215	2.351	2.084
Kn	Kn		0.033	0.033	0.033	0.033	0.033	0.033	0.021	0.021
Orig. TC	TC	Hrs.	0.541	0.227	0.470	0.386	0.138	0.156	0.486	0.220
Adjusted TC	TC'	Hrs.	0.541	0.160	0.470	0.293	0.089	0.156	0.486	0.220
Time Lag	Lg	Hrs.	-	-	-	-	-	-	-	-
Time to Peak	TP	Hrs.	0.361	0.151	0.314	0.257	0.092	0.133	0.324	0.147
							USE 0.133			

* Basin 10B_S was subdivided into two basins: 10B_S1 with an area of 12 acres, & 10B_S2 with area of 25 acres.
10B_S1 flows go to Dam No. 10.
10B_S2 flows go to Dam No. 11 and No. 12.
The time to peak for the whole 10B_S basin is 0.133 hours. This is the minimum time to peak for this method, according to the DPM, therefore, use the minimum time to peak (0.133 hours) for each of the two sub-basins 10B_S1 & 10B_S2.

WESTLAND PHASE I SUBDIVISION DRAINAGE REPORT
BHI JOB NO 95335.20
Calculation of Time to Peak
Revised DPM procedure

DEVELOPED CONDITIONS

Description	Var.	Unit										
Basin			10B_NW	10B_SW	10B_NE	10B_SE	10B_E	10B_S*	PH_1E	PH_1W	7_W 256	7_E 104
Basin Area		Sq Mi	0.586	0.044	0.124	0.219	0.021	0.058	0.026	0.073	~~0.281~~	~~0.115~~
Basin Area		Acres	375	28	79	140	14	37	17	47	~~180~~ 164	~~74~~ 66
Total Reach	L	Feet	7500.0	1800.0	4200.0	3300.0	1000.0	600.0	2200.0	2000.0	5300.0	3500.0
Overland Reach	L1	Feet	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Overland K	K1		1	1	1	1	1	1	1	1	1	1
Overland Slope	S1	Percent	2.50	11.25	5.50	7.50	5.50	2.50	1.25	2.50	5.00	5.00
Adj. Overland Slope	S1'	Percent	2.500	5.946	5.008	5.555	5.008	2.500	1.250	2.500	4.760	4.760
Gully Reach	L2	Feet	1600.0	1400.0	1600.0	1600.0	600.0	200.0	1600.0	1600.0	1600.0	1600.0
Gully K	K2		2	2	2	2	2	2	4	2	2	2
Gully Slope	S2	Percent	3.440	4.690	4.130	3.810	5.670	1.000	1.880	2.200	5.000	3.750
Adj. Gully Slope	S2'	Percent	3.440	4.569	4.125	3.810	5.078	1.000	1.880	2.200	4.760	3.750
Arroyo Reach	L3	Feet	5500.0	0.0	2200.0	1300.0	0.0	0.0	200.0	0.0	3300.0	1500.0
Arroyo K	K3		3	3	3	3	3	3	4	3	3	3
Arroyo Slope	S3	Percent	2.070	0.010	2.270	3.230	0.010	0.010	2.000	1.000	3.300	3.330
Adj. Arroyo Slope	S3'	Percent	2.070	0.010	2.270	3.230	0.010	0.010	2.000	1.000	3.300	3.330
Lca	Lca	Feet	2800.0	0.0	1900.0	0.0	0.0	0.0	0.0	0.0	2500.0	0.0
Base Discharge	Qb	cfs	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Ground Slope S	S	Percent	2.385	6.148	3.286	4.029	5.602	2.000	1.776	2.260	3.942	3.713
Adjusted Slope S'	S'	Percent	2.385	5.245	3.286	4.029	5.050	2.000	1.776	2.260	3.942	3.713
K	K		2.479	1.641	2.205	2.063	1.425	1.202	2.410	1.679	2.337	2.097
K'	K'		2.479	1.599	2.187	2.003	1.427	1.202	2.410	1.679	2.310	2.087
K"	K"		2.960	1.996	2.522	2.277	2.034	3.232	3.430	3.041	2.302	2.372
K'''	K'''		2.029	1.368	1.728	1.561	1.394	2.215	2.351	2.084	1.578	1.626
Kn	Kn		0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Orig. TC	TC	Hrs.	0.341	0.123	0.281	0.221	0.082	0.098	0.190	0.220	0.266	0.241
Adjusted TC	TC'	Hrs.	0.341	0.133	0.281	0.221	0.087	0.098	0.190	0.220	0.266	0.241
Time Lag	Lg	Hrs.	-	-	-	-	-	-	-	-	-	-
Time to Peak	TP	Hrs.	0.228	0.133	0.188	0.148	0.133	0.133	0.133	0.147	0.178	0.160

* Basin 10B_S was subdivided into two basins: 10B_S1 with an area of 12 acres, & 10B_S2 with area of 25 acres.
10B_S1 flows go to Dam No. 10.
10B_S2 flows go to Dam No. 11 and No. 12.
The time to peak for the whole 10B_S basin is 0.133 hours. This is the minimum time to peak for this method, according to the DPM, therefore, use the minimum time to peak (0.133 hours) for each of the two sub-basins 10B_S1 & 10B_S2.

~~TABLE 1~~
FROM DAM #15 REPORT

100 YEAR STORM RAINFALL AND AREA-DEPTH REDUCTION FACTORS
LADERA ~~AND WEST BLUFF~~ WATERSHEDS

WATERSHED LOCATION	LOCATION AREA (SQ MI)	STORM DURATION	UNADJUSTED RAINFALL (INCHES)	AREA-DEPTH REDUCTION FACTOR	ADJUSTED RAINFALL
EXISTING CONDITIONS					
LADERA - ABOVE DAM #12	12.51	1 HOUR	1.90	0.928	1.763
		6 HOURS	2.20	0.974	2.143
		24 HOURS	2.65	0.982	2.602
~~LADERA - ABOVE DAM #15 AND BELOW DAM #12~~	~~4.79~~	~~1 HOUR~~	~~1.90~~	~~1.000~~	~~1.900~~
		~~6 HOURS~~	~~2.20~~	~~1.000~~	~~2.200~~
		~~24 HOURS~~	~~2.65~~	~~1.000~~	~~2.650~~
~~WEST BLUFF~~	~~4.46~~	~~1 HOUR~~	~~1.90~~	~~1.000~~	~~1.900~~
		~~6 HOURS~~	~~2.20~~	~~1.000~~	~~2.200~~
		~~24 HOURS~~	~~2.65~~	~~1.000~~	~~2.650~~
FULLY DEVELOPED CONDITIONS					
LADERA - ABOVE LADERA WEST ~~DAM~~ TRAINING DIKE	11.35	1 HOUR	1.90	0.934	1.774
		6 HOURS	2.20	0.976	2.148
		24 HOURS	2.65	0.983	2.606
LADERA - ABOVE DAM #12 AND BELOW LADERA WEST ~~DAM~~ TRAINING DIKE	1.16	1 HOUR	1.90	1.000	1.900
		6 HOURS	2.20	1.000	2.200
		24 HOURS	2.65	1.000	2.650
~~LADERA - ABOVE DAM #15 AND BELOW DAM #12~~	~~4.46~~	~~1 HOUR~~	~~1.90~~	~~1.000~~	~~1.900~~
		~~6 HOURS~~	~~2.20~~	~~1.000~~	~~2.200~~
		~~24 HOURS~~	~~2.65~~	~~1.000~~	~~2.650~~
~~WEST BLUFF~~	~~4.88~~	~~1 HOUR~~	~~1.90~~	~~1.000~~	~~1.900~~
		~~6 HOURS~~	~~2.20~~	~~1.000~~	~~2.200~~
		~~24 HOURS~~	~~2.65~~	~~1.000~~	~~2.650~~

RAINFALL PARAMETERS

E:\HYDRO\9025102\LADERA.RPT

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =11/07/1995
INPUT FILE = PHAS1_E.HYM                                                                   USER NO.= BOHN_HNM.STE

                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =   1
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND        IDENTIFICATION   NO.  NO.      (SQ MI)      (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

*S   WESTLAND PHASE I DRAINAGE REPORT -  EXISTING CONDITIONS ONLY.  NO PHASE I.
*S   SEDIMENT BULKING USED:   0% UNDEV. FOR BASINS ABOVE ESCARPMENT (9 & 10A)
*S                           17% UNDEV. FOR BASINS BELOW THE ESCARPMENT
*S                            5% DEV.
*S
*SUMMARY              1       PHASE I DRAINAGE REPORT - EXIST WITH BULK
*S RAINFALL FOR BASINS ABOVE DAM #12
RAINFALL  TYPE= 2                                                                                   RAIN24=   2.602
SEDIMENT BULK                                                                                       PK BF =    1.17
*S*****************************************************************************
*S COMPUTE HYDROGRAPH FOR BASIN L1
COMPUTE NM HYD            L1   -     3        .27000       284.02      10.308       .71586    1.600    1.644 PER IMP=    .00
*S ROUTE OVERLAND FLOW FROM BASIN L1 THROUGH  BASIN L2
ROUTE                  L1RTD    3    4        .27000       277.12      10.308       .71587    1.650    1.604
*S
*S COMPUTE HYDROGRAPH FOR BASIN L2
COMPUTE NM HYD            L2   -     7        .11000       138.92       3.860       .65799    1.500    1.973 PER IMP=    .00
*S COMBINED FLOW (BASIN 1 AND 2)
ADD HYD                  AP1  4& 7   8        .38000       384.50      14.169       .69911    1.600    1.581
*S ROUTE OVERLAND FLOW (BASINS L1 AND L2) THROUGH  BASIN L3
ROUTE                  L2RTD    8    9        .38000       386.89      14.169       .69911    1.600    1.591
*S
*S COMPUTE HYDROGRAPH FOR BASIN L3
COMPUTE NM HYD            L3   -     5        .49000       262.33      15.447       .59109    1.750     .837 PER IMP=    .00
*S COMBINED FLOW (BASINS L1-L2 AND L3)
ADD HYD                 200.10  9& 5   9        .87000       608.10      29.616       .63827    1.650    1.092
*S AP 200.1 *
*S   ROUTE FLOW THROUGH POND #1
ROUTE RESERVOIR          POND1    9   10        .87000       129.43      29.616       .63827    2.200     .232 AC-FT=   18.540
*S AP 200.2 *
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD             SEDTEMP   10   25        .75168       111.82      25.588       .63827    2.200     .232
                       NOVALUE  AND   26        .11832        17.60       4.028       .63827    2.200     .232
DIVIDE HYD              200.11   25   10        .75168       111.82      25.588       .63827    2.200     .232
                       NOVALUE  AND   26        .00000           .00        .000       .00000    -.050     .000
*S ROUTE OVERLAND FLOW FROM BASINS L1-L3 THROUGH  BASIN L4
ROUTE                   L3RTD   10    9        .75168       111.89      25.588       .63827    2.250     .233
*S
*S COMPUTE HYDROGRAPH FOR BASIN L4
COMPUTE NM HYD            L4   -     6        .27000       207.27       8.512       .59109    1.600    1.200 PER IMP=    .00
*S  DIVIDE COMBINED FLOW FROM BASIN 4 FOR ROUTE THROUGH POND 2, 3 AND 4
DIVIDE HYD              401.70    6    1        .08991        69.02       2.834       .59109    1.600    1.200
                        401.80  AND    3        .18009       138.25       5.677       .59109    1.600    1.200
ADD HYD                 401.60  1& 9  10        .84159       123.26      28.422       .63323    2.050     .229
*S   ROUTE FLOW THROUGH POND #2
ROUTE RESERVOIR          POND2   10    9        .84159        56.32      28.421       .63320    3.900     .105 AC-FT=   11.243
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD             SEDTEMP    9   25        .78377        52.46      26.469       .63320    3.900     .105
                       NOVALUE  AND   26        .05782         3.87       1.953       .63320    3.900     .105
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EXISTING

PG. 1 OF 5

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
DIVIDE HYD	200.12	25	9	.78377	52.46	26.469	.63320	3.900	.105	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.20	1& 9	10	.87368	73.28	29.303	.62887	1.650	.131	
*S ROUTE FLOW THROUGH POND #3										
ROUTE RESERVOIR	POND3	10	9	.87368	26.99	28.839	.61891	7.550	.048	AC-FT= 13.330
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.86171	26.62	28.444	.61891	7.550	.048	
	NOVALUE	AND	26	.01197	.37	.395	.61891	7.550	.048	
DIVIDE HYD	200.13	25	9	.86171	26.62	28.444	.61891	7.550	.048	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.30	1& 9	10	.95162	70.70	31.278	.61628	1.600	.116	
*S ROUTE FLOW THROUGH POND #4										
ROUTE RESERVOIR	POND4	10	9	.95162	21.48	30.718	.60523	11.400	.035	AC-FT= 7.044
*S AP 200.3 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.84143	18.99	27.160	.60523	11.400	.035	
	NOVALUE	AND	26	.11020	2.49	3.557	.60523	11.400	.035	
DIVIDE HYD	200.14	25	9	.84143	18.99	27.160	.60523	11.400	.035	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-4 THROUGH BASIN 5										
ROUTE	PD4RTD	9	10	.84143	18.99	27.156	.60514	11.400	.035	
*S										
*S COMPUTE HYDROGRAPH FOR BASIN L5										
COMPUTE NM HYD	L5	-	3	.91000	408.29	30.425	.62689	1.850	.701	PER IMP= .00
*S COMBINED FLOW (BASINS 1-4 AND 5)										
ADD HYD	AP3	3&10	10	1.75143	414.58	57.581	.61644	1.850	.370	
*S ROUTE FLOW THROUGH PONDS #5										
ROUTE RESERVOIR	POND5	10	9	1.75143	116.59	56.559	.60550	2.550	.104	AC-FT= 18.253
*S AP 200.4 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.52164	101.30	49.139	.60550	2.550	.104	
	NOVALUE	AND	26	.22979	15.30	7.421	.60550	2.550	.104	
DIVIDE HYD	200.14	25	9	1.52164	101.30	49.139	.60550	2.550	.104	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-5 THROUGH BASIN 6										
ROUTE	L5RTD	9	10	1.52164	101.11	49.103	.60506	2.600	.104	
*S COMPUTE HYDROGRAPH FOR BASIN L6										
COMPUTE NM HYD	L6	-	4	.06000	62.68	1.748	.54638	1.500	1.632	PER IMP= .00
*S COMBINED FLOW (BASINS 1-5 AND 6)										
*S DIVIDE ID=4 INTO 3 PARTS FOR PONDS 6, 7 AND 8										
DIVIDE HYD	601.50	4	1	.01998	20.87	.582	.54638	1.500	1.632	
	601.60	AND	3	.04002	41.80	1.166	.54638	1.500	1.632	
ADD HYD	401.60	1&10	10	1.54162	101.61	49.685	.60430	2.600	.103	
*S ROUTE FLOW THROUGH POND #6										
ROUTE RESERVOIR	POND6	10	9	1.54162	61.52	48.977	.59569	4.150	.062	AC-FT= 8.420
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.47271	58.77	46.788	.59569	4.150	.062	
	NOVALUE	AND	26	.06891	2.75	2.189	.59569	4.150	.062	
DIVIDE HYD	200.14	25	9	1.47271	58.77	46.788	.59569	4.150	.062	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.60	1& 9	10	1.49269	58.79	47.370	.59503	4.150	.062	
*S ROUTE FLOW THROUGH POND #7										

EXISTING
PG 2 OF 5

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ROUTE RESERVOIR	POND7	10	9	1.49269	51.05	46.889	.58898	5.300	.053	AC-FT= 4.467
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.43074	48.93	44.943	.58898	5.300	.053	
	NOVALUE	AND	26	.06195	2.12	1.946	.58898	5.300	.053	
DIVIDE HYD	200.14	25	9	1.43074	48.93	44.943	.58898	5.300	.053	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.70	1& 9	10	1.45072	48.93	45.525	.58839	5.300	.053	
*S ROUTE FLOW THROUGH POND #8										
ROUTE RESERVOIR	POND8	10	9	1.45072	36.40	43.011	.55590	7.800	.039	AC-FT= 8.430
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.38457	34.74	41.050	.55590	7.800	.039	
	NOVALUE	AND	26	.06615	1.66	1.961	.55590	7.800	.039	
DIVIDE HYD	200.14	25	9	1.38457	34.74	41.050	.55590	7.800	.039	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-6 THROUGH BASIN 7										
ROUTE	L6RTD	9	10	1.38457	34.74	41.021	.55551	7.850	.039	
*S COMPUTE HYDROGRAPH FOR BASIN L7										
COMPUTE NM HYD	L7	-	3	.36000	203.86	11.108	.57856	1.700	.885	PER IMP= .00
*S COMBINED FLOW (BASINS 1-6) AND 7										
ADD HYD	200.50	3&10	10	1.74457	205.05	52.129	.56026	1.700	.184	
*S AP 200.5 *										
*S ROUTE FLOW THROUGH POND #9										
ROUTE RESERVOIR	POND9	10	19	1.74457	48.21	51.466	.55314	2.300	.043	AC-FT= 6.569
*S AP 200.6 *										
DIVIDE HYD	SEDTEMP	19	25	1.54045	42.57	45.444	.55314	2.300	.043	
	NOVALUE	AND	26	.20411	5.64	6.021	.55314	2.300	.043	
DIVIDE HYD	200.14	25	19	1.54045	42.57	45.444	.55314	2.300	.043	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S										
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SW										
COMPUTE NM HYD	10B_SW	-	1	.04400	43.79	1.352	.57606	1.550	1.555	PER IMP= .00
*S ROUTE THROUGH 10B_SE TO PROPOSED DIVERSION WEST OF WEST BNDRY OF PHASE 1										
ROUTE	RTE	1	9	.04400	30.37	1.352	.57610	1.650	1.078	
*S										
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SE										
COMPUTE NM HYD	10B_SE	-	1	.21900	147.67	6.728	.57606	1.650	1.054	PER IMP= .00
*S COMBINE ROUTED 10B_SW AND 10B_SE										
ADD HYD	TO_DIV	9& 1	5	.26300	178.04	8.080	.57607	1.650	1.058	
*S ROUTE THRU PROPOSED DIVERSION AT WEST SIDE OF PHASE 1										
ROUTE	RTE	5	9	.26300	176.05	8.080	.57607	1.650	1.046	
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S1										
COMPUTE NM HYD	10B_S1	-	1	.01900	21.04	.584	.57606	1.500	1.730	PER IMP= .00
*S COMBINE FLOW FROM 10B_S1 WITH DIVERSION FLOW										
ADD HYD	ADD	1& 9	9	.28200	188.40	8.664	.57607	1.650	1.044	
*S COMBINE WITH UPSTREAM FLOW FROM DAM #9										
ADD HYD	TO_10	19& 9	10	1.82245	211.84	54.108	.55669	1.700	.182	
*S										
*S ROUTE COMBINED THROUGH DAM #10										
*S THIS DAM NOT USED IN WESTLAND SECTOR PLAN OR DAM #15 ANALYSIS										
ROUTE RESERVOIR	POND10	10	9	1.82245	26.89	48.718	.50123	11.600	.023	AC-FT= 12.553
DIVIDE HYD	SEDTEMP	9	25	1.69488	25.00	45.308	.50123	11.600	.023	
	NOVALUE	AND	26	.12757	1.88	3.410	.50123	11.600	.023	

EXISTING
PG 3 OF 5

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                                FROM   TO                    PEAK        RUNOFF                TIME TO    CFS
                  HYDROGRAPH     ID    ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND         IDENTIFICATION   NO.   NO.      (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

DIVIDE HYD            200.14     25     9       1.69488      25.00       45.308      .50123    11.600    .023
                     NOVALUE    AND    26        .00000        .00         .000      .00000     -.050    .000
*S
*S ROUTE OVERLAND FLOW FROM DAM #10 THROUGH  BASIN 10
ROUTE                    RTE      9    10       1.69488      25.00       45.286      .50099    11.600    .023
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S2
COMPUTE NM HYD        10B_S2      -     3        .03900      43.18        1.198      .57606     1.500   1.730 PER IMP=     .00
*S DIVIDE 10B_S2 OUTFLOW INTO THIRDS FOR ADDING 1/3 TO DAM 11, 2/3 TO DAM 12.
DIVIDE HYD              S2_1      3     1        .01299      14.38         .399      .57606     1.500   1.730
                        S2_2    AND     2        .02601      28.80         .799      .57606     1.500   1.730
ADD HYD                  ADD    1&10     7       1.70787      25.00       45.685      .50156    11.600    .023
*S COMBINE WITH DAM #10 OUTFLOW
*S  FLOW INTO DAM #11
ADD HYD                TO_11   10& 1    11       1.70787      25.00       45.685      .50156    11.600    .023
ROUTE RESERVOIR        POND11     11     7       1.70787      22.18       37.308      .40959    15.600    .020 AC-FT=   11.598
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD            SEDTEMP      7    25       1.66791      21.66       36.435      .40959    15.600    .020
                     NOVALUE    AND    26        .03996        .52         .873      .40959    15.600    .020
DIVIDE HYD            200.14     25     7       1.66791      21.66       36.435      .40959    15.600    .020
                     NOVALUE    AND    26        .00000        .00         .000      .00000     -.050    .000
*S
*S COMPUTE HYDROGRAPH FOR BASIN 9
*S ABOVE ESCARPMENT - NO SEDIMENT BULK
SEDIMENT BULK                                                                                                PK BF =    1.00
COMPUTE NM HYD             L9      -     4       5.82000    1900.64      144.954      .46699     1.850    .510 PER IMP=     .00
*S ROUTE OVERLAND FLOW FROM BASIN 9 THROUGH  BASIN 10A
ROUTE                   L9RTD      4     5       5.82000    1628.89      144.954      .46699     2.000    .437
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10A
COMPUTE NM HYD           L10A      -     6       3.06000     822.38       76.555      .46909     1.950    .420 PER IMP=     .00
*S COMBINED FLOW (BASIN 9 AND 10A) AT LADERA TRAINING DIKE
ADD HYD                   AP4   6& 5     8       8.88000    2441.12      221.509      .46771     2.000    .430
*S ROUTE OUTFLOW FROM TRAINING DIKE AREA THRU 10B_NW TO 98TH ST
ROUTE                     RTE      8     9       8.88000    2391.10      221.509      .46771     2.050    .421
*S
SEDIMENT BULK                                                                                                PK BF =    1.17
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NW
COMPUTE NM HYD         10B_NW      -     1        .58600      301.15       18.004      .57606     1.750    .803 PER IMP=     .00
*S COMBINE ROUTED BASIN 9 AND 10B_NW AT 98TH ST
ADD HYD                   AP5   9& 1     4       9.46600    2557.69      239.513      .47442     2.050    .422
*S ROUTE COMBINED THRU 10B_NE
ROUTE                     RTE      4     9       9.46600    2535.01      239.513      .47442     2.100    .418
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NE
COMPUTE NM HYD         10B_NE      -     1        .12400       66.67        3.810      .57606     1.700    .840 PER IMP=     .00
*S COMBINE WITH ROUTED BASIN 9 & 10B_NW
ADD HYD                   AP6   9& 1     4       9.59000    2565.87      243.322      .47573     2.050    .418
*S
*S* BASINS 130.2 + 130.3 FROM DAM#15 STUDY =  BASIN NB4 IN WESTLAND SECT PLAN
*S*  BUT BASIN 130.2 FLOWS GO EAST(NOT TO DAM #12)SO NOT INCLUDED IN THIS MODEL.
*S
*S*** COMPUTE HYDROGRAPH FOR BASIN 130.3
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EXISTING

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                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS
                  HYDROGRAPH     ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND         IDENTIFICATION   NO.  NO.      (SQ MI)     (CFS)      (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

COMPUTE NM HYD        130.33     -     3       .03900       28.35       1.136      .54638     1.600    1.136 PER IMP=     .00
*S***** ADD TO BASIN 9+10B_NW+NE FLOW
*S  FLOW ENTERING NORTH BNDRY OF PHASE I VIA MIREHAVEN ARROYO.
ADD HYD                  AP7  4& 3   6      9.62900     2571.19     244.459      .47602     2.050     .417
*S  ROOUTE IN MIREHAVEN CHANNEL ALONG EAST BNDRY OF PHASE I.
*S  USED AN AVERAGE SECTION FROM MIREHAVEN SCOUR WALL REPORT, SOFTLINED
ROUTE                    RTE    6    9      9.62900     2563.08     244.459      .47602     2.100     .416
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH1_E
COMPUTE NM HYD         PH1_E    -     1       .02600       13.22        .799      .57606     1.700     .795 PER IMP=     .00
*S***** ADD TO ROUTED MIREHAVEN FLOW.
ADD HYD                  AP8  9& 1   6      9.65500     2568.96     245.258      .47629     2.100     .416
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_E
COMPUTE NM HYD         10B_E    -     1       .02100       23.25        .645      .57606     1.500    1.730 PER IMP=     .00
*S ROUTE 10B_E OVERLAND THRU PH_1W
ROUTE                    RTE    1    9       .02100       15.33        .645      .57614     1.600    1.141
SEDIMENT BULK                                                                                              PK BF =    1.05
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH_1W
COMPUTE NM HYD         PH_1W    -     1       .07300       66.47       2.013      .51698     1.550    1.423 PER IMP=     .00
*S COMBINE ROUTED 10B_E AND PH_1W
ADD HYD                  ADD  9& 1   3       .09400       79.95       2.658      .53019     1.550    1.329
*S COMBINE WITH ROUTED MIREHAVEN FLOW AT SOUTH BNDRY OF PHASE I
ADD HYD                  AP9  3& 6   6      9.74900     2577.86     247.916      .47681     2.100     .413
*S COMBINE WITH 2/3 FLOW DIVIDED FROM BASIN 10B_S2
ADD HYD                  ADD  6& 2   9      9.77501     2579.88     248.715      .47707     2.100     .412
*S  ADD TO DAM 11 ROUTED OUTFLOW
ADD HYD                COMB12  9& 7  12     11.44292     2580.78     285.150      .46724     2.100     .352
*S
*S ENLARGED DAM 12 BY MULTIPLYING DAM12 STORAGE BY FACTOR
ROUTE RESERVOIR         POND12   12   10     11.44292     1172.00     283.342      .46428     2.700     .160 AC-FT=  100.273
DIVIDE HYD             SEDTEMP   10   25     11.08704     1135.55     274.530      .46428     2.700     .160
                       NOVALUE  AND   26       .35587       36.45       8.812      .46428     2.700     .160
DIVIDE HYD              200.14   25   10     11.08704     1135.55     274.530      .46428     2.700     .160
                       NOVALUE  AND   26       .00000         .00        .000      .00000     -.050     .000
*S
*S END OF WESTLAND PHASE I DRAINAGE ANALYSIS EXISTING COND.
FINISH
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EXISTING

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =11/07/1995
INPUT FILE = PHAS1_EP.HYM                                                                  USER NO.= BOHN_HNM.STE

                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS       PAGE =   1
                   HYDROGRAPH   ID    ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

*S   WESTLAND PHASE I DRAINAGE REPORT -  EXISTING CONDITIONS  PLUS PHASE I.
*S  SEDIMENT BULKING USED:   0% UNDEV. FOR BASINS ABOVE THE ESCARPMENT (9 & 10A)
*S                           17% UNDEV. FOR BASINS BELOW THE ESCARPMENT
*S                           5% DEV.
*S
*S RAINFALL FOR BASINS ABOVE DAM #12
RAINFALL  TYPE= 2                                                                                          RAIN24=   2.602
SEDIMENT BULK                                                                                              PK BF =    1.17
*S*************************************************************************
*S COMPUTE HYDROGRAPH FOR BASIN L1
COMPUTE NM HYD            L1   -     3        .27000       284.02      10.308       .71586    1.600    1.644 PER IMP=    .00
*S ROUTE OVERLAND FLOW FROM BASIN L1 THROUGH  BASIN L2
ROUTE                  L1RTD    3    4        .27000       277.12      10.308       .71587    1.650    1.604
*S
*S COMPUTE HYDROGRAPH FOR BASIN L2
COMPUTE NM HYD            L2   -     7        .11000       138.92       3.860       .65799    1.500    1.973 PER IMP=    .00
*S COMBINED FLOW (BASIN 1 AND 2)
ADD HYD                  AP1  4& 7   8        .38000       384.50      14.169       .69911    1.600    1.581
*S ROUTE OVERLAND FLOW (BASINS L1 AND L2) THROUGH  BASIN L3
ROUTE                  L2RTD    8    9        .38000       386.89      14.169       .69911    1.600    1.591
*S
*S COMPUTE HYDROGRAPH FOR BASIN L3
COMPUTE NM HYD            L3   -     5        .49000       262.33      15.447       .59109    1.750     .837 PER IMP=    .00
*S COMBINED FLOW (BASINS L1-L2 AND L3)
ADD HYD                200.10  9& 5   9        .87000       608.10      29.616       .63827    1.650    1.092
*S AP 200.1 *
*S   ROUTE FLOW THROUGH POND #1
ROUTE RESERVOIR          POND1    9   10        .87000       129.43      29.616       .63827    2.200     .232 AC-FT=   18.540
*S AP 200.2 *
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD             SEDTEMP   10   25        .75168       111.82      25.588       .63827    2.200     .232
                       NOVALUE  AND   26        .11832        17.60       4.028       .63827    2.200     .232
DIVIDE HYD              200.11   25   10        .75168       111.82      25.588       .63827    2.200     .232
                       NOVALUE  AND   26        .00000          .00        .000       .00000    -.050     .000
*S ROUTE OVERLAND FLOW FROM BASINS L1-L3 THROUGH  BASIN L4
ROUTE                   L3RTD   10    9        .75168       111.89      25.588       .63827    2.250     .233
*S
*S COMPUTE HYDROGRAPH FOR BASIN L4
COMPUTE NM HYD            L4   -     6        .27000       207.27       8.512       .59109    1.600    1.200 PER IMP=    .00
*S  DIVIDE COMBINED FLOW FROM BASIN 4 FOR ROUTE THROUGH POND 2, 3 AND 4
DIVIDE HYD              401.70    6    1        .08991        69.02       2.834       .59109    1.600    1.200
                        401.80  AND    3        .18009       138.25       5.677       .59109    1.600    1.200
ADD HYD                 401.60  1& 9  10        .84159       123.26      28.422       .63323    2.050     .229
*S   ROUTE FLOW THROUGH POND #2
ROUTE RESERVOIR          POND2   10    9        .84159        56.32      28.421       .63320    3.900     .105 AC-FT=   11.243
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD             SEDTEMP    9   25        .78377        52.46      26.469       .63320    3.900     .105
                       NOVALUE  AND   26        .05782         3.87       1.953       .63320    3.900     .105
DIVIDE HYD              200.12   25    9        .78377        52.46      26.469       .63320    3.900     .105
                       NOVALUE  AND   26        .00000          .00        .000       .00000    -.050     .000
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EXISTING PLUS PHASE 1

PG 1 OF 5

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	401.20	1& 9	10	.87368	73.28	29.303	.62887	1.650	.131	
*S ROUTE FLOW THROUGH POND #3										
ROUTE RESERVOIR	POND3	10	9	.87368	26.99	28.839	.61891	7.550	.048	AC-FT= 13.330
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.86171	26.62	28.444	.61891	7.550	.048	
	NOVALUE	AND	26	.01197	.37	.395	.61891	7.550	.048	
DIVIDE HYD	200.13	25	9	.86171	26.62	28.444	.61891	7.550	.048	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.30	1& 9	10	.95162	70.70	31.278	.61628	1.600	.116	
*S ROUTE FLOW THROUGH POND #4										
ROUTE RESERVOIR	POND4	10	9	.95162	21.48	30.718	.60523	11.400	.035	AC-FT= 7.044
*S AP 200.3 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.84143	18.99	27.160	.60523	11.400	.035	
	NOVALUE	AND	26	.11020	2.49	3.557	.60523	11.400	.035	
DIVIDE HYD	200.14	25	9	.84143	18.99	27.160	.60523	11.400	.035	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-4 THROUGH BASIN 5										
ROUTE	PD4RTD	9	10	.84143	18.99	27.156	.60514	11.400	.035	
*S										
*S COMPUTE HYDROGRAPH FOR BASIN L5										
COMPUTE NM HYD	L5	-	3	.91000	408.29	30.425	.62689	1.850	.701	PER IMP= .00
*S COMBINED FLOW (BASINS 1-4 AND 5)										
ADD HYD	AP3	3&10	10	1.75143	414.58	57.581	.61644	1.850	.370	
*S ROUTE FLOW THROUGH PONDS #5										
ROUTE RESERVOIR	POND5	10	9	1.75143	116.59	56.559	.60550	2.550	.104	AC-FT= 18.253
*S AP 200.4 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.52164	101.30	49.139	.60550	2.550	.104	
	NOVALUE	AND	26	.22979	15.30	7.421	.60550	2.550	.104	
DIVIDE HYD	200.14	25	9	1.52164	101.30	49.139	.60550	2.550	.104	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-5 THROUGH BASIN 6										
ROUTE	L5RTD	9	10	1.52164	101.11	49.103	.60506	2.600	.104	
*S COMPUTE HYDROGRAPH FOR BASIN L6										
COMPUTE NM HYD	L6	-	4	.06000	62.68	1.748	.54638	1.500	1.632	PER IMP= .00
*S COMBINED FLOW (BASINS 1-5 AND 6)										
*S DIVIDE ID=4 INTO 3 PARTS FOR PONDS 6, 7 AND 8										
DIVIDE HYD	601.50	4	1	.01998	20.87	.582	.54638	1.500	1.632	
	601.60	AND	3	.04002	41.80	1.166	.54638	1.500	1.632	
ADD HYD	401.60	1&10	10	1.54162	101.61	49.685	.60430	2.600	.103	
*S ROUTE FLOW THROUGH POND #6										
ROUTE RESERVOIR	POND6	10	9	1.54162	61.52	48.977	.59569	4.150	.062	AC-FT= 8.420
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.47271	58.77	46.788	.59569	4.150	.062	
	NOVALUE	AND	26	.06891	2.75	2.189	.59569	4.150	.062	
DIVIDE HYD	200.14	25	9	1.47271	58.77	46.788	.59569	4.150	.062	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.60	1& 9	10	1.49269	58.79	47.370	.59503	4.150	.062	
*S ROUTE FLOW THROUGH POND #7										
ROUTE RESERVOIR	POND7	10	9	1.49269	51.05	46.889	.58898	5.300	.053	AC-FT= 4.467
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										

EXISTING PLUS PHASE 1

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                                FROM  TO                    PEAK        RUNOFF                TIME TO   CFS
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK    PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)      (CFS)       (AC-FT)    (INCHES)   (HOURS)  ACRE     NOTATION

