

M-9/D23 Amole Ak2040



City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

November 3, 2003

Fred Arfman, PE
Isaacson & Arfman
128 Monroe NE
Albuquerque, NM 87108

Re: Amole Arroyo Drainage Report
Engineer's Stamp dated 9-10-03, (M9/D23)

Dear Mr. Arfman,

Based upon the information provided in your submittal dated 9-16-03, the above referenced report is for Work Order requirements.

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

Sincerely,

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

C: Loren Meinz, AMAFCA
file

DRAINAGE AND TRANSPORTATION INFORMATION SHEET
(REV. 1/28/2003rd)

M-9 / D23

PROJECT TITLE: Amole Arroyo

DRB #: _____ EPC#: _____

ZONE MAP/DRG. FILE #: 128/119

WORK ORDER#: 712991

LEGAL DESCRIPTION: _____

CITY ADDRESS: _____

ENGINEERING FIRM: Isaacson & Arfman, P.A.

ADDRESS: 128 Monroe Street NE

CITY, STATE: Albuquerque, NM

CONTACT: Asa Nilsson-Weber

PHONE: (505) 268-8828

ZIP CODE: 87108

OWNER: AMAFCA/City of Albug./Curb Inc.

ADDRESS: _____

CITY, STATE: _____

CONTACT: Loren Mein z/Dan Hogan/

PHONE: _____

ZIP CODE: Bo Johnson

ARCHITECT: _____

ADDRESS: _____

CITY, STATE: _____

CONTACT: _____

PHONE: _____

ZIP CODE: _____

SURVEYOR: _____

ADDRESS: _____

CITY, STATE: _____

CONTACT: _____

PHONE: _____

ZIP CODE: _____

CONTRACTOR: _____

ADDRESS: _____

CITY, STATE: _____

CONTACT: _____

PHONE: _____

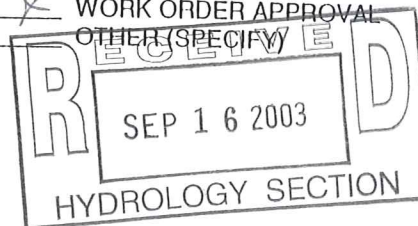
ZIP CODE: _____

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
☐ 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

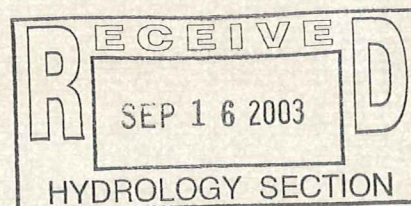
DATE SUBMITTED: 9/16/03

BY: Asa Nilsson-Weber

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.

FINAL DESIGN REPORT
FOR
AMOLE ARROYO
INCLUDING REVISIONS TO
THE AMOLE-HUBBELL
DRAINAGE MANAGEMENT PLAN
ALBUQUERQUE, NEW MEXICO



FINAL DESIGN REPORT

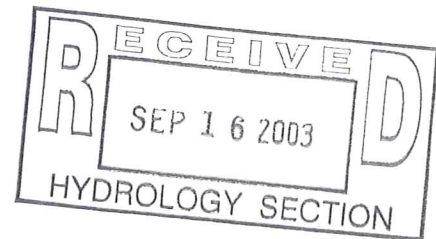
FOR

AMOLE ARROYO

**INCLUDING REVISIONS TO
THE AMOLE-HUBBELL
DRAINAGE MANAGEMENT PLAN**

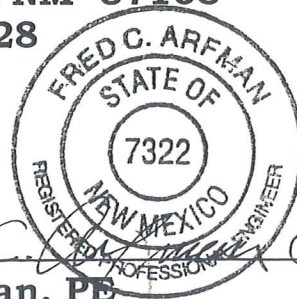
ALBUQUERQUE, NEW MEXICO

AUGUST 2003



Prepared by:

**ISAACSON & ARFMAN, P.A.
128 Monroe Street, NE
Albuquerque, NM 87108
(505) 268-8828**



Fred C. Arfman, PE

Date

09-10-03

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APPENDICES

Appendix A: AHYMO Files for 100-Year Storm

- Amole Basin
- Snow Vista Basin

Appendix B: Basin Map--Portion of DMP Basin 60104

Appendix C: HEC-RAS Profiles and Summary Tables

- Amole Arroyo
- Snow Vista

Appendix D: Summary of Channel Depth Including Superelevation

Appendix E: Centerline Radius and Easement Curve Length Calculations

Appendix F: Slug Flow Calculations and References

Appendix G: Upstream Transition Exhibit, Riprap Sizing Calculations and References

Appendix H: Confluence Exhibit and Momentum Balance Check

Appendix I: Excerpts from Amole-Hubbell Drainage Management Plan, Volume I

POCKETS

AHYMO Files and HEC-RAS Files
Amole Arroyo Plan & Profile Exhibits

I. INTRODUCTION

The Amole Arroyo will be improved between west of Delgado Drive and the Snow Vista Channel (see Location Map on page 2). The easterly portion of the Amole Arroyo will be realigned through the existing 100-foot City of Albuquerque right-of-way through the El Rancho Grande Subdivision.

These improvements are in accordance with the *Amole-Hubbell Drainage Management Plan, Volume I* (DMP), by Leedshill-Herkenhoff, Inc., Alternative 2, with the following exceptions:

- The proposed El Rancho Grande, Units 6 and 7¹⁾ and an offsite portion of Westgate Heights are included in the Amole Basin instead of the Snow Vista Basin.
- A 70-acre portion of DMP Basin 60104 is included in the Amole Arroyo Basin instead of the Sacate Blanco Basin. This change reflects a revision to the proposed Gibson Blvd alignment.

The addition of DMP Basin 60104 was analyzed in detail in the preliminary Design Report for Amole Arroyo, dated February 2003. This addition was approved by the City of Albuquerque and AMAFCA. The AHYMO was rerun in the 1997 version (which is the required version for LOMR submittal), and some minor routing errors for the Amole Basin were corrected resulting in flow reductions of less than one percent.

