CITY OF ALBUQUERQUE

THREE HUNDRED YEARS 1706 + 2006
ALBUQUERQUE
Making History

December 15, 2005

Mr. Mark Goodwin, PE
MARK GOODWIN & ASSOCIATES
P.O. Box 90606
Albuquerque, NM 87199

RE: HIGHLANDS AT ANDERSON HILLS SUBDIVISION, UNIT 2 (P-9/D2A)
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 08/22/2003
Engineers Certification dated 12/15/2005

Dear Mark:

Based upon the information provided in your Engineer's Certification Submittal dated 12/15/2005, 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

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

C: Marilyn Maldonado, COA# 708182
File

All

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

PROJECT TITLE: Highlands at Anderson Hills, Unit 2 — ZONE MAP/DRG. FILE #: N9/P9

DRB #: 1002857 — EPC#: ____ — WORK ORDER#: 708182

LEGAL DESCRIPTION: South portion of Tract G, The Highlands at Anderson Hills, Unit 1

CITY ADDRESS:

ENGINEERING FIRM: Mark Goodwin & Associates — CONTACT: Diane Hoelzer
ADDRESS: PO Box 90606 — PHONE: 828-2200
CITY, STATE: Albuquerque, NM — ZIP CODE: 87199

OWNER: Anderson Hills, LLC — CONTACT: Rex Wilson
ADDRESS: PO Box 9470 — PHONE: 822-5562
CITY, STATE: Albuquerque, NM — ZIP CODE: 87119

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

SURVEYOR: Aldrich Land Surveying — CONTACT: Tim Aldrich
ADDRESS: PO Box 30701 — PHONE: 884-1990
CITY, STATE: Albuquerque, NM — ZIP CODE: 87190-0701

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
- ☑ 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

RECEIVED
DEC 15 2005
HYDROLOGY SECTION

DATE SUBMITTED: 12/05/15

BY: Mark Goodwin

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.

CITY OF ALBUQUERQUE

THREE HUNDRED YEARS
1706 * 2006
ALBUQUERQUE
Making History

December 15, 2005

Mr. Mark Goodwin, PE
MARK GOODWIN & ASSOCIATES
P.O. Box 90606
Albuquerque, NM 87199

RE: HIGHLANDS AT ANDERSON HILLS SUBDIVISION, UNIT 1 (P-9/D2A)
Engineers Certification for Release of Financial Guaranty
Engineers Stamp dated 08/22/2003
Engineers Certification dated 12/15/2005

Dear Mark:

Based upon the information provided in your Engineer's Certification Submittal dated 12/15/2005, 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

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

C: Marilyn Maldonado, COA# 708181
File

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

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

(REV. 1/28/2003rd)

P-9/D2

PROJECT TITLE: Highlands at Anderson Hills, Unit 1
DRB #: 1002857 EPC#:____

ZONE MAP/DRG. FILE #:N9/P9
WORK ORDER#:708188

LEGAL DESCRIPTION: Tract A, Arrowood Ranch Development
CITY ADDRESS:

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

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

OWNER: Anderson Hills, LLC
ADDRESS: PO Box 9470
CITY, STATE: Albuquerque, NM

CONTACT: Rex Wilson
PHONE: 822-5562
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ADDRESS: _____
CITY, STATE: _____

CONTACT: _____
PHONE:
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SURVEYOR: Aldrich Land Surveying
ADDRESS: PO Box 30701
CITY, STATE: Albuquerque, NM

CONTACT: Tim Aldrich
PHONE: 884-1990
ZIP CODE: 87190-0701

CONTRACTOR: _____
ADDRESS: _____
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- ☐ 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
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- ☐ BUILDING PERMIT APPROVAL
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- ☐ 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
DEC 15 2005
HYDROLOGY SECTION

DATE SUBMITTED: 12/15/05

BY: Mark Goodwin Mark Goodwin

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.

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

September 5, 2003

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

Re: Anderson Hills Drainage Management Plan
Engineer's Stamp dated 8-22-03 (P9/D2)

Dear Ms. Hoelzer,

Based upon the information provided in your submittal dated 8-26-03, the above referenced DMP is approved for Preliminary Plat action by the DRB.

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: file

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

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

September 5, 2003

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

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Engineer's Stamp dated 8-22-03 (P9/D2)

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Sincerely,

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

C: file

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

D. Mark Goodwin & Associates, P.A.
Consulting Engineers

P.O. BOX 90606, ALBUQUERQUE, NM 87199
(505) 828-2200 FAX 797-9539
e-mail: dmg@swcp.com

August 26, 2003

Mr. Bradley Bingham
Plaza del Sol
Hydrology Dept.
P.O. Box 1293
Albuquerque, NM 87103

RECEIVED
AUG 2 6 2003
HYDROLOGY SECTION

Re: Anderson Hills Drainage Management Plan for The Highlands, The Meadows and The Mesa
Drainage File: (P9 / D2)

Dear Mr. Bingham,

In response to your comment letter dated August 4, 2003:

1. *Under existing and future drainage conditions, runoff from Dennis Chavez Blvd. will continue to be directed to roadside swales with overflow to the Rio Bravo Channel. Eric Zamora from Bernalillo County Public Works has indicated that under future conditions there will not be curb and gutter along Dennis Chavez Blvd. Immediately east of the 98th street and Unser Blvd. intersection with Dennis Chavez the swale will be directed to a rundown at the channel. Details will be worked out at DRC.*

2. *The Rio Bravo channel along the north side of Dennis Chavez Blvd. will be extended to our projects west property line. This item has been added to the Infrastructure list for The Highlands @ Anderson Hills. Preliminary spot elevations have been added to the grading and drainage plan.*

3. *The two basins you are referring to that impact the west property boundary at our project site are being diverted either to the Rio Bravo channel to the south or to a temporary sediment pond and then a storm sewer that is stubbed at the northwest corner of The Highlands. These improvements are shown in more detail on the revised Highlands Grading Plan. Please find enclosed a concurrence / approval letter from Westland Development allowing these improvements on their property.*

   Improvements to Pond #6 is premature and not necessary at this time for our project. Upstream flows that this future pond will intercept is being diverted at our west property boundary. No road grades or profiles have been set for 118 th street or either of the areas to the west and east. This alone would make it difficult to design Pond #6 (South Powerline Channel Basin) will any accuracy other than just a temporary hole in the ground. In addition, the construction of this pond would not completely divert the offsite runoff entering our project site from the west. There would still be runoff from the area between our project site and the future 118th street that would require diversions. Finally, the 118th street corridor is not clearly defined and consequently permission for an easement to do construction in this area that far upstream of our project site is not likely to be granted.

4. *Written concurrence from Bernalillo County is being pursued with the anticipation of an approval prior to the next DRB hearing.*

5. *Yes, there will be a perimeter wall around the entire subdivision. There will be minimal grading in the PNM easement as required for th 10' asphalt trail and landscaping efforts.*

6. *The grading plan for The Highlands has been approved as indicated in the accompanying signed letter from Westland Development. An execute written agreement between the Anderson Hills LLC will formalized prior to The Highlands final flat.*

7. *Preliminary profiles for both 98th street and Unser Blvd. have been prepared and have been included as part of the revised Anderson Hills Drainage Report.*

In summary the revised grading plans for Anderson Hills include modifications to the offsite improvements on unplatted lands of Westland Development, more spot elevations along 98th street and Unser Blvd., revisions on the storm drain connects in 98th street and Unser Blvd. to the Rio Bravo channel, modifications to the street orientation in the northwest corner of The Highlands, the addition of a secondary access road and reorientation of lots located in the northeast corner of The Mesa.

If you have any questions, please call me.

Sincerely,

MARK GOODWIN AND ASSOCIATES, P.A.

Diane Hoelzer, P.E.
file: anderson\drainage\dr_2 ltr

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

August 4, 2003

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

Re: Anderson Hills Drainage Management Plan
Engineer's Stamp dated 7-17-03 (P9/D2)

Dear Ms. Hoelzer,

Based upon the information provided in your submittal dated 7-18-03, the above referenced DMP cannot be approved for Preliminary Plat until the following comments are addressed:

- The ultimate build-out of Dennis Chavez Blvd (along your frontage) should be addressed in your report and any storm drain needed should be shown.

- The channel along Dennis Chavez must be extended up to and possibly beyond your west property line. Please provide preliminary spot elevations to show this.

- Written concurrence from AMAFCA of the revision to the Amole-Hubbell DMP will be required prior to approval of this report. The developed runoff amounts in the channel are predicated on the Powerline channel being in place. Basins ~~B-2 and~~ B-3W and B-3E (from the A-H DMP) still impact your site and should be part of your project. Therefore, improvements to pond 6 (SP-11 from the DMP) shall be required. Contact Loren Meinz at AMAFCA for specific requirements.

- Written concurrence from Bernalillo County Public Works will also be required due to the proposed revisions to their channel.

- Is there going to be some regrading in the gas easement? If not, it appears that some retaining wall is needed in the SW corner of The Highlands as well other parts no mentioned. Will there be a wall around the perimeter?

- Please provide written permission for the off-site grading required by your proposed grades.

- Please provide preliminary profiles for 98th and Unser. You should also put some more spot elevations from those profiles on the grading plan.