DIVIDE HYD            SEDTEMP     9   25      1.43074       48.93       44.943      .58898     5.300   .053
                      NOVALUE   AND   26       .06195        2.12        1.946      .58898     5.300   .053
DIVIDE HYD             200.14    25    9      1.43074       48.93       44.943      .58898     5.300   .053
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050   .000
ADD HYD                401.70  1& 9   10      1.45072       48.93       45.525      .58839     5.300   .053
*S   ROUTE FLOW THROUGH POND #8
ROUTE RESERVOIR          POND8    10    9      1.45072       36.40       43.011      .55590     7.800   .039 AC-FT=    8.430
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD            SEDTEMP     9   25      1.38457       34.74       41.050      .55590     7.800   .039
                      NOVALUE   AND   26       .06615        1.66        1.961      .55590     7.800   .039
DIVIDE HYD             200.14    25    9      1.38457       34.74       41.050      .55590     7.800   .039
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050   .000
*S ROUTE OVERLAND FLOW FROM BASINS 1-6 THROUGH  BASIN 7
ROUTE                    L6RTD     9   10      1.38457       34.74       41.021      .55551     7.850   .039
*S COMPUTE HYDROGRAPH FOR BASIN L7
COMPUTE NM HYD             L7     -     3       .36000      203.86       11.108      .57856     1.700   .885 PER IMP=    .00
*S COMBINED FLOW (BASINS 1-6) AND 7
ADD HYD                200.50   3&10   10      1.74457      205.05       52.129      .56026     1.700   .184
*S AP 200.5 *
*S   ROUTE FLOW THROUGH POND #9
ROUTE RESERVOIR          POND9    10   19      1.74457       48.21       51.466      .55314     2.300   .043 AC-FT=    6.569
*S AP 200.6 *
DIVIDE HYD            SEDTEMP    19   25      1.54045       42.57       45.444      .55314     2.300   .043
                      NOVALUE   AND   26       .20411        5.64        6.021      .55314     2.300   .043
DIVIDE HYD             200.14    25   19      1.54045       42.57       45.444      .55314     2.300   .043
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050   .000
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SW
COMPUTE NM HYD         10B_SW     -     1       .04400       43.79        1.352      .57606     1.550  1.555 PER IMP=    .00
*S ROUTE THROUGH 10B_SE TO PROPOSED DIVERSION WEST OF WEST BNDRY OF PHASE 1
ROUTE                     RTE     1     9       .04400       30.37        1.352      .57610     1.650  1.078
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SE
COMPUTE NM HYD         10B_SE     -     1       .21900      147.67        6.728      .57606     1.650  1.054 PER IMP=    .00
*S COMBINE ROUTED 10B_SW AND 10B_SE
ADD HYD                TO_DIV  9& 1     5       .26300      178.04        8.080      .57607     1.650  1.058
*S ROUTE THRU PROPOSED DIVERSION AT WEST SIDE OF PHASE 1
ROUTE                     RTE     5     9       .26300      176.05        8.080      .57607     1.650  1.046
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S1
COMPUTE NM HYD         10B_S1     -     1       .01900       21.04         .584      .57606     1.500  1.730 PER IMP=    .00
*S COMBINE FLOW FROM 10B_S1 WITH DIVERSION FLOW
ADD HYD                   ADD  1& 9     9       .28200      188.40        8.664      .57607     1.650  1.044
*S COMBINE WITH UPSTREAM FLOW FROM DAM #9
ADD HYD                 TO_10 19& 9    10      1.82245      211.84       54.108      .55669     1.700   .182
*S
*S ROUTE COMBINED THROUGH DAM #10
*S THIS DAM NOT USED IN WESTLAND SECTOR PLAN OR DAM #15 ANALYSIS
ROUTE RESERVOIR         POND10    10     9      1.82245       26.89       48.718      .50123    11.600   .023 AC-FT=   12.553
DIVIDE HYD            SEDTEMP     9   25      1.69488       25.00       45.308      .50123    11.600   .023
                      NOVALUE   AND   26       .12757        1.88        3.410      .50123    11.600   .023
DIVIDE HYD             200.14    25    9      1.69488       25.00       45.308      .50123    11.600   .023
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050   .000
*S
*S ROUTE OVERLAND FLOW FROM DAM #10 THROUGH  BASIN 10
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EXISTING PLUS PHASE 1

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                                FROM  TO                    PEAK        RUNOFF                TIME TO   CFS
                   HYDROGRAPH   ID    ID        AREA     DISCHARGE     VOLUME      RUNOFF     PEAK     PER
COMMAND          IDENTIFICATION NO.   NO.     (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

ROUTE                     RTE    9    10      1.69488      25.00       45.286      .50099    11.600    .023
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S2
COMPUTE NM HYD          10B_S2   -     3       .03900      43.18        1.198      .57606     1.500   1.730 PER IMP=    .00
*S DIVIDE 10B_S2 OUTFLOW INTO THIRDS FOR ADDING 1/3 TO DAM 11, 2/3 TO DAM 12.
DIVIDE HYD                S2_1    3    1       .01299      14.38         .399      .57606     1.500   1.730
                          S2_2  AND    2       .02601      28.80         .799      .57606     1.500   1.730
ADD HYD                    ADD  1&10   7      1.70787      25.00       45.685      .50156    11.600    .023
*S COMBINE WITH DAM #10 OUTFLOW
*S  FLOW INTO DAM #11
ADD HYD                  TO_11 10& 1  11      1.70787      25.00       45.685      .50156    11.600    .023
ROUTE RESERVOIR         POND11   11    7      1.70787      22.18       37.308      .40959    15.600    .020 AC-FT=   11.598
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD             SEDTEMP    7   25      1.66791      21.66       36.435      .40959    15.600    .020
                       NOVALUE  AND   26       .03996        .52         .873      .40959    15.600    .020
DIVIDE HYD              200.14   25    7      1.66791      21.66       36.435      .40959    15.600    .020
                       NOVALUE  AND   26       .00000        .00         .000      .00000     -.050    .000
*S
*S COMPUTE HYDROGRAPH FOR BASIN 9
*S ABOVE ESCARPMENT - NO SEDIMENT BULK
SEDIMENT BULK                                                                                          PK BF =   1.00
COMPUTE NM HYD              L9   -     4      5.82000    1900.64      144.954      .46699     1.850    .510 PER IMP=    .00
*S ROUTE OVERLAND FLOW FROM BASIN 9 THROUGH  BASIN 10A
ROUTE                    L9RTD    4    5      5.82000    1628.89      144.954      .46699     2.000    .437
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10A
COMPUTE NM HYD           L10A   -     6      3.06000     822.38       76.555      .46909     1.950    .420 PER IMP=    .00
*S COMBINED FLOW (BASIN 9 AND 10A) AT LADERA TRAINING DIKE
ADD HYD                   AP4  6& 5   8      8.88000    2441.12      221.509      .46771     2.000    .430
*S ROUTE OUTFLOW FROM TRAINING DIKE AREA THRU 10B_NW TO 98TH ST
ROUTE                     RTE    8    9      8.88000    2391.10      221.509      .46771     2.050    .421
*S
SEDIMENT BULK                                                                                          PK BF =   1.17
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NW
COMPUTE NM HYD          10B_NW   -     1       .58600     301.15       18.004      .57606     1.750    .803 PER IMP=    .00
*S COMBINE ROUTED BASIN 9 AND 10B_NW AT 98TH ST
ADD HYD                   AP5  9& 1   4      9.46600    2557.69      239.513      .47442     2.050    .422
*S ROUTE COMBINED THRU 10B_NE
ROUTE                     RTE    4    9      9.46600    2535.01      239.513      .47442     2.100    .418
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NE
COMPUTE NM HYD          10B_NE   -     1       .12400      66.67        3.810      .57606     1.700    .840 PER IMP=    .00
*S COMBINE WITH ROUTED BASIN 9 & 10B_NW
ADD HYD                   AP6  9& 1   4      9.59000    2565.87      243.322      .47573     2.050    .418
*S
*S* BASINS 130.2 + 130.3 FROM DAM#15 STUDY =  BASIN NB4 IN WESTLAND SECT PLAN
*S*  BUT BASIN 130.2 FLOWS GO EAST(NOT TO DAM #12)SO NOT INCLUDED IN THIS MODEL.
*S
*S*** COMPUTE HYDROGRAPH FOR BASIN 130.3
COMPUTE NM HYD          130.33   -     3       .03900      28.35        1.136      .54638     1.600   1.136 PER IMP=    .00
*S***** ADD TO BASIN 9+10B_NW+NE FLOW
*S  FLOW ENTERING NORTH BNDRY OF PHASE I VIA MIREHAVEN ARROYO.
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EXISTING PLUS PHASE 1

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                                FROM  TO                    PEAK        RUNOFF                 TIME TO    CFS
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF       PEAK      PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)      (CFS)       (AC-FT)    (INCHES)    (HOURS)    ACRE      NOTATION

ADD HYD                    AP7  4& 3   6     9.62900     2571.19      244.459      .47602      2.050     .417
*S  ROOUTE IN MIREHAVEN CHANNEL ALONG EAST BNDRY OF PHASE I.
*S  USED AN AVERAGE SECTION FROM MIREHAVEN SCOUR WALL REPORT, SOFTLINED
ROUTE                      RTE    6   9     9.62900     2563.08      244.459      .47602      2.100     .416
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH1_E
COMPUTE NM HYD           PH1_E   -    1      .02600       35.86        2.534     1.82773      1.700    2.155 PER IMP=  54.00
*S***** ADD TO ROUTED MIREHAVEN FLOW.
ADD HYD                    AP8  9& 1   6     9.65500     2579.32      246.994      .47966      2.100     .417
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_E
COMPUTE NM HYD          10B_E   -    1      .02100       23.25         .645      .57606      1.500    1.730 PER IMP=    .00
*S ROUTE 10B_E OVERLAND THRU PH_1W
ROUTE                      RTE    1   9      .02100       15.33         .645      .57614      1.600    1.141
SEDIMENT BULK                                                                                             PK BF =   1.05
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH_1W
COMPUTE NM HYD          PH_1W   -    1      .07300      136.42        6.192     1.59029      1.500    2.920 PER IMP=  53.00
*S COMBINE ROUTED 10B_E AND PH_1W
ADD HYD                    ADD  9& 1   3      .09400      145.91        6.837     1.36371      1.500    2.425
*S COMBINE WITH ROUTED MIREHAVEN FLOW AT SOUTH BNDRY OF PHASE I
ADD HYD                    AP9  3& 6   6     9.74900     2605.84      253.830      .48818      2.100     .418
*S COMBINE WITH 2/3 FLOW DIVIDED FROM BASIN 10B_S2
ADD HYD                    ADD  6& 2   9     9.77501     2607.86      254.629      .48842      2.100     .417
*S  ADD TO DAM 11 ROUTED OUTFLOW
ADD HYD                  COMB12  9& 7  12    11.44292     2608.76      291.065      .47693      2.100     .356
*S
*S ENLARGED DAM 12 BBBY MULTIPLYING DAM #15 REPORT'S DAM12 STORAGE BY FACTOR
ROUTE RESERVOIR           POND12   12   10    11.44292     1173.06      289.199      .47387      2.700     .160 AC-FT=  103.270
DIVIDE HYD               SEDTEMP   10   25    11.08704     1136.58      280.205      .47387      2.700     .160
                         NOVALUE  AND   26      .35587       36.48        8.994      .47387      2.700     .160
DIVIDE HYD                200.14   25   10    11.08704     1136.58      280.205      .47387      2.700     .160
                         NOVALUE  AND   26      .00000         .00         .000      .00000      -.050     .000
*S
*S END OF WESTLAND PHASE I DRAINAGE ANALYSIS EXISTING COND.
FINISH
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EXISTING PLUS PHASE I

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AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994          RUN DATE (MON/DAY/YR) =11/07/1995
INPUT FILE = PHAS1_D.HYM                                                                  USER NO.= BOHN_HNM.STE

                              FROM  TO                    PEAK        RUNOFF                TIME TO    CFS      PAGE =    1
                HYDROGRAPH     ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND       IDENTIFICATION   NO.  NO.      (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

*S   WESTLAND PHASE I DRAINAGE REPORT -  DEVELOPED CONDITIONS
*S  SEDIMENT BULKING USED:   0% UNDEV. FOR BASINS ABOVE THE ESCARPMENT (9 & 10A)
*S                           17% UNDEV. FOR BASINS BELOW THE ESCARPMENT
*S                           5% DEV.
*S
*S RAINFALL FOR BASINS BELOW LADERA WEST DAM AND ABOVE DAM #12
RAINFALL  TYPE= 2                                                                                   RAIN24=   2.650
SEDIMENT BULK                                                                                       PK BF =    1.05
*S*************************************************************************
*S COMPUTE HYDROGRAPH FOR BASIN L1
COMPUTE NM HYD            L1   -     3        .27000       437.20      17.974      1.24819    1.550    2.530 PER IMP=  32.00
*S ROUTE OVERLAND FLOW FROM BASIN L1 THROUGH  BASIN L2
ROUTE                  L1RTD    3    4        .27000       432.08      17.974      1.24819    1.550    2.500
*S
*S COMPUTE HYDROGRAPH FOR BASIN L2
COMPUTE NM HYD            L2   -     7        .11000       221.43       9.125      1.55533    1.500    3.145 PER IMP=  50.00
*S COMBINED FLOW (BASIN 1 AND 2)
ADD HYD                  AP1  4& 7   8        .38000       630.76      27.098      1.33710    1.550    2.594
*S ROUTE OVERLAND FLOW (BASINS L1 AND L2) THROUGH  BASIN L3
ROUTE                  L2RTD    8    9        .38000       635.96      27.099      1.33710    1.550    2.615
*S
*S COMPUTE HYDROGRAPH FOR BASIN L3
COMPUTE NM HYD            L3   -     5        .49000       596.50      34.393      1.31606    1.650    1.902 PER IMP=  35.00
*S COMBINED FLOW (BASINS L1-L2 AND L3)
ADD HYD                200.10  9& 5   9        .87000      1156.36      61.491      1.32525    1.600    2.077
*S AP 200.1 *
*S   ROUTE FLOW THROUGH POND #1
ROUTE RESERVOIR         POND1    9   10        .87000       202.79      61.447      1.32430    2.250     .364 AC-FT=   35.446
*S AP 200.2 *
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD            SEDTEMP   10   25        .75168       175.21      53.091      1.32430    2.250     .364
                      NOVALUE  AND   26        .11832        27.58       8.357      1.32430    2.250     .364
DIVIDE HYD             200.11   25   10        .75168       175.21      53.091      1.32430    2.250     .364
                      NOVALUE  AND   26        .00000          .00        .000       .00000    -.050     .000
*S ROUTE OVERLAND FLOW FROM BASINS L1-L3 THROUGH  BASIN L4
ROUTE                  L3RTD   10    9        .75168       175.11      53.089      1.32426    2.250     .364
*S
*S COMPUTE HYDROGRAPH FOR BASIN L4
COMPUTE NM HYD            L4   -     6        .27000       557.14      26.568      1.84503    1.550    3.224 PER IMP=  63.64
*S  DIVIDE COMBINED FLOW FROM BASIN 4 FOR ROUTE THROUGH POND 2, 3 AND 4
DIVIDE HYD             401.70    6    1        .08991       185.53       8.847      1.84503    1.550    3.224
                       401.80  AND    3        .18009       371.61      17.721      1.84503    1.550    3.224
ADD HYD                401.60  1& 9  10        .84159       220.82      61.936      1.37989    1.800     .410
*S   ROUTE FLOW THROUGH POND #2
ROUTE RESERVOIR         POND2   10    9        .84159        89.96      61.726      1.37521    4.350     .167 AC-FT=   23.085
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD            SEDTEMP    9   25        .82114        87.78      60.226      1.37521    4.350     .167
                      NOVALUE  AND   26        .02045         2.19       1.500      1.37521    4.350     .167
DIVIDE HYD             200.12   25    9        .82114        87.78      60.226      1.37521    4.350     .167
                      NOVALUE  AND   26        .00000          .00        .000       .00000    -.050     .000
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DEVELOPED
PG 1 OF 5

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	401.20	1& 9	10	.91105	198.15	69.073	1.42157	1.550	.340	
*S ROUTE FLOW THROUGH POND #3										
ROUTE RESERVOIR	POND3	10	9	.91105	43.99	65.976	1.35783	9.150	.075	AC-FT= 29.893
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.90659	43.77	65.653	1.35783	9.150	.075	
	NOVALUE	AND	26	.00446	.22	.323	1.35784	9.150	.075	
DIVIDE HYD	200.13	25	9	.90659	43.77	65.653	1.35783	9.150	.075	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.30	1& 9	10	.99650	191.11	74.500	1.40179	1.550	.300	
*S ROUTE FLOW THROUGH POND #4										
ROUTE RESERVOIR	POND4	10	9	.99650	38.57	70.010	1.31731	14.350	.060	AC-FT= 15.258
*S AP 200.3 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	.96082	37.19	67.504	1.31731	14.350	.060	
	NOVALUE	AND	26	.03567	1.38	2.506	1.31731	14.350	.060	
DIVIDE HYD	200.14	25	9	.96082	37.19	67.504	1.31731	14.350	.060	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-4 THROUGH BASIN 5										
ROUTE	PD4RTD	9	10	.96082	37.19	67.472	1.31669	14.400	.060	
*S										
*S COMPUTE HYDROGRAPH FOR BASIN L5										
COMPUTE NM HYD	L5	-	3	.91000	959.02	66.645	1.37318	1.750	1.647	PER IMP= 37.37
*S COMBINED FLOW (BASINS 1-4 AND 5)										
ADD HYD	AP3	3&10	10	1.87082	973.21	134.117	1.34417	1.750	.813	
*S ROUTE FLOW THROUGH PONDS #5										
ROUTE RESERVOIR	POND5	10	9	1.87082	221.53	129.157	1.29445	2.400	.185	AC-FT= 37.394
*S AP 200.4 *										
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.79842	212.95	124.159	1.29445	2.400	.185	
	NOVALUE	AND	26	.07240	8.57	4.998	1.29445	2.400	.185	
DIVIDE HYD	200.14	25	9	1.79842	212.95	124.159	1.29445	2.400	.185	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
*S ROUTE OVERLAND FLOW FROM BASINS 1-5 THROUGH BASIN 6										
ROUTE	L5RTD	9	10	1.79842	212.73	123.971	1.29250	2.450	.185	
*S COMPUTE HYDROGRAPH FOR BASIN L6										
COMPUTE NM HYD	L6	-	4	.06000	97.22	3.657	1.14295	1.500	2.532	PER IMP= 29.00
*S COMBINED FLOW (BASINS 1-5 AND 6)										
*S DIVIDE ID=4 INTO 3 PARTS FOR PONDS 6, 7 AND 8										
DIVIDE HYD	601.50	4	1	.01998	32.37	1.218	1.14294	1.500	2.532	
	601.60	AND	3	.04002	64.84	2.439	1.14294	1.500	2.532	
ADD HYD	401.60	1&10	10	1.81840	213.83	125.189	1.29086	2.450	.184	
*S ROUTE FLOW THROUGH POND #6										
ROUTE RESERVOIR	POND6	10	9	1.81840	140.10	121.982	1.25779	4.100	.120	AC-FT= 17.372
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										
DIVIDE HYD	SEDTEMP	9	25	1.79385	138.21	120.335	1.25779	4.100	.120	
	NOVALUE	AND	26	.02455	1.89	1.647	1.25778	4.100	.120	
DIVIDE HYD	200.14	25	9	1.79385	138.21	120.335	1.25779	4.100	.120	
	NOVALUE	AND	26	.00000	.00	.000	.00000	-.050	.000	
ADD HYD	401.60	1& 9	10	1.81383	138.31	121.553	1.25652	4.100	.119	
*S ROUTE FLOW THROUGH POND #7										
ROUTE RESERVOIR	POND7	10	9	1.81383	125.54	119.470	1.23499	5.300	.108	AC-FT= 10.493
*S DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)										

DEVELOPED
PG 2 OF 5

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                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.      (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

DIVIDE HYD            SEDTEMP     9   25      1.79225      124.05      118.048     1.23499     5.300    .108
                      NOVALUE   AND   26       .02158        1.49        1.422     1.23499     5.300    .108
DIVIDE HYD             200.14    25    9      1.79225      124.05      118.048     1.23499     5.300    .108
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050    .000
ADD HYD                401.70  1& 9   10      1.81223      124.14      119.266     1.23398     5.300    .107
*S   ROUTE FLOW THROUGH POND #8
ROUTE RESERVOIR         POND8    10    9      1.81223       81.06      112.465     1.16360     7.850    .070 AC-FT=   21.624
DIVIDE HYD            SEDTEMP     9   25      1.78957       80.05      111.059     1.16360     7.850    .070
                      NOVALUE   AND   26       .02265        1.01        1.406     1.16360     7.850    .070
DIVIDE HYD             200.11    25    9      1.78957       80.05      111.059     1.16360     7.850    .070
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050    .000
*S ROUTE OVERLAND FLOW FROM BASINS 1-6 THROUGH  BASIN 7
ROUTE                   L6RTD     9   10      1.78957       80.04      110.952     1.16248     7.850    .070
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SW
COMPUTE NM HYD         10B_SW     -    1       .04400       91.54        3.685     1.57021     1.500   3.251 PER IMP=  48.00
*S ROUTE 10B_SW DOWN 98TH ST TO BASIN 7
ROUTE                     RTE     1    9       .04400       93.15        3.685     1.57022     1.500   3.308
*S
*S COMPUTE HYDROGRAPH FOR BASIN L7_W
COMPUTE NM HYD           L7_W     -    3       .25600      401.35       17.903     1.31127     1.550   2.450 PER IMP=  36.00
*S COMBINED FLOW (10B_SW AND 7_W)
ADD HYD                   ADD   3& 9    2       .30000      487.89       21.588     1.34925     1.550   2.541
*S ROUTE COMBINED THROUGH 7_E DOWN PROPOSED CHANNEL TO DAM 9
ROUTE                     RTE     2    9       .30000      493.10       21.588     1.34925     1.550   2.568
*S
*S COMPUTE HYDROGRAPH FOR BASIN L7_E
COMPUTE NM HYD           L7_E     -    3       .10400      188.31        8.503     1.53304     1.550   2.829 PER IMP=  47.00
*S COMBINED FLOW (10B_SW, 7_E, 7_W)
ADD HYD                   ADD   3& 9    2       .40400      681.41       30.091     1.39656     1.550   2.635
*S COMBINED FLOW (BASINS 1-6) AND 7
ADD HYD                200.50  2&10   10      2.19357      682.45      141.043     1.20559     1.550    .486
*S AP 200.5 *
*S   ROUTE FLOW THROUGH POND #9
ROUTE RESERVOIR         POND9    10   19      2.19357       90.22      137.949     1.17914     2.200    .064 AC-FT=   18.308
*S AP 200.6 *
DIVIDE HYD            SEDTEMP    19   25      2.11570       87.01      133.051     1.17914     2.200    .064
                      NOVALUE   AND   26       .07787        3.20        4.897     1.17914     2.200    .064
DIVIDE HYD             200.14    25   19      2.11570       87.01      133.051     1.17914     2.200    .064
                      NOVALUE   AND   26       .00000         .00         .000      .00000     -.050    .000
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_SE
COMPUTE NM HYD         TO_DIV     -    1       .21900      497.17       20.523     1.75714     1.500   3.547 PER IMP=  57.00
*S ROUTE THRU PROPOSED DIVERSION AT WEST SIDE OF PHASE 1
ROUTE                     RTE     1    9       .21900      488.55       20.523     1.75715     1.500   3.486
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S1
COMPUTE NM HYD         10B_S1     -    1       .01900       21.08         .594      .58637     1.500   1.734 PER IMP=    .00
*S COMBINE FLOW FROM 10B_S1 WITH DIVERSION FLOW
ADD HYD                   ADD   1& 9    9       .23800      509.63       21.118     1.66368     1.500   3.346
*S COMBINE WITH UPSTREAM FLOW FROM DAM #9
ADD HYD                 TO_10 19& 9   10      2.35370      548.35      154.169     1.22814     1.500    .364
*S
*S ROUTE COMBINED THROUGH DAM #10
*S THIS DAM NOT USED IN WESTLAND SECTOR PLAN OR DAM #15 ANALYSIS
```

DEVELOPED
PG 3 OF 5

```
                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)     (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE     NOTATION

ROUTE RESERVOIR        POND10    10    9      2.35370      57.81      122.436     .97534    16.700     .038 AC-FT=   43.744
DIVIDE HYD            SEDTEMP     9   25      2.28309      56.08      118.762     .97534    16.700     .038
                      NOVALUE   AND   26       .07061       1.73        3.673     .97534    16.700     .038
DIVIDE HYD             200.14    25    9      2.28309      56.08      118.762     .97534    16.700     .038
                      NOVALUE   AND   26       .00000        .00         .000     .00000     -.050     .000
*S ROUTE OVERLAND FLOW FROM DAM #10 THROUGH  BASIN 10
ROUTE                     RTE     9   10      2.28309      56.08      118.672     .97460    16.700     .038
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_S2
COMPUTE NM HYD         10B_S2   -     3       .03900      43.26        1.220     .58637     1.500    1.733 PER IMP=     .00
*S DIVIDE 10B_S2 OUTFLOW INTO THIRDS FOR ADDING 1/3 TO DAM 11, 2/3 TO DAM 12.
DIVIDE HYD               S2_1     3    1       .01299      14.41         .406     .58636     1.500    1.733
                         S2_2   AND    2       .02601      28.86         .813     .58636     1.500    1.733
ADD HYD                   ADD   1&10    7      2.29608      56.08      119.078     .97240    16.700     .038
*S COMBINE WITH DAM #10 OUTFLOW
*S  FLOW INTO DAM #11
ADD HYD                 TO_11 10& 1   11      2.29608      56.08      119.078     .97240    16.700     .038
ROUTE RESERVOIR        POND11    11    7      2.29608      54.14       90.068     .73550    22.350     .037 AC-FT=   29.122
*S  DECREASE RUNOFF FOR SEDIMENT REMOVAL AT DAM (BASED ON 80% TRAP EFFICIENCY)
DIVIDE HYD            SEDTEMP     7   25      2.24235      52.87       87.960     .73550    22.350     .037
                      NOVALUE   AND   26       .05373       1.27        2.108     .73550    22.350     .037
DIVIDE HYD             200.14    25    7      2.24235      52.87       87.960     .73550    22.350     .037
                      NOVALUE   AND   26       .00000        .00         .000     .00000     -.050     .000
*S*************************************************************************
RAINFALL  TYPE= 2                                                                                   RAIN24=   2.606
*S
*S COMPUTE HYDROGRAPH FOR BASIN 9
*S ABOVE ESCARPMENT - NO SEDIMENT BULK
SEDIMENT BULK                                                                                       PK BF =    1.00
COMPUTE NM HYD             L9   -     4      5.82000    4589.65     327.530    1.05519     1.750    1.232 PER IMP=  29.00
*S ROUTE OVERLAND FLOW FROM BASIN 9 THROUGH  BASIN L10A
ROUTE                   L9RTD     4    5      5.82000    3971.88     327.529    1.05518     1.850    1.066
SEDIMENT BULK                                                                                       PK BF =    1.05
*S
*S COMPUTE HYDROGRAPH FOR BASIN L10A
COMPUTE NM HYD           L10A   -     6      3.06000    2167.11     180.076    1.10341     1.800    1.107 PER IMP=  29.00
*S COMBINED FLOW (BASIN 9 AND 10A) AT LADERA TRAINING DIKE
ADD HYD                   AP4  6& 5    8      8.88000    6122.36     507.606    1.07180     1.850    1.077
*S ROUTE OUTFLOW FROM TRAINING DIKE AREA THRU 10B_NW TO 98TH ST
ROUTE                     RTE     8    9      8.88000    5996.37     507.605    1.07180     1.900    1.055
*S
RAINFALL  TYPE= 2                                                                                   RAIN24=   2.650
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NW
COMPUTE NM HYD         10B_NW   -     1       .58600     608.13      28.456     .91049     1.600    1.622 PER IMP=  17.00
*S COMBINE ROUTED BASIN 9 AND 10B_NW AT 98TH ST
ADD HYD                   AP5  9& 1    4      9.46600    6246.23     536.061    1.06182     1.900    1.031
*S ROUTE COMBINED THRU 10B_NE
ROUTE                     RTE     4    9      9.46600    6194.05     536.061    1.06181     1.900    1.022
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_NE
COMPUTE NM HYD         10B_NE   -     1       .12400     220.43      10.765    1.62779     1.550    2.778 PER IMP=  51.00
*S COMBINE WITH ROUTED BASIN 9 & 10B_NW
```

DEVELOPED
PG 4 OF 5

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                                FROM  TO                    PEAK        RUNOFF                TIME TO    CFS
                   HYDROGRAPH    ID   ID        AREA     DISCHARGE     VOLUME      RUNOFF      PEAK     PER
COMMAND          IDENTIFICATION  NO.  NO.     (SQ MI)      (CFS)       (AC-FT)    (INCHES)   (HOURS)   ACRE      NOTATION

ADD HYD                   AP6  9& 1   4      9.59000      6272.52     546.826     1.06913     1.900    1.022
*S
*S* BASINS 130.2 + 130.3 FROM DAM#15 STUDY =  BASIN NB4 IN WESTLAND SECT PLAN
*S*  BUT BASIN 130.2 FLOWS GO EAST(NOT TO DAM #12)SO NOT INCLUDED IN THIS MODEL.
*S
*S*** COMPUTE HYDROGRAPH FOR BASIN 130.3
COMPUTE NM HYD        130.33   -    3       .03900        86.48       3.553     1.70811     1.500    3.465 PER IMP=  54.00
*S ADD TO BASIN 9+10B_NW+NE FLOW.
*S FLOW ENTERING NORTH BNDRY OF PHASE I VIA MIREHAVEN CHANNEL.
ADD HYD                   AP7  4& 3   6      9.62900      6294.26     550.379     1.07172     1.900    1.021
*S* ROUTE IN MIREHAVEN CHANNEL ALONG EAST BNDRY OF PHASE I.
*S  USED AN AVERAGE SECTION FROM MIREHAVEN SCOUR WALL REPORT, CONCRETE
ROUTE                     RTE    6   9      9.62900      6297.55     550.378     1.07172     1.950    1.022
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH1_E
COMPUTE NM HYD         PH1_E   -    1       .02600        58.00       2.369     1.70811     1.500    3.486 PER IMP=  54.00
*S***** ADD TO ROUTED MIREHAVEN FLOW.
ADD HYD                   AP8  9& 1   6      9.65500      6310.53     552.747     1.07343     1.950    1.021
*S
*S COMPUTE HYDROGRAPH FOR BASIN 10B_E
COMPUTE NM HYD         10B_E   -    1       .02100        47.83       1.985     1.77254     1.500    3.559 PER IMP=  58.00
*S ROUTE 10B_E OVERLAND THRU PH_1W
ROUTE                     RTE    1   9       .02100        38.05       1.985     1.77257     1.600    2.831
SEDIMENT BULK                                                                                                PK BF =    1.05
*S
*S COMPUTE HYDROGRAPH FOR BASIN PH_1W
COMPUTE NM HYD         PH_1W   -    1       .07300       147.80       6.447     1.65589     1.500    3.164 PER IMP=  53.00
*S COMBINE ROUTED 10B_E AND PH_1W
ADD HYD                   ADD  9& 1   3       .09400       179.22       8.432     1.68194     1.550    2.979
*S COMBINE WITH ROUTED MIREHAVEN FLOW AT SOUTH BNDRY OF PHASE I
ADD HYD                   AP9  3& 6   6      9.74900      6362.10     561.180     1.07930     1.950    1.020
*S COMBINE WITH 2/3 FLOW DIVIDED FROM BASIN 10B_S2
ADD HYD                   ADD  6& 2   9      9.77501      6365.14     561.993     1.07799     1.950    1.017
*S  ADD TO DAM 11 ROUTED OUTFLOW
ADD HYD                 COMB12  9& 7  12     12.01736      6366.58     649.954     1.01409     1.950     .828
*S
*S   ROUTE FLOW THROUGH POND #12
*S ENLARGED DAM 12 BBBY MULTIPLYING WESTLAND SECTOR DEV DAM12 STORAGE BY FACTOR
ROUTE RESERVOIR         POND12   12   10     12.01736      2672.44     631.059      .98461     2.450     .347 AC-FT=  246.297
DIVIDE HYD             SEDTEMP   10   25     11.64362      2589.33     611.434      .98461     2.450     .347
                       NOVALUE  AND   26       .37374        83.11      19.626      .98461     2.450     .347
DIVIDE HYD              200.14   25   10     11.64362      2589.33     611.434      .98461     2.450     .347
                       NOVALUE  AND   26       .00000          .00        .000      .00000     -.050     .000
*S
*S END OF WESTLAND PHASE I DRAINAGE ANALYSIS DEVELOPED COND.
FINISH
```