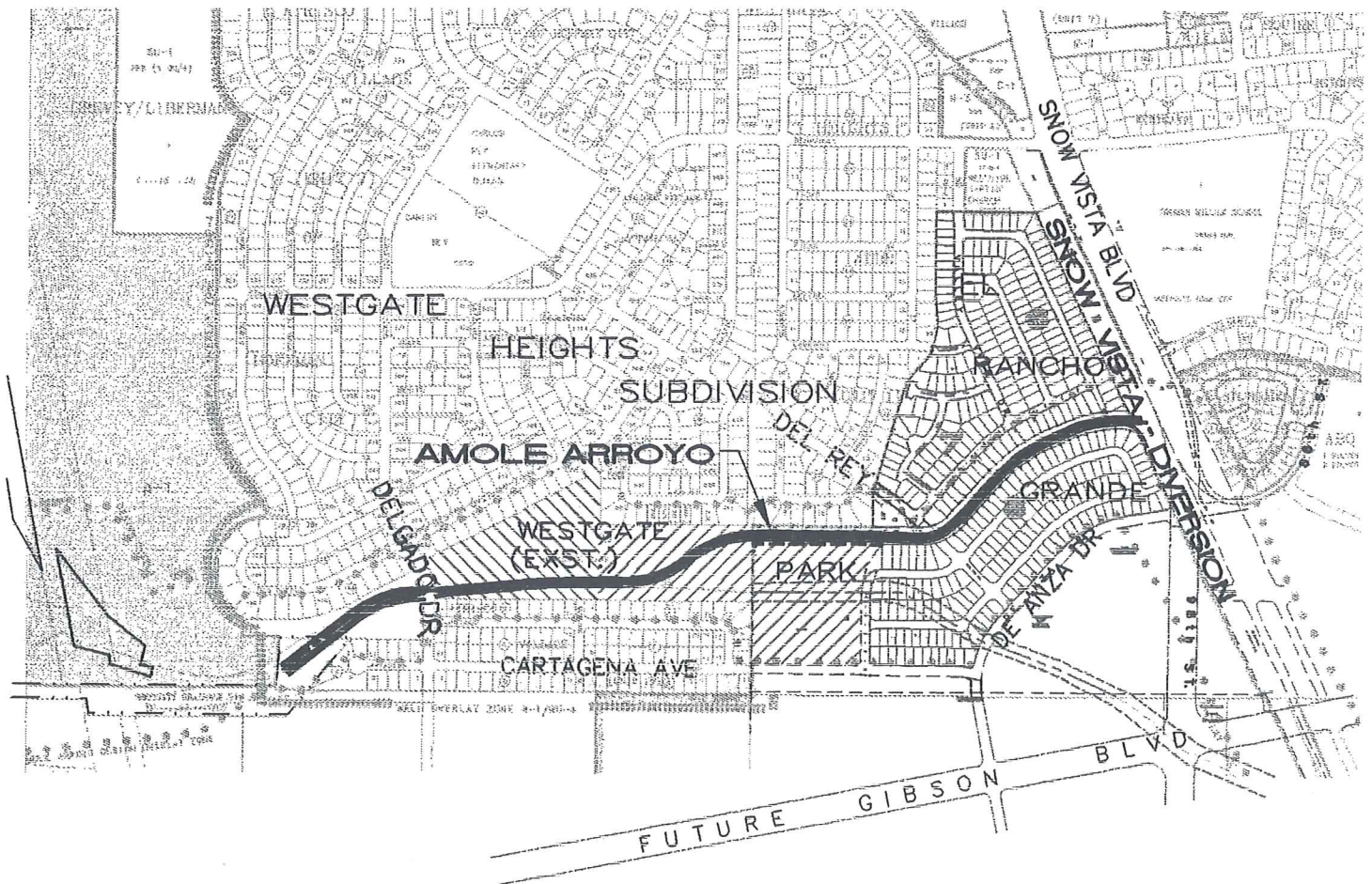
In addition to the channel improvements, a bridge crossing structure at the Del Rey Road extension will be constructed as part of this project. Also, a storm drain system in Del Rey Road will convey the offsite flows from Westgate Heights to the Amole Arroyo channel.

¹⁾ El Rancho Grande, Unit 7, as referred to in this report is now known as Elegante at El Rancho Grande.

LOCATION MAP



SCALE:
1"=1000'