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

Sincerely,

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

C: Loren Meinz, AMAFCA
Brian Kent, BCPW
file

DRAINAGE MANAGEMENT PLAN

For

ANDERSON HILLS

The Highlands, The Meadows, The Mesa

VOLUME II

Prepared for:
AMAFCA
City of Albuquerque
Bernalillo County

JAMES D. HUGHES
11674
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

8-26-03

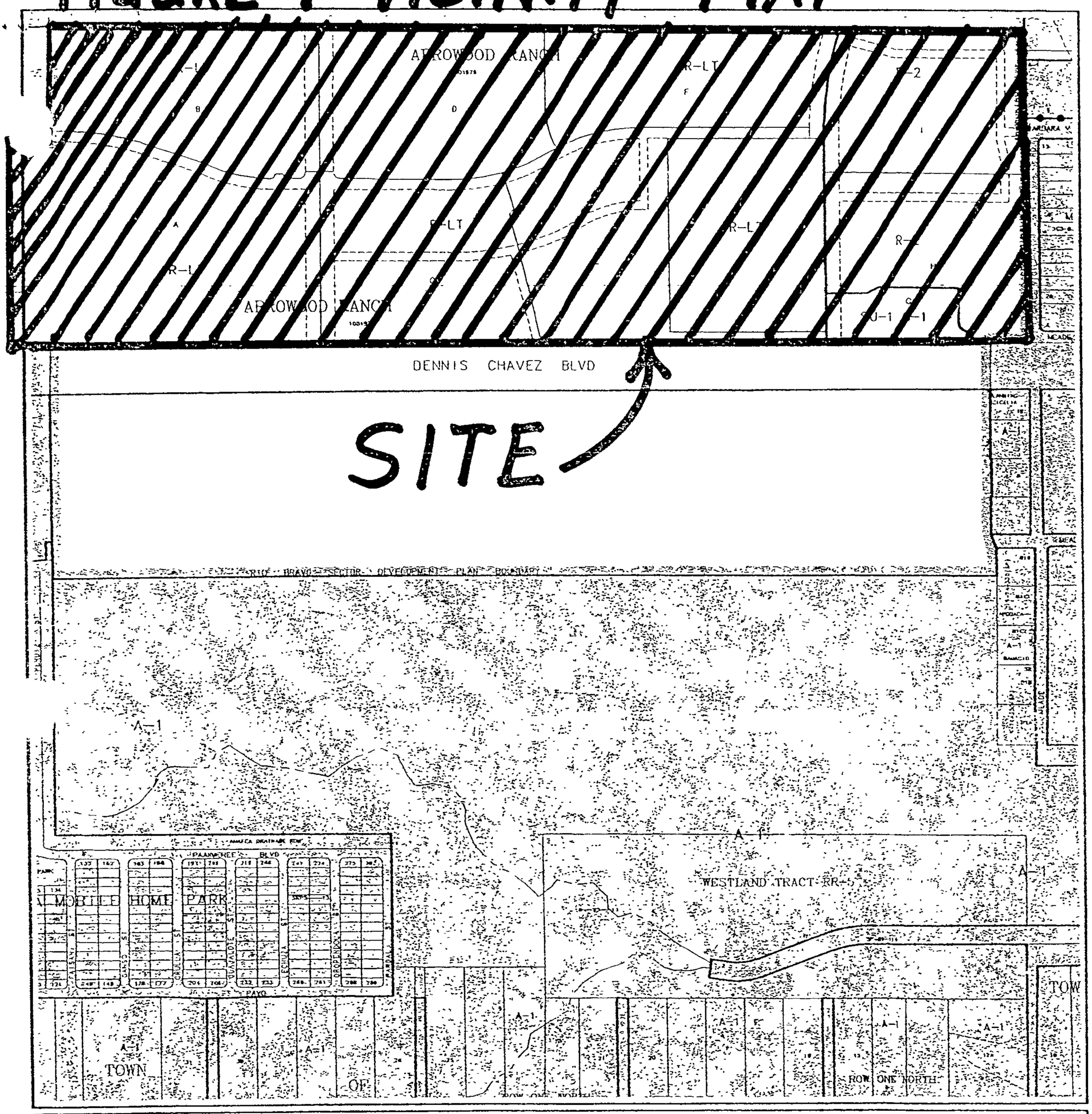
Prepared by
Mark Goodwin & Associates, P.A.

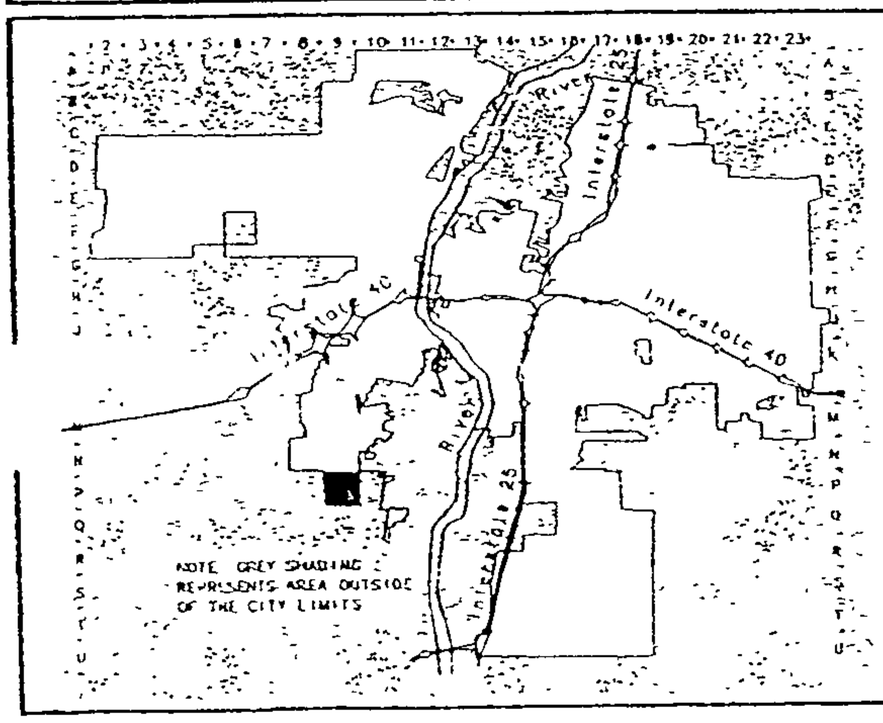
August 19, 2003

RECEIVED
AUG 2 6 2003
HYDROLOGY SECTION

f:\\2106anderson hills\ drainage\AMAFCA_rpt1.wpd

FIGURE 1 VICINITY MAP





CITY OF
Albuquerque

Albuquerque Geographic Information System
PLANNING DEPARTMENT

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GRAPHIC SCALE IN FEET

250 0 750 1000

Zone Atlas Page

P-9-Z 1

Map Amended through January 22, 2003

DRAINAGE MANAGEMENT PLAN

For

ANDERSON HILLS

The Highlands, The Meadows, The Mesa

VOLUME II

Prepared for:
AMAFCA
City of Albuquerque
Bernalillo County

JAMES D. FISHER
11674
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

8-26-03

Prepared by
Mark Goodwin & Associates, P.A.

August 19, 2003

f:\\2106anderson hills\ drainage\AMAFCA_rpt1.wpd

Anderson Hills

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I. PURPOSE & SCOPE

The primary purpose of this report is to obtain the Preliminary Plat approval for 917 lots on 210 acres from the City of Albuquerque which requires concurrence from both AMAFCA and Bernalillo County. Construction plans will be approved separately at a later date. Volume I of this report demonstrates the adequacy of the onsite infrastructure and Volume II demonstrates the adequacy of the offsite Rio Bravo Channel to handle developed runoff from the entire watershed as originally shown in the AMOLE HUBBELL Drainage Management Plan and as modified by subsequent reports including this one. Also demonstrated in this Volume is the adequacy of the Temporary Upstream Offsite Improvements, and sediment transport through the Rio Bravo Channel.

II. DRAINAGE MANAGEMENT PLAN

This development will free discharge to the Rio Bravo Channel. Improvements include:

1. *Concrete line west 274' of the Rio Bravo Channel and provide new upstream Interim Transitions, thus removing the flood plain from this site.*
2. *Add block walls to the banks of the existing channel as required for free board assuming developed conditions throughout the entire watershed.*
3. *Add new bridges (12x6 box culverts with wing walls and associated channel improvements) at 98th Street and Unser Blvd.*

The resulting Rio Bravo Channel will have capacity adjacent to and downstream from this development for fully developed drainage from the entire watershed, including sediment.

Interim undeveloped offsite drainage will be directed away from the private lots by floodwalls and swales along the West and North perimeters of this site to three (3) collection points where that drainage will enter this site in lined public drainage facilities. Basin OS-2 will drain through a temporary offsite sediment basin and then into a storm sewer stubbed out to that point. Basin OS-3 will temporarily surface drain into 98th Street. Basins OS-4 and OS-5 will temporarily drain into a storm sewer at the end of Unser Blvd. Basin OS-6 will drain to the offsite undeveloped property east of this site as it has always done. Basins OS-3, OS-4and OS-5 will drain north and not enter this development when those offsite properties are developed by others in the future.

Future development of properties west of this site will construct the South Power Line diversion which will increase flows in the Rio Bravo Channel as already anticipated in the analysis presented in this report. Future development will also reduce sediment in the Rio Bravo Channel. Most of the basins in the South Power Line diversion do not drain to Anderson Hills in the interim.

III. EXISTING INFRASTRUCTURE AND PREVIOUS REPORTS

This report relied on the latest hydrology and hydraulic analyses found in the following reports:

1. *"AMOLE - HUBBELL Drainage Management Plan"*
   Prepared for AMAFCA, by Leedshill Herkenhoff, Inc., July 22, 1999.

2. *"Borrega Detention Dam & North Borrega Channel" Design Analysis Report*
   Prepared for AMAFCA by Wilson & Company Engineers & Architects, April 2000.

3. *"Preliminary Master Drainage Plan for Arrowood Ranch Development"*
   by American Engineering & Surveying Inc., November 2000.

4. *"CLOMR Request for Paakweree Village"*
   by Wilson & Company, April 2000.

5. *"Revised Borrega Arroyo LOMR"*
   Prepared for AMAFCA by Bohannan Houston Inc., March 2002.

6. *"LOMR for Rio Bravo Boulevard Channel"*
   Prepared for AMAFCA by Resource Technology Inc., November 2000.

Since the adoption of the Amole Hubbell DMP in 1999 the following drainage facilities have been constructed:

1. *The Borrega Dam has been constructed with some modification to the Amole Hubbell DMP watershed boundaries,*

2. *The Rio Bravo Channel has also been constructed as planned,*

3. *The Gibson Boulevard corridor has been shifted several hundred feet south of the Amole Hubbell DMP location thus shifting about 30 acres from the South Power Line and / or Sacate Blanco Watershed into the Amole Arroyo Watershed below Westgate Dam,*

4. *Construction of the Amole Channel between Westgate Dam and the Snow Vista Channel is expected to begin in September 2003 and it has been designed to receive developed drainage from that 30 acres.*

IV. HYDROLOGY

This analysis includes hydrology for two conditions, "Developed and Interim". "Developed" conditions includes developement both onsite and offsite. "Interim" only includes development onsite with natural conditions offsite. The "Developed" condition produces the highest flows, and the "Interim" condition poses the greatest potential for sediment deposition.

A. DEVELOPED CONDITIONS

In keeping with the Amole Hubbell DMP, the flows from the upper part of the watershed are attenuated in ponds and flows from the lower part are allowed free discharge. Plans for the Gibson Blvd. Corridor and the Borrega Dam reduce the size of the original watershed draining to the Rio Bravo Channel such that the existing channel still has capacity for higher densities within the remaining watershed and for the elimination of Rio Bravo Pond # 10 and for the additional flow from Westpack properties attenuated in a new pond. As a result of sub-basin boundary changes there is a net shift of 12.80 ac-ft of runoff volume that will now bypass the Amole Dam and flow directly into the Hubbell Lake. This change is due to 16.66 ac-ft of runoff volume for the Westpack property now flowing to the Hubbell outfall and 3.86 ac-ft of runoff volume from sub- basin B-5 flowing to the Amole outfall.