DEVELOPED

EXHIBIT 1

OVERALL DRAINAGE BASIN MAP

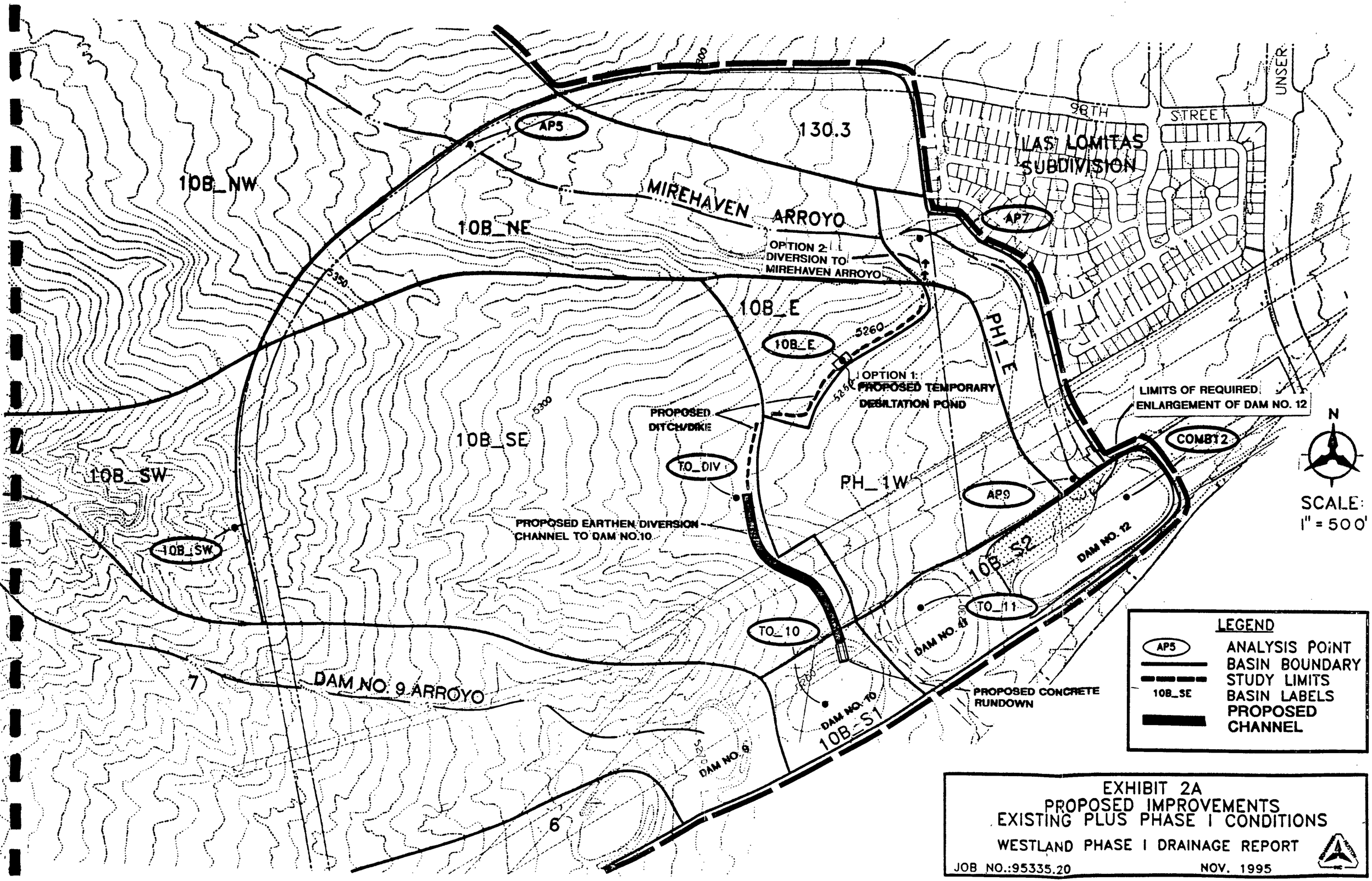


EXHIBIT 2A
PROPOSED IMPROVEMENTS
EXISTING PLUS PHASE I CONDITIONS

WESTLAND PHASE I DRAINAGE REPORT

JOB NO.:95335.20 NOV. 1995

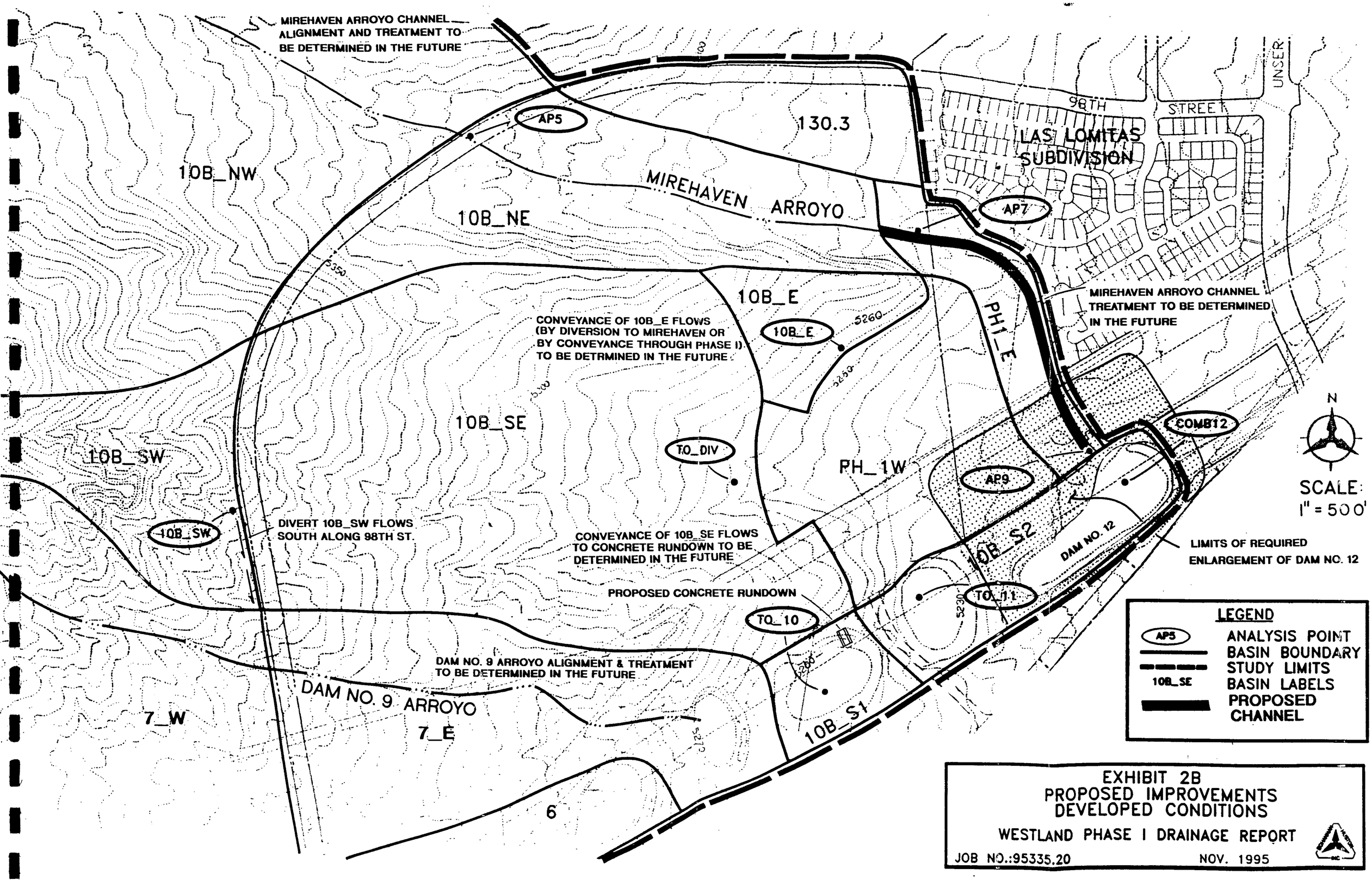


EXHIBIT 2B
PROPOSED IMPROVEMENTS
DEVELOPED CONDITIONS

WESTLAND PHASE I DRAINAGE REPORT

JOB NO.:95335.20 NOV. 1995

APPENDIX B

PROPOSED SITE CONDITIONS HYDROLOGY & POND CALCULATIONS

1. WEST DIVERSION CHANNEL & DESILTATION POND #1
2. DESILTATION POND #2
3. NORTH DIVERSION SWALE
4. ASPHALT RUNDOWNS (EAST EDGE OF SUBDIVISION)

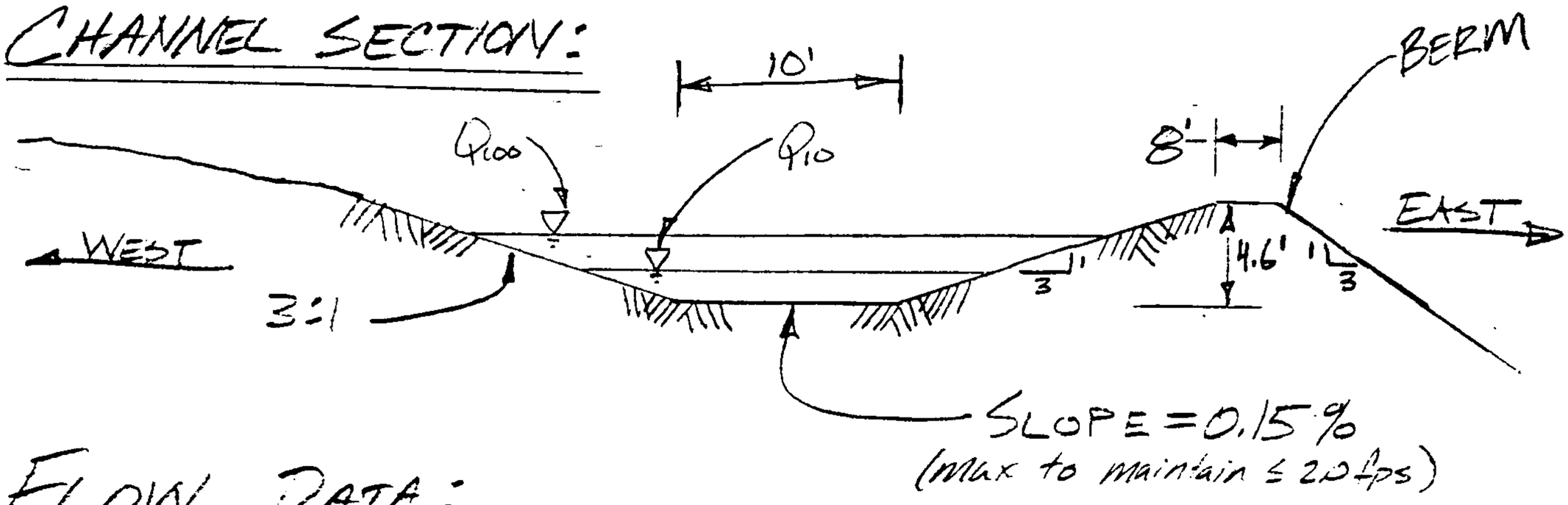
TEMP. WEST DIVERSION CHANNEL & DESILTATION POND #1 CALCULATIONS

① CHANNEL

DESIGN CRITERIA:

- NON-EROSIVE FOR 10 YR STORM
- NON-EROSIVE DEFINED AS ≤ 2.0 FPS
- SAFELY PASS 100 yr STORM.

CHANNEL SECTION:



FLOW DATA:

STORM FREQ	10 YR	100 YR
Q (CFS)	19	178.0
D (FT)	.73	3.05
V (FPS)	1.01	3.04

FREEBOARD CALC:

$$Frbd\,(ft) = 0.7(2.0 + 0.025\,Vd^{1/3})$$ [See DPM Sec 22.3 4.b.(2)]

$$= 0.7(2.0 + 0.025(3.05)(3.04)^{1/3})$$

$$= 1.48'$$

BOHANNAN-HUSTON INC.

PROJECT NAME THE [illegible] SHEET 1 OF 5

PROJECT NO. _____ BY _____ DATE _____

SUBJECT W. DIV. CHAN & [illegible] CH'D _____ DATE _____

DETERMINE CHANNEL DEPTH:

Q100 DEPTH = 3.05'

FREEBOARD = 1.48'

TOTAL = 4.53'

USE 4.6'

DETERMINE TOTAL DROP STRUCTURE HEIGHT:

TOTAL FALL FROM DESILTATION POND TO LADERA

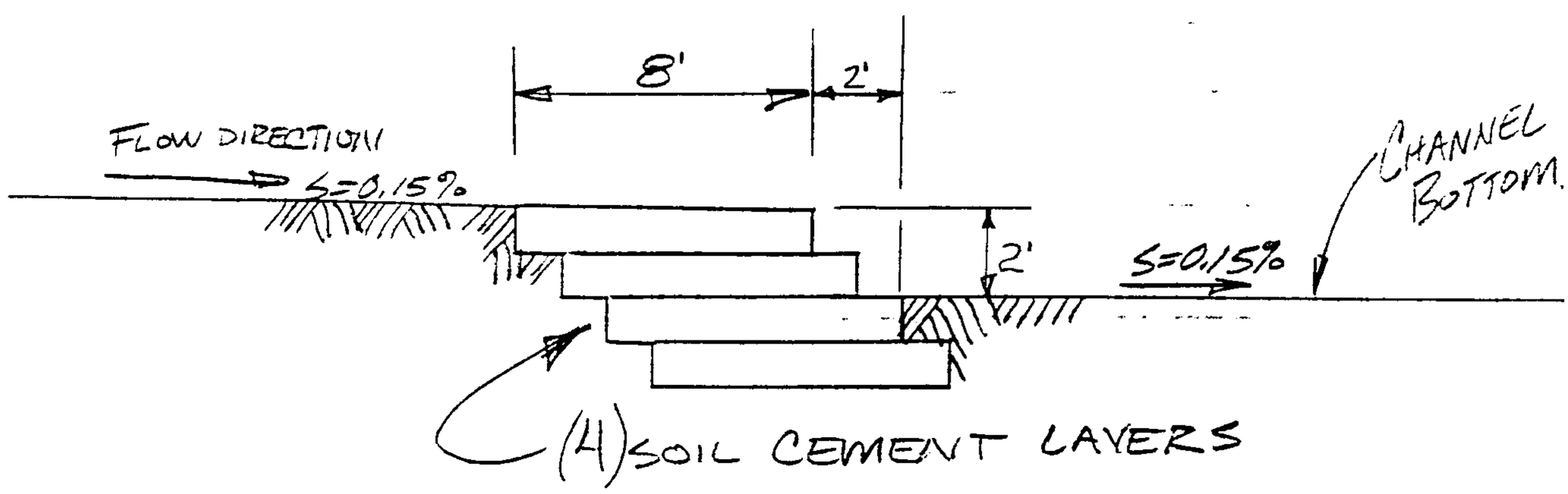
POND # 10: 5258 - 5254.5 = 3.5'

FALL DUE TO SLOPE = 1020' * 0.15% = 1.53'

FALL DUE TO DROP STRUCTURES = 3.5 - 1.53 = 1.97'

∴ USE 1 - 2' DROP STRUCTURE.
(SOIL CEMENT)

DROP STRUCTURE CROSS SECTION:



BOHANNAN-HUSTON INC.

PROJECT NAME THE CROSSING UNITS 1&2 SHEET 2 OF 5

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

② DESILTATION POND

- DESIGN CRITERIA:
  - 100% REMOVAL OF DESIGN PARTICLE (10 YR STORM)
  - DESIGN PARTICLE = COURSE SILT (.05mm)
  - Settling Velocity (V_s) = 0.0062 ft/sec.
- REQ'D SURFACE AREA:

REQ'D SURFACE AREA (SA) FOR SETTLING =

$$SA = \frac{1.2\,Q_{10}}{V_s}$$

$$= \frac{1.2\,(40.9\,cfs)}{0.0062\,fps} = 7916\,ft^2$$

- AVG. ANNUAL SEDIMENT YIELD:

SEE UNIVERSAL SOIL LOSS EQN. SPREADSHEET

YIELD = 10219 CF = REQ'D SEDIMENT
= REQ'D STORAGE VOL.

BOHANNAN-HUSTON INC.

PROJECT NAME THE CROSSING AT [illegible] SHEET 3 OF 5
PROJECT NO. _____ BY _____ DATE _____
SUBJECT _____ CHD _____ DATE _____

- ACTUAL POND DIMENSIONS:

POND BOTTOM = 5257.00

MAX WATER SURFACE ELEV = 5261.00 (100 yr)

BOTTOM OF OUTLET = 5258.00

→ SED. STORAGE VOL = AREA WITHIN CONTOUR 5257

= 20250 ft³ > 10219 ft³ ∴ ok

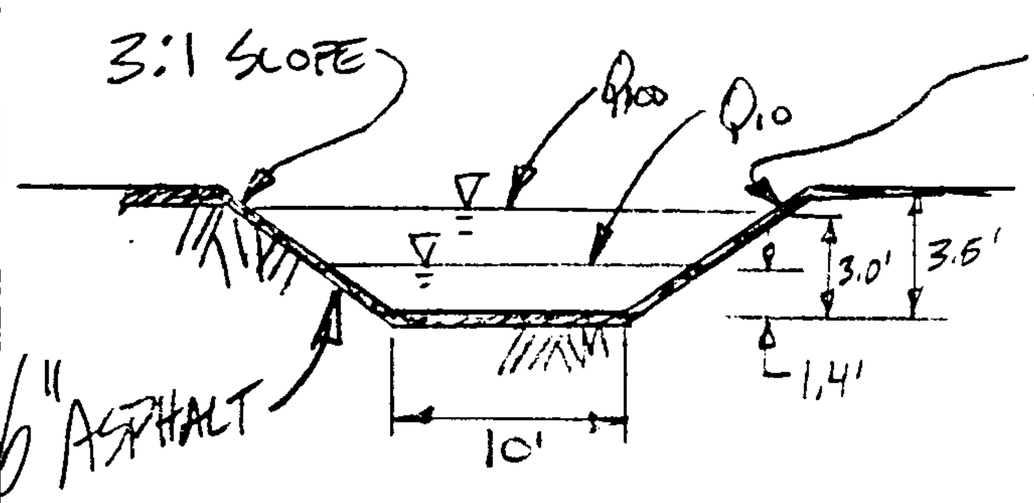
→ NOT COUNTING THE 1' OF SED. STORAGE, SETTLING DEPTH = FLOW DEPTH IN THE OUTLET CHANNEL (1.4' - 10 yr)(3.0' - 100 yr).

→ POND SIDE SLOPES = 3:1

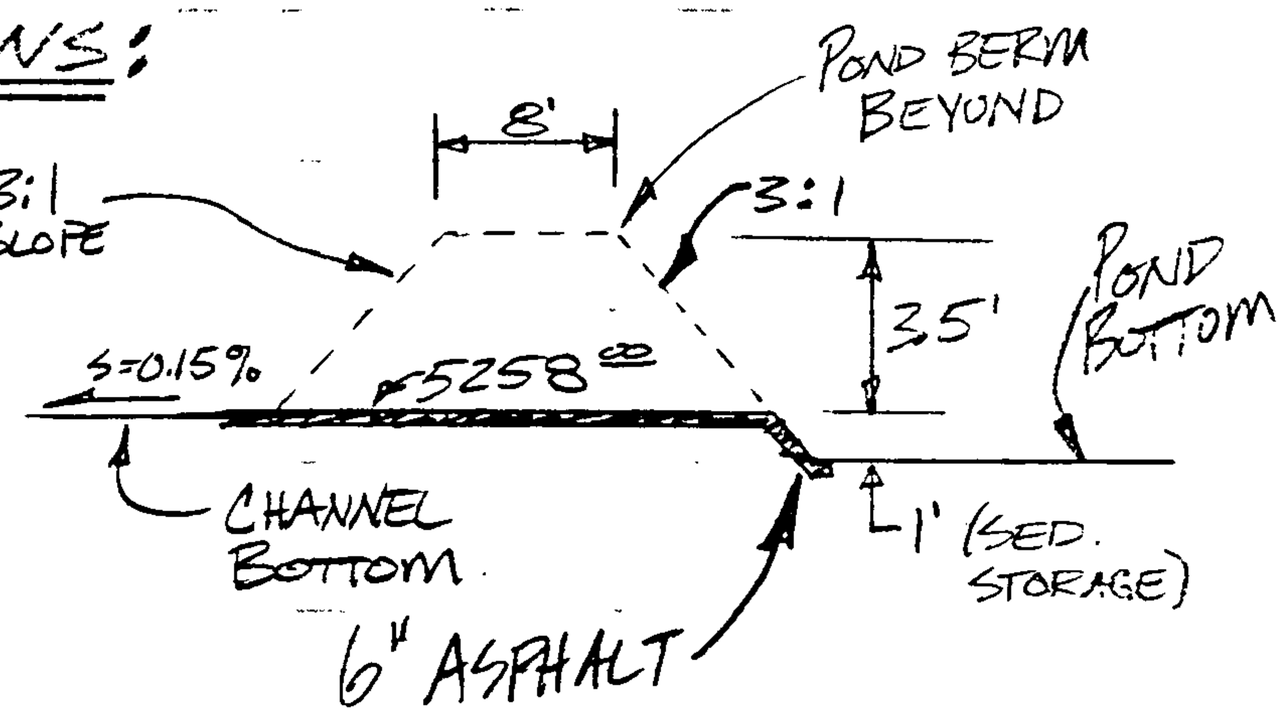
→ TOTAL POND VOL (INC. SED. STORAGE)

≅ 81,000 FT³

POND OUTLET SECTIONS:



TRANSVERSE SECTION



LATERAL SECTION

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 4 OF 5

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

The Crossing Subdivsion Units 1 & 2

SEDIMENT YIELD ANALYSIS FOR BASIS CONTRIBUTING TO THE WEST DIVERSION SWALE

USLE METHOD (UNIVERSAL SOIL LOSS EQUATION)

DESCRIPTION	VARIABLE	UNIT			
Basin				10B_SW	10B_SE
Drainage Area	DA	Sq. Mi.		0.044	0.219
Slope	S	Ft/Ft		0.052	0.036
Slope Angle	THETA	Radians		0.052	0.036
	L	Feet		2400.000	3000.000
Rainfall	R			25.000	25.000
Soil Erodability*	K			0.170	0.170
Slope Length Factor	LS			1.000	1.000
Cover*	C			0.250	0.250
Support Practice Factor	P			1.000	1.000
Sediment Yield	A	Tons/Acre		1.063	1.063
		Tons		29.920	148.920
		Cy		21.108	105.058
Estimated Soil Unit Weight	105.000 Lbs/Cf		Adjustment Factor	3.000	3.000
			Adjusted Sediment Yielc	63.323	315.175
		Total Annual Sediment Yield (CY)		**378**	
		Total Annual Sediment Yield (CF)		**10219**	

NOTE: The Universal Soil Loss Equation typically underestimates the actual sediment yield by 3 times so a factor of 3 is applied to the total annual sediment yield.

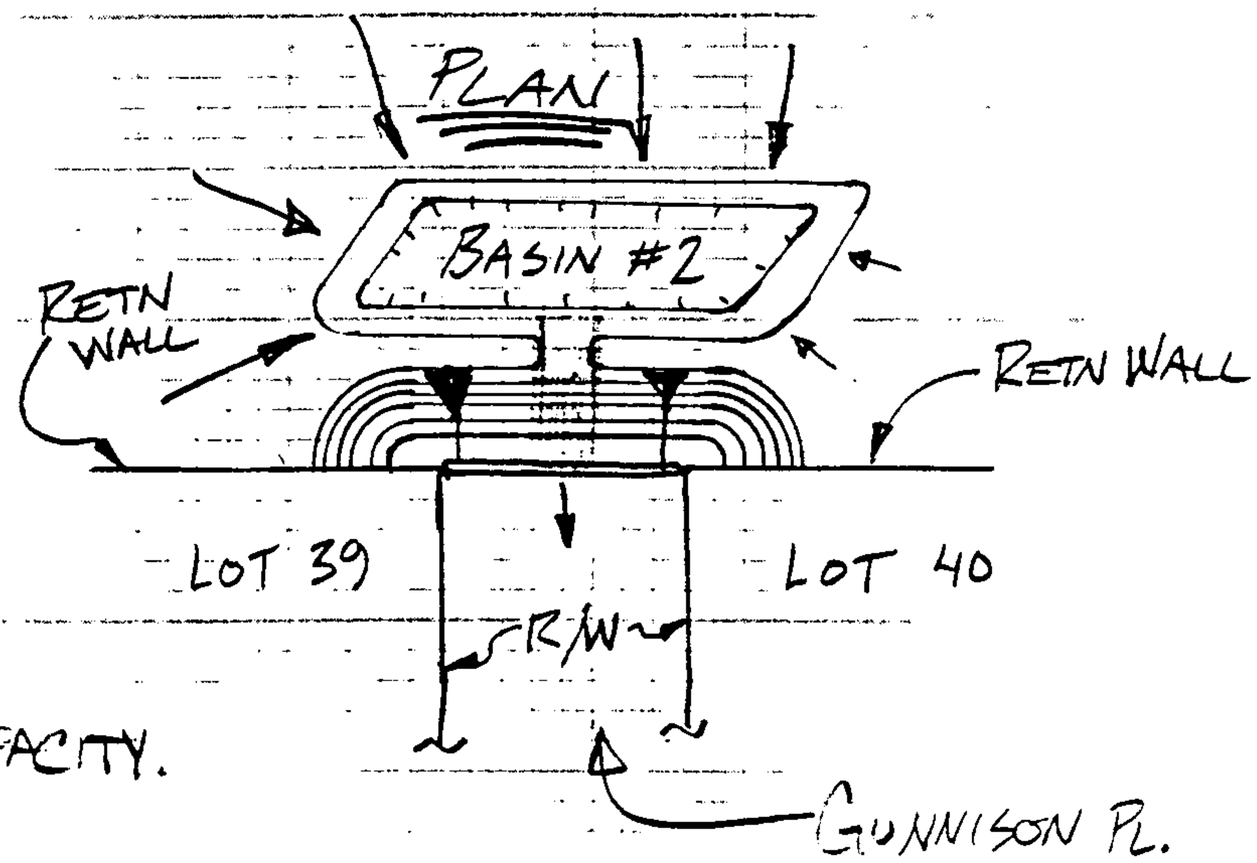
DESILTATION BASIN #2

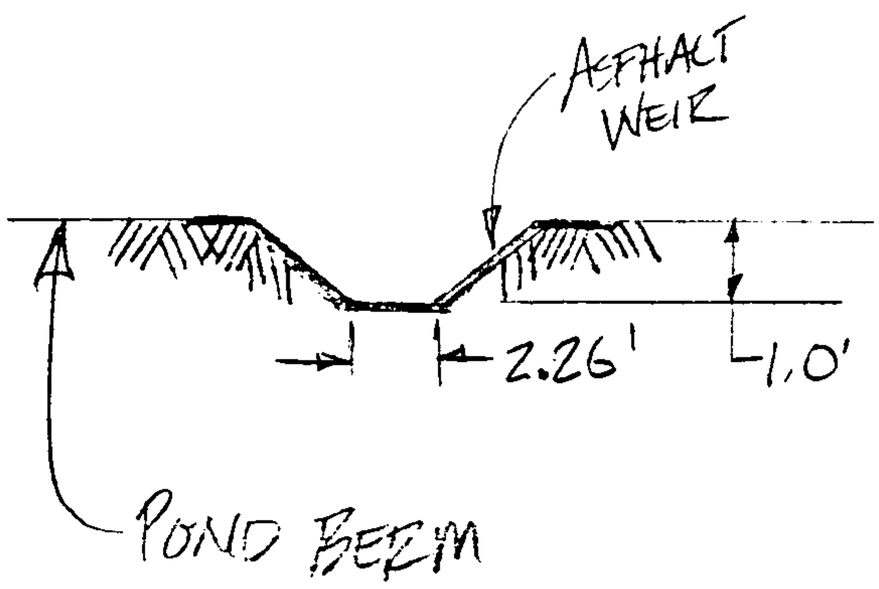
- ACCEPTS LOCALIZED FLOWS FROM PROPOSED BASIN 05 ONLY (6.7 CFS)
- BECAUSE FLOW IS SMALL & NOT CONCENTRATED DESILTATION CALCS. ARE NOT PERFORMED FOR POND #2.

POND OUTLET:

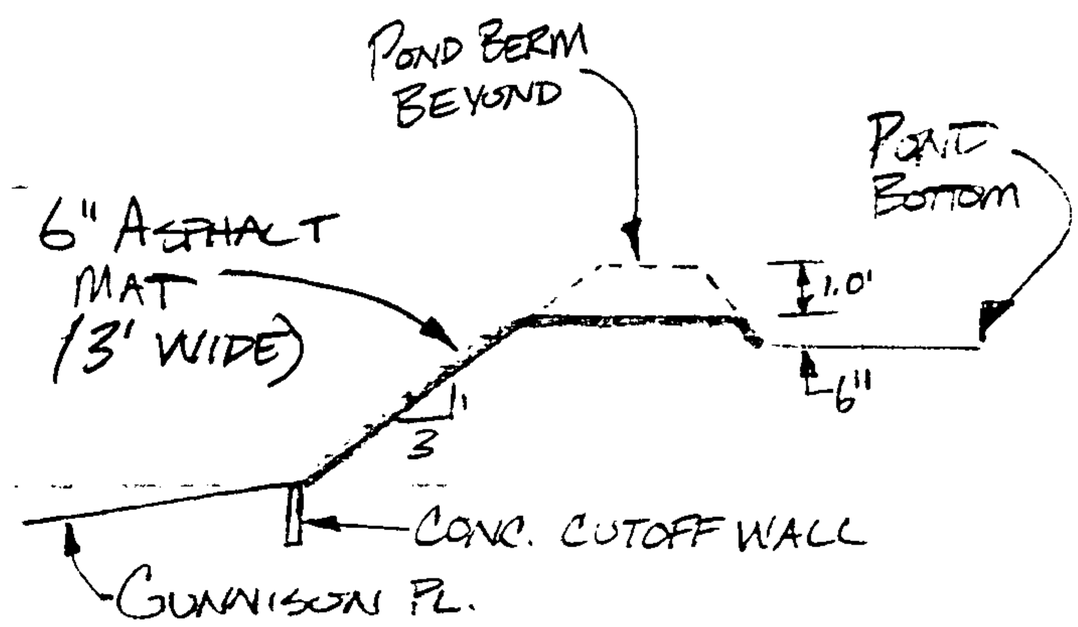
ASSUME FLOW DEPTH @ OUTLET WEIR = 1.0',
$Q = 6.7$ cfs
$\therefore L = 2.26'$

NOTE: SLOPE WEIR SIDES SHOWN BELOW WILL GIVE WEIR EXCESS CAPACITY.





TRANSVERSE SECTION



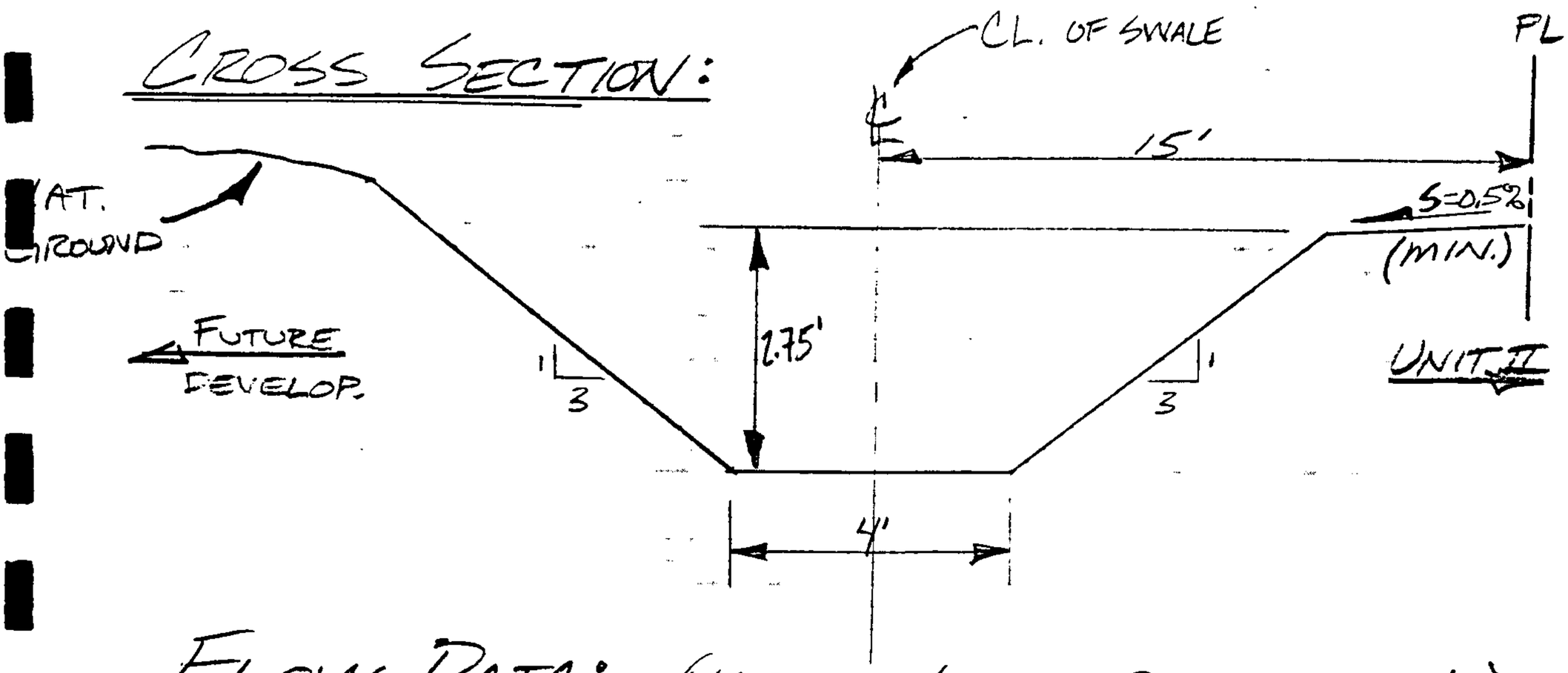
LATERAL SECTION

BOHANNAN-HUSTON INC.

PROJECT NAME The Crossing Units #2 SHEET 1 OF 1
PROJECT NO. BY DATE
SUBJECT Desilt Pond #2 CH'D DATE

NORTH DIVERSION SWALE

CROSS SECTION:



FLOW DATA: (100yr storm, Q_{100}=12.8cfs)

THE SWALE IS DIVIDED INTO THE UPPER REACH & THE LOWER REACH. (CHANNEL SECTION SAME FOR BOTH)

	SLOPE	DEPTH	VEL.	VEL (10yr)
UPPER REACH	1.5%	0.61	3.6	~2.3
LOWER REACH	0.5%	0.82'	2.4	~1.6

FREEBOARD CALCS:

$Fbd\ (feet) = 1.0 + 0.025\, Vd^{1/3}$ (DFM Sec. 22.3. 4.b (1))

$= 1.0 + .025\,(3.6)(.61)^{1/3} = 1.08'$ (Upper Reach)

OR

$= 1.0 + .025\,(2.4)(.82)^{1/3} = 1.06'$ (LOWER REACH)

	DEPTH	REQ'D FBD.	TOTAL	ACTUAL
UPPER REACH	0.61	1.08'	1.67'	< 2.75
LOWER REACH	0.82	1.06	1.88	< 2.75

BOHANNAN-HUSTON INC.