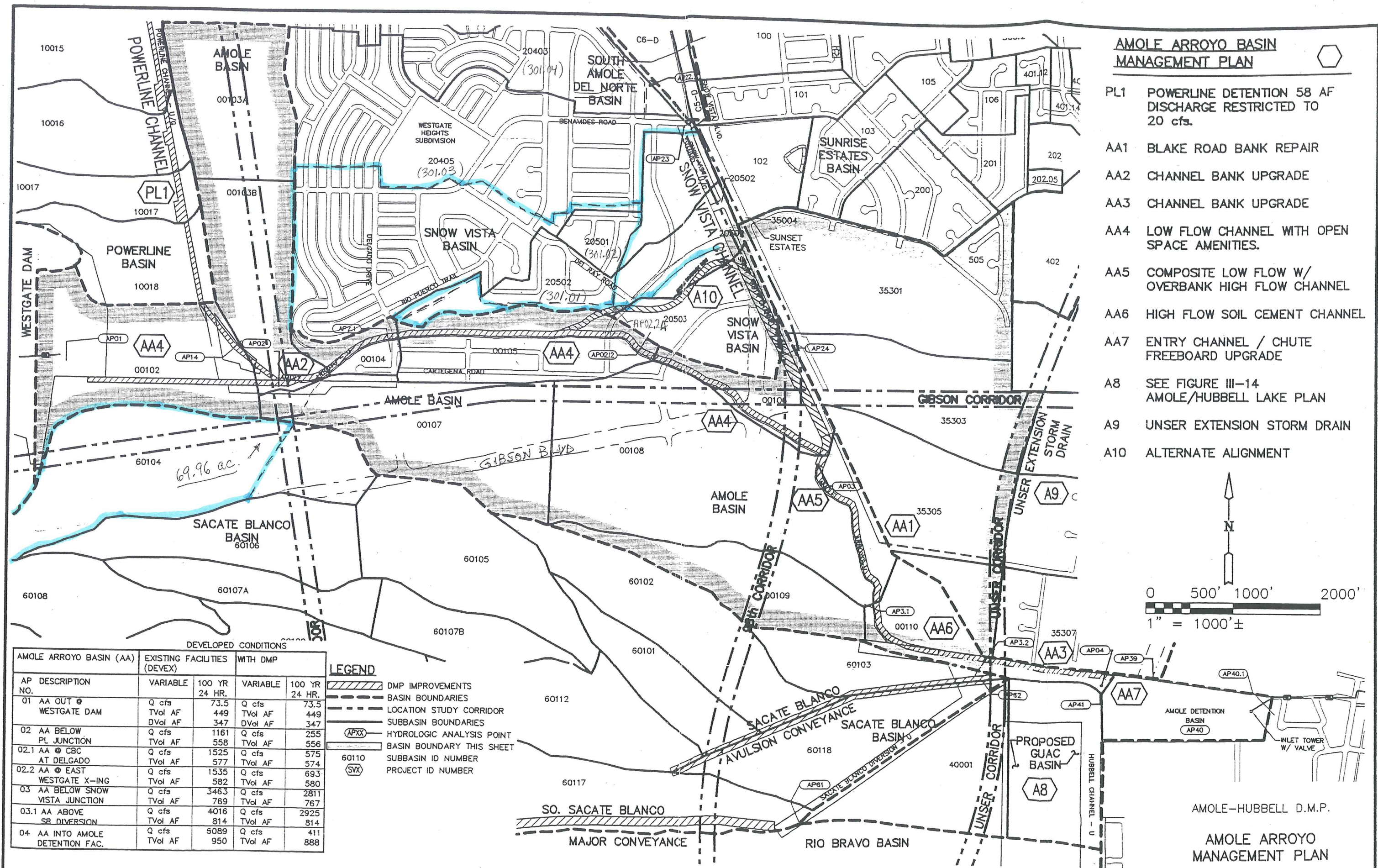


II. BASIN REVISIONS

The proposed El Rancho Grande subdivision development--El Rancho Grande, Units 6 and 7--and a portion of Westgate Heights will drain to the realigned Amole Arroyo instead of the Snow Vista Channel. Therefore, the AHYMO runs from the DMP were modified to include these areas in the Amole Arroyo basin and exclude them from the Snow Vista basin. Also, a 70-acre portion of DMP Basin 60104 is proposed to drain to the Amole Arroyo because of revisions to the proposed location of Gibson Boulevard. See Appendix B for an enlarged basin map.

The DMP basin map on page 4 shows the revised limits of the basins. The El Rancho Grande subdivisions on-site and off-site basins are shown on pages 5-6. The table below lists the changes.

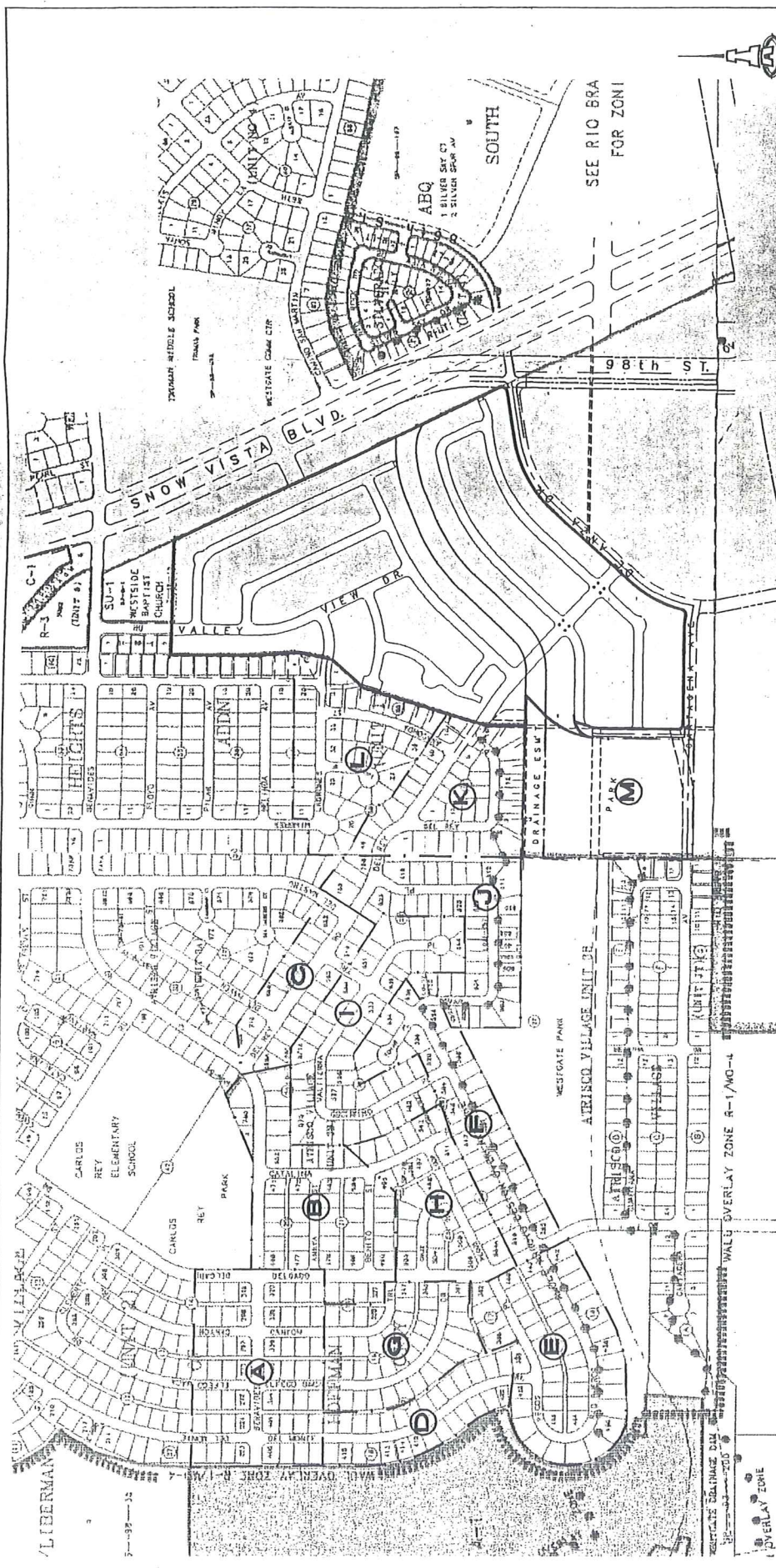
Area Changes to the Amole Arroyo Basins		
El Rancho Grande Units 6 & 7	Basins 210-280 & 600	+ 32.1 ac
El Rancho Grande Offsite	Basins A-L	+120.9 ac.
DMP	Portion of Basin 20405 added to Basin 00105	+ 5.8 ac.
<i>Total Excluding Portion of Basin 60104</i>		+158.8 ac.
DMP	Portion of Basin 60104	+70.0 ac.
<i>Total Including Portion of Basin 60104</i>		+228.8 ac.
Area Changes to the Snow Vista Basins		
DMP	Basin 20501 (=301.02)	- 25.0 ac.
DMP	Basin 20502 (=301.01)	- 44.2 ac.
DMP	Basin 20405 (=301.03)	- 91.1 ac.
El Rancho Grande Unit 6	Basin 500	+ 1.4 ac.
<i>Total</i>		-158.8 ac.