The only change that the proposed Anderson Hills development is making to the Amole Hubbell DMP is slightly higher densities draining to the Rio Bravo Channel. Additional changes to the DMP to accommodate other development are as follows;

1. *Gibson Blvd. corridor shifted south thus diverting a portion of the Sacate Blanco into the Amole Basin.*

2. *Borrega Dam is designed to receive a significant portion of the watershed previously assumed to drain to Rio Bravo.*

3. *Pond # 10 on Westland's property was deleted from the DMP because the channel seems to have capacity which eliminates the need for a detention pond. The peak flow from the area occurs earlier than the larger peak flow from the South Power Line Basin so deletion of that pond has less impact on the total flow in the channel than would the deletion of other ponds.*

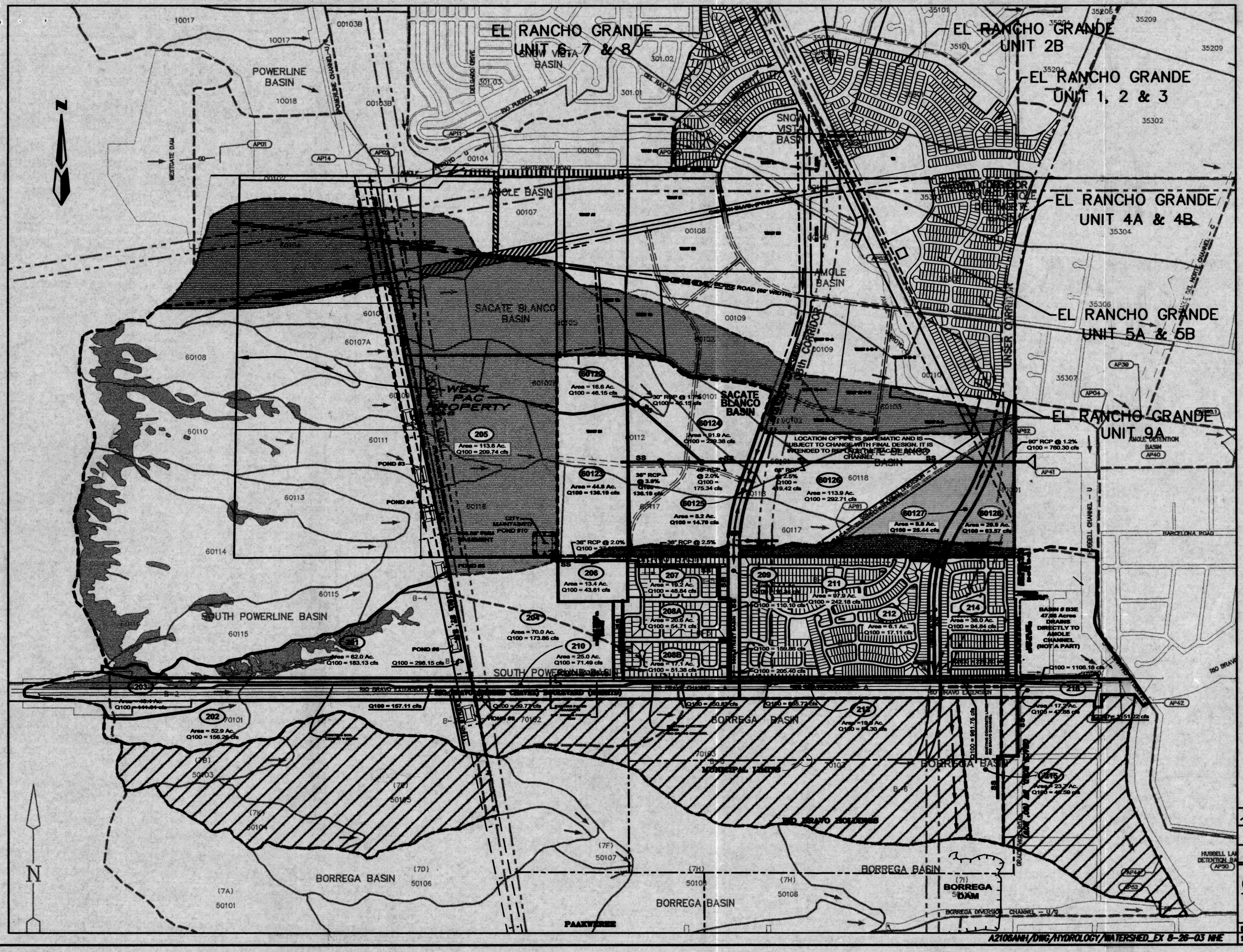
4. *Westpack Properties below the power line is to be diverted south to the Rio Bravo Channel after being attenuated in an onsite pond. A pipe will be constructed thru Anderson Hills to serve Westpack and a portion of Westland Property that would otherwise be difficult to drain.*

5. *The land use densities were revised to be consistent with the zoning in the approved Rio Bravo Sector Plan and the Land Use Map as published in the approved Amole Hubbell DMP. Previously used land use densities were underestimated.*

6. *Drainage basin divides now follow lines of ownership and divides between developments. It appears the previous calculated areas were overestimated in the Sacate Blanco basin so that the new total area is not equal to the old total area. Time of Concentrations were also recalculated for the revised sub-basins. New routing routines were added for a) Pond #10 on West Pack property, b) the Rio Bravo Channel and c) the pipes in the Sacate Blanco and in the west part of Anderson Hills. The South Power Line Basins were not changed except as required by changes to the Borrega Dam and the Gibson Corridor, including deletion of Ponds # 7 and #1. Finally, a 3% sediment bulking factor is applied to all basins. See figure 3 for Basin Boundaries.*

TABLE 1: SUMMARY OF HYDROLOGY (Developed Conditions)

SUB-BASIN ID	AREA (sq.mi)	AREA (acres)	L.TR A	L.TR B	L.TR C	L.TR D	TP hrs	Q100* cfs
60106	0.0501	32.06	0	28	23	49	0.133	96.02
60107A	0.0313	20.03	0	28	23	49	0.133	59.99
60108	0.0924	59.14	0	48	17	35	0.133	156.76
60109	0.0414	26.50	0	28	23	49	0.133	79.35
60110	0.1046	66.94	0	40	19	41	0.133	186.73
60111	0.0384	24.58	0	28	23	49	0.133	73.60
60113	0.0580	37.12	0	29	23	48	0.133	110.37
60116N	0.0381	24.38	0	28	23	49	0.133	73.03
60114	0.2162	138.37	0	46	17	37	0.133	371.51
60115	0.0764	48.90	0	32	21	47	0.133	143.45
60116S	0.0244	15.62	0	28	23	49	0.133	46.77
201	0.0969	62.02	0	27	27	46	0.133	183.13
202	0.0826	52.86	0	27	27	46	0.133	156.26
203	0.0772	49.41	0	30	30	40	0.133	141.01
204	0.1093	69.95	0	14	29	57	0.210	173.86
205	0.1776	113.66	0	14	29	57	0.200	290.74
206	0.0210	13.44	0	14	29	57	0.133	43.61
207	0.0302	19.35	0	27	27	46	0.180	48.84
208.A	0.0320	20.49	0	30	30	41	0.150	54.71
208.B	0.0270	17.25	0	27	27	47	0.133	51.38
209	0.0111	7.10	0	11	24	65	0.270	16.34
210	0.0391	25.02	0	30	30	40	0.133	71.49
211	0.1530	97.92	0	14	29	57	0.210	242.18
212	0.0095	6.08	0	11	24	65	0.190	17.11
213	0.0297	19.01	0	30	30	40	0.133	54.30
214	0.0593	37.95	0	14	29	57	0.210	94.84
215	0.0310	19.84	0	14	29	57	0.210	49.59
216	0.0269	17.22	0	30	30	40	0.140	47.88
*Note: All flows include 3% bulking for Sediment								



LEGEND

- SACATE BLANCO NOW DIVERTED TO AMOLE
- AMOLE NOW DIVERTED TO SACATE BLANCO
- BIO BRAVO NOW DIVERTED TO SACATE BLANCO
- SACATE BRANCO NOW DIVERTED TO RIO BRAVO
- RIO BRAVO NOW DIVERTED TO AMOLE
- RIO BRAVO BASIN NOW DIVERTED TO BORREGA (MOSTLY)

FIGURE 3

ANDERSON HILLS SUBDIVISION

REVISED AMOLE HUBBELL

DRAINAGE BASIN MAP

dmg
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Designed: DMG	Drawn: NHE	Checked: DMG	Sheet 1 of 1
Scale: 1" = 400'	Date: 4-25-03	Job: A02109	

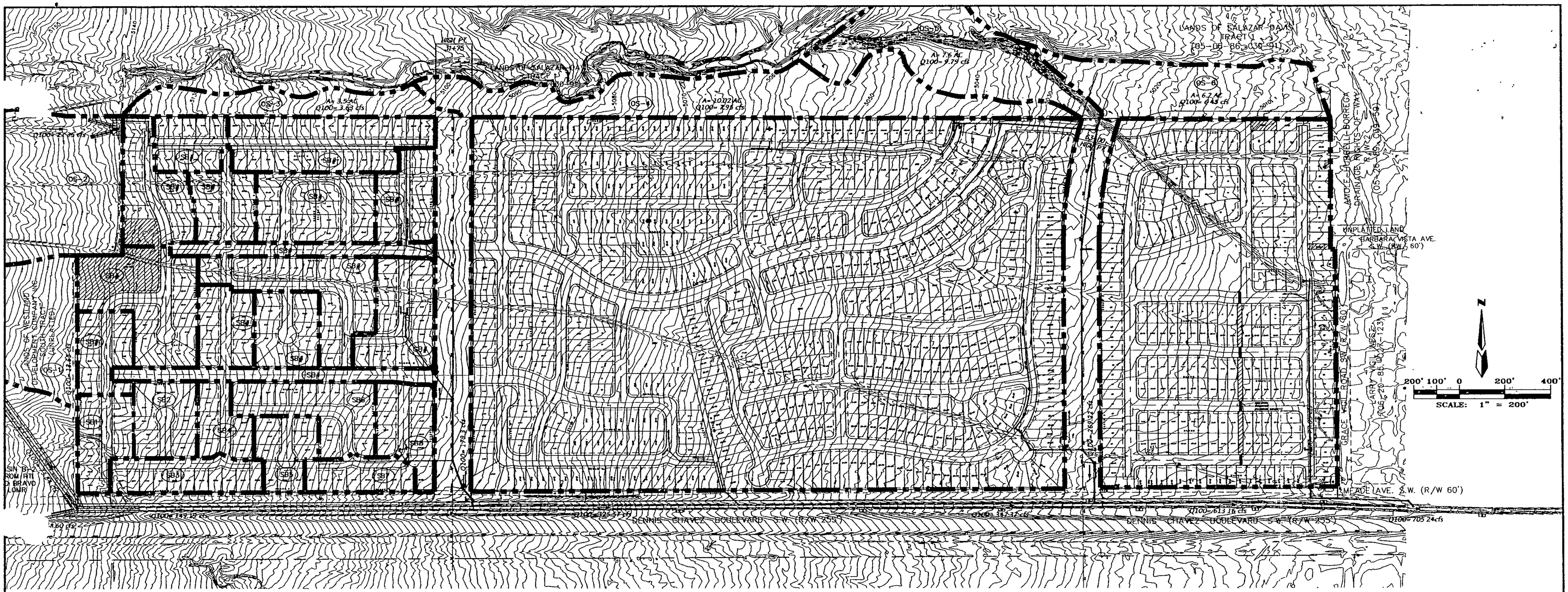
A2109ANH/DWG/HYDROLOGY/WATERSHED_EX 8-26-03 NHE

B. INTERIM CONDITIONS

The "Existing" conditions AHYMO model is from a LOMR currently in the process of being submitted to FEMA by Resource Technology, Inc. for AMAFCA and Bernalillo County. Interim conditions started with that model, added six new undeveloped offsite basins, and added the onsite hydrology for developed conditions. See the "Onsite Temporary Offsite Drainage Basin Map".