PROJECT NAME THE CROSSING - UNITS 1&2 SHEET 1 OF 3

PROJECT NO. BY DATE

SUBJECT N. DIV. SWALE CH'D DATE

Analysis of North Channel - Lower Reach

MANNING'S N = .0300 SLOPE = .0050

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.75	3	12.25	0.00			
2	8.25	0.00	4	20.50	2.75			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.20	0.20	0.9	1.0	5.3	1.1	5.20
0.40	0.40	2.1	3.4	6.5	1.6	6.40
0.60	0.60	3.5	7.1	7.8	2.0	7.60
0.80	0.80	5.1	12.3	9.1	2.4	8.80
1.00	1.00	7.0	18.9	10.3	2.7	10.00
1.20	1.20	9.1	27.2	11.6	3.0	11.20
1.40	1.40	11.5	37.3	12.9	3.2	12.40
1.60	1.60	14.1	49.2	14.1	3.5	13.60
1.80	1.80	16.9	63.1	15.4	3.7	14.80
2.00	2.00	20.0	79.2	16.6	4.0	16.00
2.20	2.20	23.3	97.4	17.9	4.2	17.20
2.40	2.40	26.9	117.9	19.2	4.4	18.40
2.60	2.60	30.7	140.9	20.4	4.6	19.60
2.75	2.75	33.7	159.7	21.4	4.7	20.50

$Q_{100} = 128$ cfs
D = .82'
V = 2.4 ft

Analysis of North Channel - Upper Reach

MANNING'S N = .0300 SLOPE = .0150

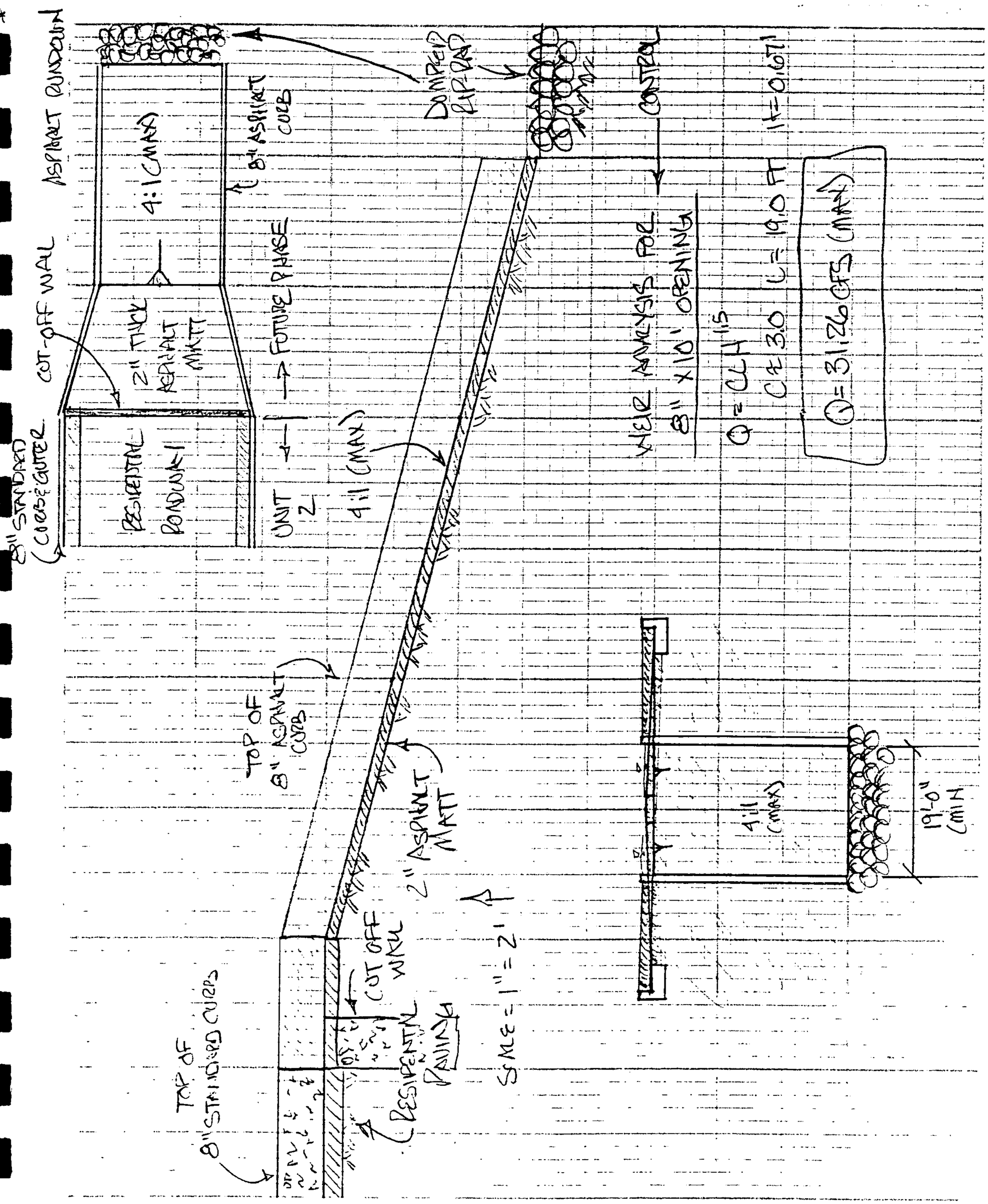
POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	2.75	3	12.25	0.00			
2	8.25	0.00	4	20.50	2.75			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.20	0.20	0.9	1.7	5.3	1.9	5.20
0.40	0.40	2.1	5.9	6.5	2.8	6.40
0.60	0.60	3.5	12.3	7.8	3.5	7.60
0.80	0.80	5.1	21.2	9.1	4.1	8.80
1.00	1.00	7.0	32.8	10.3	4.7	10.00
1.20	1.20	9.1	47.2	11.6	5.2	11.20
1.40	1.40	11.5	64.6	12.9	5.6	12.40
1.60	1.60	14.1	85.3	14.1	6.1	13.60
1.80	1.80	16.9	109.4	15.4	6.5	14.80
2.00	2.00	20.0	137.1	16.6	6.9	16.00
2.20	2.20	23.3	168.7	17.9	7.2	17.20
2.40	2.40	26.9	204.2	19.2	7.6	18.40
2.60	2.60	30.7	244.0	20.4	8.0	19.60
2.75	2.75	33.7	276.6	21.4	8.2	20.50

$Q_{100} = 17.8$ cfs

D = .61'

V = 3.6 ft



BOHANNAN-HUSTON INC.

PROJECT NAME THE CROSSING SHEET 1 OF 1

PROJECT NO. BY K. PATTON DATE 4/4/96

SUBJECT ASPHALT RUNDOWN CH'D DATE

APPENDIX C

STREET FLOW, INLET AND STORM DRAIN CAPACITY

1. GUNNISON PLACE INLET & SD ANALYSIS
2. CASA VERDE INLET & SD ANALYSIS
3. ANALYSIS OF FULLY DEVELOPED FLOW IN MISCELLANEOUS STREETS

GUNNISON PLACE INLET DESIGN

- TOTAL FLOW AT AP 13 (SEE PROPOSED COND MAP)
  = 32.6 CFS

→ • FLOW @ THE DOUBLE 'A' INLETS JUST NORTH OF UNITS 3 & 4 (future) = 32.6 − (½ of BASIN 01) = 28.5 cfs

- ROADWAY SLOPE = 1.8%

- FLOW DEPTH AT DOUBLE 'A' INLETS = .45'
  (See GUNNISON PLACE FLOW ANALYSIS)

- DOUBLE 'A' INLETS ACCEPT <u>7.3 cfs EA.</u>

→ • FLOW AT DOUBLE 'C' INLETS (AT AP 13)
  = 32.6 − (7.3 × 2) = 18.0 cfs

- FLOW DEPTH @ DOUBLE 'C' INLETS = 0.40'

- DOUBLE 'C' INLETS ACCEPT <u>5.6 CFS EACH.</u>

→ • RESIDUAL FLOW PASSING THE LAST INLETS
  = 6.8 cfs.

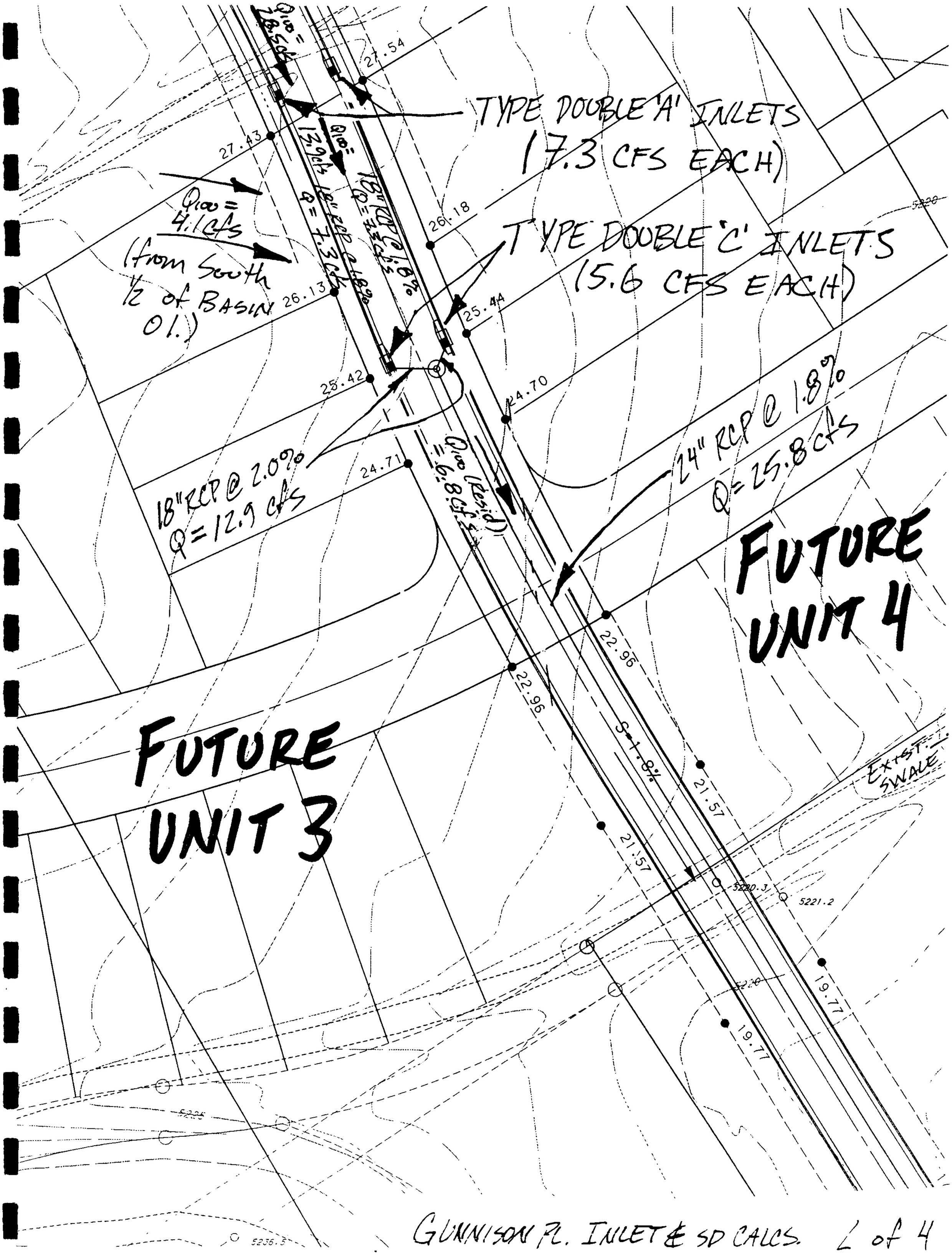
- THIS FLOW WILL ENTER A NATURAL SWALE AT THE SOUTH EDGE OF UNIT 4.

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 1 OF 4

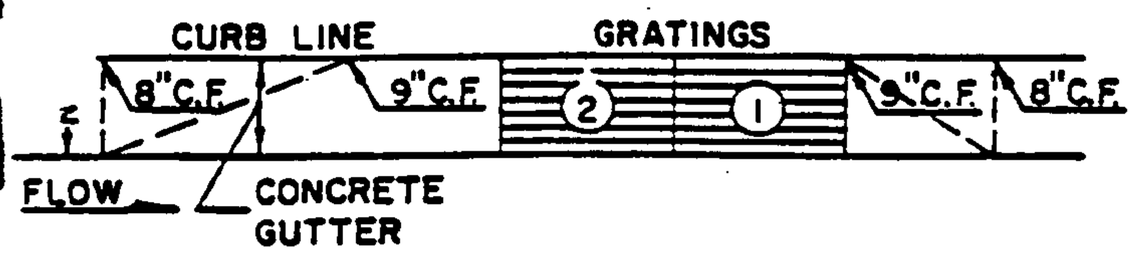
PROJECT NO. _____ BY _____ DATE _____

SUBJECT GN. PL. INLET & SD ANALYSIS CH'D _____ DATE _____

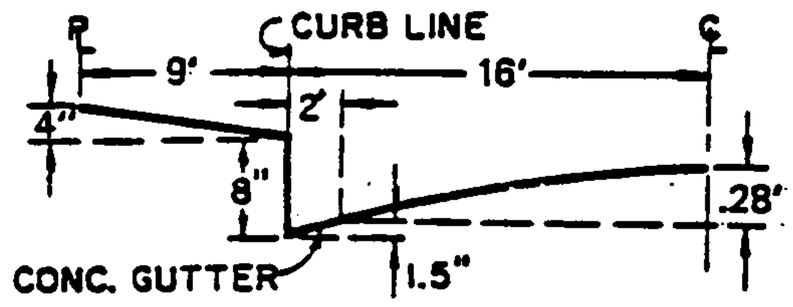


GUNNISON PL. INLET & SD CALCS. 2 of 4

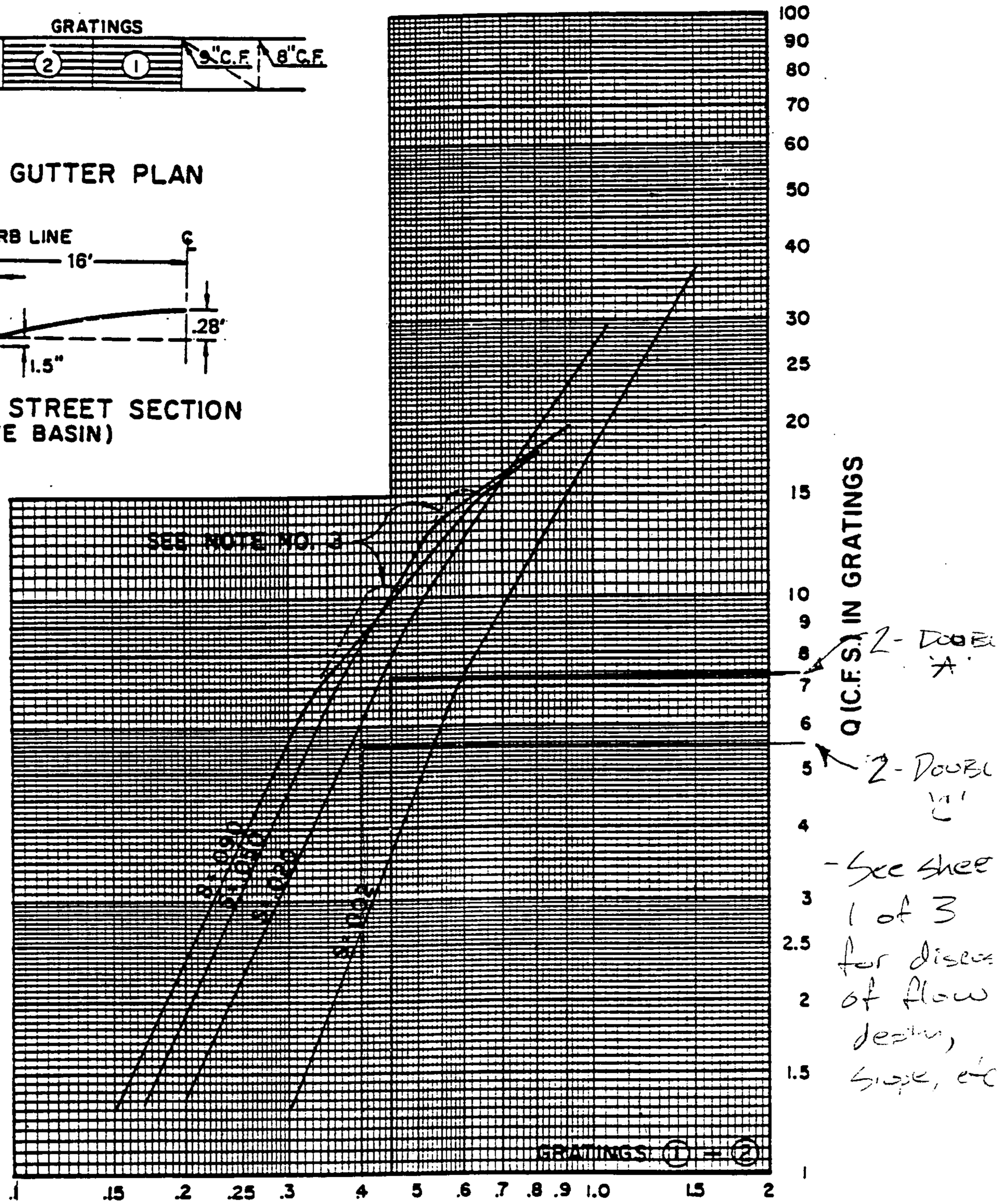
GRATING CAPACITIES FOR TYPE DOUBLE "A" "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



D = DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

GUNNISON P. INLET DETAIL

3 of 4

GUNNISON PL SD ANALYSIS

18" RCP CONNECTOR PIPES:

(Connecting Double A's to Double C's)

- Q = 7.3 cfs
- n = .013
- SLOPE = 1.8 %

Mannings Eqn. gives flow depth = 9.2"

& Vel = 8.0 fps

∴ NON-PRESSURE FLOW

18" RCP PIPES CONNECTING Double C's to MH:

- Q = 7.3 cfs + 5.6 cfs = 12.9 cfs
- SLOPE = 2.0 %, n = .013

By Manning's, FLOW DEPTH = 13"

VEL = 9.5 fps

∴ NON-PRESSURE FLOW

36" RCP CONNECTING MH TO MH:

- THIS SECTION IS DESIGNED TO ACCEPT FUTURE FLOW FROM DEVELOPED BASIN D13.
- SLOPE = 1.8 %, $Q_{FULL\ DEVEL.} = 56.5 > Q_{PROPOSED} = 12.9 * 2 = 25.8$ cfs.

By Mannings, DEPTH = 20.8", VEL = 13.4 fps

∴ NON-PRESSURE FLOW

36" RCP CONNECTING MH TO LAKERA POND #12:

SINCE THE pipe above was adequate, & the slope for this pipe = 2%, this pipe is adequate.

BOHANNAN-HUSTON INC.

PROJECT NAME		SHEET 4	OF 4
PROJECT NO.		BY	DATE
SUBJECT		CH'D	DATE

CASA VERDE INLET ANALYSIS

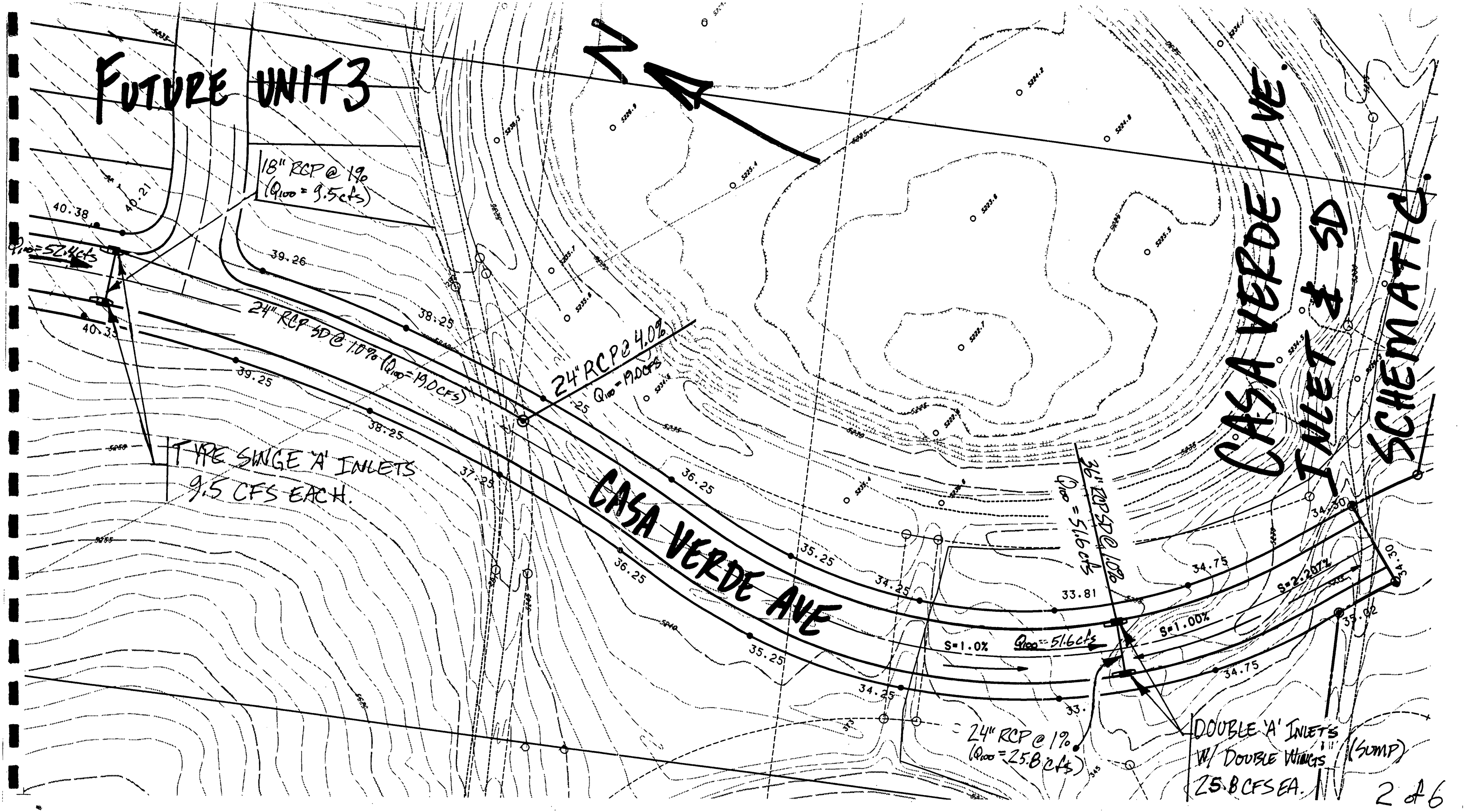
- TOTAL FLOW @ AP H (See Fully Dev. Cond. MAP) = 52.4 cfs
- DEPTH OF FLOW @ AP H = 0.61' (See CASA VERDE, STREET FLOW ANALYSIS)
- ROADWAY SLOPE = 1.0%
- SINGLE 'A' INLETS ACCEPT 9.5 CFS EACH
- TOTAL FLOW @ AP K = 51.6 cfs
- TWO TYPE DOUBLE 'A' INLETS W/ DOUBLE WINGS IN SUMP COND.
- ATTACHED SPREADSHEET SHOWS THAT EACH INLET CAN ACCEPT 26.11 CFS W/ 8" OF HEAD, & 47.9 CFS W/ 1.0' OF HEAD
- 2 * 26.11 = 52.2 > 51.6 ∴ OK

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 1 OF 6

PROJECT NO. _____ BY _____ DATE _____

SUBJECT CASA VERDE INLET & SD ANALYSIS CH'D _____ DATE _____


FUTURE UNIT 3
N
18" RCP @ 1%
(Q100 = 9.5 cfs)
Q100 = 52.4 cfs
24" RCP SD @ 1.0% (Q100 = 19.0 CFS)
24" RCP @ 4.0%
Q100 = 19.0 CFS
TYPE SUMP 'A' INLETS
9.5 CFS EACH.
CASA VERDE AVE
36" RCP SD @ 1.0%
Q100 = 51.6 cfs
S=1.0%
Q100 = 51.6 cfs
S=1.00%
S=2.30%
24" RCP @ 1%
(Q100 = 25.8 cfs)
DOUBLE 'A' INLETS
W/ DOUBLE WINGS (SUMP)
25.8 CFS EA.
CASA VERDE AVE.
INLET & SD
SCHEMATIC
40.38
40.21
40.33
39.26
39.25
38.25
38.25
37.25
36.25
36.25
35.25
35.25
34.25
34.25
33.81
34.75
34.75
34.50
34.30
35.02

The Crossing Units 1 & 2

Inlet Analysis for Type Double A, with Double Wings as proposed for the low point~~s~~ in ~~Gunnison &~~ Casa Verde

Open Area (for orifice calc in sq. ft.):	7.797743
Length of Weir (feet):	7.979167
Orifice Coeficient	0.6
Weir Coeficient	3

Head (ft)	Head (in)	1 Wing Weir Q (cfs)	Grate Weir Q (cfs)	Grate Orifice Q (cfs)	Total Q (cfs)
0.05	0.6	0.13	0.27	8.40	0.54
0.1	1.2	0.38	0.76	11.87	1.52
0.15	1.8	0.70	1.39	14.54	2.78
0.2	2.4	1.07	2.14	16.79	4.29
0.25	3	1.50	2.99	18.77	5.99
0.3	3.6	1.97	3.93	20.56	7.88
0.35	4.2	2.48	4.96	22.21	9.93
0.4	4.8	3.04	6.06	23.75	12.13
0.45	5.4	3.62	7.23	25.19	14.47
0.5	6	4.24	8.46	26.55	16.95
0.55	6.6	4.89	9.76	27.84	19.55
0.6	7.2	5.58	11.13	29.08	22.28
0.65	7.8	6.29	12.54	30.27	25.12
0.667	**8.0**	**6.54**	**13.04**	**30.66**	**26.11**
0.7	8.4	7.03	14.02	31.41	28.08
0.75	9	7.79	15.55	32.52	31.14
0.8	9.6	8.59	17.13	33.58	34.30
0.85	10.2	9.40	18.76	34.62	37.57
0.9	10.8	10.25	20.44	35.62	40.93
0.95	11.4	11.11	22.16	36.60	44.39
1	12	12.00	23.94	37.55	47.94

Calculation of open area:

Total Grate Area	2000	13.88889
Cross Bar Area	-732	-5.08333
Supports (ends)	-115.625	-0.80295
(middle)	-100	-0.69444
Areas Counted Twice	70.5	0.489583
	1122.875	7.797743

Calculation of Length of Weir (for the grate only)

Total Perimeter of Grate	130	10.83333
Short Cross Bars	-7	-0.58333
Bearing Bars	-13	-1.08333
End Supports	-9.25	-0.77083
Middle Supports	-5	-0.41667
	110	7.979167

NOTE: THE FLOW AT AP K = 51.6 cfs.
AT A DEPTH OF 8", INLET CAPACITY = 52.2 cfs.
AT 1.0' OF DEPTH (R/W), INLET CAP = 95.9 cfs.

Note: Total Q = 2 x the flow for 1 Wing plus the smaller of the Weir or Orifice flows for the grate.

BECAUSE INLETS ARE "[illegible]"

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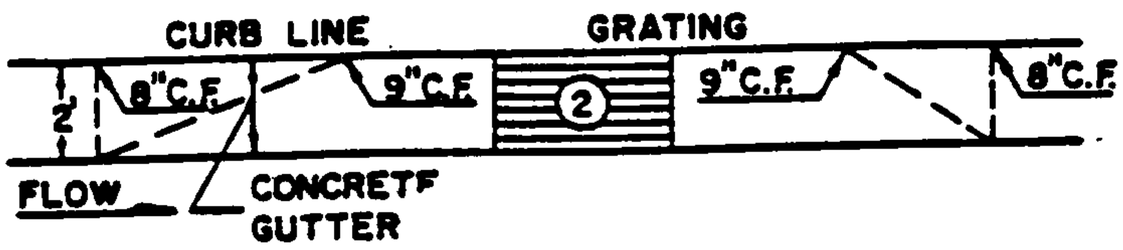
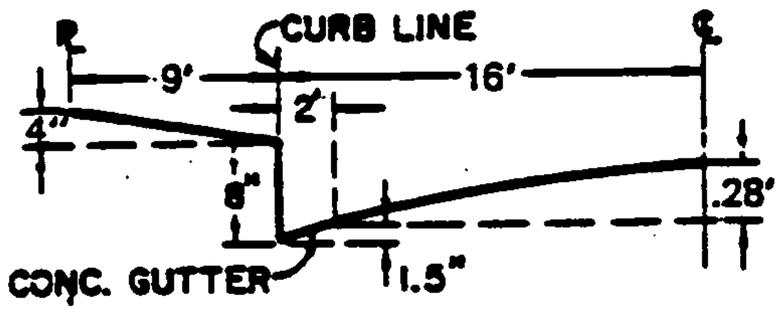
GRATING CAPACITIES FOR TYPE "A", "C" and "D"

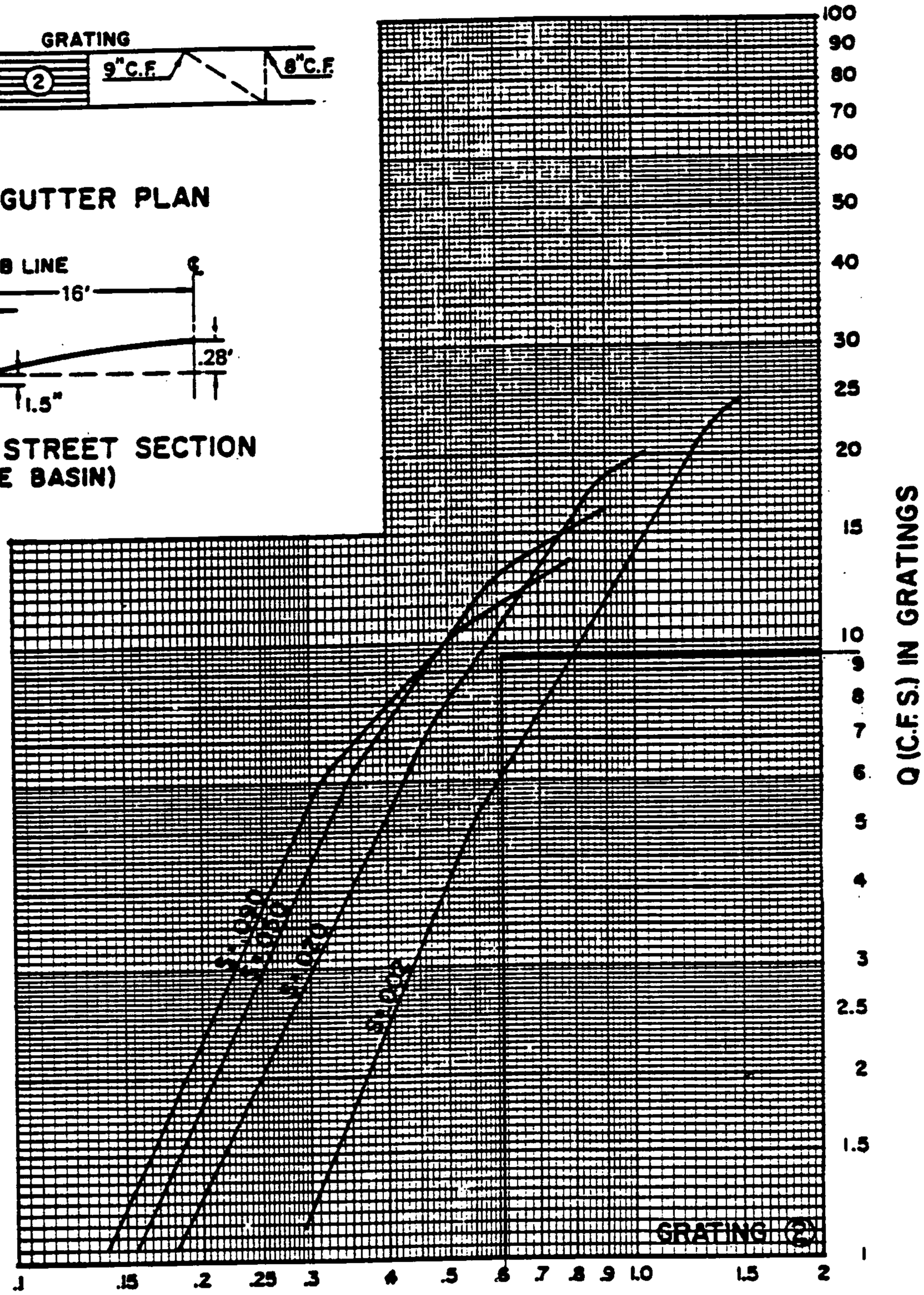


GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

FLOW DEPTH = 0.61'
SLOPE = 1.0%
∴ Q ≅ 9.5 cfs EACH



ANALYSIS FOR TYPE SINGE 'A' INLETS IN CASA VERDE AVE.

4 of 6

CASA VERDE SD ANALYSIS

18" RCP CONNECTING SINGLE 'A' INETS TOGETHER:

- $Q_{100} = 9.5$ CFS, $n = .013$
- $S = 1.0\%$, By Manning's Eqn,

  $D = 13.4''$, $V = 6.7$ fps

∴ NON-PRESSURE FLOW

24" RCP, SINGLE 'A' TO MH:

- $Q_{100} = 9.5 * 2 = 19.0$ cfs, $n = .013$
- $S = 1.0\%$, By Manning's,

  $D = 16.8''$ $V = 8.1$ fps

∴ NON-PRESSURE

24" RCP, CONNECTING MH TO POND #11:

SAME AS ABOVE BUT $S = 4.0\%$

∴ NON-PRESSURE FLOW.