LEEDSHILL-HERKENHOFF, INC.

P:\95043\95043_32\DWG\C\AM-BASIN.dwg 6-9-99 KHK

FIGURE NO. III-1



BASIN AREA TABLE

BASIN	AC.	BASIN	AC.
A	14.14	H	8.44
B	12.32	I	11.89
C	5.95	J	10.63
D	6.33	K	9.80
E	12.65	L	10.30
F	9.66	M	11.00
G	8.80		

OFFSITE BASIN MAP

ISAACSON & ARFMAN, P.A.
 Consulting Engineering Associates
 128. Morris Street N.E.
 Albuquerque
 New Mexico
 08/23/01

III. FLOW RATE REVISIONS

The AHYMO runs from the DMP were modified to include these additional areas in the Amole Basins and exclude them from the Snow Vista Basins, and to include the proposed addition of the 70-acre portion of Basin 60104. See Appendix A for AHYMO Summary Tables. The table below summarizes the revised flows versus the DMP flow rates at the analysis points shown on pages 4-6. The DMP flow rate summary tables for the Amole Basin and the Snow Vista Basin are included in Appendix I.

Flow Rate Summary Table

Analysis Point	Flow Rate (cfs)	
	DMP	Revised Incl. Basin 60401
AP02.1 (Delgado)	652	784
AP02.2A (West of Del Rey)	693	907
AP22A (Sta 25+00)	N/A	1124
AP18A (Sta 17+00)	N/A	1185
AP21A (Sta 12+50)	N/A	1223
AP25 (Amole outfall to Snow Vista)	N/A	1230
AP 23 (Snow Vista north of subdivision)	2050	1723
AP23.2 (Snow Vista north of confluence)	2143	1692
AP25.1 (Snow Vista south of confluence)	N/A	2879

IV. CHANNEL DESIGN

Centerline Radii and Easement Curves

The horizontal alignment was laid out with a minimum centerline radius of 265 feet. The horizontal curves have easement curves upstream

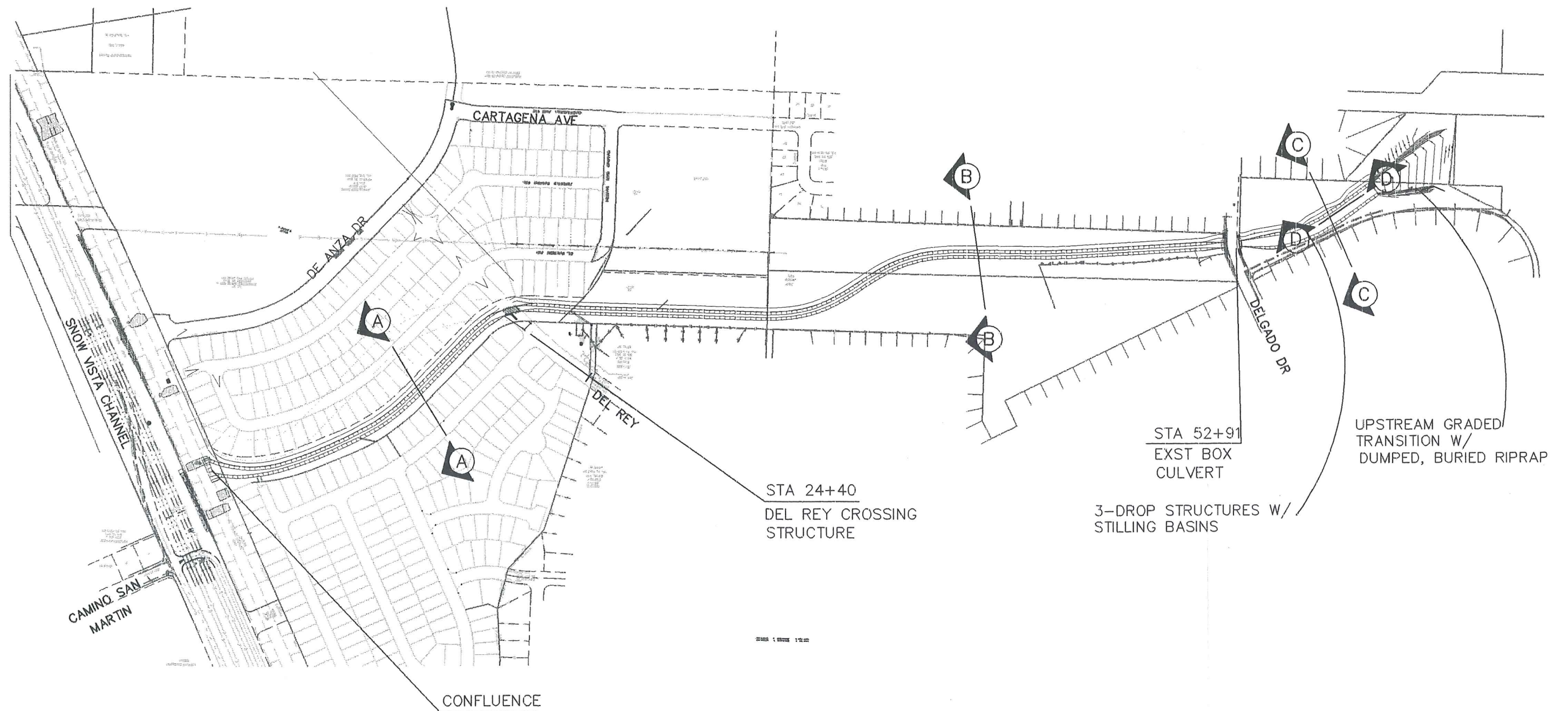
and downstream per the City of Albuquerque Development Process Manual (DPM). See Appendix E for calculations.