TABLE 2: SUMMARY OF HYDROLOGY (Interim Conditions)

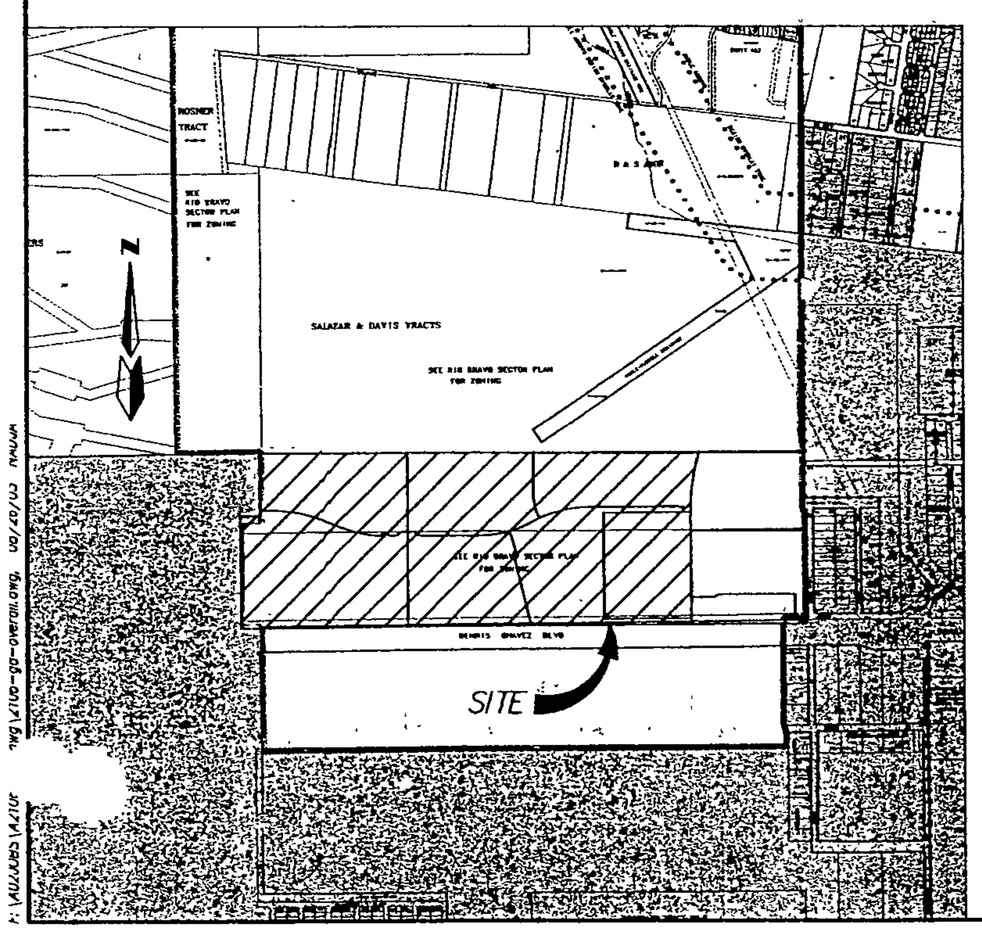
BASIN ID	AREA (sq.mi)	L.TR A	L.TR B	L.TR C	L.TR D	TP hrs	Q100* cfs
B-1A	0.0137	37	23	26	14	0.15	15.11
B-1B	0.01200	53	32	7	8	0.13	11.89
B-1C	0.02560	66	9	13	12	0.13	25.96
B-2	0.1476	86	9	2	3	0.23	73.84
OS-1	0.0253	100	0	0	0	0.17	13.65
OS02	0.0491	100	0	0	0	0.16	27.35
207	0.03023	0	27	27	46	0.18	47.41
208.A	0.03201	0	29.5	29.5	41	0.15	53.12
208.B	0.02696	0	26.5	26.5	47	0.13	49.88
OS-3	0.00540	100	0	0	0	0.13	3.63
209	0.0111	0	11	24	65	0.27	15.87
210	0.0114	0	30	30	40	0.13	20.27
211	0.1530	0	14	29	57	0.21	235.13
OS-4	0.0157	100	0	0	0	0.18	7.95
OS-5	0.0119	80	0	20	0	0.13	9.79
212	0.00950	0	11	24	65	0.19	16.61
213	0.0174	0	30	30	40	0.13	30.89
214	0.0593	0	14	29	57	0.21	92.08
OS-6	0.0960	100	0	0	0	0.13	6.45

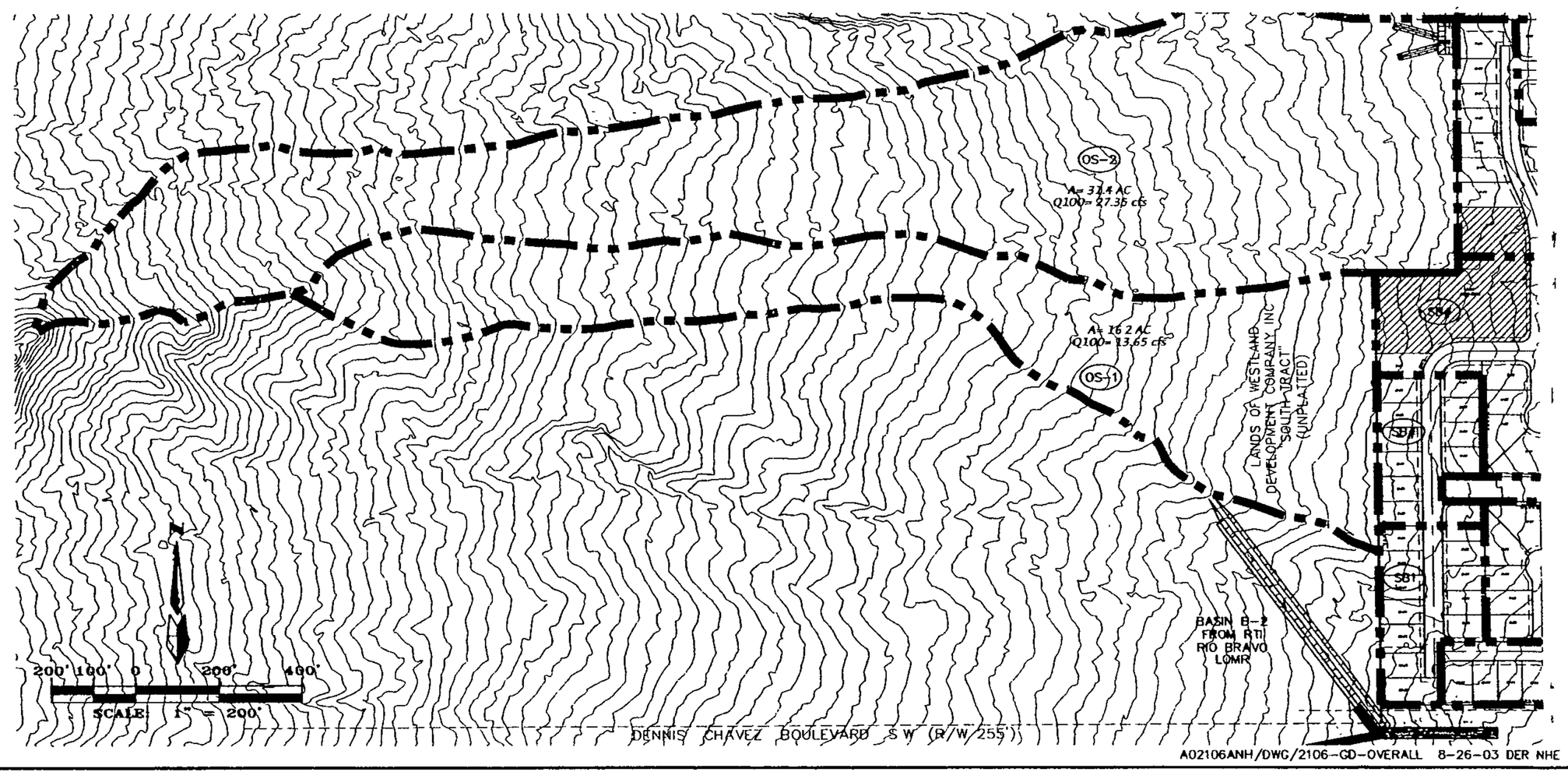


LOCATION MAP

ZONE ATLAS P-9

SCALE. NONE





NOTE: FLOWS SHOWN HEREON ARE FOR POST DEVELOPMENT CONDITIONS (NATURAL OFFSITE, DEVELOPMENT ON-SITE) AND DO NOT INCLUDE SEDIMENT

ONSITE AND TEMPROARY OFFSITE DRAINAGE BASIN MAP

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Designed: DMG	Drawn: SPS	Checked: DMG	Sheet 1 of 7
Scale: 1" = 200'	Date 02-06-03	Job: A02106	

A02106ANH/DWG/2106-GD-OVERALL 8-26-03 DER NHE

HYDRAULICS

A. RIO BRAVO CHANNEL

The existing conditions model used in this report was taken from the LOMR currently in the process of being submitted to FEMA by Resource Technology Inc. for AMAFCA and Bernalillo County and is assumed to be the "Duplicated Effective Model." Two Box Culverts were added to this existing model; one at the proposed Unser Blvd. crossing and one at the proposed 98th Street crossing. The concrete channel was extended to the west edge of this development and new temporary transitions were designed west of this new channel. The flows in the model were changed from existing drainage conditions to the ultimate developed drainage conditions for the entire upstream watersheds. Most of the watershed is now being annexed. Developed condition flows will be submitted to FEMA for Flood map revisions. An eight inch high wall is needed in two locations to contain the freeboard as summarized in Table 3.