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 5 OF 6

PROJECT NO. _____ BY _____ DATE _____

SUBJECT CASA VERDE INLET & SD ANALYSIS CH'D _____ DATE _____

24" RCP CONNECTING DOUBLE 'A' W/ DOUBLE WING INLETS (AT SUMP CONDITION PT.):

- Q_{100} = 25.8 CFS, S = 1.0%, n = .013

By Mannings Equ;

D = 22.5" V = 8.4 fps

∴ NON-PRESSURE FLOW

36" RCP CONNECTING DOUBLE 'A' W/ DOUBLE WINGS TO POND #11:

- Q_{100} = 51.6 cfs, S = 1.0%, n = .013

By Mannings Equ;

D = 23.8" V = 10.4 fps

∴ NON-PRESSURE CONNECTION

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 6 OF 6

PROJECT NO. _____ BY _____ DATE _____

SUBJECT _____ CH'D _____ DATE _____

The Crossing Units 1 & 2 -- Casa Verde Ave.
36' FF Street w/ Std C&G @ 1.0% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0100

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	18.00	0.44	7	36.00	0.67
2	0.00	0.00	5	34.00	0.13			
3	2.00	0.13	6	36.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.02	0.0	0.0	0.7	0.4	0.64
0.04	0.04	0.0	0.0	1.4	0.6	1.28
0.06	0.06	0.1	0.0	2.0	0.8	1.92
0.08	0.08	0.1	0.1	2.7	1.0	2.56
0.10	0.10	0.2	0.2	3.4	1.1	3.20
0.12	0.12	0.2	0.3	4.1	1.3	3.84
0.14	0.14	0.3	0.4	5.8	1.3	5.50
0.16	0.16	0.5	0.6	7.8	1.3	7.50
0.18	0.18	0.6	0.9	9.9	1.4	9.50
0.20	0.20	0.8	1.2	11.9	1.5	11.50
0.22	0.22	1.1	1.7	13.9	1.6	13.50
0.24	0.24	1.4	2.3	16.0	1.7	15.50
0.26	0.26	1.7	3.1	18.0	1.8	17.50
0.28	0.28	2.1	4.0	20.1	1.9	19.50
0.30	0.30	2.5	5.0	22.1	2.0	21.50
0.32	0.32	2.9	6.3	24.2	2.1	23.50
0.34	0.34	3.4	7.7	26.2	2.3	25.50
0.36	0.36	4.0	9.3	28.2	2.4	27.50
0.38	0.38	4.5	11.1	30.3	2.5	29.50
0.40	0.40	5.1	13.2	32.3	2.6	31.50
0.42	0.42	5.8	15.4	34.4	2.7	33.50
0.44	0.44	6.5	17.9	36.4	2.8	35.50
0.46	0.46	7.2	21.1	36.9	2.9	36.00
0.48	0.48	7.9	24.7	37.0	3.1	36.00
0.50	0.50	8.6	28.6	37.0	3.3	36.00
0.52	0.52	9.3	32.6	37.1	3.5	36.00
0.54	0.54	10.1	36.9	37.1	3.7	36.00
0.56	0.56	10.8	41.4	37.1	3.8	36.00
0.58	0.58	11.5	46.0	37.2	4.0	36.00
0.59	0.59	11.9	48.5	37.2	4.1	36.00
0.60	0.60	12.2	50.9	37.2	4.2	36.00
Under Fully Developed Conditions, Worst Case, Q100 = 52.4 @ AP H Using Water Depth = 0.61', Vel. = 4.3 fps, EGL = .90'						
0.61	0.61	12.6	53.4	37.2	4.2	36.00
0.62	0.62	12.9	56.0	37.3	4.3	36.00
0.63	0.63	13.3	58.6	37.3	4.4	36.00
0.64	0.64	13.7	61.2	37.3	4.5	36.00
0.65	0.65	14.0	63.9	37.3	4.6	36.00
0.66	0.66	14.4	66.6	37.3	4.6	36.00
0.67	0.67	14.6	68.6	37.3	4.7	36.00

ANALYSIS OF FULLY DEV. FLOW, Mac Street

The Crossing Units 1 & 2 -- Arkansas Drive
36' FF Street w/ Std C&G @ 2.48% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0248

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	18.00	0.44	7	36.00	0.67
2	0.00	0.00	5	34.00	0.13			
3	2.00	0.13	6	36.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.02	0.0	0.0	0.7	0.6	0.64
0.04	0.04	0.0	0.0	1.4	1.0	1.28
0.06	0.06	0.1	0.1	2.0	1.3	1.92
0.08	0.08	0.1	0.2	2.7	1.5	2.56
0.10	0.10	0.2	0.3	3.4	1.8	3.20
0.12	0.12	0.2	0.5	4.1	2.0	3.84
0.14	0.14	0.3	0.6	5.8	2.0	5.50
0.16	0.16	0.5	0.9	7.8	2.1	7.50
0.18	0.18	0.6	1.4	9.9	2.2	9.50
0.20	0.20	0.8	1.9	11.9	2.3	11.50
0.22	0.22	1.1	2.7	13.9	2.5	13.50
0.24	0.24	1.4	3.7	16.0	2.7	15.50
0.26	0.26	1.7	4.9	18.0	2.9	17.50
0.28	0.28	2.1	6.3	20.1	3.0	19.50
0.30	0.30	2.5	7.9	22.1	3.2	21.50
0.32	0.32	2.9	9.9	24.2	3.4	23.50
0.34	0.34	3.4	12.1	26.2	3.5	25.50
0.36	0.36	4.0	14.7	28.2	3.7	27.50
0.38	0.38	4.5	17.5	30.3	3.9	29.50
0.40	0.40	5.1	20.7	32.3	4.0	31.50
0.42	0.42	5.8	24.3	34.4	4.2	33.50
0.43	0.43	6.1	26.2	35.4	4.3	34.50
0.44	0.44	6.5	28.2	36.4	4.4	35.50
0.45	0.45	6.8	30.5	36.9	4.5	36.00
0.46	0.46	7.2	33.2	36.9	4.6	36.00
0.47	0.47	7.5	36.1	37.0	4.8	36.00

Under Fully Developed Conditions, Q100 = 38.5cfs for AP 2 Plus Basin 2
Assume Water Surface = .48', Vel. = 4.9fps, then EGL = 0.85'

0.48	0.48	7.9	38.9	37.0	4.9	36.00
0.49	0.49	8.3	41.9	37.0	5.1	36.00
0.50	0.50	8.6	45.0	37.0	5.2	36.00
0.51	0.51	9.0	48.2	37.0	5.4	36.00
0.53	0.53	9.7	54.7	37.1	5.6	36.00
0.55	0.55	10.4	61.6	37.1	5.9	36.00
0.54	0.54	10.1	58.1	37.1	5.8	36.00

The Crossing Units 1 & 2 -- Gunnison Place
28' FF Street w/ Std C&G @ 3.713% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0371

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.37	7	28.00	0.67
2	0.00	0.00	5	26.00	0.13			
3	2.00	0.13	6	28.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.01	0.01	0.0	0.0	0.3	0.5	0.32
0.02	0.02	0.0	0.0	0.7	0.7	0.64
0.03	0.03	0.0	0.0	1.0	1.0	0.96
0.04	0.04	0.0	0.0	1.4	1.2	1.28
0.05	0.05	0.0	0.1	1.7	1.4	1.60
0.06	0.06	0.1	0.1	2.0	1.6	1.92
0.07	0.07	0.1	0.1	2.4	1.7	2.24
0.08	0.08	0.1	0.2	2.7	1.9	2.56
0.09	0.09	0.1	0.3	3.1	2.0	2.88
0.10	0.10	0.2	0.4	3.4	2.2	3.20
0.11	0.11	0.2	0.5	3.7	2.3	3.52
0.12	0.12	0.2	0.6	4.1	2.5	3.84
0.13	0.13	0.3	0.7	4.8	2.5	4.50
0.14	0.14	0.3	0.8	5.8	2.5	5.50
0.15	0.15	0.4	0.9	6.8	2.5	6.50
0.16	0.16	0.5	1.1	7.8	2.5	7.50
0.17	0.17	0.5	1.4	8.8	2.6	8.50
0.18	0.18	0.6	1.7	9.9	2.7	9.50
0.19	0.19	0.7	2.0	10.9	2.8	10.50
0.20	0.20	0.8	2.4	11.9	2.9	11.50
0.21	0.21	1.0	2.8	12.9	3.0	12.50
0.22	0.22	1.1	3.3	13.9	3.1	13.50
0.23	0.23	1.2	3.9	15.0	3.2	14.50
0.24	0.24	1.4	4.5	16.0	3.3	15.50
0.25	0.25	1.5	5.2	17.0	3.4	16.50
0.26	0.26	1.7	5.9	18.0	3.5	17.50
0.27	0.27	1.9	6.8	19.1	3.6	18.50
0.28	0.28	2.1	7.7	20.1	3.7	19.50
0.29	0.29	2.3	8.7	21.1	3.8	20.50
0.30	0.30	2.5	9.7	22.1	3.9	21.50
0.31	0.31	2.7	10.9	23.1	4.0	22.50
0.32	0.32	2.9	12.1	24.2	4.1	23.50
0.33	0.33	3.2	13.4	25.2	4.2	24.50

Under fully Developed Conditions, Q100 = 13.7cfs @ AP 5
Assume Water Surface = .34', Vel = 4.3fps, EGL = .63'

0.34	0.34	3.4	14.8	26.2	4.3	25.50
0.35	0.35	3.7	16.3	27.2	4.4	26.50
0.36	0.36	4.0	17.9	28.2	4.5	27.50
0.37	0.37	4.2	19.9	28.8	4.7	28.00
0.38	0.38	4.5	22.1	28.8	4.9	28.00
0.39	0.39	4.8	24.4	28.8	5.1	28.00
0.40	0.40	5.1	26.8	28.8	5.3	28.00
0.41	0.41	5.3	29.3	28.8	5.5	28.00
0.42	0.42	5.6	31.9	28.9	5.7	28.00
0.43	0.43	5.9	34.6	28.9	5.9	28.00
0.44	0.44	6.2	37.3	28.9	6.0	28.00
0.45	0.45	6.5	40.2	28.9	6.2	28.00

The Crossing Units 1 & 2 -- Gunnison Place
28' FF Street w/ Std C&G @ 1.8% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0180

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.37	7	28.00	0.67
2	0.00	0.00	5	26.00	0.13			
3	2.00	0.13	6	28.00	0.00			

NOTE: PROPOSED CONDITIONS ARE USED FOR THIS CASE BECAUSE THE GUNNISON CONNECTION TO LADERA IS TEMP.

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.01	0.01	0.0	0.0	0.3	0.3	0.32
0.02	0.02	0.0	0.0	0.7	0.5	0.64
0.03	0.03	0.0	0.0	1.0	0.7	0.96
0.04	0.04	0.0	0.0	1.4	0.8	1.28
0.05	0.05	0.0	0.0	1.7	1.0	1.60
0.06	0.06	0.1	0.1	2.0	1.1	1.92
0.07	0.07	0.1	0.1	2.4	1.2	2.24
0.08	0.08	0.1	0.1	2.7	1.3	2.56
0.09	0.09	0.1	0.2	3.1	1.4	2.88
0.10	0.10	0.2	0.2	3.4	1.5	3.20
0.11	0.11	0.2	0.3	3.7	1.6	3.52
0.12	0.12	0.2	0.4	4.1	1.7	3.84
0.13	0.13	0.3	0.5	4.8	1.7	4.50
0.14	0.14	0.3	0.5	5.8	1.7	5.50
0.15	0.15	0.4	0.7	6.8	1.7	6.50
0.16	0.16	0.5	0.8	7.8	1.7	7.50
0.17	0.17	0.5	1.0	8.8	1.8	8.50
0.18	0.18	0.6	1.2	9.9	1.9	9.50
0.19	0.19	0.7	1.4	10.9	1.9	10.50
0.20	0.20	0.8	1.7	11.9	2.0	11.50
0.21	0.21	1.0	2.0	12.9	2.1	12.50
0.22	0.22	1.1	2.3	13.9	2.1	13.50
0.23	0.23	1.2	2.7	15.0	2.2	14.50
0.24	0.24	1.4	3.1	16.0	2.3	15.50
0.25	0.25	1.5	3.6	17.0	2.4	16.50
0.26	0.26	1.7	4.1	18.0	2.4	17.50
0.27	0.27	1.9	4.7	19.1	2.5	18.50
0.28	0.28	2.1	5.3	20.1	2.6	19.50
0.29	0.29	2.3	6.0	21.1	2.7	20.50
0.30	0.30	2.5	6.8	22.1	2.7	21.50
0.31	0.31	2.7	7.6	23.1	2.8	22.50
0.32	0.32	2.9	8.4	24.2	2.9	23.50
0.33	0.33	3.2	9.3	25.2	2.9	24.50
0.34	0.34	3.4	10.3	26.2	3.0	25.50
0.35	0.35	3.7	11.4	27.2	3.1	26.50
0.36	0.36	4.0	12.5	28.2	3.2	27.50
0.37	0.37	4.2	13.8	28.8	3.3	28.00
0.38	0.38	4.5	15.4	28.8	3.4	28.00
0.39	0.39	4.8	17.0	28.8	3.5	28.00
0.40	0.40	5.1	18.7	28.8	3.7	28.00
0.41	0.41	5.3	20.4	28.8	3.8	28.00
0.42	0.42	5.6	22.2	28.9	3.9	28.00
0.43	0.43	5.9	24.1	28.9	4.1	28.00
0.44	0.44	6.2	26.0	28.9	4.2	28.00
0.45	0.45	6.5	28.0	28.9	4.3	28.00
0.46	0.46	6.7	30.0	28.9	4.4	28.00

WORST CASE IS JUST UPSTREAM OF DOUBLE 'A' INLETS.

$Q_{100} = 28.5$

FLOW DEPTH = 0.46', VEL HEAD = $\frac{4.4^2}{64.4}$ = 0.30'

EGL = 0.46 + 0.30 = 0.76 < 1.0' ∴ ok

The Crossing Units 1 & 2 -- Casa Verde Ave. (EAST OF SELWAY)
32' FF Street w/ Std C&G @ .66% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0066

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	16.00	0.41	7	32.00	0.67
2	0.00	0.00	5	30.00	0.13			
3	2.00	0.13	6	32.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.01	0.01	0.0	0.0	0.3	0.2	0.32
0.02	0.02	0.0	0.0	0.7	0.3	0.64
0.03	0.03	0.0	0.0	1.0	0.4	0.96
0.04	0.04	0.0	0.0	1.4	0.5	1.28
0.05	0.05	0.0	0.0	1.7	0.6	1.60
0.06	0.06	0.1	0.0	2.0	0.7	1.92
0.07	0.07	0.1	0.1	2.4	0.7	2.24
0.08	0.08	0.1	0.1	2.7	0.8	2.56
0.09	0.09	0.1	0.1	3.1	0.9	2.88
0.10	0.10	0.2	0.1	3.4	0.9	3.20
0.11	0.11	0.2	0.2	3.7	1.0	3.52
0.12	0.12	0.2	0.2	4.1	1.0	3.84
0.13	0.13	0.3	0.3	4.8	1.1	4.50
0.14	0.14	0.3	0.3	5.8	1.0	5.50
0.15	0.15	0.4	0.4	6.8	1.0	6.50
0.16	0.16	0.5	0.5	7.8	1.1	7.50
0.17	0.17	0.5	0.6	8.8	1.1	8.50
0.18	0.18	0.6	0.7	9.9	1.1	9.50
0.19	0.19	0.7	0.8	10.9	1.2	10.50
0.20	0.20	0.8	1.0	11.9	1.2	11.50
0.21	0.21	1.0	1.2	12.9	1.2	12.50
0.22	0.22	1.1	1.4	13.9	1.3	13.50
0.23	0.23	1.2	1.6	15.0	1.3	14.50
0.24	0.24	1.4	1.9	16.0	1.4	15.50
0.25	0.25	1.5	2.2	17.0	1.4	16.50
0.26	0.26	1.7	2.5	18.0	1.5	17.50
0.27	0.27	1.9	2.9	19.1	1.5	18.50
0.28	0.28	2.1	3.2	20.1	1.6	19.50
0.29	0.29	2.3	3.7	21.1	1.6	20.50
0.30	0.30	2.5	4.1	22.1	1.7	21.50
0.31	0.31	2.7	4.6	23.1	1.7	22.50
0.32	0.32	2.9	5.1	24.2	1.7	23.50
0.33	0.33	3.2	5.7	25.2	1.8	24.50
0.34	0.34	3.4	6.3	26.2	1.8	25.50
0.35	0.35	3.7	6.9	27.2	1.9	26.50
0.36	0.36	4.0	7.6	28.2	1.9	27.50
0.37	0.37	4.2	8.3	29.3	2.0	28.50
0.38	0.38	4.5	9.0	30.3	2.0	29.50
0.39	0.39	4.8	9.8	31.3	2.0	30.50
0.40	0.40	5.1	10.7	32.3	2.1	31.50
0.41	0.41	5.4	11.7	32.8	2.1	32.00
0.42	0.42	5.8	12.9	32.9	2.2	32.00
0.43	0.43	6.1	14.1	32.9	2.3	32.00
0.44	0.44	6.4	15.3	32.9	2.4	32.00
0.45	0.45	6.7	16.6	32.9	2.5	32.00
0.46	0.46	7.0	17.9	32.9	2.5	32.00
0.47	0.47	7.4	19.3	33.0	2.6	32.00
0.48	0.48	7.7	20.7	33.0	2.7	32.00
0.49	0.49	8.0	22.1	33.0	2.8	32.00
0.50	0.50	8.3	23.6	33.0	2.8	32.00
0.51	0.51	8.6	25.1	33.0	2.9	32.00
0.52	0.52	9.0	26.7	33.1	3.0	32.00

0.53	0.53	9.3	28.3	33.1	3.0	32.00
0.54	0.54	9.6	29.9	33.1	3.1	32.00
0.55	0.55	9.9	31.6	33.1	3.2	32.00
0.56	0.56	10.2	33.3	33.1	3.2	32.00
0.57	0.57	10.6	35.0	33.2	3.3	32.00
0.58	0.58	10.9	36.8	33.2	3.4	32.00
0.59	0.59	11.2	38.6	33.2	3.4	32.00
0.60	0.60	11.5	40.4	33.2	3.5	32.00
0.61	0.61	11.8	42.3	33.2	3.6	32.00
0.62	0.62	12.2	44.2	33.3	3.6	32.00
0.63	0.63	12.5	46.2	33.3	3.7	32.00
0.64	0.64	12.8	48.1	33.3	3.8	32.00
0.65	0.65	13.1	50.1	33.3	3.8	32.00
0.66	0.66	13.4	52.2	33.3	3.9	32.00
0.67	0.67	13.7	53.6	33.3	3.9	32.00

$Q_{100} = 49.8$ @ AP 10 (fully dev. Cond.)

WATER SURFACE = 0.64'

$$\text{VEL. HEAD} = \frac{3.8^2}{64.4} = .22'$$

$$EGL = 0.64 + 0.22 = 0.86' < \underline{1.0' \therefore ok}$$

The Crossing Units 1 & 2 -- Platte Court
28' FF Street w/ Std. C & G @ 0.5% slope and 2% cross slope

MANNING'S N = .0170 SLOPE = .0050

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.37	7	28.00	0.67
2	0.00	0.00	5	26.00	0.13			
3	2.00	0.13	6	28.00	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.01	0.01	0.0	0.0	0.3	0.2	0.32
0.02	0.02	0.0	0.0	0.7	0.3	0.64
0.03	0.03	0.0	0.0	1.0	0.4	0.96
0.04	0.04	0.0	0.0	1.4	0.4	1.28
0.05	0.05	0.0	0.0	1.7	0.5	1.60
0.06	0.06	0.1	0.0	2.0	0.6	1.92
0.07	0.07	0.1	0.0	2.4	0.6	2.24
0.08	0.08	0.1	0.1	2.7	0.7	2.56
0.09	0.09	0.1	0.1	3.1	0.8	2.88
0.10	0.10	0.2	0.1	3.4	0.8	3.20
0.11	0.11	0.2	0.2	3.7	0.9	3.52
0.12	0.12	0.2	0.2	4.1	0.9	3.84
0.13	0.13	0.3	0.2	4.8	0.9	4.50
0.14	0.14	0.3	0.3	5.8	0.9	5.50
0.15	0.15	0.4	0.3	6.8	0.9	6.50
0.16	0.16	0.5	0.4	7.8	0.9	7.50
0.17	0.17	0.5	0.5	8.8	0.9	8.50
0.18	0.18	0.6	0.6	9.9	1.0	9.50
0.19	0.19	0.7	0.7	10.9	1.0	10.50
0.20	0.20	0.8	0.9	11.9	1.0	11.50
0.21	0.21	1.0	1.0	12.9	1.1	12.50
0.22	0.22	1.1	1.2	13.9	1.1	13.50
0.23	0.23	1.2	1.4	15.0	1.2	14.50
0.24	0.24	1.4	1.6	16.0	1.2	15.50
0.25	0.25	1.5	1.9	17.0	1.2	16.50
0.26	0.26	1.7	2.2	18.0	1.3	17.50
0.27	0.27	1.9	2.5	19.1	1.3	18.50
0.28	0.28	2.1	2.8	20.1	1.4	19.50
0.29	0.29	2.3	3.2	21.1	1.4	20.50
0.30	0.30	2.5	3.6	22.1	1.4	21.50
0.31	0.31	2.7	4.0	23.1	1.5	22.50
0.32	0.32	2.9	4.4	24.2	1.5	23.50
0.33	0.33	3.2	4.9	25.2	1.6	24.50
0.34	0.34	3.4	5.4	26.2	1.6	25.50
0.35	0.35	3.7	6.0	27.2	1.6	26.50
0.36	0.36	4.0	6.6	28.2	1.7	27.50
0.37	0.37	4.2	7.3	28.8	1.7	28.00
0.38	0.38	4.5	8.1	28.8	1.8	28.00
0.39	0.39	4.8	9.0	28.8	1.9	28.00
0.40	0.40	5.1	9.8	28.8	1.9	28.00
0.41	0.41	5.3	10.8	28.8	2.0	28.00
0.42	0.42	5.6	11.7	28.9	2.1	28.00
0.43	0.43	5.9	12.7	28.9	2.1	28.00
0.44	0.44	6.2	13.7	28.9	2.2	28.00
0.45	0.45	6.5	14.7	28.9	2.3	28.00
0.46	0.46	6.7	15.8	28.9	2.3	28.00
0.47	0.47	7.0	16.9	29.0	2.4	28.00
0.48	0.48	7.3	18.0	29.0	2.5	28.00
0.49	0.49	7.6	19.2	29.0	2.5	28.00
0.50	0.50	7.9	20.4	29.0	2.6	28.00
0.51	0.51	8.1	21.6	29.0	2.6	28.00
0.52	0.52	8.4	22.8	29.1	2.7	28.00

0.53	0.53	8.7	24.1	29.1	2.8	28.00
0.54	0.54	9.0	25.4	29.1	2.8	28.00
0.55	0.55	9.3	26.7	29.1	2.9	28.00
0.56	0.56	9.5	28.1	29.1	2.9	28.00
0.57	0.57	9.8	29.4	29.2	3.0	28.00
0.58	0.58	10.1	30.8	29.2	3.0	28.00
0.59	0.59	10.4	32.3	29.2	3.1	28.00
0.60	0.60	10.7	33.7	29.2	3.2	28.00
0.61	0.61	10.9	35.2	29.2	3.2	28.00
0.62	0.62	11.2	36.7	29.3	3.3	28.00
0.63	0.63	11.5	38.2	29.3	3.3	28.00
0.64	0.64	11.8	39.7	29.3	3.4	28.00
0.65	0.65	12.1	41.3	29.3	3.4	28.00
0.66	0.66	12.3	42.9	29.3	3.5	28.00
0.67	0.67	12.5	44.0	29.3	3.5	28.00

$Q_{100} = 30.$ @ AP 12 (fully dev Cond

WATER SURFACE = 0.58'

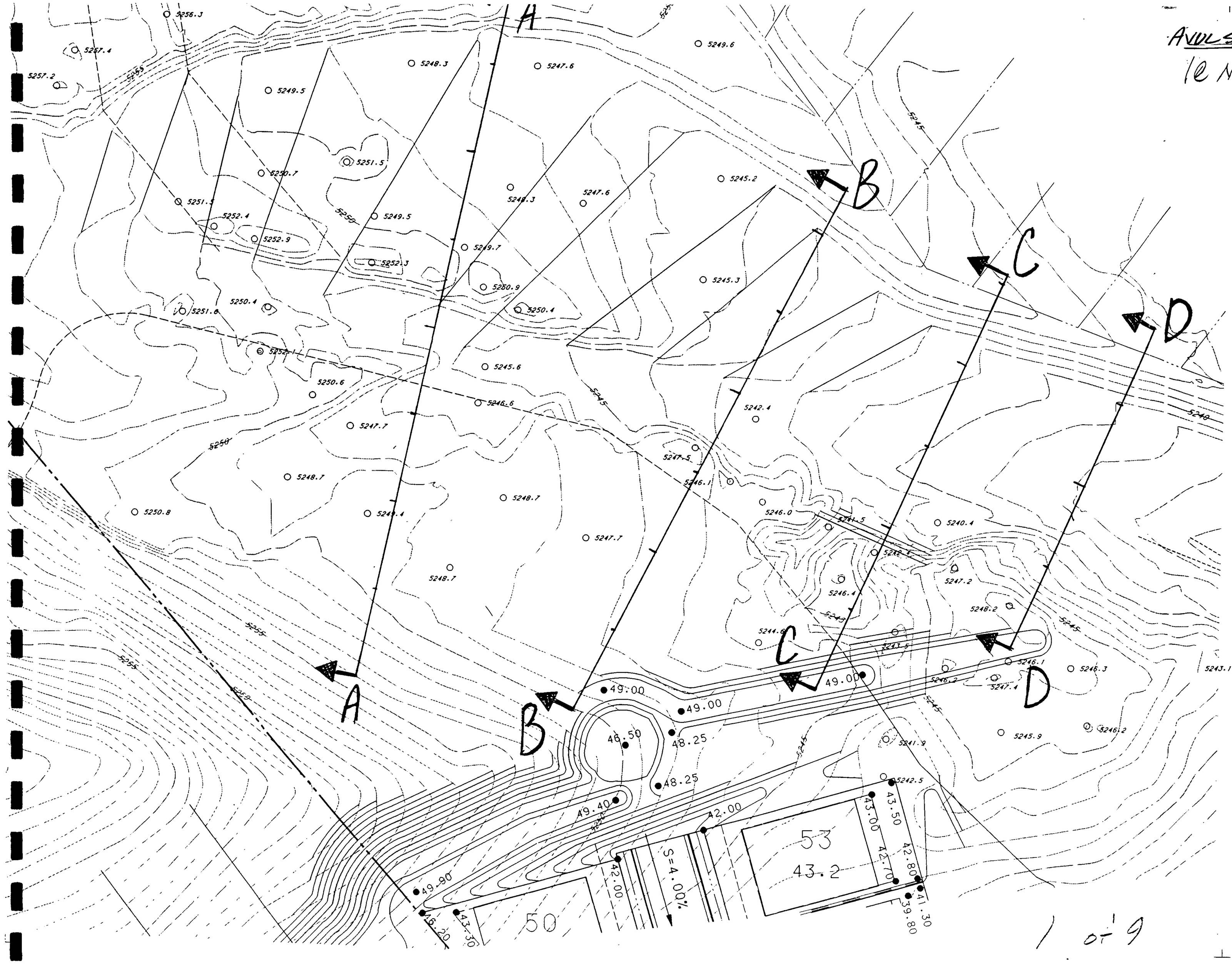
VEL. HEAD = $\frac{3.0^2}{64.4} = 0.14'$

EGL = 0.58 + 0.14 = 0.72 < 1.0' ∴ ok

APPENDIX D
OFFSITE/AMAFCA ISSUES

CONTENTS:

1. AVULSION CONTROL BERN ANALYSIS
2. DAM 12 SENSITIVITY ANALYSIS
3. MISCELLANEOUS OUTFALL STRUCTURES
   a) Soil Cement Plunge Pool
   b) Impact Basins
   c) Soil Cement Rundowns
4. MIREHAVEN ARROYO SCOUR ANALYSIS

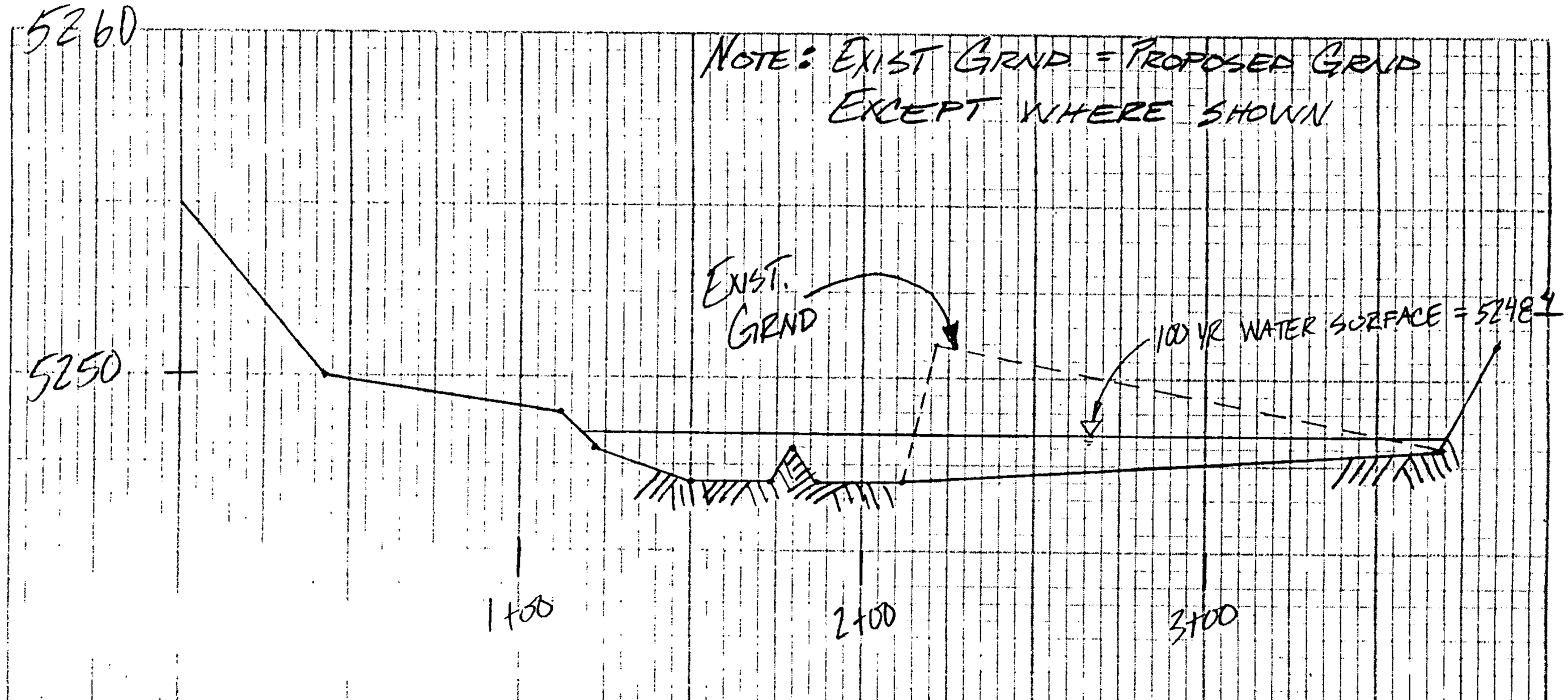


AVULSION CONTROL BERM ANALYSIS
(@ NE corner of Unit 2)

NOTE: CROSS SECTIONS A-A, B-B, C-C, & D-D SHOW THAT THE 100 YR STORM IS VERY SAFELY PASSED IN THE MIREHAVEN ARROYO.

A FLOWRATE OF 1677 CFS HAS BEEN USED. (Comes from the Las Lomitas DMP IIB Mirehaven Arroyo Scourwall Analysis & Design report, dated Oct. 1994)

This flowrate is conservative compared to the flowrate of 1316cfs computed by the I-40 DMP. (Hydrology & Hydraulics submitted to AMAFCA 6/6/96)



MIREHAVEN ARROYO SECTION A-A

$Q_{100} \simeq 1677$ cfs (from the Las Lomitas Unit IIB Mirehaven Arroyo scourwall analysis & design Oct. 1994)

$V_{100} = 6.9$ fps (see pg. 3)

$$EGL = 5248.4 + \frac{6.9^2}{64.4} = 5249.1 \ll 5251.00 \quad \underline{\underline{ok}}$$

PROJECT NAME The Ridge Subd
PROJECT NO.
SUBJECT Berm @ NE Corner

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

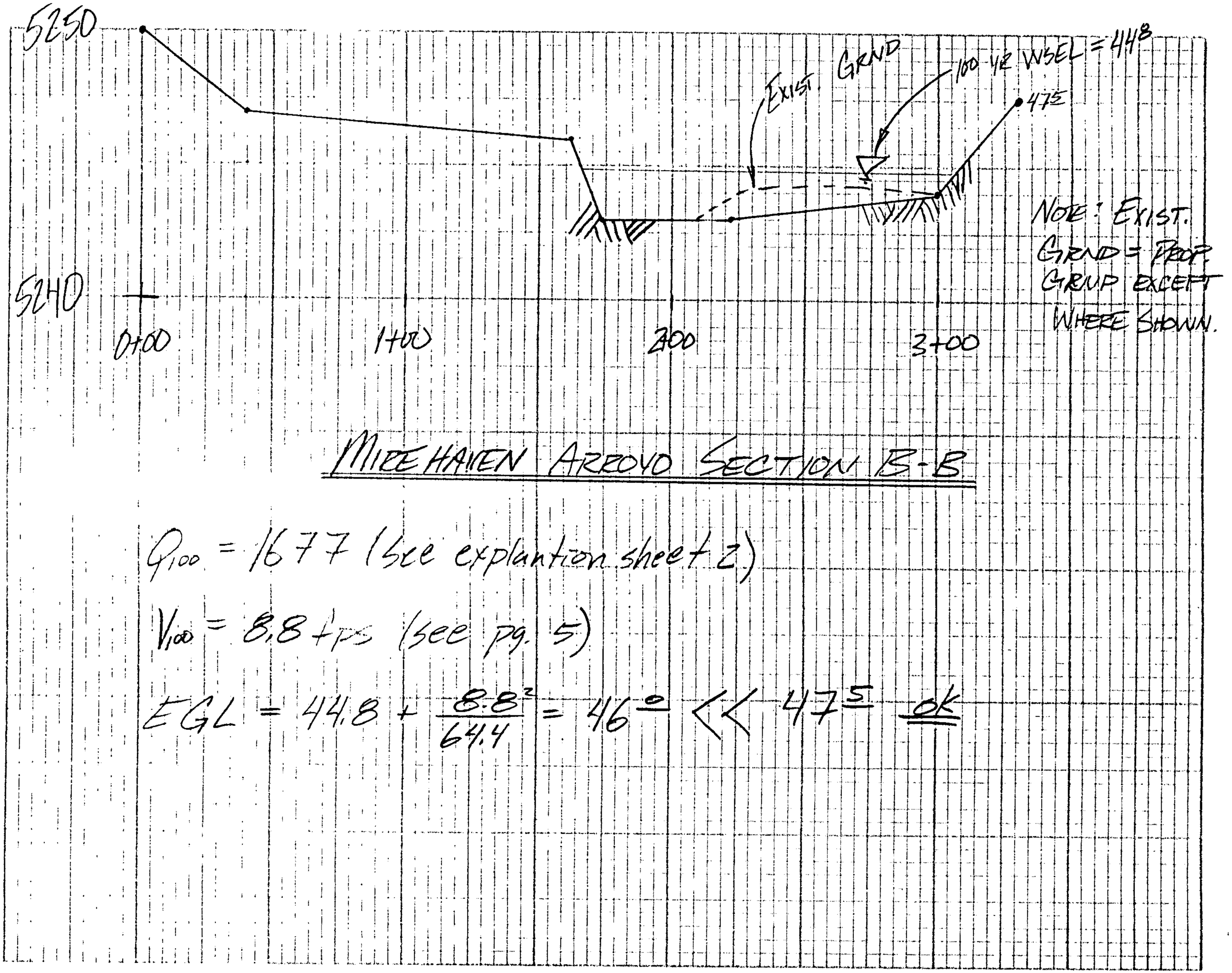
SHEET 2 OF 9
BY BS DATE 6/25/96
CH'D DATE

Analysis of the Interim Berm N. of Selway - SECTION A-A

MANNING'S N = .0300 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	55.00	5	150.00	47.00	9	212.00	47.00
2	43.00	50.00	6	173.00	47.00	10	368.00	48.00
3	112.00	49.00	7	180.00	48.00	11	385.00	51.00
4	122.00	48.00	8	187.00	47.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
47.10	0.10	5.8	7.9	67.8	1.4	67.80
47.20	0.20	13.6	27.4	87.6	2.0	87.60
47.30	0.30	23.3	59.0	107.4	2.5	107.40
47.40	0.40	35.0	103.9	127.3	3.0	127.20
47.50	0.50	48.8	163.6	147.1	3.4	147.00
47.60	0.60	64.4	239.4	166.9	3.7	166.80
47.70	0.70	82.1	332.6	186.7	4.1	186.60
47.80	0.80	101.8	444.7	206.5	4.4	206.40
47.90	0.90	123.4	576.8	226.3	4.7	226.20
48.00	1.00	147.0	730.2	246.2	5.0	246.00
48.10	1.10	171.7	941.8	247.7	5.5	247.57
48.20	1.20	196.5	1174.6	249.3	6.0	249.13
48.30	1.30	221.5	1428.0	250.9	6.4	250.70
48.40	1.40	246.7	1701.1	252.5	6.9	252.27
48.50	1.50	272.0	1993.5	254.1	7.3	253.83
48.60	1.60	297.4	2304.6	255.6	7.7	255.40
48.70	1.70	323.0	2634.1	257.2	8.2	256.97
48.80	1.80	348.8	2981.4	258.8	8.5	258.53
48.90	1.90	374.7	3346.3	260.4	8.9	260.10
49.00	2.00	400.8	3728.4	262.0	9.3	261.67
49.10	2.10	427.4	4071.7	269.4	9.5	269.13
49.20	2.20	454.7	4432.6	276.9	9.7	276.60
49.30	2.30	482.7	4811.2	284.4	10.0	284.07
49.40	2.40	511.5	5207.8	291.9	10.2	291.53
49.50	2.50	541.0	5622.9	299.3	10.4	299.00
49.60	2.60	571.3	6056.6	306.8	10.6	306.47
49.70	2.70	602.3	6509.2	314.3	10.8	313.93
49.80	2.80	634.1	6981.1	321.8	11.0	321.40
49.90	2.90	666.6	7472.6	329.3	11.2	328.87
50.00	3.00	699.8	7983.9	336.7	11.4	336.33
50.10	3.10	733.5	8610.5	338.2	11.7	337.76
50.20	3.20	767.4	9256.5	339.6	12.1	339.19
50.30	3.30	801.4	9921.8	341.1	12.4	340.61
50.40	3.40	835.5	10606.2	342.5	12.7	342.04
50.50	3.50	869.8	11309.6	343.9	13.0	343.47
50.60	3.60	904.2	12031.7	345.4	13.3	344.89
50.70	3.70	938.8	12772.4	346.8	13.6	346.32
50.80	3.80	973.5	13531.5	348.3	13.9	347.75
50.90	3.90	1008.3	14308.9	349.7	14.2	349.17
51.00	4.00	1043.3	15104.5	351.1	14.5	350.60



$Q_{100} = 1677$ (see explantion sheet 2)

$V_{100} = 8.8$ fps (see pg. 5)

$EGL = 44.8 + \frac{8.8^2}{64.4} = 46^{0} << 47^{5}$ ok

PROJECT NAME

PROJECT NO.