Hydraulic Analysis

HEC-RAS was used to model the Amole Arroyo and the Snow Vista Channel. The stations in HEC-RAS correspond to those shown on the plan & profile exhibits in the back pocket. Summary tables and water surface profiles are shown in Appendix C. The superelevation depths on the curves were calculated and added to the water depths, and a tabulation of the total water depths in the Amole Arroyo are included in Appendix D. Freeboard is 2 feet minimum throughout the project. The channel depth will vary between 6 feet east of the Del Rey crossing structure, 5.5 feet west of the crossing structure and 7 feet at the stilling pools as shown on the plan and sections on pages 9-12. From the west end of the project to the Delgado crossing, the channel will have shotcrete-lined sides, an earthen bottom and three shotcrete drop structures with stilling pools. The remaining portion of the channel will be completely lined with shotcrete. The flows are mixed west of the Delgado crossing and supercritical in the remaining reach.

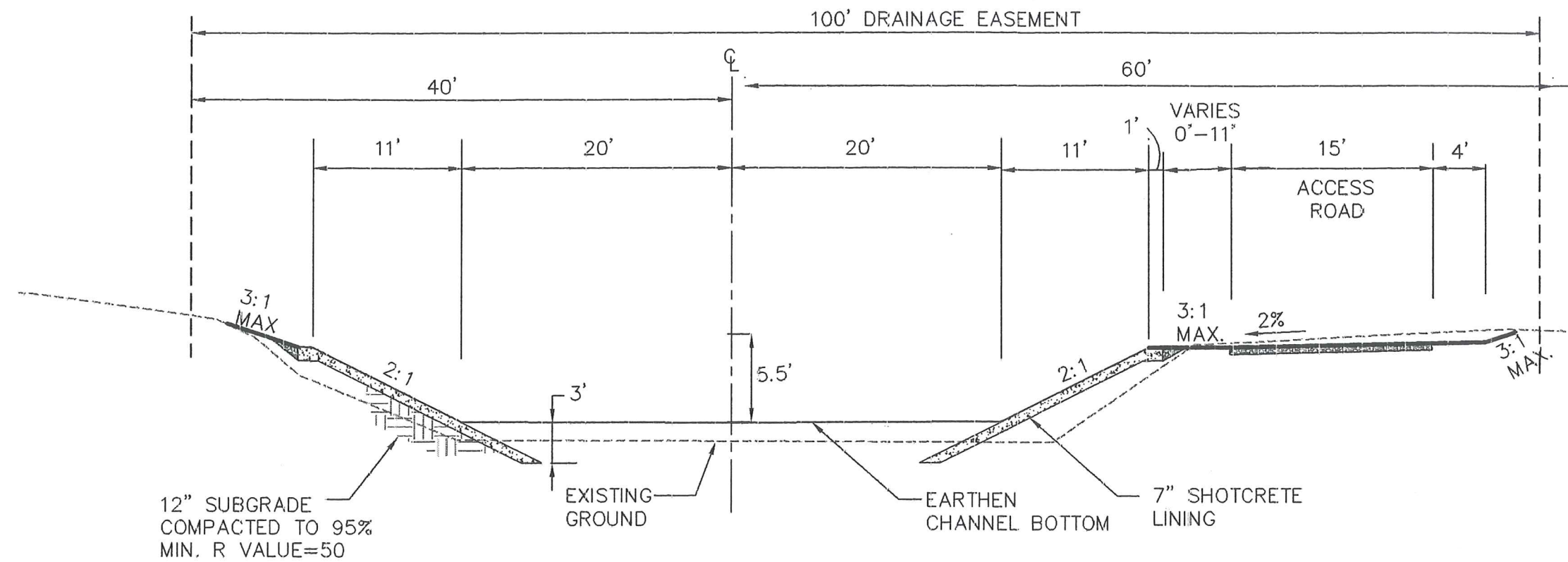
Slug Flows

Waves generated by slug flows "are the result of transition from supercritical laminar to subcritical turbulent state of flow," (*Open Channel Hydraulics*, Chow). Theoretically, slug flow can occur when the Froude number is greater than 2 and the slope of the channel is greater than 12 divided by the Reynolds number. An experiment by Mayer showed that, in actuality, slug waves were formed only on slopes greater than two percent and for Reynolds number between 1000 and 4000 (Chow).