Table 3 - Summary of Hydraulic Calculations For Rio Bravo Channel

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Max Chl Dpt (ft)	Vel Chnl (ft/s)	Req'd Freeboard	Req'd Depth	Actual Depth	Comments
88.18200	353.64	5209.80	5211.56	1.76	18.21	1.78	3.54	2.00	Future new channel
86.18400	353.64	5200.60	5202.36	1.76	18.18	1.78	3.54	2.00	Future new channel
84.18600	353.64	5193.40	5195.32	1.92	16.29	1.75	3.67	2.00	Future new channel
82.19100	353.64	5176.30	5178.17	1.87	16.49	1.76	3.63	2.00	Future new channel
80.19200	353.64	5169.20	5171.20	2.00	20.94	1.86	3.86	2.50	Future new channel
78.20000	353.64	5143.50	5145.50	2.00	14.75	1.73	3.73	2.50	Future new channel
77.20050	353.64	5141.89	5143.86	1.97	15.16	1.73	3.70	2.50	Future new channel
202+25 BEGIN ANDERSON HILLS									
76.20226	450.83	5131.00	5132.58	1.58	22.81	1.86	3.44	4.00	New channel
205+00 BEGIN CONCRETE									
74.20500	450.83	5123.21	5125.02	1.81	18.94	1.80	3.61	4.00	
72.20925	450.83	5113.43	5115.34	1.91	17.60	1.78	3.69	4.00	
70.21300	450.83	5100.01	5101.65	1.64	21.73	1.85	3.49	4.00	
68.21500	450.83	5091.71	5093.33	1.63	22.03	1.85	3.48	4.00	
67.21705	450.83	5084.12	5085.80	1.68	21.13	1.84	3.52	4.00	Begin new wing walls
64.21780	450.83	5076.94	5078.38	1.44	26.14	1.92	3.36	6.00	Begin new CBC
218+64 CENTERLINE 98TH STREET									
63.21955	450.83	5071.34	5073.05	1.71	21.93	1.86	3.57	6.00	New CBC
62.21980	665.72	5070.88	5072.73	1.85	21.10	1.85	3.70	6.00	End new CBC
61.22030	665.72	5070.63	5073.16	2.53	17.57	1.82	4.35	5.00	End new wing walls
60.22200	665.72	5069.78	5072.84	3.06	13.27	1.74	4.80	5.00	New channel
59.22321	665.72	5069.18	5072.49	3.31	11.80	1.71	5.02	4.00	End chan, add 16"wall
58.22500	665.72	5063.80	5066.09	2.29	20.26	1.87	4.16	4.00	Add 8" wall
56.22650	665.72	5055.55	5057.51	1.96	25.18	1.95	3.91	4.00	
54.22800	665.72	5050.51	5052.57	2.06	23.49	1.92	3.98	4.00	
52.23000	665.72	5044.61	5046.76	2.15	22.10	1.90	4.05	4.00	Add 8" wall
50.23300	665.72	5037.29	5039.60	2.31	20.70	1.88	4.19	4.00	Add 8" wall
48.23500	665.72	5032.41	5034.71	2.30	20.92	1.88	4.18	5.00	
46.23800	665.72	5024.10	5026.32	2.22	21.87	1.90	4.12	5.00	
44.24100	665.72	5016.81	5019.14	2.33	20.96	1.89	4.22	5.00	
42.24200	665.72	5014.54	5016.89	2.35	20.69	1.88	4.23	5.00	
40.24442	665.72	5009.05	5011.40	2.35	20.68	1.88	4.23	5.00	Begin new wing walls
39.24527	665.72	5007.18	5009.87	2.69	20.61	1.90	4.59	6.00	Begin new CBC
246+06 UNSER BLVD.									
38.24606	665.72	5005.38	5008.05	2.67	20.78	1.90	4.57	6.00	New CBC
37.24693	665.72	5003.57	5006.22	2.65	20.94	1.91	4.56	6.00	End new CBC
36.24718	961.75	5003.07	5005.53	2.46	21.15	1.90	4.36	5.00	End new wing walls
35.24768	961.75	5002.07	5005.22	3.15	19.92	1.91	5.06	5.00	Add 8" wall
34.24800	961.75	5001.54	5004.69	3.15	19.98	1.91	5.06	5.00	Add 8" wall
32.25000	961.75	4998.24	5001.36	3.12	20.24	1.92	5 04	5.00	Add 8" wall
30.25200	961.75	4996.18	4999.56	3.38	18.04	1.87	5.25	5.00	Add 8" wall
28.25400	961.75	4994.12	4997.58	3.46	17.39	1.86	5.32	5.00	Add 8" wall
26.25600	961.75	4992.06	4995.60	3.54	17.20	1.86	5.40	5.00	Add 8" wall
24.25650	961.75	4991.38	4994.81	3.43	17.65	1.87	5.30	5.00	Add 8" wall
257+20 END ANDERSON HILLS									
22.25900	961.75	4987.98	4991.29	3.31	18.59	1.88	5.19	5.00	Add 8" wall
20.26000	961.75	4986.84	4990.17	3.33	18.32	1.88	5.21	5.00	Add 8" wall
18.26200	1106.18	4984.58	4988.37	3.79	17.42	1.88	5.67	5.00	Add 8" wall
16.26300	1106.18	4981.39	4984.71	3.32	21.10	1.95	5.27	6.00	End wall
14.26500	1106.18	4975.02	4978.01	2.99	24.56	2.02	5.01	6.00	
12.26700	1106.18	4970.99	4974.09	3.10	23.36	2.00	5.10	6.00	
10.26776	1151.22	4969.47	4972.69	3.22	23.03	2.00	5.22	6.00	
'GIN BOX CULVERT									
8.26925	1151.22	4966.52	4971.34	4.82	19.91	1.99	6.81	8.33	
7.27150	1151.22	4948.13	4950.93	2.80	34.24	2.24	5.04	6.00	
6.27219	1151.22	4946.75	4949.98	3.23	29.67	2.17	5.40	6.00	
5.27249	1151.22	4945.90	4948.32	2.42	29.92	2.10	4.52	6.00	

AS BUILT INFORMATION			
CONTRACTOR			
WORK STAKED BY			DATE
INSPECTOR'S ACCEPTANCE BY			DATE
FIELD VERIFICATION BY			DATE
DRAWINGS CORRECTED BY			DATE
MICRO-FILM INFORMATION			
RECORDED BY			DATE
NO			

BENCH MARKS
STATION "2-P10" IS LOCATED 4.9 MI. SW OF DOWNTOWN ALBUQUERQUE
TO REACH STATION FROM INT OF COORS AND DENIS CHAVEZ BLVD.
(FORMERLY RIO BRAVO), GO N. ON COORS 0.1 MI. TO FLORA VISTA
AND GO WEST ON FLORA VISTA 0.5 MI. TO CONDERSHIRE. THEN GO
S. ON CONDERSHIRE 0.4 MI. TO A POINT APPROX. 50 FT. W. OF THE
STATION. STATION MARK IS AN ACS 3 1/4" ALUM CAP STAMPED
"2-P10, 1987" RIVETTED TO A PIPE PROJECTING 0.25 FT ABOVE THE
GROUND. X=358411.13, Y=1464349.24 (NAD 27) Z=4991 (NGVD 29)

SURVEY INFORMATION		
FIELD NOTES		
NO	BY	DATE

ENGINEER'S SEAL

JAMES D. HIGHTOWER
NEW MEXICO
7874
REGISTERED PROFESSIONAL ENGINEER

NO	DATE	REMARKS	BY
REVISIONS			
DESIGN			
DESIGNED BY	JDH	DATE	2/03
DRAWN BY	NHE	DATE	2/03
CHECKED BY	DMG	DATE	2/03

dmg MARK GOODWIN & ASSOCIATES, P.A
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE
ANDERSON HILLS
DENNIS CHAVEZ BOULEVARD SW
PRELIMINARY CHANNEL IMPROVEMENTS