SUBJECT BERM ANALYSIS

SHEET 4 OF 9

BY DATE

CH'D DATE

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

Analysis of the Interim Berm N. of Selway - SECTION B-B

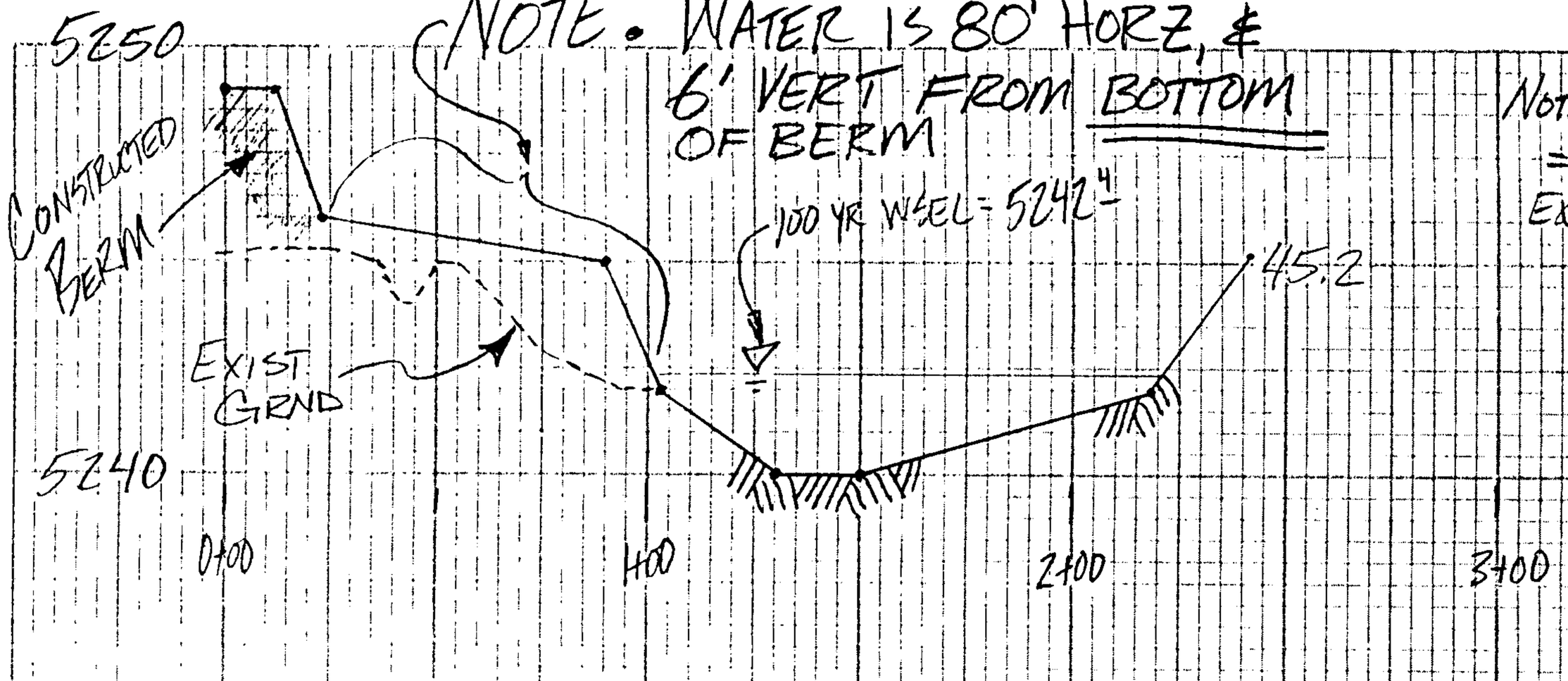
MANNING'S N = .0300 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	50.00	4	173.00	43.00	7	330.00	47.50
2	40.00	47.00	5	222.00	43.00			
3	162.00	46.00	6	300.00	44.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
43.10	0.10	5.3	7.6	57.2	1.4	57.17
43.20	0.20	11.4	25.1	65.4	2.2	65.33
43.30	0.30	18.4	51.1	73.5	2.8	73.50
43.40	0.40	26.1	85.6	81.7	3.3	81.67
43.50	0.50	34.7	128.9	89.9	3.7	89.83
43.60	0.60	44.1	181.3	98.1	4.1	98.00
43.70	0.70	54.3	243.2	106.3	4.5	106.17
43.80	0.80	65.3	314.9	114.4	4.8	114.33
43.90	0.90	77.2	397.0	122.6	5.1	122.50
44.00	1.00	89.8	489.8	130.8	5.5	130.67
44.10	1.10	103.0	611.0	132.1	5.9	131.89
44.20	1.20	116.2	742.9	133.3	6.4	133.11
44.30	1.30	129.6	885.3	134.5	6.8	134.34
44.40	1.40	143.1	1037.9	135.8	7.3	135.56
44.50	1.50	156.7	1200.4	137.0	7.7	136.79
44.60	1.60	170.4	1372.6	138.3	8.1	138.01
44.70	1.70	184.3	1554.3	139.5	8.4	139.23
44.80	1.80	198.3	1745.5	140.8	8.8	140.46
44.90	1.90	212.4	1945.9	142.0	9.2	141.68
45.00	2.00	226.6	2155.4	143.2	9.5	142.90
45.10	2.10	241.0	2374.0	144.5	9.9	144.13
45.20	2.20	255.4	2601.5	145.7	10.2	145.35
45.30	2.30	270.0	2837.8	147.0	10.5	146.58
45.40	2.40	284.8	3082.9	148.2	10.8	147.80
45.50	2.50	299.6	3336.7	149.5	11.1	149.02
45.60	2.60	314.6	3599.1	150.7	11.4	150.25
45.70	2.70	329.7	3870.1	151.9	11.7	151.47
45.80	2.80	344.9	4149.6	153.2	12.0	152.70
45.90	2.90	360.2	4437.7	154.4	12.3	153.92
46.00	3.00	375.6	4734.1	155.7	12.6	155.14
46.10	3.10	391.8	4812.9	168.7	12.3	168.20
46.20	3.20	409.3	4924.9	181.8	12.0	181.26
46.30	3.30	428.1	5067.3	194.9	11.8	194.31
46.40	3.40	448.1	5238.2	207.9	11.7	207.37
46.50	3.50	469.5	5436.1	221.0	11.6	220.43
46.60	3.60	492.2	5660.1	234.0	11.5	233.49
46.70	3.70	516.2	5909.6	247.1	11.4	246.54
46.80	3.80	541.5	6184.2	260.2	11.4	259.60
46.90	3.90	568.2	6483.8	273.2	11.4	272.66
47.00	4.00	596.1	6808.1	286.3	11.4	285.71
47.10	4.10	624.8	7325.3	288.5	11.7	287.90
47.20	4.20	653.7	7858.9	290.7	12.0	290.10
47.30	4.30	682.8	8408.6	292.9	12.3	292.29
47.40	4.40	712.1	8974.5	295.1	12.6	294.48
47.50	4.50	741.7	9556.4	297.3	12.9	296.67

NOTE: WATER IS 80' HORZ, & 6' VERT FROM BOTTOM OF BERM

NOTE: EXIST GROUND = PROP. GROUND EXCEPT WHERE SHOWN



MIREHAVEN ARROYO SECTION C-C

$Q_{100} = 1677$ cfs (see sheet 2)

$V_{100} = 9.2$ fps (see page 7)

$EGL = 5242.4 + \frac{9.2^2}{64.4} = 5243.7 << 5245.2$

PROJECT NAME

PROJECT NO.

SUBJECT BERM ANALYSIS

SHEET 6 OF 9

BY DATE

CH'D DATE

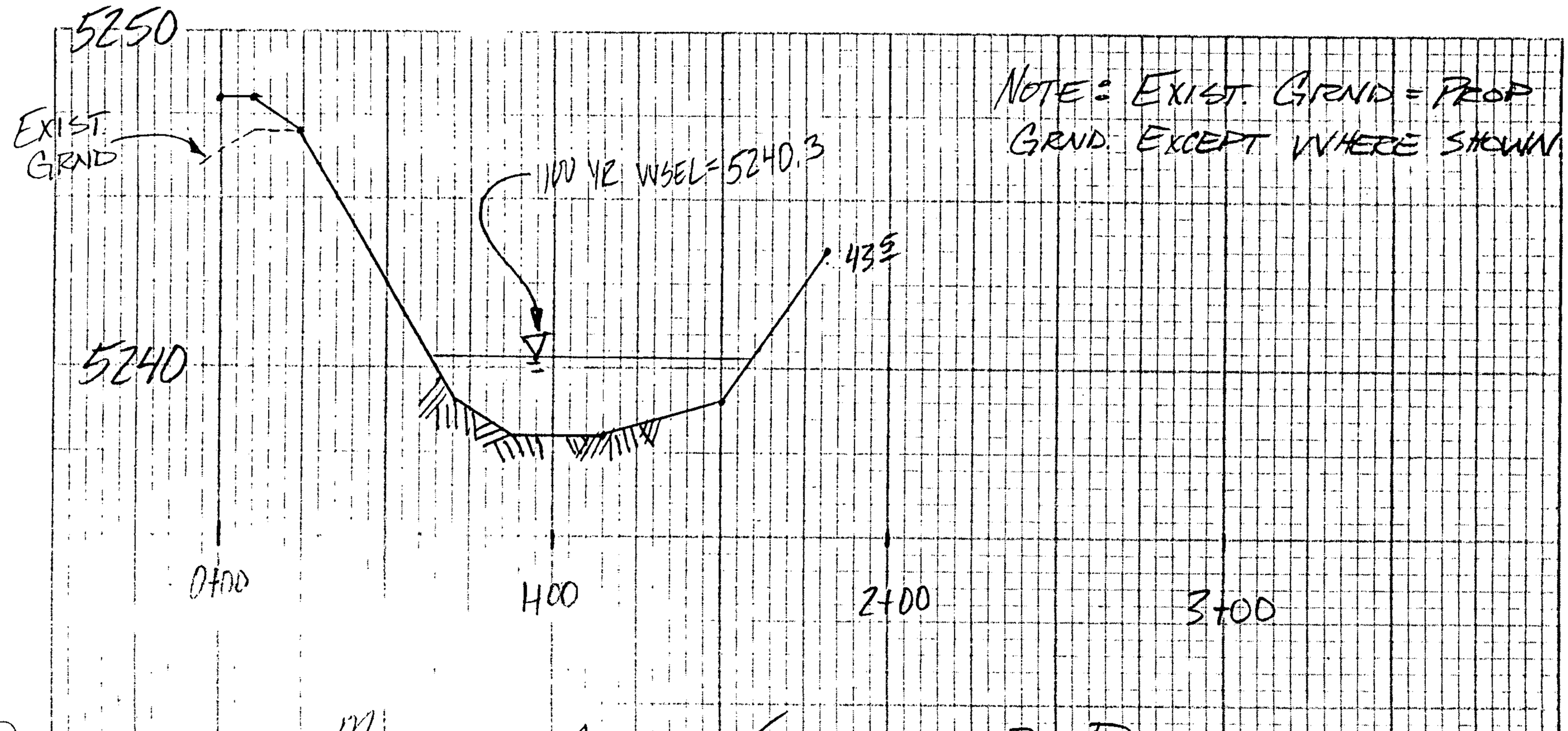
BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

Analysis of the Interim Berm N. of Selway - SECTION C-C

MANNING'S N = .0300 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	12.00	49.00	4	103.00	42.00	7	218.00	42.00
2	23.00	46.00	5	130.00	40.00	8	242.00	45.20
3	90.00	45.00	6	150.00	40.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
40.10	0.10	2.2	3.2	24.8	1.4	24.75
40.20	0.20	4.9	10.5	29.5	2.1	29.50
40.30	0.30	8.1	21.9	34.3	2.7	34.25
40.40	0.40	11.8	37.2	39.0	3.2	39.00
40.50	0.50	15.9	56.9	43.8	3.6	43.75
40.60	0.60	20.6	81.2	48.5	4.0	48.50
40.70	0.70	25.6	110.3	53.3	4.3	53.25
40.80	0.80	31.2	144.5	58.0	4.6	58.00
40.90	0.90	37.2	184.1	62.8	4.9	62.75
41.00	1.00	43.8	229.4	67.6	5.2	67.50
41.10	1.10	50.7	280.7	72.3	5.5	72.25
41.20	1.20	58.2	338.1	77.1	5.8	77.00
41.30	1.30	66.1	402.0	81.8	6.1	81.75
41.40	1.40	74.6	472.7	86.6	6.3	86.50
41.50	1.50	83.4	550.3	91.3	6.6	91.25
41.60	1.60	92.8	635.2	96.1	6.8	96.00
41.70	1.70	102.6	727.5	100.8	7.1	100.75
41.80	1.80	113.0	827.6	105.6	7.3	105.50
41.90	1.90	123.7	935.6	110.3	7.6	110.25
42.00	2.00	135.0	1051.7	115.1	7.8	115.00
42.10	2.10	146.6	1197.8	116.3	8.2	116.18
42.20	2.20	158.2	1351.7	117.5	8.5	117.37
42.30	2.30	170.0	1513.5	118.7	8.9	118.55
42.40	2.40	181.9	1683.0	119.9	9.2	119.73
42.50	2.50	194.0	1860.2	121.1	9.6	120.92
42.60	2.60	206.1	2044.9	122.3	9.9	122.10
42.70	2.70	218.4	2237.1	123.5	10.2	123.28
42.80	2.80	230.8	2436.8	124.7	10.6	124.47
42.90	2.90	243.3	2643.9	125.9	10.9	125.65
43.00	3.00	255.9	2858.3	127.1	11.2	126.83
43.10	3.10	268.7	3080.0	128.3	11.5	128.02
43.20	3.20	281.5	3309.1	129.5	11.8	129.20
43.30	3.30	294.5	3545.3	130.7	12.0	130.38
43.40	3.40	307.6	3788.8	131.9	12.3	131.57



NOTE: EXIST. GRND = PROP GRND. EXCEPT WHERE SHOWN

MIREHAVEN ARROYO SECTION D-D

$Q_{100} = 1677$ (see sheet 2)

$V_{100} = 10.1$ fps (see sheet 9)

$EGL = 5240.3 + \frac{10.1^2}{64.4} = 5241.9 < < 52435$ ok

PROJECT NAME

PROJECT NO.

SUBJECT BERM ANALYSIS

SHEET 8 OF 9

BY DATE

CH'D DATE

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

Analysis of the Interim Berm N. of Selway - SECTION D-D

MANNING'S N = .0300 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	10.00	48.00	4	88.00	38.00	7	182.00	43.50
2	24.00	47.00	5	115.00	38.00			
3	71.00	39.00	6	150.00	39.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
38.10	0.10	3.0	4.2	32.2	1.4	32.20
38.20	0.20	6.4	14.0	37.4	2.2	37.40
38.30	0.30	10.4	28.6	42.6	2.7	42.60
38.40	0.40	15.0	48.3	47.8	3.2	47.80
38.50	0.50	20.0	73.1	53.0	3.7	53.00
38.60	0.60	25.6	103.4	58.2	4.0	58.20
38.70	0.70	31.6	139.4	63.4	4.4	63.40
38.80	0.80	38.2	181.4	68.6	4.7	68.60
38.90	0.90	45.4	229.6	73.8	5.1	73.80
39.00	1.00	53.0	284.4	79.0	5.4	79.00
39.10	1.10	61.0	355.2	80.4	5.8	80.30
39.20	1.20	69.1	432.6	81.7	6.3	81.60
39.30	1.30	77.3	516.3	83.0	6.7	82.90
39.40	1.40	85.6	606.2	84.3	7.1	84.19
39.50	1.50	94.1	702.3	85.6	7.5	85.49
39.60	1.60	102.7	804.5	86.9	7.8	86.79
39.70	1.70	111.5	912.6	88.2	8.2	88.09
39.80	1.80	120.4	1026.7	89.6	8.5	89.39
39.90	1.90	129.4	1146.7	90.9	8.9	90.69
40.00	2.00	138.5	1272.6	92.2	9.2	91.99
40.10	2.10	147.8	1404.3	93.5	9.5	93.28
40.20	2.20	157.2	1541.8	94.8	9.8	94.58
40.30	2.30	166.7	1685.1	96.1	10.1	95.88
40.40	2.40	176.3	1834.2	97.4	10.4	97.18
40.50	2.50	186.1	1989.1	98.8	10.7	98.48
40.60	2.60	196.0	2149.8	100.1	11.0	99.78
40.70	2.70	206.1	2316.2	101.4	11.2	101.08
40.80	2.80	216.2	2488.4	102.7	11.5	102.37
40.90	2.90	226.5	2666.5	104.0	11.8	103.67
41.00	3.00	237.0	2850.3	105.3	12.0	104.97
41.10	3.10	247.5	3039.9	106.6	12.3	106.27
41.20	3.20	258.2	3235.4	108.0	12.5	107.57

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET, N.E. ALBUQUERQUE, NM 87109
TEL (505) 823-1000 FAX (505) 821-0892

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LARRY A. LARRAÑAGA, P.E.
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WILLIAM KE, P.E.
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MARY E. CARTER
GEORGE RADNOVICH, R.L.A.
SILAS V. SUAZO
JAMES R. TOPMILLER, P.E.

February 1, 1996

John Kelly, P.E.
AMAFCA
2600 Prospect NE
Albuquerque, NM 87107

Re: Ladera Dam #12 Sensitivity Analysis for Westland Subdivision Unit I

Dear John:

Per our meeting on January 17, 1996, we have completed a Dam #12 diversion/storage sensitivity analysis.

Three scenarios were analyzed. For each scenario varying flow rates to be diverted from the Ladera System at Dam #12 to the proposed I-40 Diversion Channel were considered. Diversion of 500, 1000, and 1500 cfs were studied. The resulting impacts on the required dam storage volume for the 100-year storm for fully developed conditions were determined. A summary of these findings is provided on the attached table.

Based on this analysis, the previously proposed expansion "footprint" for Dam #12 is sufficient. However, depending on the magnitude of the diverted flow rate, modifications to the emergency spillway may be required. If only 500 cfs are diverted to the I-40 Diversion Channel, then the dam spillway crest must be raised 1.2'. Similarly, if 1000 cfs are diverted, the spillway crest must be raised 0.7'. Finally, if the full 1,500 cfs recommended in the Dam #15 Drainage Report are diverted, no increase in the spillway height is required. Diversion of flows was modeled using a separate weir with a crest elevation x' above the pond invert. This matches the Dam #15 models.

These possible increases in the emergency spillway crest elevation do not necessarily translate directly to an equivalent increase in the top of dam elevation. With elevation modifications to the spillway the length of the spillway can also be increased, potentially eliminating the need to raise the height of the dam. The present height of the dam is 5217'.

This analysis, along with responses to AMAFCA comments on the Westland Phase I Drainage Report (draft), will be incorporated in the final drainage report.

If you have any comments or questions on the schedule, please call me at 823-1000.

Sincerely,

Craig W. Hoover, P.E.
Water Resources Group

CWH/rkl
Attachment
pc (w/attch): Kurt Browning, AMAFCA
Leroy Chavez, Westland
Fred Ambrogi, Westland
Howard Stone, BHI
Michial Emery, BHI
Paul Wymer, BHI
Kevin Patton, BHI

I:\HYDRO\95335\A2101\KELLY1.LTR-2/1/96

SUMMARY OF WEIR/SENSITIVITY ANALYSIS FOR DAM NO. 12

LIMIT OUTFLOW TO (cfs)	INCREASE EXIST. DAM12 BY FACTOR	DIVERSION WEIR ELEV (feet)	LENGTH OF WEIR (feet)	EMERGENCY SPILLWAY CREST ELEV & TOP OF WEIR	Qout WEIR PLUS PIPE OUTFLOW (cfs)	WSEL (feet)	STORAGE (acre-ft) **	COMMENTS
500	4.3	5208.9	20	5212.5	1730	5212.32	288	NEED TO RAISE SPILLWAY 1.2 FT
1000--OPTION 1	4.5	5207	30	5211.3	2112	5211.28	271	DON'T NEED TO RAISE SPILLWAY
1000--OPTION 2	4.3	5208	38	5212	2031	5211.81	268	NEED TO RAISE SPILLWAY 0.7 FT
1500--FROM DAM15 REPORT	4.3	5207	45	5211.3	2672	5211.24	246	DON'T NEED TO RAISE SPILLWAY

** Note: Dam No. 12 as drawn in the latest PADED file has a storage capacity of 265 ac-ft at elevation 5211.30.

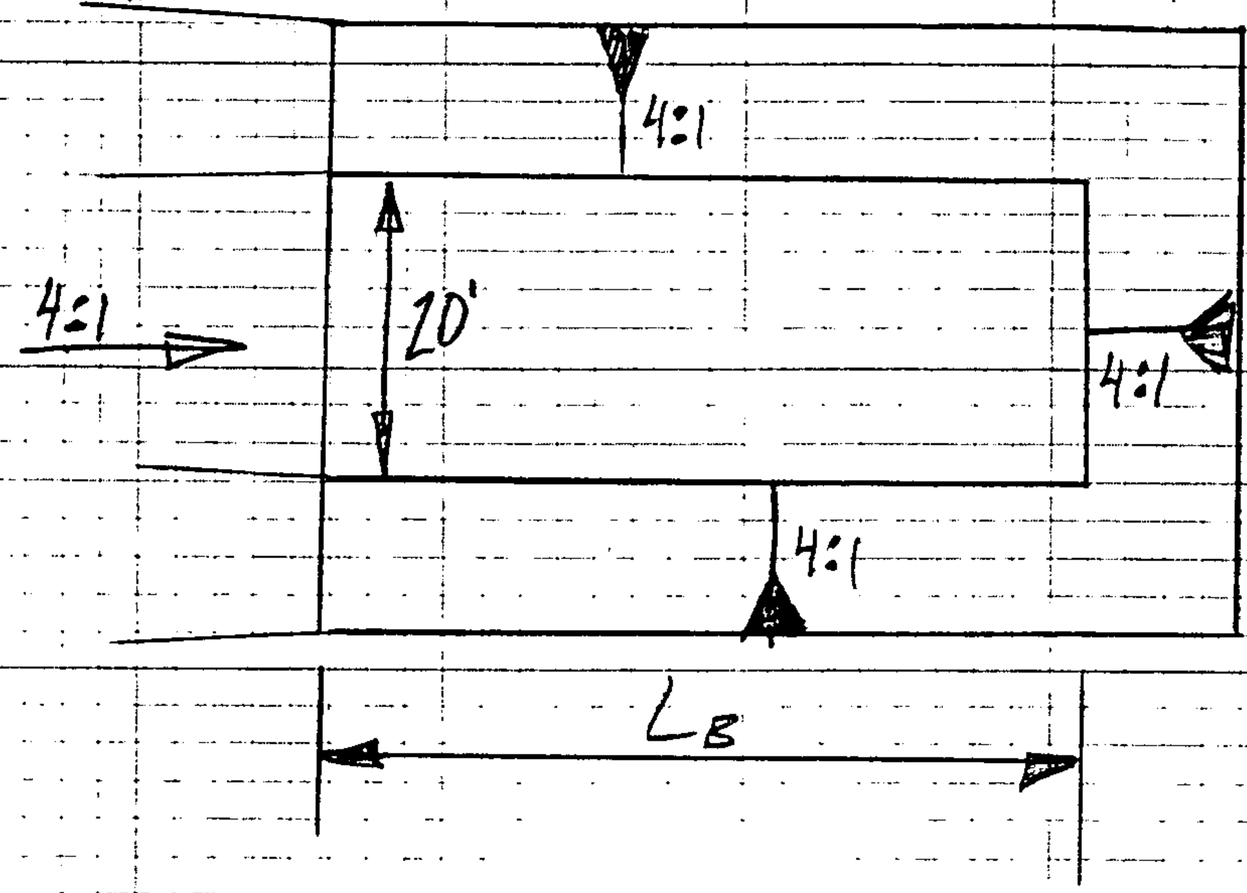
DAM 12 SENSITIVITY ANALYSIS 1 OF

SOIL CEMENT PLUNGE POOL DESIGN

for: THE CROSSING UNIT 1, WEST DIVERSION CHANNEL

(– modeled after Middle Branch Piedras Marcadas Arroyo Plunge Pool – COA Proj #4569.94)

TECHNICAL DESIGN REFERENCE:



NOTE: SEE CONST. PLANS FOR MORE DETAILED DRWG.

ASSUME: $C_1 = 1.0$ $Z_o - Z_1 = 15.5'$, (See Fig. IV-E-4)

GIVEN: $W_B = 20$

DESIGN $Q = 300$ cfs (PER DISCUSSION W/ JOHN KELLY

$Fr_1 = 4.11$, $Y_1 = 0.71'$ (FROM HEC-2 ANALYSIS)

FIND: REQ'D LENGTH & DEPTH OF PLUNGE POOL.

BOHANNAN-HUSTON INC.

PROJECT NAME THE XING UNIT 1 SHEET 1 OF 11

PROJECT NO. BY BS DATE 6/11/96

SUBJECT PLUNGE POOL DESIGN CH'D DATE

FROM FIG VI-11, $\frac{L_B}{Y_1} = 30$

THEN, $L_B = 30Y_1 = 42.25'$

$$Y_2 = C_1 Y_1 \frac{\sqrt{1+8F_r^2} - 1}{2} \quad \text{(EQN IV-B-9)}$$

$$= 1.0 * 0.71 \frac{\sqrt{1+8(4.11^2)} - 1}{2}$$

$$= 3.79' \Rightarrow \text{USE } 4.0'$$

$$\boxed{\text{LENGTH} = 43', \ \text{DEPTH} = 4.0'}$$

— THIS ANALYSIS BASED ON FHWA H.E.C. 14 PP IV-B-8 to IV-B-12 —

BOHANNAN-HUSTON INC.

PROJECT NAME _____ SHEET 2 OF 11

PROJECT NO. _____ BY _____ DATE _____

SUBJECT PLUNGE POOL DESIGN CH'D _____ DATE _____

˜HEC2 S/N: 1363001424 HMVersion: 6.52 Data File: c:\westland\hydrau~1\wdive4.hec

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*****************************************
     ****************************************
*  HEC-2 WATER SURFACE PROFILES            *
     *  U.S. ARMY CORPS OF ENGINEERS        *
*                                          *
     *  HYDROLOGIC ENGINEERING CENTER       *
*  Version   4.6.2;  May 1991              *
     *  609 SECOND STREET, SUITE D          *
*                                          *
     *  DAVIS, CALIFORNIA 95616-4687        *
*  RUN DATE    11JUN96    TIME    8:06:35  *
     *        (916) 756-1104                *
*****************************************
     ****************************************
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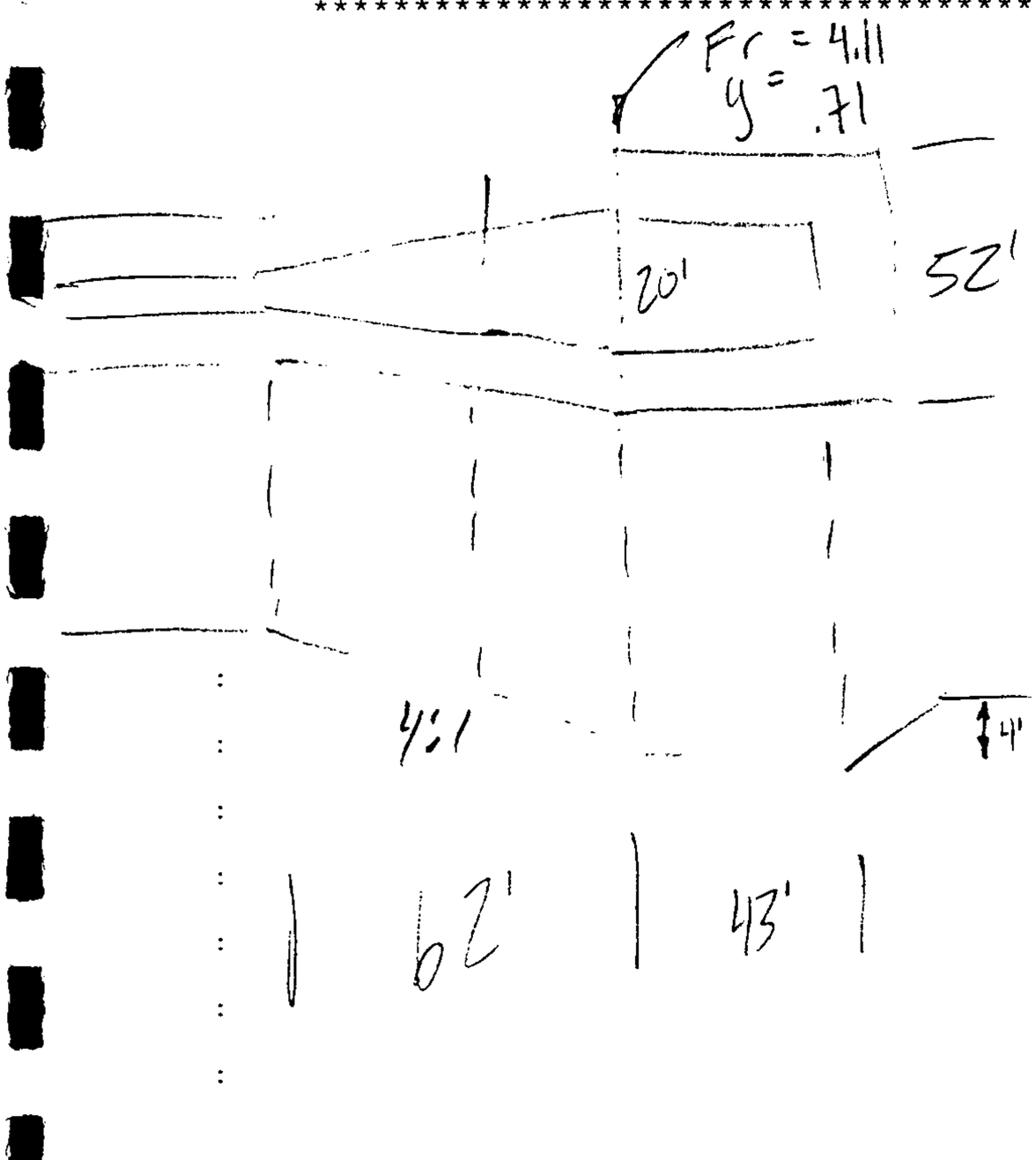


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X     X  XXXXXXX   XXXXX                XXXXX
X     X  X        X     X              X     X
X     X  X        X                          X
XXXXXXX  XXXX     X          XXXXX     XXXXX
X     X  X        X                    X
X     X  X        X     X              X
X     X  XXXXXXX   XXXXX               XXXXXXX

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:::                                        ::
:::   FULL MICRO-COMPUTER IMPLEMENTATION   ::
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H A E S T A D M E T H O D S
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

1˘
Run Date: 11JUN96 Run Time: 8:06:35 HMVersion: 6.52 Data File: c:\westland\hydrau~1\wdive4.hec Page 1