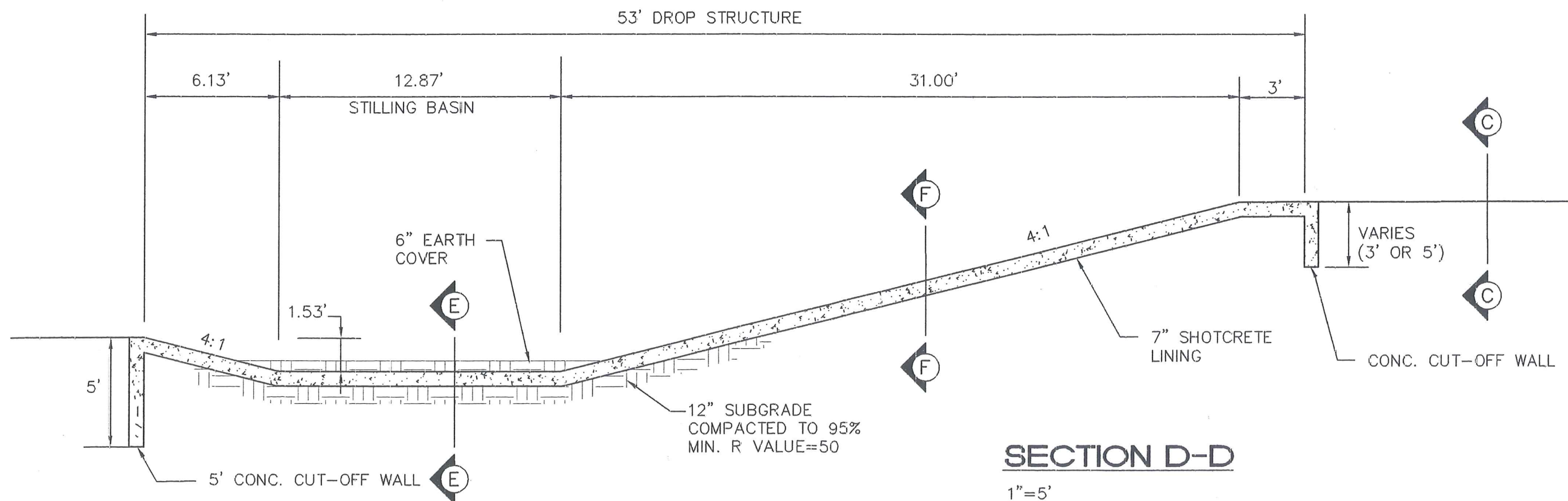
AMOLE ARROYO

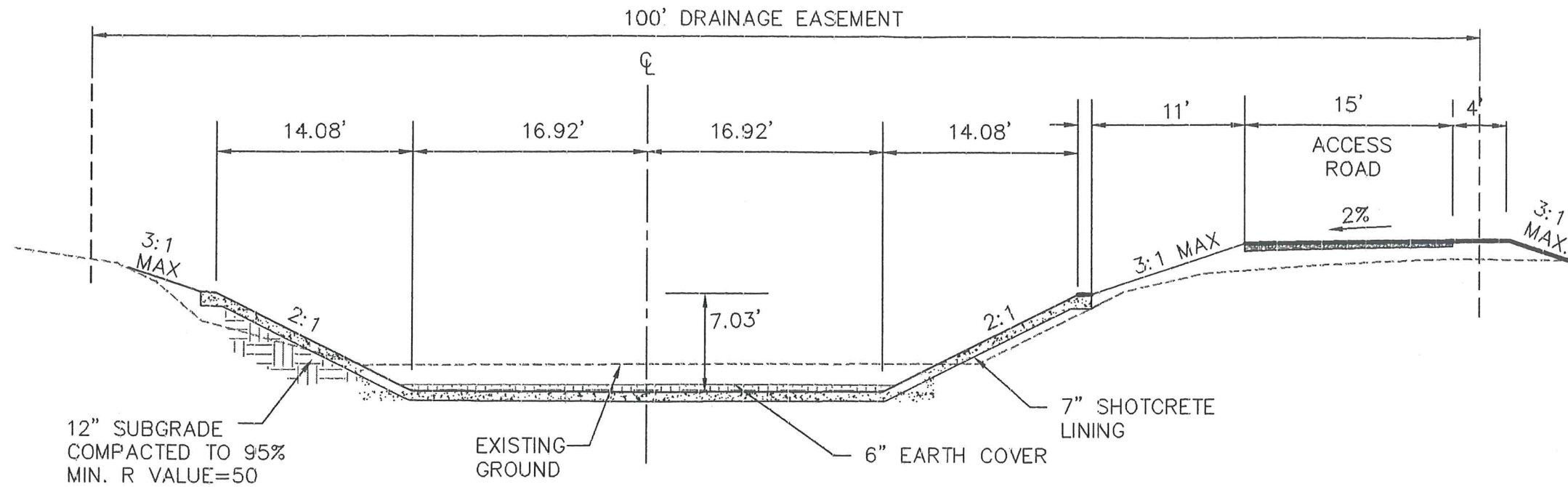
1" = 400'



SECTION C-C

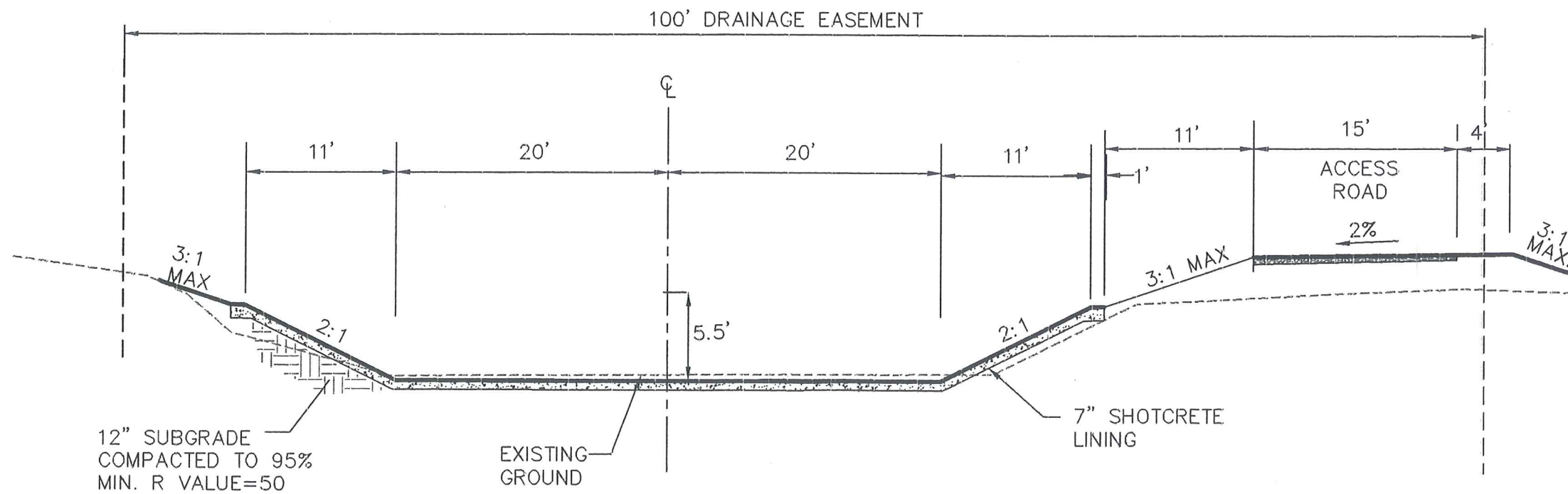
1"=10'





SECTION E-E

1"=10'



SECTION F-F

1"=10'

The areas where slug waves possibly could occur in the Amole Arroyo channel are at the drop structures (4:1 slope) west of the Delgado crossing. Calculations for a typical drop structure indicate that slug flow will not form (See Appendix F).