DESIGN REVIEW COMMITTEE | CITY ENGINEER APPROVAL | LAST DESIGN UPDATE | MO./DAY/YR | MO./DAY/YR

CITY PROJECT NO. # | ZONE MAP NO P-9 | SHEET 2 OF 7

2106ANH/DWG/2106-PP1 8-26-03 NHE JDER RDQ

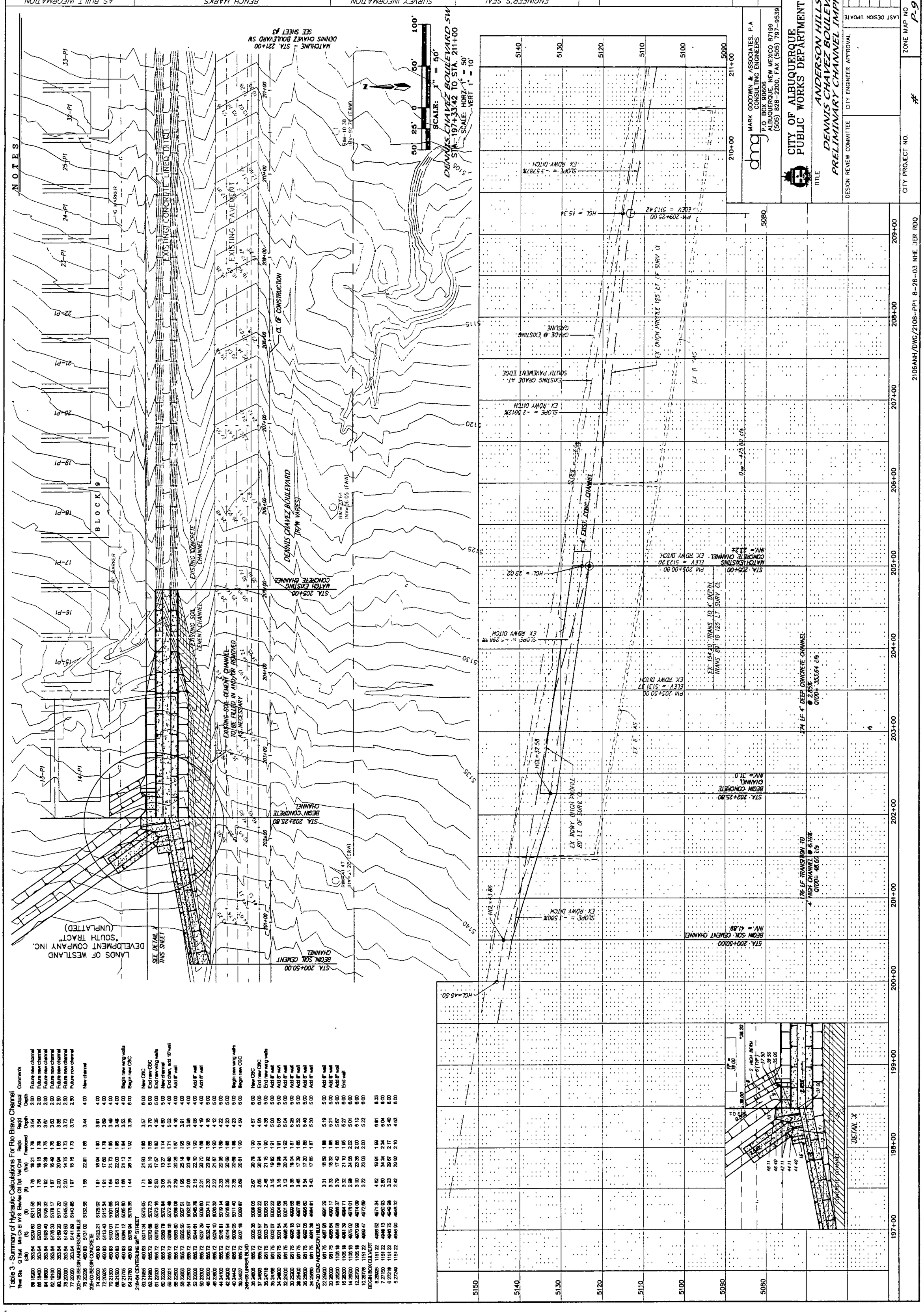

Table 3 - Summary of Hydraulic Calculations For Rio Bravo Channel

River Sta	Q Total (cfs)	Min Ch El (ft)	W S Elev (ft)	Crit Dpt (ft)	Vel Chnl (ft/s)	Reqd Freeboard	Reqd Depth	Actual Depth	Comments
89.15200	353.64	5209.60	5211.58	1.78	18.21	1.78	3.54	2.00	Future new channel
86.15400	353.64	5200.60	5202.38	1.78	18.18	1.78	3.54	2.00	Future new channel
84.18800	353.64	5192.40	5195.32	1.92	16.28	1.75	3.67	2.00	Future new channel
82.19100	353.64	5178.30	5178.17	1.87	18.49	1.78	3.65	2.00	Future new channel
80.19200	353.64	5169.20	5171.20	2.00	20.94	1.85	3.85	2.50	Future new channel
78.20000	353.64	5143.50	5145.50	2.00	14.75	1.73	3.73	2.50	Future new channel
77.20050	353.64	5141.80	5143.85	1.97	16.16	1.73	3.70	2.50	Future new channel
202+25 BEGIN ANDERSON HILLS									
76.20226	450.83	5131.00	5132.58	1.58	22.81	1.85	3.44	4.00	New channel
205+00 BEGIN CONCRETE									
74.20500	450.83	5123.21	5125.02	1.81	18.94	1.80	3.61	4.00	
72.20825	450.83	5113.43	5115.34	1.91	17.60	1.78	3.69	4.00	
70.21300	450.83	5100.01	5101.85	1.84	21.73	1.85	3.49	4.00	
68.21500	450.83	5091.71	5093.33	1.63	22.03	1.85	3.48	4.00	
67.21705	450.83	5084.12	5085.80	1.68	21.13	1.84	3.52	4.00	Begin new wing walls
64.21760	450.83	5076.94	5078.38	1.44	26.14	1.92	3.36	6.00	Begin new CBC
218+64 CENTERLINE 98TH STREET									
63.21965	450.83	5071.34	5073.05	1.71	21.93	1.85	3.57	6.00	New CBC
62.21980	665.72	5070.86	5072.73	1.85	21.10	1.85	3.70	6.00	End new CBC
61.22030	665.72	5070.65	5073.16	2.53	17.57	1.82	4.35	5.00	End new wing walls
60.22200	665.72	5069.78	5072.84	3.06	13.27	1.74	4.80	5.00	New channel
59.22321	665.72	5069.18	5072.49	3.31	11.80	1.71	5.02	4.00	End chan, end 16' wall
58.22500	665.72	5068.60	5068.08	2.29	20.25	1.87	4.16	4.00	Add 8' wall
56.22650	665.72	5065.55	5067.51	1.96	25.18	1.95	3.91	4.00	
54.22800	665.72	5060.51	5062.57	2.06	23.49	1.92	3.98	4.00	
52.23000	665.72	5044.61	5045.78	2.15	22.10	1.90	4.05	4.00	Add 8' wall
50.23300	665.72	5037.29	5038.60	2.31	20.70	1.88	4.19	4.00	Add 8' wall
48.23500	665.72	5032.41	5034.71	2.30	20.92	1.88	4.18	5.00	
46.23800	665.72	5024.10	5025.32	2.22	21.67	1.90	4.12	5.00	
44.24100	665.72	5016.81	5019.14	2.33	20.95	1.88	4.22	5.00	
42.24300	665.72	5014.54	5015.88	2.36	20.69	1.85	4.23	5.00	
40.24442	665.72	5009.05	5011.40	2.36	20.68	1.88	4.23	5.00	Begin new wing walls
38.24537	665.72	5007.18	5009.87	2.60	20.61	1.90	4.50	6.00	Begin new CBC
246+06 LINSER BLVD									
38.24906	665.72	5005.36	5008.05	2.67	20.78	1.90	4.57	6.00	New CBC
37.24963	665.72	5003.57	5006.22	2.65	20.94	1.91	4.56	6.00	End new CBC
36.24718	661.75	5003.07	5005.53	2.46	21.15	1.90	4.36	5.00	End new wing walls
35.24768	661.75	5002.07	5003.22	3.15	19.82	1.91	5.06	5.00	Add 8' wall
34.24800	661.75	5001.54	5004.60	3.15	19.98	1.91	5.06	5.00	Add 8' wall
32.25000	661.75	4998.24	5001.36	3.12	20.24	1.92	5.04	5.00	Add 8' wall
30.25300	661.75	4995.18	4999.58	3.38	19.04	1.87	5.25	5.00	Add 8' wall
28.25400	661.75	4994.12	4997.85	3.45	17.39	1.85	5.32	5.00	Add 8' wall
26.25600	661.75	4992.05	4996.60	3.54	17.20	1.86	5.40	5.00	Add 8' wall
24.25800	661.75	4991.38	4994.81	3.43	17.65	1.87	5.30	5.00	Add 8' wall
257+20 END ANDERSON HILLS									
22.25900	661.75	4987.95	4991.29	3.31	18.50	1.88	5.19	5.00	Add 8' wall
20.26000	661.75	4986.84	4990.17	3.33	18.32	1.88	5.21	5.00	Add 8' wall
18.26300	1105.18	4984.58	4988.37	3.79	17.42	1.88	5.67	5.00	Add 8' wall
16.26500	1105.18	4981.39	4984.71	3.32	21.10	1.90	5.27	6.00	End wall
14.26600	1105.18	4975.02	4978.01	2.99	24.56	2.02	5.01	6.00	
12.26700	1105.18	4970.99	4974.09	3.10	23.36	2.00	5.10	6.00	
10.26776	1151.22	4969.47	4972.69	3.22	23.03	2.00	5.22	6.00	
BEGIN BOX CULVERT									
8.26925	1151.22	4966.52	4971.34	4.82	19.91	1.99	6.81	8.33	
7.27150	1151.22	4948.13	4960.93	2.80	34.24	2.24	5.04	8.00	
6.27219	1151.22	4946.75	4949.98	3.23	29.67	2.17	5.40	8.00	
5.27249	1151.22	4945.90	4948.32	2.42	29.92	2.10	4.52	6.00	

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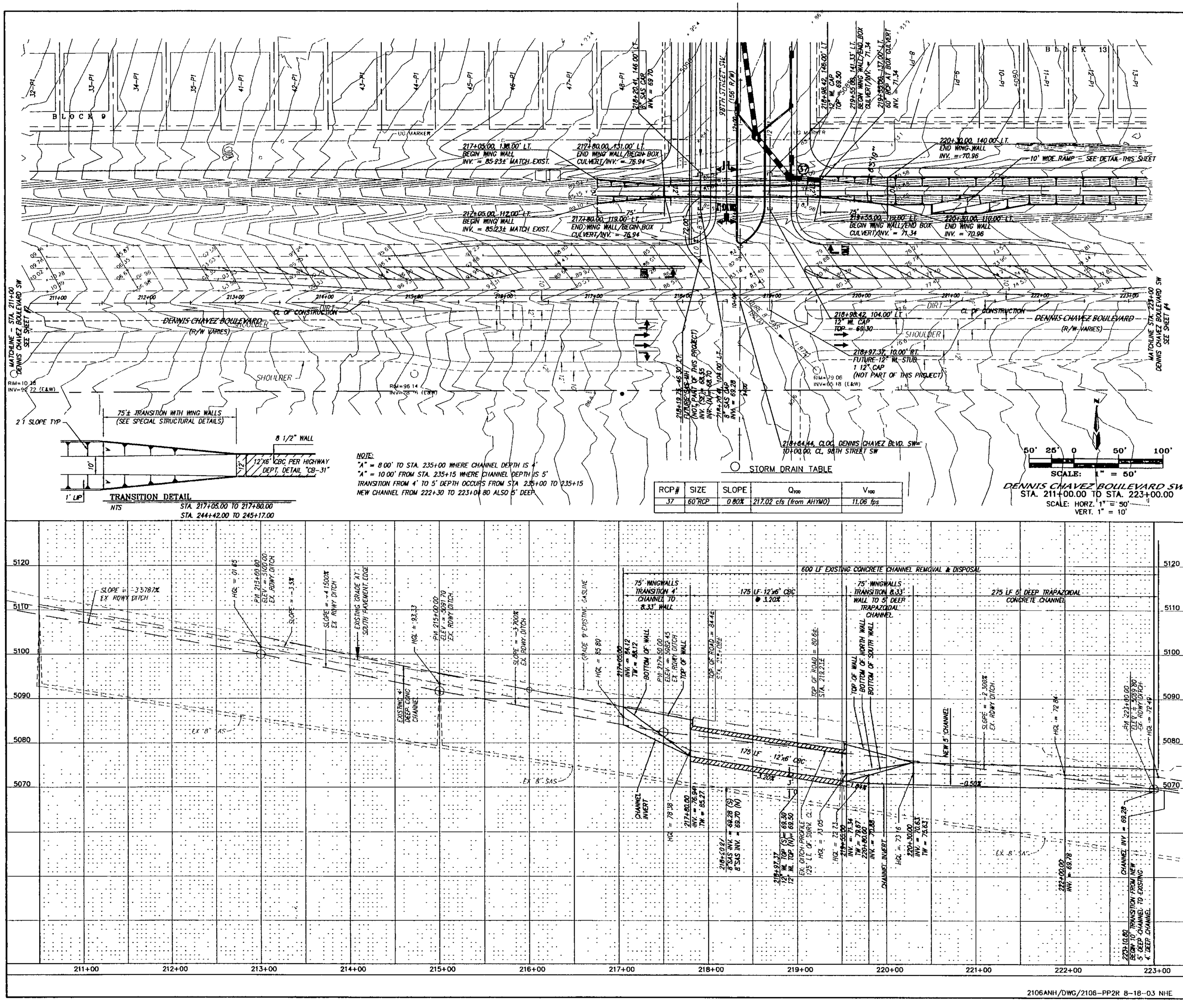
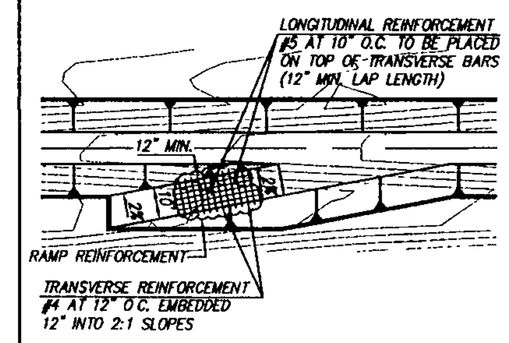


STORM DRAIN TABLE

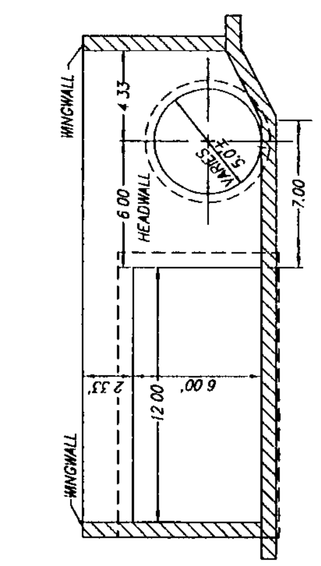
RCP#	SIZE	SLOPE	Q_{100}	V_{100}
37	60" RCP	0.80%	217.02 cfs (from AHYMO)	11.06 fps

NOTES

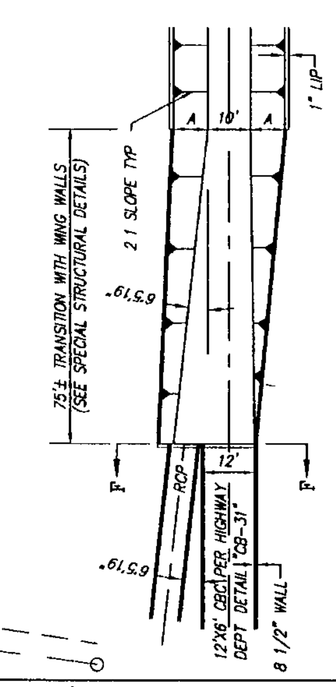
1. ALL STATIONING IS BASED ON CENTERLINE OF DENNIS CHAVEZ BOULEVARD



RAMP DETAIL
N.T.S.



SECTION F
NTS
STA. 219+55.00 AND 246+93.00
STA 246+93.00 TO 247+68.00



TRANSITION DETAIL
NTS
STA. 219+55.00 TO 220+30.00
STA. 246+93.00 TO 247+68.00

AS BUILT INFORMATION

CONTRACTOR		
WORK STAKED BY		DATE
WORK INSPECTED BY		DATE
ACCEPTANCE BY		DATE
FIELD VERIFICATION BY		DATE
DRAWINGS CORRECTED BY		DATE

MICRO-FILM INFORMATION

RECORDED BY	DATE
NO	

BENCH MARKS

STATION "2-P10" IS LOCATED 4.9 MI. SW OF DOWNTOWN ALBUQUERQUE, (FORMERLY RIO BRAVO), GO N. ON COORS 0.1 MI. TO FLORA VISTA AND GO WEST ON FLORA VISTA 0.5 MI. TO CONDERSHIRE, THEN GO S. ON CONDERSHIRE 0.4 MI. TO A POINT APPROX. 50 FT. W. OF THE CENTERLINE OF DENNIS CHAVEZ BOULEVARD.