~~Page 1~~

PLUNGE POOL DESIGN 3 of 11

THIS

```
 RUN EXECUTED 11JUN96      8:06:35
*************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
*************************************


T1   West Diversion
T2   At Dam 10 Modeling Drop Structure/plunge pool
T3          SUPERCRITICAL RUN

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL
      FQ

            2.                     1         0                                   57.8


J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM
      ITRACE

   -1.          0        -1.                                     -1.


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.        42.        4.        26.        1.        2.        8.        14.
    33.        68.

J5  LPRNT    NUMSEC                    ********REQUESTED SECTION NUMBERS********

    -10       -10


QT      1.0       300

NC     .030       .030       .030        .1        .3

X1    100.0        4.0     500.00     570.0      0.00       0.0       0.0

GR     60.7      500.0      55.65     530.0     55.65     540.0     60.65       5
70.0

X1    105.0        4.0     500.00     570.0      5.00       5.0       5.0

GR     60.6      500.0      55.64     530.0     55.64     540.0     60.64       5
70.0

X1    110.0        4.0     500.00     570.0      5.00       5.0       5.0

GR     60.6      500.0      55.64     530.0     55.64     540.0     60.64       5
70.0

X1    115.0        4.0     500.00     570.0      5.00       5.0       5.0

GR     60.6      500.0      55.63     530.0     55.63     540.0     60.63       5
70.0

X1    120.0        4.0     500.00     570.0      5.00       5.0       5.0

GR     60.6      500.0      55.62     530.0     55.62     540.0     60.62       5
70.0

X1    125.0        4.0     500.00     570.0      5.00       5.0       5.0
```


PLUNGE POOL DESIGN 4 of 1

```
GR      60.6       500.0       55.61       530.0       55.61       540.0       60.61       5
70.0

X1     130.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.60       530.0       55.60       540.0       60.60       5
70.0
   Run Date:  11JUN96    Run Time:  8:06:35    HMVersion: 6.52    Data File:   c:\westla
nd\hydrau~1\wdive4.hec     Page    2

X1     135.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.60       530.0       55.60       540.0       60.60       5
70.0

X1     140.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.59       530.0       55.59       540.0       60.59       5
70.0

X1     145.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.58       530.0       55.58       540.0       60.58       5
70.0

X1     150.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.58       530.0       55.58       540.0       60.58       5
70.0

X1     155.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.57       530.0       55.57       540.0       60.57       5
70.0

X1     160.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.56       530.0       55.56       540.0       60.56       5
70.0

X1     165.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.6       500.0       55.55       530.0       55.55       540.0       60.55       5
70.0

X1     170.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.5       500.0       55.55       530.0       55.55       540.0       60.55       5
70.0

X1     175.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.5       500.0       55.54       530.0       55.54       540.0       60.54       5
70.0

X1     180.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.5       500.0       55.53       530.0       55.53       540.0       60.53       5
70.0

X1     185.0         4.0      500.00       570.0        5.00         5.0         5.0

GR      60.5       500.0       55.52       530.0       55.52       540.0       60.52       5
70.0
```

```
X1      190.0        4.0     500.00      570.0        5.00        5.0        5.0

GR       60.5      500.0      55.51      530.0       55.51      540.0      60.51       5
70.0

X1      195.0        4.0     500.00      570.0        5.00        5.0        5.0

GR       60.5      500.0      55.51      530.0       55.51      540.0      60.51       5
70.0

X1      200.0        4.0     500.00      570.0        5.00        5.0        5.0

GR       60.5      500.0      55.50      530.0       55.50      540.0      60.50       5
70.0

X1      205.0        4.0     500.00      569.2        5.00        5.0        5.0

GR       59.3      500.0      54.25      529.2       54.25      540.0      59.25       5
69.2

X1      210.0        4.0     500.00      568.4        5.00        5.0        5.0

GR       58.0      500.0      53.00      528.4       53.00      540.0      58.00       5
68.4
```



```
X1      215.0        4.0     500.00      567.6        5.00        5.0        5.0

GR       56.8      500.0      51.75      527.6       51.75      540.0      56.75       5
67.6

X1      220.0        4.0     500.00      566.8        5.00        5.0        5.0

GR       55.5      500.0      50.50      526.8       50.50      540.0      55.50       5
66.8

X1      225.0        4.0     500.00      566.0        5.00        5.0        5.0

GR       54.3      500.0      49.25      526.0       49.25      540.0      54.25       5
66.0

X1      230.0        4.0     500.00      565.2        5.00        5.0        5.0

GR       53.0      500.0      48.00      525.2       48.00      540.0      53.00       5
65.2

X1      235.0        4.0     500.00      564.4        5.00        5.0        5.0

GR       51.8      500.0      46.75      524.4       46.75      540.0      51.75       5
64.4

X1      240.0        4.0     500.00      563.5        5.00        5.0        5.0

GR       50.5      500.0      45.50      523.5       45.50      540.0      50.50       5
63.5

X1      245.0        4.0     500.00      562.7        5.00        5.0        5.0

GR       49.3      500.0      44.25      522.7       44.25      540.0      49.25       5
62.7

X1      250.0        4.0     500.00      561.9        5.00        5.0        5.0
```

```
GR      48.0      500.0      43.00      521.9      43.00      540.0      48.00      5
61.9

X1     255.0        4.0     500.00      561.1       5.00        5.0        5.0

GR      46.8      500.0      41.75      521.1      41.75      540.0      46.75      5
61.1

X1     260.0        4.0     500.00      560.3       5.00        5.0        5.0

GR      45.5      500.0      40.50      520.3      40.50      540.0      45.50      5
60.3

X1     262.0        4.0     500.00      560.0       2.00        2.0        2.0

GR      45.0      500.0      40.00      520.0      40.00      540.0      45.00      5
60.0
```


THIS

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 RUN EXECUTED 11JUN96      8:06:37
*************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
*************************************
```

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERROR
S LIST

SUPERCRITICAL RUN

SUMMARY PRINTOUT

	SECNO	ELMIN	TOPWID	VCH	CWSEL	CRIWS	DEPTH	QCH	K*C	HSL	FRCH
*	100.000	55.65	34.59	6.53	57.71	57.71	2.06	300.00		0.00	1.00
	105.000	55.64	33.42	7.11	57.58	57.68	1.94	300.00	-1	0.00	1.11
*	110.000	55.64	34.64	6.57	57.69	57.69	2.05	300.00		0.00	1.01
*	115.000	55.63	34.66	6.56	57.68	57.68	2.05	300.00	-	2.00	1.01
*	120.000	55.62	34.63	6.56	57.67	57.67	2.05	300.00	-	2.00	1.01
*	125.000	55.61	34.62	6.56	57.66	57.66	2.05	300.00	-	2.00	1.01
*	130.000	55.60	34.60	6.56	57.65	57.65	2.05	300.00	-	2.00	1.01

PLUNGE POOL DESIGN

```
*     135.000      55.60      34.59      6.56      57.65      57.65      2.05     300.00
0.00       1.01

*     140.000      55.59      34.58      6.56      57.64      57.64      2.05     300.00      -
2.00       1.01

*     145.000      55.58      34.56      6.57      57.63      57.63      2.05     300.00      -
2.00       1.01

*     150.000      55.58      34.56      6.57      57.63      57.63      2.05     300.00
0.00       1.01

*     155.000      55.57      34.54      6.57      57.62      57.62      2.05     300.00      -
2.00       1.01

*     160.000      55.56      34.52      6.57      57.61      57.61      2.05     300.00      -
2.00       1.01

*     165.000      55.55      34.50      6.57      57.60      57.60      2.05     300.00      -
2.00       1.01

*     170.000      55.55      34.67      6.56      57.60      57.60      2.05     300.00
0.00       1.01

*     175.000      55.54      34.68      6.56      57.59      57.59      2.05     300.00      -
2.00       1.01

*     180.000      55.53      34.65      6.56      57.58      57.58      2.05     300.00      -
2.00       1.01
```



```
      SECNO      ELMIN     TOPWID       VCH      CWSEL      CRIWS      DEPTH       QCH      K*C
HSL     FRCH

*     185.000      55.52      34.63      6.56      57.57      57.57      2.05     300.00      -
2.00       1.01

*     190.000      55.51      34.61      6.56      57.56      57.56      2.05     300.00      -
2.00       1.01

*     195.000      55.51      34.61      6.56      57.56      57.56      2.05     300.00
0.00       1.01

*     200.000      55.50      34.60      6.56      57.55      57.55      2.05     300.00      -
2.00       1.01

*     205.000      54.25      26.12     12.33      55.57      56.26      1.32     300.00     -25
0.00       2.25

      210.000      53.00      24.58     14.51      54.14      54.99      1.14     300.00     -25
0.00       2.79

      215.000      51.75      23.83     15.91      52.79      53.71      1.04     300.00     -25
0.00       3.15

      220.000      50.50      23.56     16.88      51.47      52.43      0.97     300.00     -25
0.00       3.43

      225.000      49.25      23.45     17.55      50.16      51.16      0.91     300.00     -25
0.00       3.62

      230.000      48.00      23.54     18.04      48.86      49.87      0.86     300.00     -25
0.00       3.78
```


PLUNGE POOL DESIGN 3

```
     235.000     46.75     23.69     18.32     47.58     48.59     0.83     300.00    -25
0.00      3.88

     240.000     45.50     24.02     18.52     46.30     47.31     0.80     300.00    -25
0.00      3.97

     245.000     44.25     24.30     18.62     45.02     46.03     0.77     300.00    -25
0.00      4.03

     250.000     43.00     24.69     18.65     43.75     44.75     0.75     299.99    -25
0.00      4.07

     255.000     41.75     25.05     18.64     42.48     43.48     0.73     299.99    -25
0.00      4.10

     260.000     40.50     25.50     18.58     41.21     42.20     0.71     299.99    -25
0.00      4.11 Fr.

     262.000     40.00     26.18     16.81     40.77     41.69     0.77     300.00    -10
0.00      3.59
1
   Run Date:  11JUN96    Run Time:  8:06:35    HMVersion: 6.52    Data File:   c:\westla
nd\hydrau~1\wdive4.hec     Page    6


 SUMMARY OF ERRORS AND SPECIAL NOTES


CAUTION SECNO=    100.000  PROFILE=  1  CRITICAL DEPTH ASSUMED

CAUTION SECNO=    110.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    110.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    110.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    115.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    115.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    115.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    120.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    120.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    120.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    125.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    125.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    125.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    130.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    130.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    130.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    135.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    135.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    135.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    140.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    140.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    140.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    145.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    145.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=    145.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=    150.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=    150.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
```