Upstream Transition

The Amole Arroyo upstream transition will have buried riprap as shown on the plan in the back pocket. See Appendix G for an exhibit of the upstream transition area and riprap sizing calculations.

Confluence

The Amole Arroyo and Snow Vista Channel confluence was analyzed using the momentum method in HEC-RAS. The hydraulic jump will occur where the supercritical flows in the Amole Arroyo enter the subcritical flows in Snow Vista at the junction. A momentum balance check was calculated (see Appendix H) and shows a five percent deviation. This deviation may be a result of 1) an average friction slope equal to the energy grade line slope was used in the calculations, while HEC-RAS uses a flow-weighted friction slope and 2) the flow rate out does not equal the flow rate in, since the peak flow rates from AHYMO were used as input for the three sections at the confluence.

There is an existing riprap check structure at the confluence that is proposed to be removed. The rundown from the Amole Arroyo is proposed to be shotcreted to the invert of the Snow Vista Channel with riprap gabion baskets tied to the 5-foot deep cutoff wall along the rundown. The bottom and sides of the Snow Vista Channel through the confluence will have wire-tied riprap. See Appendix H for an exhibit of the confluence.

Snow Vista Channel Freeboard

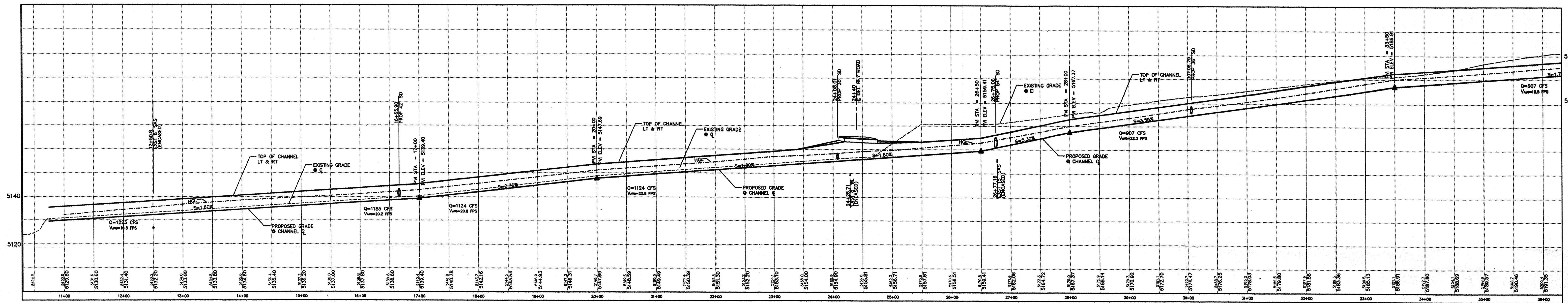
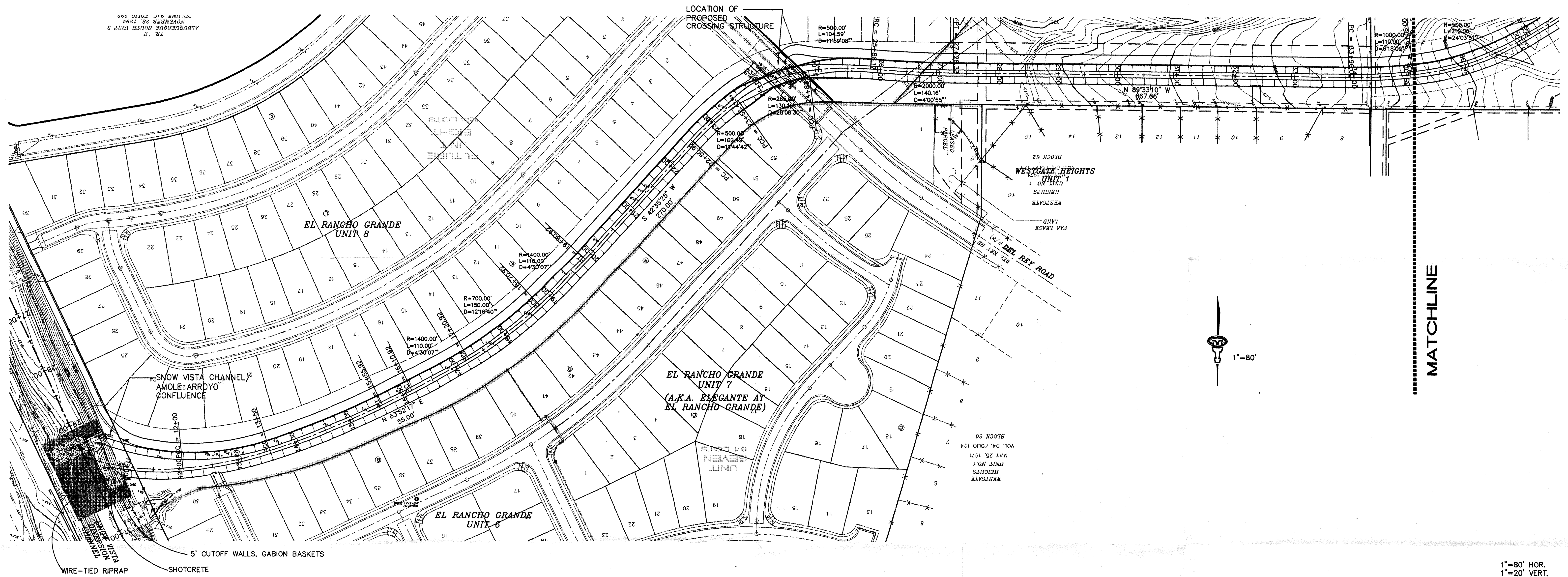
The hydraulic analysis shows that the Snow Vista Channel does not have adequate freeboard on the east side downstream of the confluence. An earthen berm along portions of the east bank will be constructed with the El Rancho Grande, Unit 8 construction by the developer.