STATION, STATION MARK IS AN ACS 3 1/4" ALUM. CAP STAMPED "2-P10, 1987, RIMETED TO A PIPE PROJECTING 0.25 FT. ABOVE THE GROUND. X=1494349.24 (NAD 27) Z=4991 (NGVD 29).

SURVEY INFORMATION

FIELD NOTES

NO	BY	DATE

ENGINEER'S SEAL

JAMES D. HUGHES
NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER
8-26-03

NO	DATE	REMARKS	BY
		REVISIONS	

		DATE
DESIGNED BY	JDH	2/03
DRAWN BY	NHE	2/03
CHECKED BY	DMG	2/03

dmg
MARK GOODWIN & ASSOCIATES, P.A.
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE
ANDERSON HILLS
DENNIS CHAVEZ BOULEVARD SW
PRELIMINARY CHANNEL IMPROVEMENTS

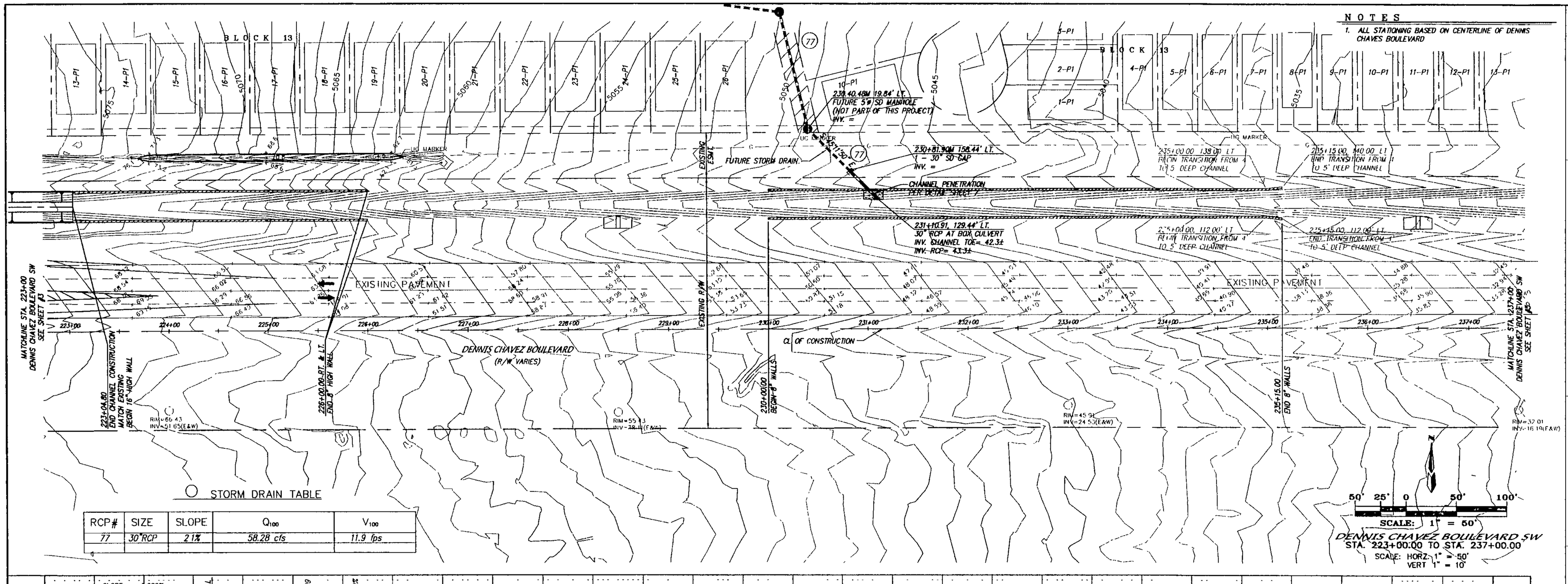
DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	LAST DESIGN UPDATE	MO/DAY/YR	MO/DAY/YR

CITY PROJECT NO	ZONE MAP NO	SHEET	OF
#	P-9	3	7

_JOBS\2106ANH\dwg\2106-PP2R.dwg, 08/26/03 12:47:38 PM, PLOTTED BY RDO

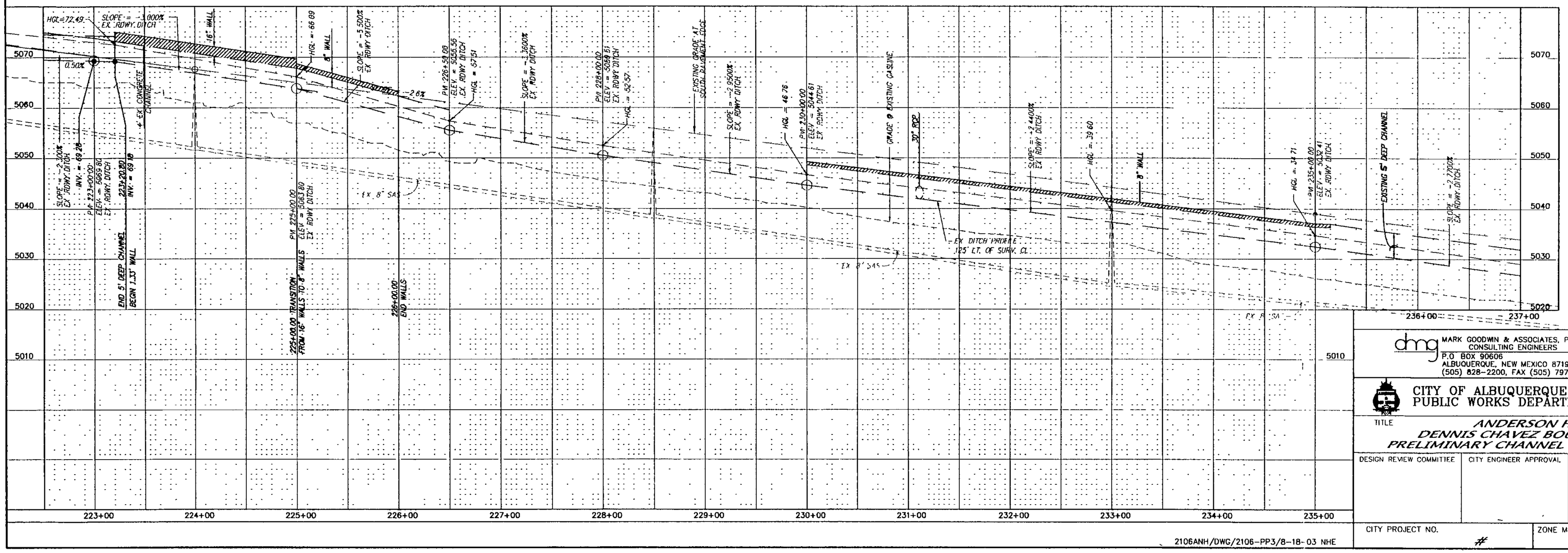
NOTES

1. ALL STATIONING BASED ON CENTERLINE OF DENNIS CHAVES BOULEVARD



STORM DRAIN TABLE

RCP#	SIZE	SLOPE	Q_{100}	V_{100}
77	30"RCP	21%	58.28 cfs	11.9 fps



2106ANH/DWG/2106-PP3/8-18-03 NHE

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CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE
ANDERSON HILLS
DENNIS CHAVEZ BOULEVARD SW
PRELIMINARY CHANNEL IMPROVEMENTS

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	LAST DESIGN UPDATE	MO/DAY/YR	MO/DAY/YR

CITY PROJECT NO.	ZONE MAP NO	SHEET	OF
#	P-9	4	7

AS BUILT INFORMATION

CONTRACTOR		
WORK STAKED BY		DATE
INSPECTOR'S ACCEPTANCE BY		DATE
VERIFICATION BY		DATE
SCANNED BY		DATE
MICRO-FILM INFORMATION		
RECORDED BY		DATE
NO.		

BENCH MARKS

STATION "2-P10" IS LOCATED 4.9 MI. SW OF DOWNTOWN ALBUQUERQUE, TO REACH STATION FROM INT. OF COORS AND DENIS CHAVEZ BLVD. (FORMERLY RIO BRAVO), GO N. ON COORS 0.1 MI. TO FLORA VISTA AND GO WEST ON FLORA VISTA 0.5 MI. TO CONDERSHIRE, THEN GO S. ON CONDERSHIRE 0.4 MI. TO A POINT APPROX. 50 FT. W. OF THE STATION. STATION MARK IS AN ACS 3 1/4" ALUM CAP STAMPED "2-P10, 1987" RIVETED TO A PIPE PROJECTING 0.25 FT ABOVE THE GROUND. X=1541.13, Y=1464348.24 (NAD 27) Z=4891 (NGVD 29).