```
CAUTION SECNO=     150.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     155.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     155.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     155.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     160.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     160.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     160.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     165.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     165.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     165.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     170.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
```



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CAUTION SECNO=     170.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     170.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     175.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     175.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     175.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     180.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     180.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     180.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     185.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     185.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     185.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     190.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     190.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     190.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     195.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     195.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     195.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

CAUTION SECNO=     200.000  PROFILE=  1  CRITICAL DEPTH ASSUMED
CAUTION SECNO=     200.000  PROFILE=  1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=     200.000  PROFILE=  1  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=     205.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```
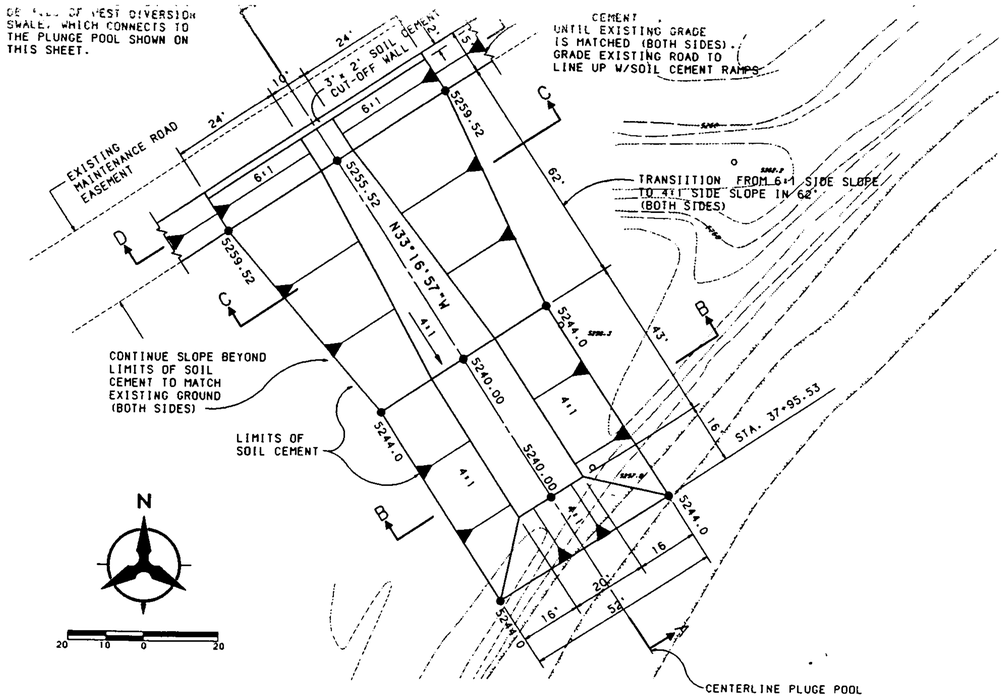
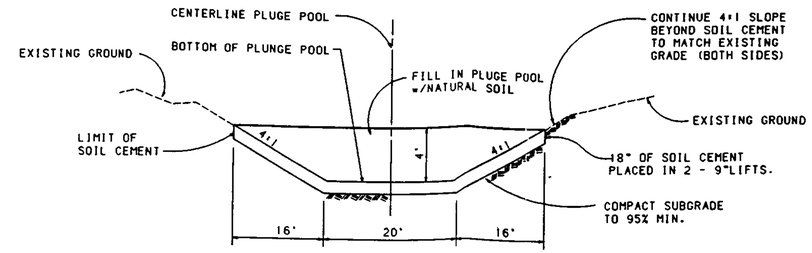
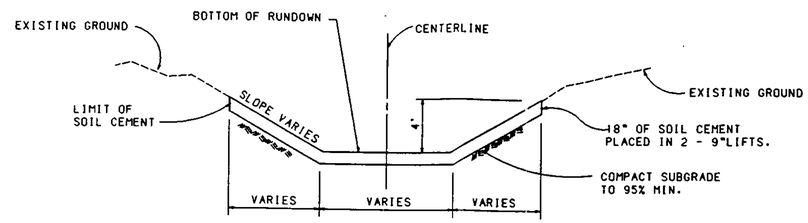



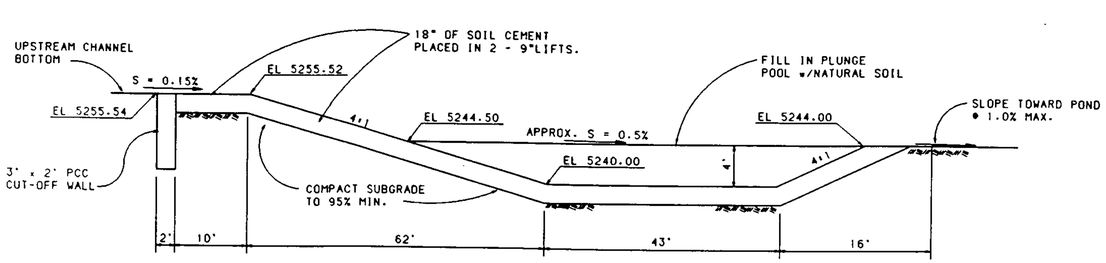
PLAN VIEW
SCALE : 1" = 20'



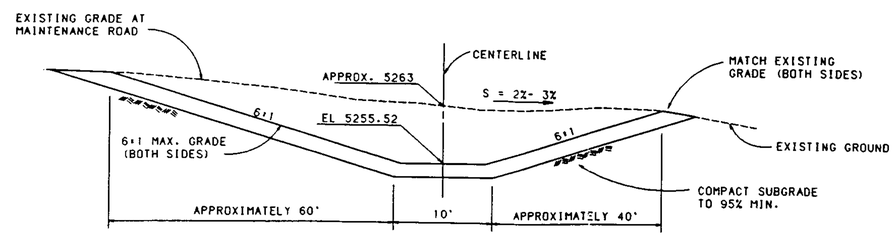
SECTION B-B
NO SCALE



SECTION C-C
NO SCALE



SECTION A-A
NO SCALE



SECTION D-D
NO SCALE

NOTE: ALL SOIL CEMENT FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SUPPLEMENTAL TECHNICAL SPECIFICATIONS.

ENGINEER'S SEAL

SURVEY INFORMATION

FIELD NOTES

NO.	BY	DATE

BENCH MARKS

ACS ALUMINUM TABLET STAMPED "BH-40"
GEOGRAPHIC POSITION (NAD 1927)
N.M. STATE PLANE COORDINATES
(CENTRAL ZONE) X = 362,790.66
Y = 1,492,346.53
GROUND TO GRID FACTOR = 0.99967105
D = 00° 16' 59"
NGVD 1929 ELEVATION = 5305.43

AS-BUILT INFO:

CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
FIELD VERIFICATION BY
DRAWINGS CORRECTED BY
MICRO-FILM IN
RECORDED BY
NO.

NO.	DATE	REMARKS	BY

REVISIONS

DESIGN

DESIGNED BY KP/BJS DATE 8/96
DRAWN BY OR DATE 8/96
CHECKED BY DATE

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

THE CROSSING SUBDIVISION UNIT I
SOIL CEMENT PLUNGE POOL
PLUNGE POOL DETAIL SHEET

DESIGN REVIEW

CITY PROJECT NO.

SOIL CEMENT PLUNGE POOL 11 OF 11

IMPACT BASIN DESIGN

(A) FOR OUTFALL FROM CASA VERDE STREET STORM DRAIN TO POND 11.

TECHNICAL REF: DESIGN OF SMALL CANAL STRUCTURES (BOR), CHAP 6, PART C.

GIVEN: PIPE DIA = 36", Q = 70.6 cfs

FIND: REQ'D BASIN WIDTH

(1) $V = Q/A = \frac{70.6 \text{ cfs}}{7.0744^2} = 10.0 \text{ fps}$ (Assumes full pipe as determined by HGL ANALYSIS.

(2) $d = \sqrt{A} = 2.66'$ (Assumes square jet, see pg 309 & 321 of reference)

(3) $F = \frac{V}{\sqrt{gd}} = \frac{10.0}{\sqrt{32.2 \cdot 2.66}} = 1.06$

(4) From FIG 6-10 (pg 310), $\frac{W}{d} = 3.0$

(5) $W = 3.0d = 7.98' \Rightarrow$ USE 8.0'

BOHANNAN-HUSTON INC.

PROJECT NAME: TE [illegible] SHEET 1 OF 4

PROJECT NO. BY BS DATE [illegible]

SUBJECT: IMPACT BASINS CH'D DATE

(B) FOR OUTFALL FROM GUNNISON AVE STORM DRAIN TO POND 12.

GIVEN: PIPE DIA = 30", Q_{100} = 56.5 cfs

FIND: REQ'D BASIN WIDTH

(1) V (from Mannings eqn, pipe is not flowing full) = 13.5 fps

(2) $d = \sqrt{A} = \sqrt{4.2} = 2.05'$ (Assumes square jet, see pg. 309 & 321)

(3) $F = \frac{V}{\sqrt{gd}} = \frac{13.5}{\sqrt{32.2(2.05)}} = 1.66$

(4) FROM FIG 6-10, $\frac{W}{d} = 3.75$

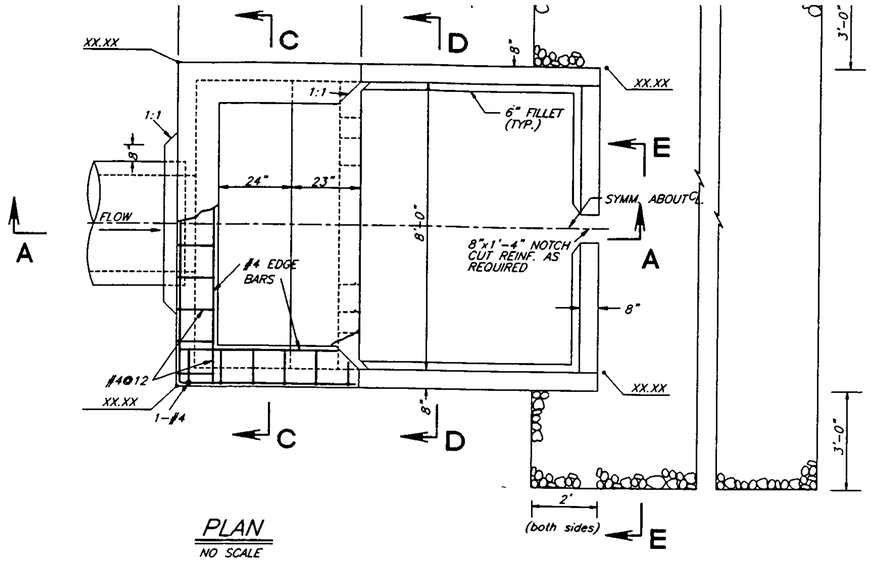
(5) $W = 2.05 \times 3.75 = 7.69' \Rightarrow$ USE 8.0'

BOHANNAN-HUSTON INC.

PROJECT NAME THE CROSSING SUB'D SHEET 2 OF 4

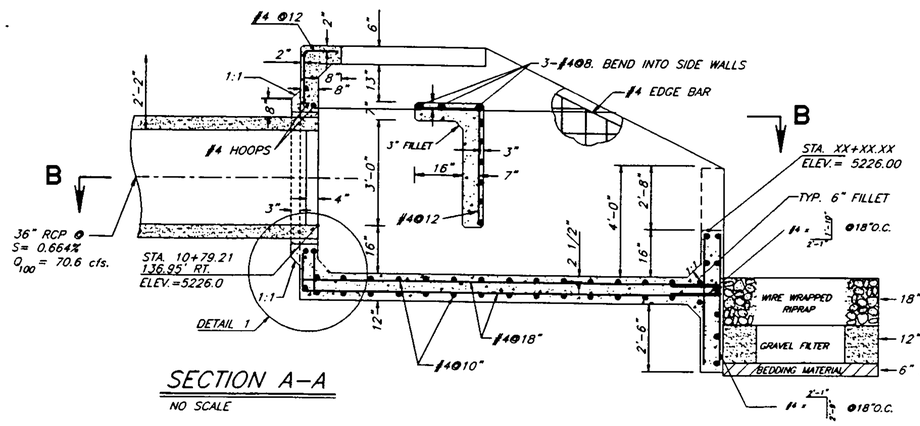
PROJECT NO. BY BS DATE 6/12/96

SUBJECT IMPACT BASINS CH'D DATE



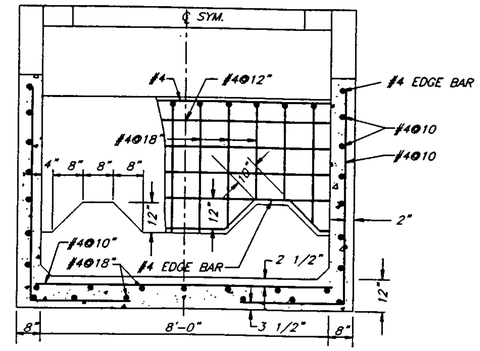
PLAN

NO SCALE



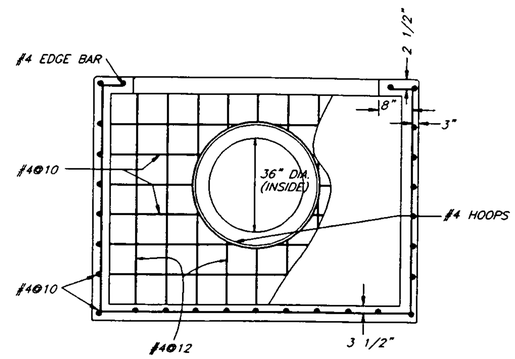
SECTION A-A

NO SCALE



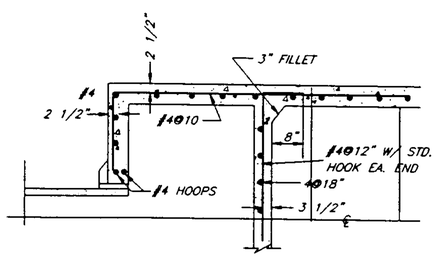
SECTION D-D

NO SCALE



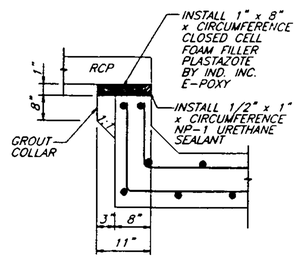
SECTION C-C

NO SCALE



SECTION B-B

NO SCALE



DETAIL "1"

NO SCALE

RIPRAP NOTES

(1) WIRE WRAPPED RIPRAP SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 603 OF THE STANDARD SPECIFICATIONS. RIPRAP SHALL BE TYPE L PER SECTION 109. ON SITE ROCK WILL HAVE TO BE SORTED TO MEET GRADATION.

(2) RIPRAP SHALL BE PLACED ON GRAVEL FILTER MATERIAL. GRAVEL FILTER MATERIAL SHALL BE SUPPLIED AND INSTALLED PER SECTION 603.10 OF THE STANDARD SPECIFICATIONS, AND THE GRADATION SHALL BE AS FOLLOWS:

SIEVE SIZE	% PASSING
3"	90-100
3/4"	20-90
#4	0-20
#200	0-3

(3) RIPRAP SUBGRADE SCARIFIED AND COMPACTED TO A DEPTH OF 6" AT MINIMUM 90% ASTM D-1557 DENSITY.

1. CODES AND MANUALS:
   Uniform Building Code, 1991 Edition
   ACI 318, Latest Edition, Building Code Requirements for Reinforced Concrete.
2. DESIGN LOADS:
   A. Live Loads:
      Soil Weight = 120 pcf
      Equiv lateral =40 pcf
   B. Maximum Allowable soil bearing pressure: 2000psf*
      *Allowable 1/3 stress increase for gravity and/or lateral loading.
3. GENERAL:
   A. The Contractor shall verify all dimensions in the field.
   B. Shop drawings shall be furnished for review before any fabrication and erection is started. Poorly executed shop drawings shall be rejected and re submitted.
   C. The Contractor shall be responsible for providing safe and adequate shoring for all parts of the wall and adjacent structures during construction, as well as worker safety and compliance with OSHA or other agency safety guidelines.
   D. The Contractor shall field all existing utility locations and notify the Engineer immediately of any descrepancies.
   E. The Contractor is responsible for repair and/or replacement of all utility conduits and existing lines.
   F. The contractor shall park equipment and vehicles as not to interfere with normal activities of residents or other Contractors on site.
   G. Any damage to existing facilities (curb and gutter, pavement, conduits, landscaping, utilities, ect.) during construction shall be replaced at the Contractors expense.
   H. Chamfer all exposed corners 3/4" TYP.
4. MATERIALS:
   A. Cast-in-Place Concrete:
      (1) All concrete shall conform to Standard Spec. Section 101. Concrete shall be 4000 psi for hydraulic structures.
   B. Reinforcing Steel:
      (1) All reinforcing steel shall conform to ASTM A615 Grade 60; except stirrups, ties, may conform to ASTM A615 Grade 40.
      (2) Reinforcing shall be stored in such a manner as to inhibit rusting or the deposit of oils or other bond inhibiting deposits.
      (3) Reining steel shall be fabricated and placed in accordance with the Building Code Requirements for Reinforced Concrete (ACI 318) and the CRSI Standard Manual.
      (4) Bar supports and spacers for rebar shall be provided in accordance with ACI and CRSI.
      (5) All lap splices shall be class B.
      (6) Concrete cover for reinforcing shall be as follows:
         a. Concrete poured against earth — 3 inches
         b. Concrete poured in forms but exposed to weather or earth:
            1. If bars are larger than No. 5 — 2 inches
            2. If bars are No. 5 or smaller — 1-1/2 inches
      (7) The Contractor shall be responsible to see that all rebar is properly aligned and tied in place before placing concrete. All column, wall dowels and vertical steel shall be accurately located and secured in place so that it remains in the position shown during the concrete placing operation. Any rebar found to be improperly installed shall be removed at no additional cost to the Owner.
      (8) Form ties shall be either of the threaded or snap-off type or other approved equal so that no metal will be left within 1 inch of the surface of the wall. Following removal of form ties, recesses are to be carefully filled and pointed with mortar.

NOTIFY AMAFCA 2 DAYS PRIOR TO WORK IN R.O.W. AMAFCA MUST INSPECT STEEL & FORMWORK PRIOR TO CASTING CONCRETE

AS-BUILT INFORMATION
CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
FIELD VERIFICATION BY
DRAWINGS CORRECTED BY
MICRO-FILM INFORMATION

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE	REMARKS

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY

REVISIONS
DESIGN

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GRO

TITLE: THE CROSSING SUBDIVISION UNIT I
IMPACT BASIN DETAILS

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	LAST DESIGN UPDATE	MO./DAY/YR.	MO.

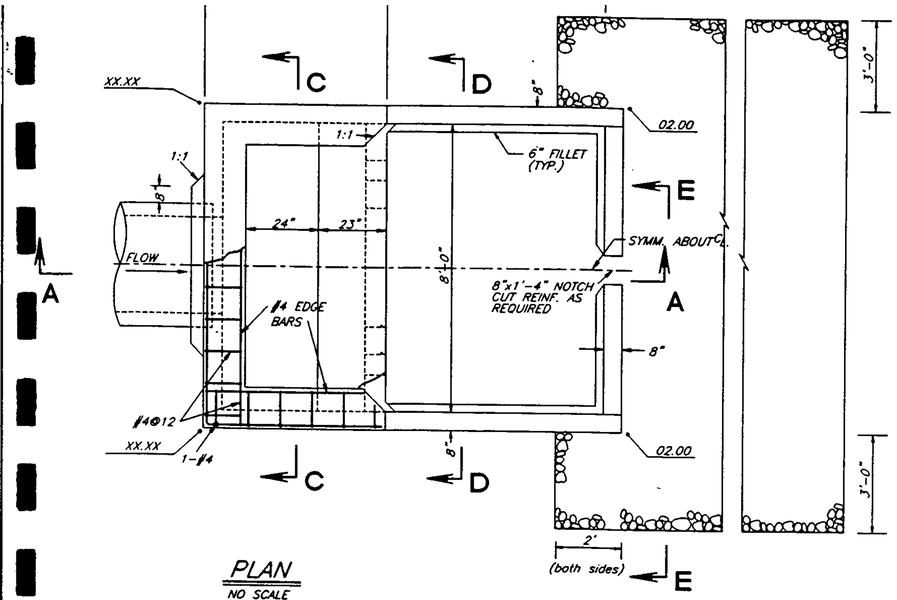
CITY PROJECT NO.	ZONE MAP NO.	SHEET	OF
545382	H-9, J-9	18B	

SCALE: 1"=50' (HORIZ.) 1"=10' (VERT.)

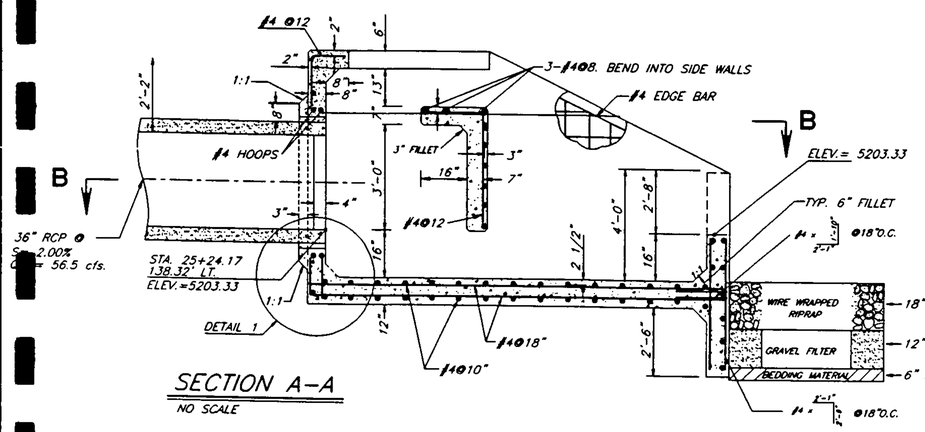
BHI PROJ. NO.
FILENAME:
XX/XX/XX

COPYRIGHT BOHANNAN-HU
XX/XX/XX

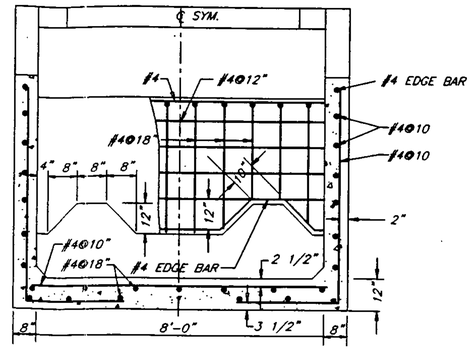
IMPACT BASIN 3 OF 4



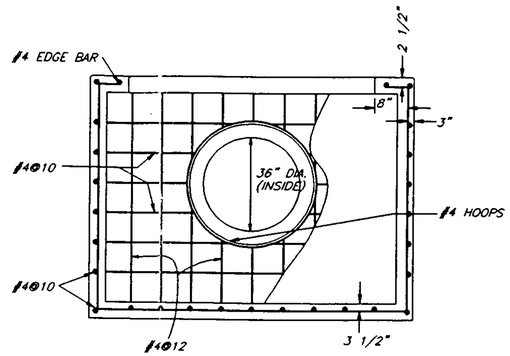
PLAN
NO SCALE



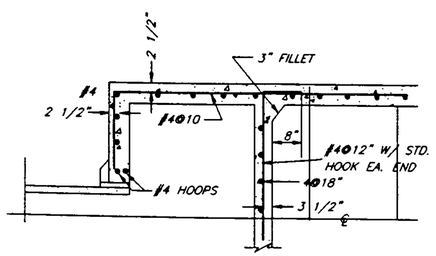
SECTION A-A
NO SCALE



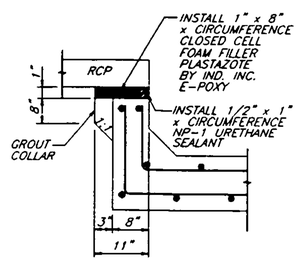
SECTION D-D
NO SCALE



SECTION C-C
NO SCALE



SECTION B-B
NO SCALE



DETAIL "1"
NO SCALE

GENERAL STRUCTURAL NOTES

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   ACI 318, Latest Edition, Building Code Requirements for Reinforced Concrete.
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      Soil Weight = 120 pcf
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RIPRAP NOTES

(1) WIRE WRAPPED RIPRAP SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 603 OF THE STANDARD SPECIFICATIONS. RIPRAP SHALL BE TYPE L PER SECTION 109. ON SITE ROCK WILL HAVE TO BE SORTED TO MEET GRADATION.

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SCALE: 1"=50' (HORIZ.) 1"=10' (VERT.)

AS-BUILT INFORMATION
CONTRACTOR — DATE
WORK STAKED BY — DATE
INSPECTOR'S CHANGES BY — DATE
FIELD VERIFICATION BY — DATE
DRAWINGS CORRECTED BY — DATE
MICRO-FILM INFORMATION
RECORDED BY — DATE
NO.

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES

NO.	BY	DATE

ENGINEER'S SEAL

NO.	DATE	REMARKS	BY
		REVISIONS	
		DESIGN	

DESIGNED BY (PROJ. ENG.) DATE 1-95
DRAWN BY (CAD TECH.) DATE 1-95

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

TITLE: THE CROSSING SUBDIVISION UNIT II
IMPACT BASIN DETAILS

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	LAST DESIGN UPDATE	MO./DAY/YR.	MO./DAY/YR.

CITY PROJECT NO.	ZONE MAP NO.	SHEET	OF
545383	H-9, J-9	3C	18

IMPACT BASIN
4 OF 4

BHI PROJ. NO.
FILENAME:
XX/XX/XX

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ANALYSIS OF CLARK'S FORK RUNDOWN

BASIC INFO = $Q_{100} = 34.2$ cfs

CROSS SECTION AT TOP OF RUNDOWN IS IDENTICAL TO STD ROADWY CROSS-SECTION (STD C&G, 32' F-F, 2% X-SLOPE)

* NORMAL FLOW ANALYSIS OF Clark's Fork gives a depth of 0.55' and V = 3.6 fps (for 34.2 cfs) just prior to entering the rundown.

* NORMAL FLOW ANALYSIS OF SECTION D-D SHOWS that the flow velocity IS 4.54 fps (assume n = .017)

RIP RAP DESIGN:

Technical Reference = Urban Storm Drng. Criteria Manual - Vol 2 - Wright-McLaughlin Engrs. Denver CO. March 1969, SECT 5.6.2

$$Q/WH^{1.5} = \frac{34.2}{30 \times 1^{1.5}} = 1.14 < 8.0 \text{ ok}$$

$$Q/WH^{0.5} = 1.14$$

$$y_t/H_a = \frac{0.28}{\left(\frac{1}{2}(1+.26)\right)} = 0.44$$

} GIVES < TYPE L.

FIG 5-8 YIELDS TYPE VL RIP RAP FOR 3H DOWNSTREAM

USE: TYPE VL FOR 5', 12" THICK W/ 12" TYPE I BEDDING.

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ALBUQUERQUE LAS CRUCES SANTA FE

PROJECT NAME [illegible] SHEET 1 OF 3
PROJECT NO. BY BS DATE
SUBJECT Soil Cement [illegible] CH'D DATE

ANALYSIS OF PLATTE CT RUNDOWN

BASIC INFO: $Q_{100} = 30.0$ cfs

* NORMAL FLOW ANALYSIS OF PLATTE CT JUST PRIOR TO RUNDOWN YIELDS;
  VEL = 3.0 fps DEPTH = 0.58'

* NORMAL FLOW ANALYSIS OF 4:1 PORTION 10' WIDE YIELDS; (this is worst case)
  VEL = 14.1 DEPTH = 0.20'
  - NOTE the velocity where the water hits the rip-rap is not this high - for two reasons; 1) the water most likely never transitions to the worst case flow conditions above. 2) THE flat portion of soil cement prior to the rip rap will slow the water down.

RIP RAP DESIGN: (same tech. ref. as Clark's Fork)

$$\frac{Q}{WH^{1.5}} = \frac{30}{10(1)^{1.5}} = 3.0 < 8.0 \text{ ok}$$

$$\frac{Q}{WH^{0.5}} = 3.0, \quad \frac{y_t}{H_a} = \frac{0.4}{(1/2(1+.67))} = 0.48$$

∴ TYPE L REQ'D.

USE: TYPE L, 18" DEEP, 10' LONG w/ 12" BED (II)
(see sect 5.6.3)

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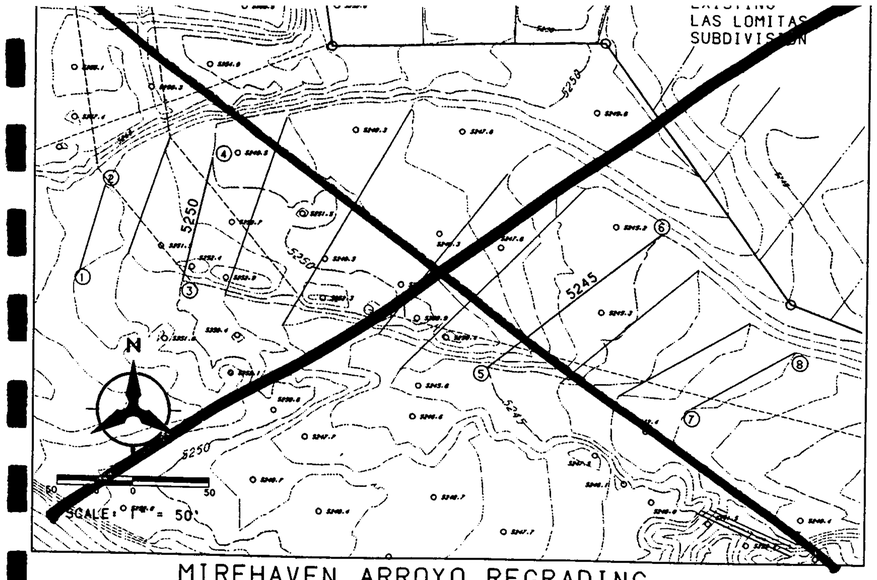
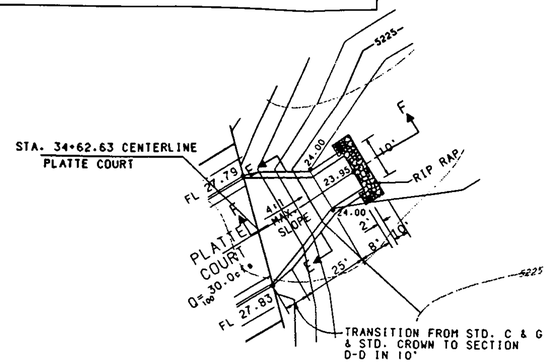
ALBUQUERQUE LAS CRUCES SANTA FE

PROJECT NAME _____ SHEET 2 OF 3
PROJECT NO. _____ BY _____ DATE _____
SUBJECT Soil Cement Rundowns CH'D _____ DATE _____



MIREHAVEN ARROYO REGRADING

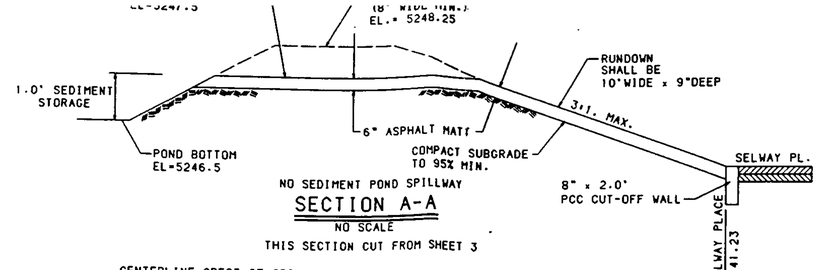
2	X=354.126.39	Y=1.495.350.54
3	X=354.177.24	Y=1.495.287.64
4	X=354.196.64	Y=1.495.370.87
5	X=354.379.96	Y=1.495.234.65
6	X=354.494.92	Y=1.495.325.41
7	X=354.514.30	Y=1.495.210.60
8	X=354.581.98	Y=1.495.248.64



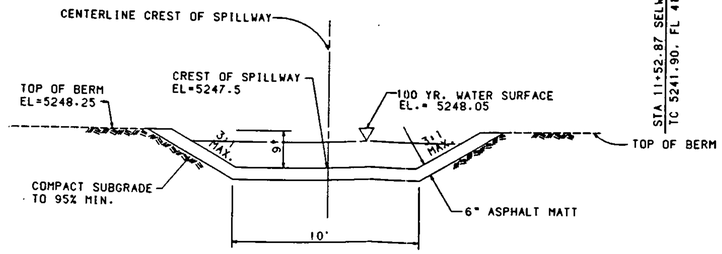
PLATTE COURT
SOIL CEMENT RUNDOWN
NO SCALE

NOTE:
ALL AREAS DISTURBED FOR MIREHAVEN ARROYO REGRADING AND POND 12 VOLUME EXPANSION SHALL BE RESEEDED PER COA STD. SPEC. 1012.

NOTE:
CONTRACTOR SHALL OBTAIN PERMIT FROM AMAFCA. & PROVIDE PROOF OF INSURANCE PRIOR TO WORKING ON AMAFCA FACILATIES.

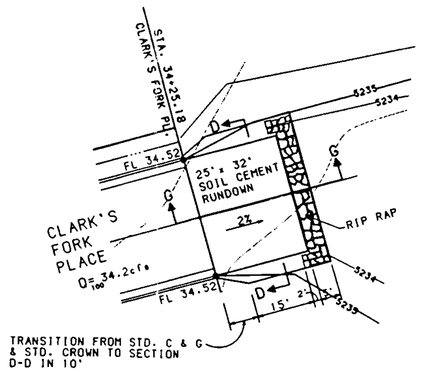


NO SEDIMENT POND SPILLWAY
SECTION A-A
NO SCALE
THIS SECTION CUT FROM SHEET 3

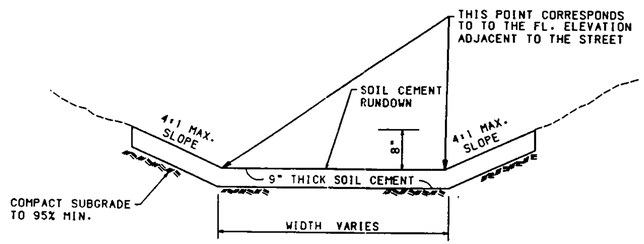


NO SEDIMENT POND SPILLWAY
SECTION B-B
NO SCALE
THIS SECTION CUT FROM SHEET 3

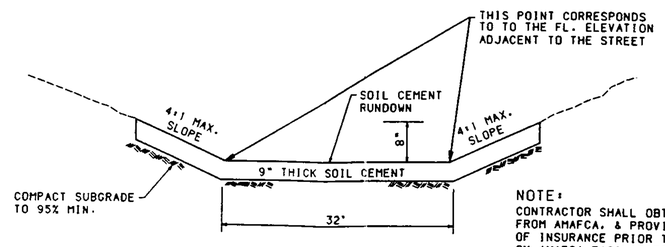
NOTE:
SECTIONS A-A & B-B ARE CUT FROM SHEET 3 OF 18



CLARK'S FORK PLACE
SOIL CEMENT RUNDOWN
NO SCALE



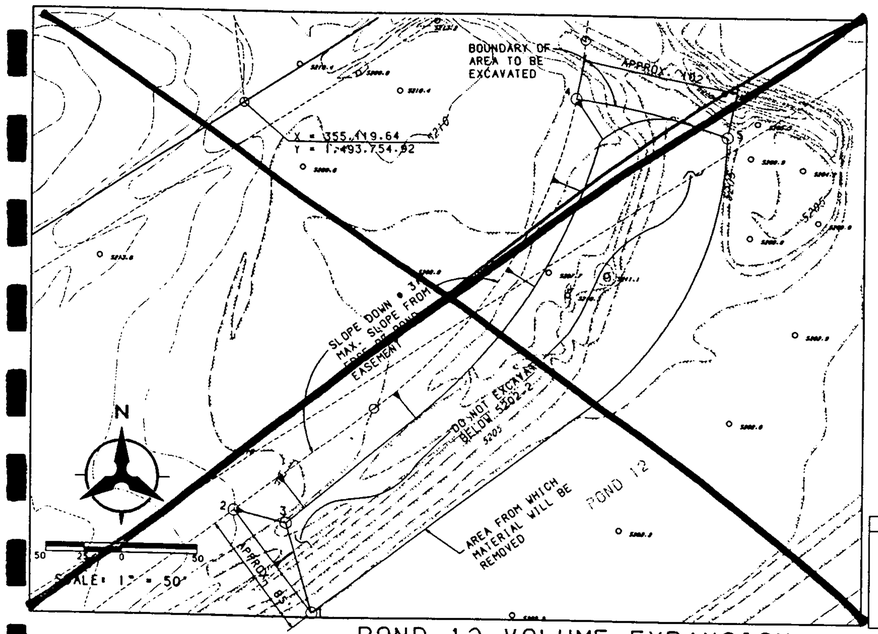
SECTION E - E
NO SCALE



SECTION D - D
NO SCALE

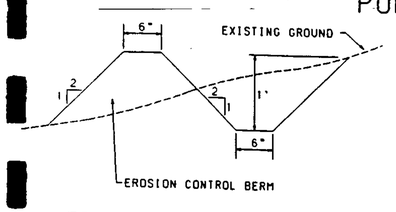
NOTE:
CONTRACTOR SHALL OBTAIN PERMIT FROM AMAFCA. & PROVIDE PROOF OF INSURANCE PRIOR TO WORKING ON AMAFCA FACILATIES.

NOTE: ALL SOIL CEMENT FACILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SUPPLEMENTAL TECHNICAL SPECIFICATIONS.



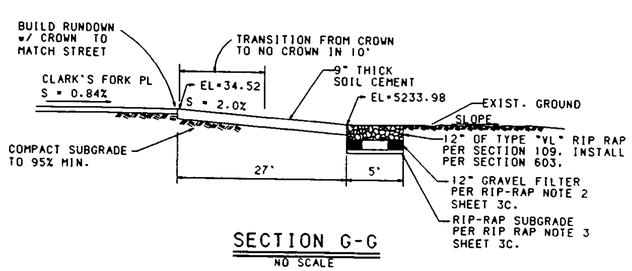
POND 12 VOLUME EXPANSION
(TOTAL OF 5000 CY. TO BE REMOVED)

POND 12 COORDINATE DATA TABLE		
NUMBER		
1	X=355.167.78	Y=1.493.415.69
2	X=355.117.62	Y=1.493.482.92
3	X=355.150.39	Y=1.493.474.99
4	X=355.340.26	Y=1.493.759.87
5	X=355.439.77	Y=1.493.735.83

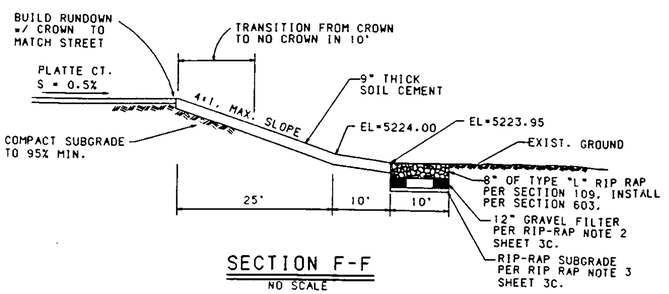


EROSION CONTROL PLAN
NO SCALE

A BERM WITH THE DIMENSIONS SHOWN SHALL BE MAINTAINED DURING CONSTRUCTION UNTIL COMPLETION OF INDIVIDUAL HOMES WITHIN THE PROJECT.



SECTION G-G
NO SCALE



SECTION F-F
NO SCALE

AS-BUILT INFORMATION
CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
FIELD VERIFICATION BY
CORRECTIONS CHECKED BY
MICRO-FILM INFORMATION
RECORDED BY
NO.

BENCH MARKS
ACS ALUMINUM TABLET STAMPED "8H-40"
GEOGRAPHIC POSITION (NAD 1927)
N.M. STATE PLANE COORDINATES
(CENTRAL ZONE) X = 362,790.66
Y = 1,492,346.53
GROUND TO GRID FACTOR = 0.99967105
D = 00° 16' 59"
NGVD 1929 ELEVATION = 5305.43

SURVEY INFORMATION
FIELD NOTES
NO. BY DATE

ENGINEER'S SEAL

REVISIONS
NO. DATE REMARKS BY
DESIGN
DESIGNED BY KP/BJS DATE 8/96
DRAWN BY OR DATE 8/96

BOHANNAN-HUSTON INC.
ENGINEERS • PLANNERS • PHOTOGRAMMETRISTS • SURVEYORS • LANDSCAPE ARCHITECTS
ALBUQUERQUE LAS CRUCES SANTA FE

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DEVELOPMENT GROUP

THE CROSSING SUBDIVISION UNIT II
GRADING AND DRAINAGE DETAILS
DETAIL SHEET

DESIGN REV.
CITY PROJECT

SOIL CEMENT RUNDOWNS 3 OF 3

WESTLAND MASTERPLAN WATERLINE ARROYO CROSSINGS SCOUR ANALYSIS
JOB NO. 96178A 2134
FILE NAME: HYDRO:[H96178A2100.SCOUR]SCOUR.WK3
DATE: 3/14/96

SCOUR ANALYSIS - HEGGEN'S METHOD

LONG TERM SCOUR
Based on Arroyo Equlibrium Slope from CURVCALC Computer Sediment Analysis for comprable arroyos

PARAMETER	DESCRIPTION	UNIT	
			Mirehaven Arroyo
REACH	Reach Number/Bridge Name		@ AP7
Crossing Elevation	Arroyo Invert Elev. at crossing		5254
Se	Equilibrium Slope		0.0254
Control	Arroyo Control Elev.		5254.15
Length	Distance from Control		0.00
Crossing Equilibrium Elevation	Long Term Arroyo Invert		5254.15
Q	Disharge		2571.00
ALOB	Area Lt. Overbank	(sf)	0.00
ACH	Area Channel	(sf)	320.50
AROB	Area Rt. Overbank	(sf)	0.00
ATOTAL	Total Area	(sf)	320.50
TOPWID	Top Width	(ft)	234.00
Beff	Width	(ft)	234.00
V	Velocity	(fps)	8.02
D	Hydraulic Depth	(ft)	1.37
F	Froude Number		1.21
q	Unit Discharge	(cfs/ft)	10.99
yc	Critical Depth	(ft)	1.55
scour t	Long Term Scour	(ft)	0.00
scour c	Contraction Scour	(ft)	0.00
scour l	Local Scour	(ft)	5.83
scour tot	Total Scour	(ft)	5.83

MIREHAVEN. ARROYO SCOUR ANALYSIS 1 OF 6

CROSS SECT[illegible] CROSSING

MANNING'S N = .0350 SLOPE = .0254

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	5256.69	4	100.00	5254.15	7	295.00	5265.00
2	20.00	5256.00	5	250.00	5255.00	8	320.00	5270.00
3	30.00	5255.00	6	270.00	5260.00	9	340.00	5275.00

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
5254.20	0.05	0.3	0.2	12.9	0.6	12.94
5254.25	0.10	1.3	1.2	25.9	0.9	25.88
5254.30	0.15	2.9	3.5	38.8	1.2	38.82
5254.35	0.20	5.2	7.5	51.8	1.5	51.76
5254.40	0.25	8.1	13.7	64.7	1.7	64.70
5254.45	0.30	11.6	22.2	77.6	1.9	77.64
5254.50	0.35	15.9	33.6	90.6	2.1	90.58
5254.55	0.40	20.7	47.9	103.5	2.3	103.52
5254.60	0.45	26.2	65.6	116.5	2.5	116.46
5254.65	0.50	32.3	86.9	129.4	2.7	129.40
5254.70	0.55	39.1	112.0	142.3	2.9	142.34
5254.75	0.60	46.6	141.3	155.3	3.0	155.28
5254.80	0.65	54.7	174.9	168.2	3.2	168.22
5254.85	0.70	63.4	213.1	181.2	3.4	181.16
5254.90	0.75	72.8	256.1	194.1	3.5	194.10
5254.95	0.80	82.8	304.2	207.0	3.7	207.04
5255.00	0.85	93.5	357.6	220.0	3.8	219.97
5255.05	0.90	104.5	429.6	220.7	4.1	220.70
5255.10	0.95	115.6	506.9	221.4	4.4	221.40
5255.15	1.00	126.6	589.2	222.1	4.7	222.10
5255.20	1.05	137.8	676.5	222.8	4.9	222.80
5255.25	1.10	148.9	768.7	223.5	5.2	223.50
5255.30	1.15	160.1	865.5	224.3	5.4	224.20
5255.35	1.20	171.3	967.0	225.0	5.6	224.90
5255.40	1.25	182.6	1073.0	225.7	5.9	225.60
5255.45	1.30	193.9	1183.4	226.4	6.1	226.30
5255.50	1.35	205.2	1298.2	227.1	6.3	227.00
5255.55	1.40	216.6	1417.3	227.8	6.5	227.70
5255.60	1.45	228.0	1540.6	228.5	6.8	228.40
5255.65	1.50	239.4	1668.1	229.2	7.0	229.10
5255.70	1.55	250.9	1799.7	229.9	7.2	229.80
5255.75	1.60	262.4	1935.4	230.6	7.4	230.50
5255.80	1.65	274.0	2075.0	231.3	7.6	231.20
5255.85	1.70	285.5	2218.7	232.1	7.8	231.90
5255.90	1.75	297.2	2366.3	232.8	8.0	232.60
5255.95	1.80	308.8	2517.8	233.5	8.2	233.30
5256.00	1.85	320.5	2673.1	234.2	8.3	234.00
5256.05	1.90	332.2	2825.0	235.8	8.5	235.65
5256.10	1.95	344.1	2980.7	237.5	8.7	237.30
5256.15	2.00	356.0	3140.0	239.1	8.8	238.94
5256.20	2.05	367.9	3302.9	240.8	9.0	240.59
5256.25	2.10	380.0	3469.6	242.5	9.1	242.24
5256.30	2.15	392.2	3640.0	244.1	9.3	243.89
5256.35	2.20	404.4	3814.0	245.8	9.4	245.54
5256.40	2.25	416.7	3991.6	247.4	9.6	247.19
5256.45	2.30	429.1	4173.0	249.1	9.7	248.84
5256.50	2.35	441.6	4357.9	250.7	9.9	250.49
5256.55	2.40	454.2	4546.6	252.4	10.0	252.14
5256.60	2.45	466.8	4738.8	254.1	10.2	253.79
5256.65	2.50	479.6	4934.7	255.7	10.3	255.44
5256.69	2.54	489.8	5094.3	257.0	10.4	256.76

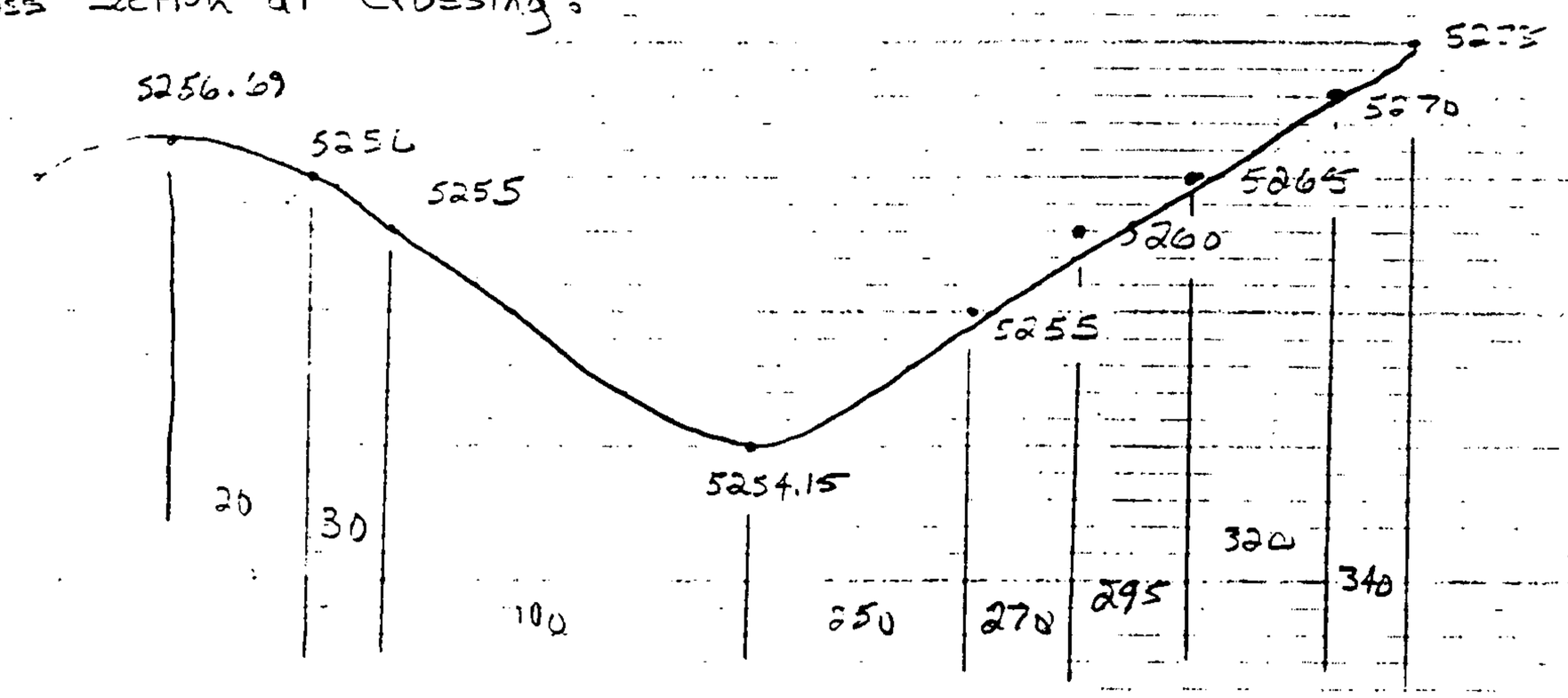
Mirehaven Arroyo

Existing Plus Phase I Developement Flowrate = 2,571 cfs

$$\text{Slope} = \frac{5260 - 5245'}{590'} = \frac{15'}{590} = 0.0254$$

Crossing Elev. ≈ 5254

Cross Section at Crossing:



Q = 2,571 cfs

WSEL = 5256

TOP WIDTH = 234'

AREA = 320.5 ft²

BOHANNAN-HUSTON INC.

PROJECT NAME Westland Waterline SHEET 1 OF

PROJECT NO. 96178 A BY DEB DATE 5/14

SUBJECT Scour Analysis CH'D DATE

SCOUR ANAL 3 OF 6

FILE: 761PA 4-4

Richard J. Heggen
PE, PH, PhD
Water Resources Engineering
620 Ridgecrest SE
Albuquerque, NM 87108

Monday, July 20, 1992

The following notes refer to channel scour analysis estimated in accord with *Sediment and Erosion Design Guide*, prepared for AMAFCA by Resource Consultants, Inc., draft copy, August, 1991.

It is my opinion that these calculations may overestimate scour depth, as

1) All scour mechanisms are considered to be independent and additive.

2) Local scour is exponentially related to Froude Number. Model calibration appears to be for subcritical data. Extrapolation into the supercritical regime may not be justified.

3) The scour formulae presume a rectangular channel.

As overestimation leads to conservative engineering design, I support RCI's methodology until such a time that improved methods are justified.

My analysis employs Excel 3.0. Channel reaches are indicated by rows. Reach data, including scour, are indicated by columns.

Column		Notes
A	Reach	Reach number
B	Q	Discharge
C	ALOB	Area, left overbank, from HEC-2
D	ACH	Area, channel, from HEC-2
E	AROB	Area, left overbank, from HEC-2
F	A tot	Total area, **C** + **D** + **E**
G	TOPWID	Top width, from HEC-2
H	b eff	Width of rectangular channel approximation, $\mathbf{G}\left(\frac{\mathbf{C}/2 + \mathbf{D} + \mathbf{E}/2}{\mathbf{F}}\right)$

The rectangular channel approximation is a channel where

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width = top width of actual cross-section, if all flow is confined to channel

width = $\frac{\text{top width of actual cross-section}}{2}$, if all flow is on overbank

width is interploated from above when flow is on both channel and overbank.

The rectangular channel approximation preserves both the cross-sectional area and velocity of the actual channel.

Figs. 1 and 2 illustrate consequences of channel and overbank delineation (STCHL and STCHR, the channel-overbank stations, on the X1, cross-section record, in HEC-2) on the rectangular approximation. The illustrations are simplified, as actual cross-sections of any configuration can be input into HEC-2. If scour is likely to occur in the central portion of the channel, flow along the outer boundaries (above the sideslopes in Figs. 1 and 2) should be defined in HEC-2 as overbank flow (Fig. 1). If scour is likely to occur under the full water surface, flow at the outer boundaries should be defined as channel flow (Fig. 2).

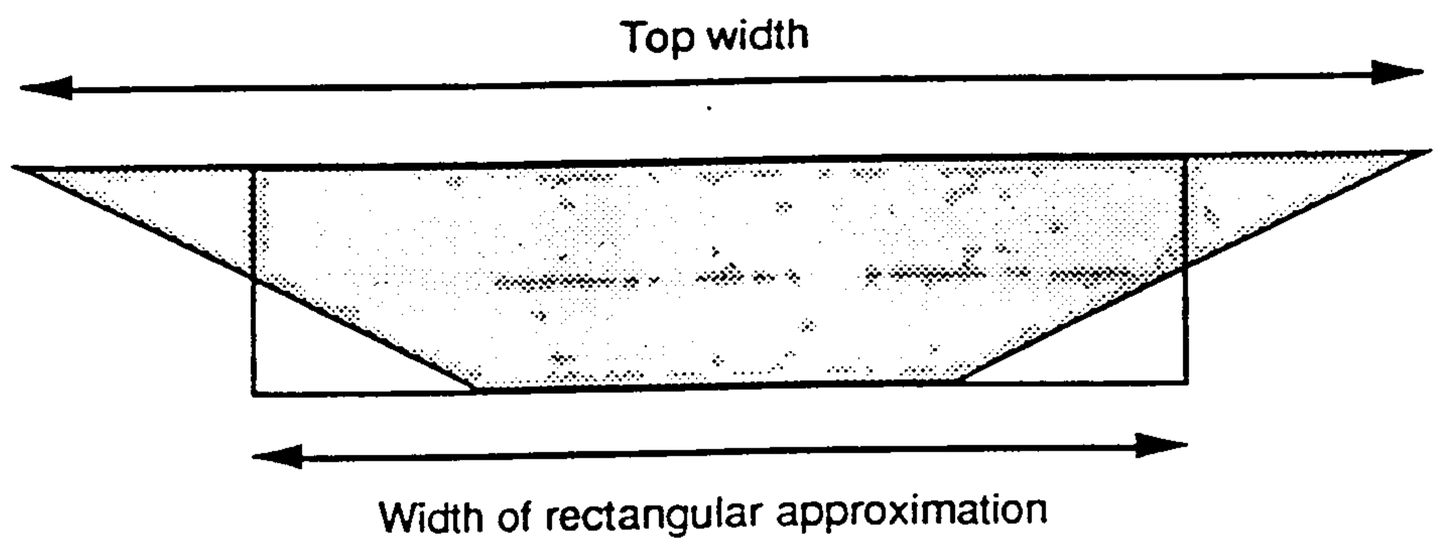

Fig. 1. Sideslopes taken as overbank

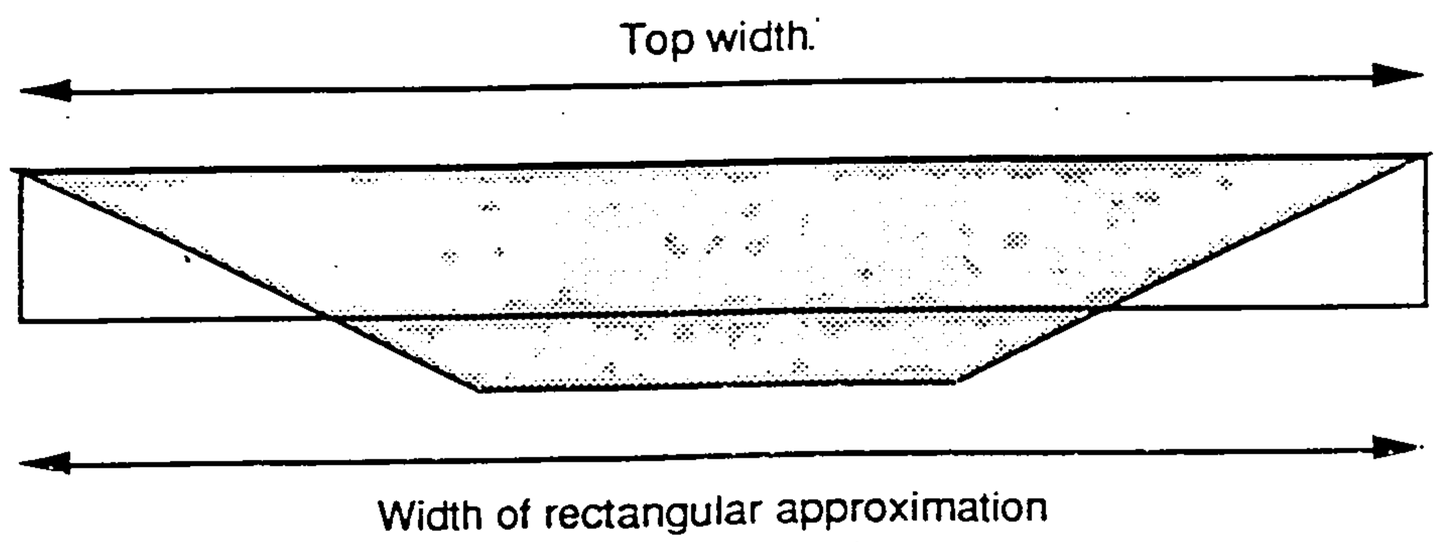

Fig. 2. Sideslopes taken as channel

SCOUR ANAL 5 OF 6

I	V	Velocity, $\frac{B}{F}$
J	D	Hydraulic depth of rectangular approximation, $\frac{F}{G}$
K	F	Froude number for rectangular approximation, $\frac{I}{\sqrt{g\,J}}$
L	= q	Unit discharge in rectangular channel approximation, $\frac{B}{H}$
M	= yc	Critical depth in rectangular channel approximation, $\sqrt[3]{\frac{L^2}{g}}$
		Included for general information. Not used for scour estimation.
N	scour t	Long term scour
		Estimated from anticipated geomorphic trends. See RCI Sec. 3.4.2-3.4.4 for discussion of equilibrium slope.
O	scour c	Contraction scour
		Estimated from abutment, pier, or other contraction analogies. See RCI Sec. 3.4.5 for discussion of bridges.
P	scour l	Local scour, $4 * J * K^{1/3}$
		The limiting scour depth, FHWA, HEC 20, 1991. The Froehlich equation is also considered acceptable by RCI. See RCI Sec. 3.6 for alternative methods.
Q	scour a	Antidune scour, $0.44 * J * K^2$
		Derived from the Kennedy formula, $h_a = 0.14\frac{2\pi V^2}{g}$
R	scour tot	Total scour, **N + O + P + Q**

PLATES

GRADING AND DRAINAGE PLAN
(1"=100' scale, shows Units I & II)

GRADING AND DRAINAGE PLAN
(1"=50' scale, separate sheets showing Units I & II)

EXISTING CONDITIONS BASIN MAP

PROPOSED CONDITIONS BASIN MAP

FULLY DEVELOPED CONDITIONS BASIN MAP

PROPOSED BULK LAND PLAT

GRADING AND DRAINAGE PLAN
(1"=100' scale, shows Units I & II)

GRADING AND DRAINAGE PLAN
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EXISTING CONDITIONS BASIN MAP

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