V. SUMMARY

The Amole Arroyo will be improved from the Snow Vista Channel to approximately one mile west per the plan and sections shown on pages 9-10.

The required improvements include:

- 5.5-foot deep channel with earthen bottom and shotcrete check structures and side slope shotcrete lining west of the existing Delgado box culvert
- 5.5-foot deep shotcrete lining between Delgado Drive and the proposed Del Rey Road crossing.
- 6-foot deep shotcrete lining from Sta 25+00 to Snow Vista Channel
- wire-tied riprap confluence structure per the plan in back pocket
- graded upstream transition with buried, dumped riprap
- crossing structure at the proposed Del Rey Road extension.
- storm drain system in Del Rey Road



AMOLE ARROYO

PLAN & PROFILE EXHIBIT

FRED C. ARFMAN
STATE OF NEW MEXICO
7322

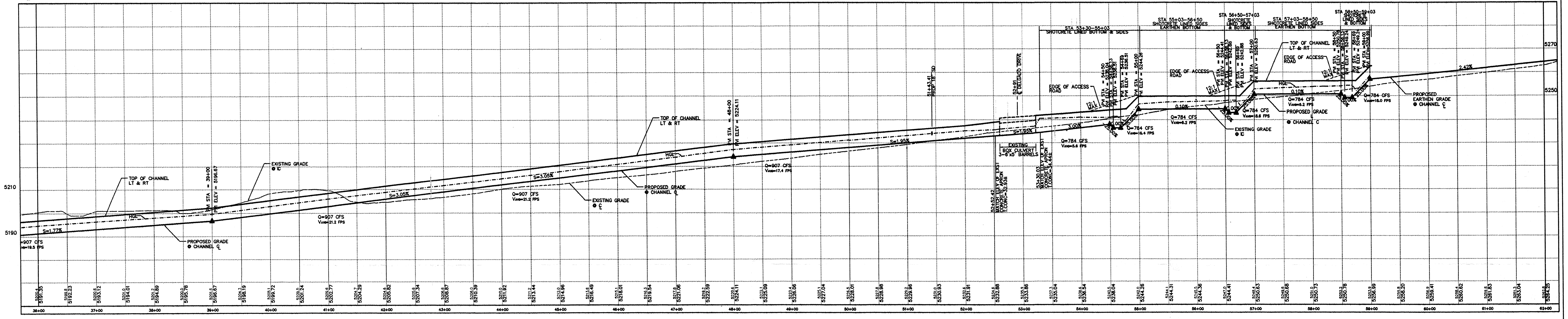
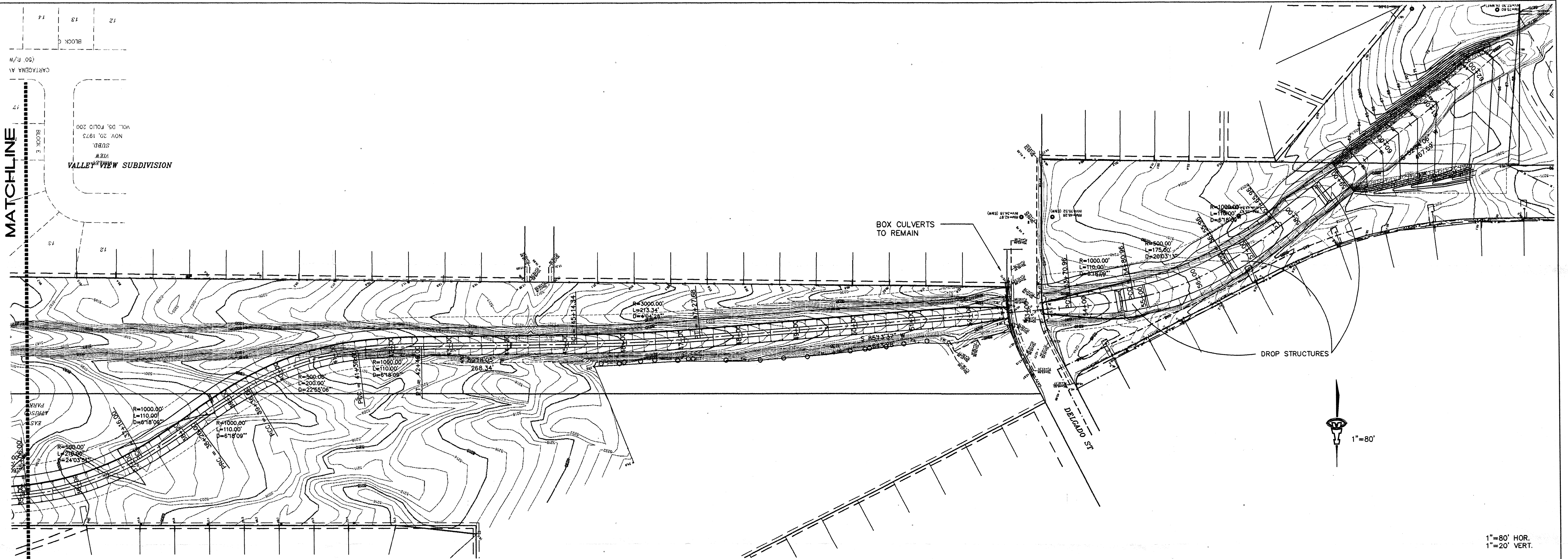
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SEP 16 2003

ISAACSON & BERMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico

1241EXH.DWGaww 8/29/03

SHEET 1 OF 2

MATCHLINE



AMOLE ARROYO
PLAN & PROFILE EXHIBIT

Professional Engineer Seal for Fred C. Arfman, State of New Mexico, License No. 7320.
ISAACSON & ARFMAN, P.C.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico
1241EXH.DWGonw 8/29/03
SHEET 2 OF 2