SURVEY INFORMATION

NO.	BY	DATE	FIELD NOTES

ENGINEER'S SEAL

JAMES D. HUGHES — NEW MEXICO — 10278 — REGISTERED PROFESSIONAL ENGINEER — 8-21-03

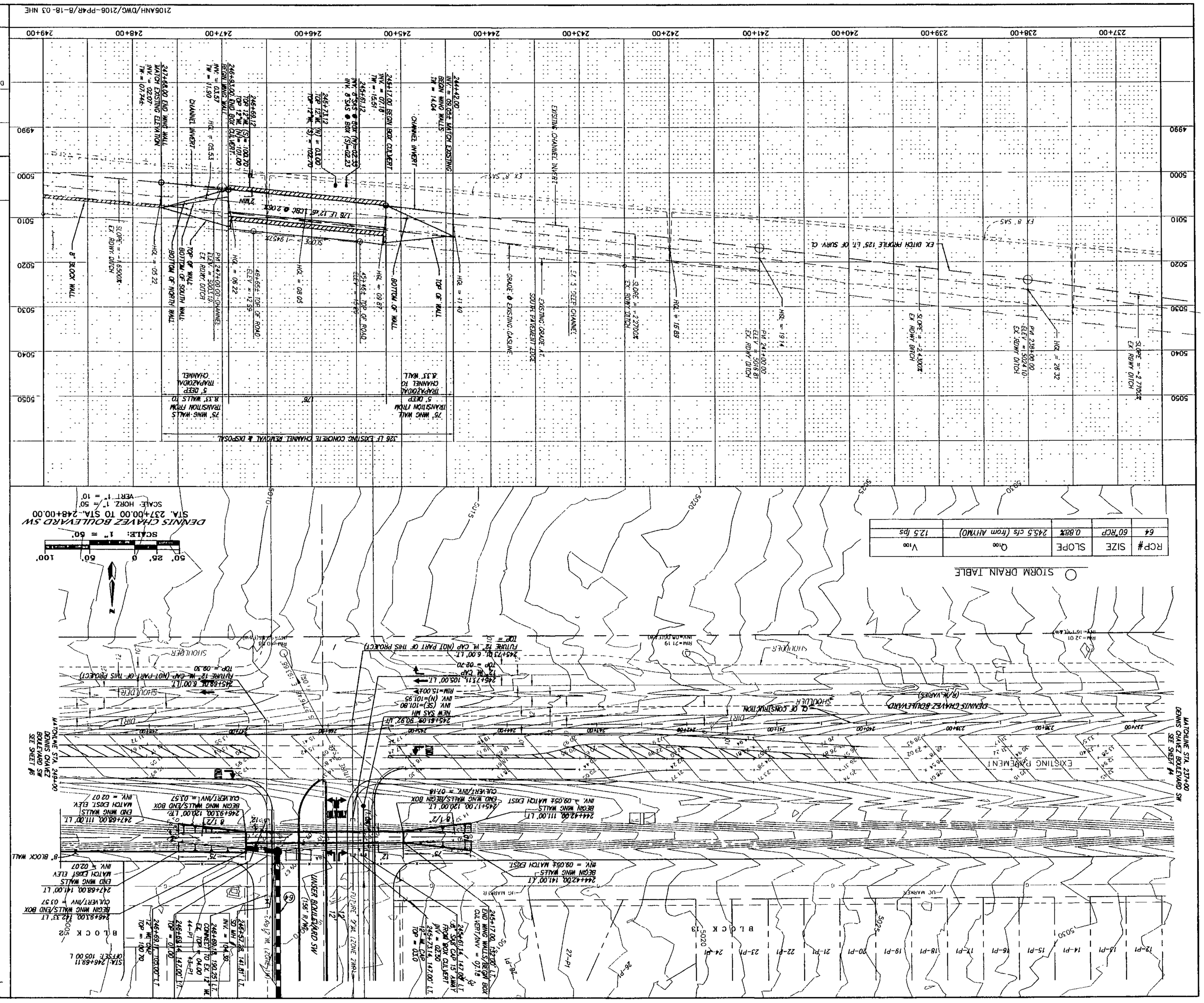
NO	DATE	REMARKS	BY
		REVISIONS	

		DATE
DESIGNED BY	JDH	2/03
DRAWN BY	NHE	2/03
CHECKED BY	DMG	2/03

\\AO2JOBS\2106ANH\dwg\2106-PP3.dwg, 08/26/03 12:27:32 PM, PLOTTED BY RDO

F:\A02JOBS\A2106ANH\dwg\2106-PP4R.dwg, 02/26/03 12:09:49 PM, PLOTTED BY RDO

2106ANH/DWG/2106-PP4R/8-18-03 NHE



NOTES

1 ALL STATIONING IS BASED ON THE CENTERLINE OF DENNIS CHAVEZ BOULEVARD

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE: ANDERSON HILLS
DENNIS CHAVEZ BOULEVARD SW
PRELIMINARY CHANNEL IMPROVEMENTS

MARK GOODWIN & ASSOCIATES, P.A.
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

NO	DATE	REMARKS	BY
		REVISIONS	

		DATE
DESIGNED BY	JDH	2/03
DRAWN BY	NHE	2/03
CHECKED BY	DMG	2/03

DESIGN

ENGINEER'S SEAL: JAMES D. HIGHFILL, NEW MEXICO REGISTERED PROFESSIONAL ENGINEER 9284, 4-24-03

SURVEY INFORMATION

NO	BY	DATE	STATION "2-PID" IS LOCATED 4.9 MI. SW. OF DOWNTOWN ALBUQUERQUE (FORMERLY ORTO BRAVO), GO N. ON GOORS 0.1 MI. TO FLORA VISTA AND GO WEST ON FLORA VISTA 0.5 MI. TO CONDERSHIRE, THEN GO S. ON CONDERSHIRE 0.4 MI. TO A POINT APPROX. 50 FT. W. OF THE STATION. STATION MARK IS AN ACS 3 1/4" ALUM CAP STAMPED "2-PID, 1987" RIVETED TO A PIPE, PROJECTING 0.25 FT. ABOVE THE GROUND. X=1664349.24 (NAD 27) Z=4591 (NGVD 29).

FIELD NOTES

BENCH MARKS

AS BUILT INFORMATION

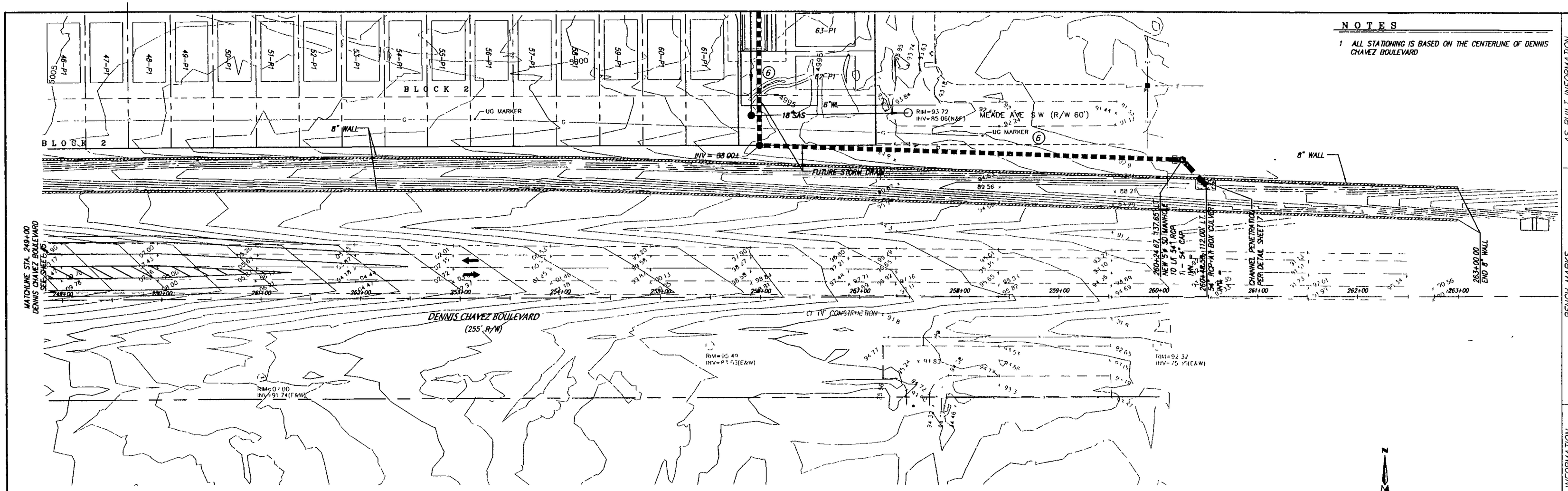
CONTRACTOR		
WORK STAKED BY		DATE
INSPECTOR'S ACCEPTANCE BY		DATE
VERIFICATION BY		DATE
CORRECTIONS CONPLETED BY		DATE
MICRO-FILM INFORMATION		
RECORDED BY		DATE
NO		

LAST DESIGN UPDATE | CITY ENGINEER APPROVAL | DESIGN REVIEW COMMITTEE | MO/DAY/YR | MO/DAY/YR

CITY PROJECT NO | # | ZONE MAP NO P-9 | SHEET 5 OF 7

NOTES

1 ALL STATIONING IS BASED ON THE CENTERLINE OF DENNIS CHAVEZ BOULEVARD

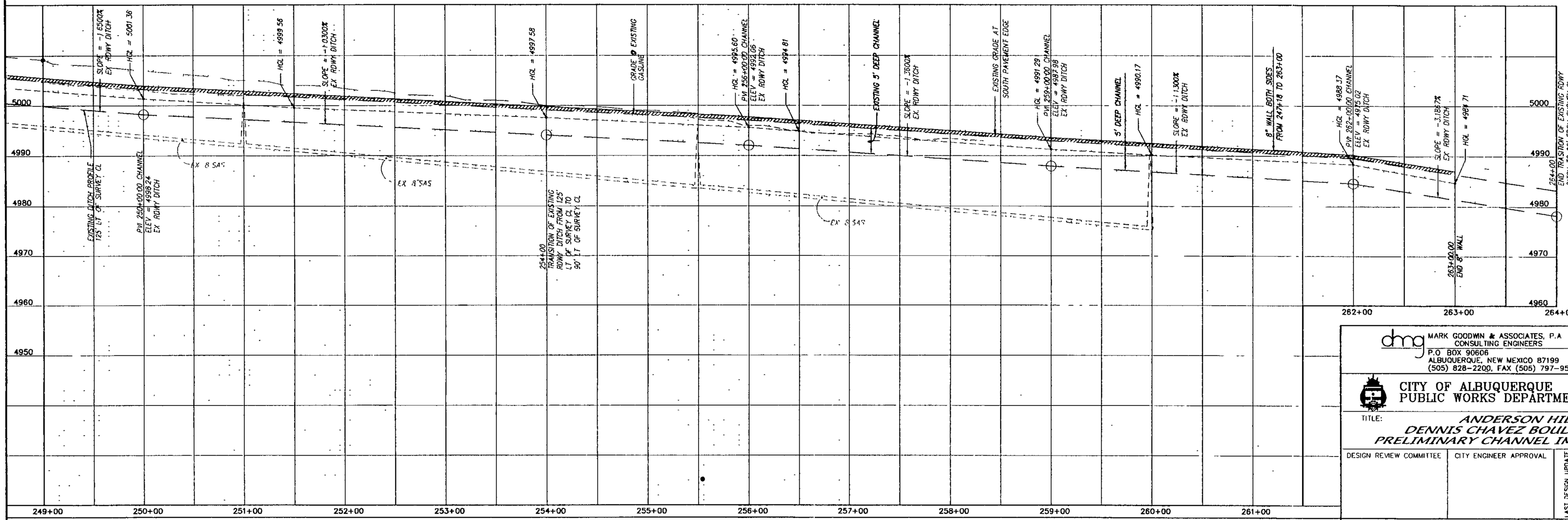


STORM DRAIN TABLE

RCP#	SIZE	SLOPE	Q_{100}	V_{100}
6	54" RCP	0.43%	129.37 cfs	8.1 fps

SCALE: 1" = 50'

DENNIS CHAVEZ BOULEVARD SW
STA. 249+00.00 TO STA. 263+00.00
SCALE: HORZ 1" = 50'
VERT. 1" = 10'



dmg MARK GOODWIN & ASSOCIATES, P.A
CONSULTING ENGINEERS
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ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE:
ANDERSON HILLS
DENNIS CHAVEZ BOULEVARD SW
PRELIMINARY CHANNEL IMPROVEMENTS

DESIGN REVIEW COMMITTEE	CITY ENGINEER APPROVAL	LAST DESIGN UPDATE	MO./DAY/YR	MO./DAY/YR

CITY PROJECT NO.	ZONE MAP NO	SHEET	OF
#	P-9	6	7

2106ANH/DWG/2106-PP16 8-26-03 NHE RDQ

AS BUILT INFORMATION
CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
FIELD VERIFICATION BY
DRAWINGS CORRECTED BY
MICRO-FILM INFORMATION
RECORDED BY
NO DATE

BENCH MARKS

SURVEY INFORMATION
FIELD NOTES
NO BY DATE

ENGINEER'S SEAL
JAMES D. HUGHES
REGISTERED PROFESSIONAL ENGINEER
8-26-03

NO.	DATE	REMARKS	BY
		REVISIONS	

		DATE
DESIGNED BY	JDH	2/03
DRAWN BY	NHE	2/03
CHECKED BY	DMG	2/03

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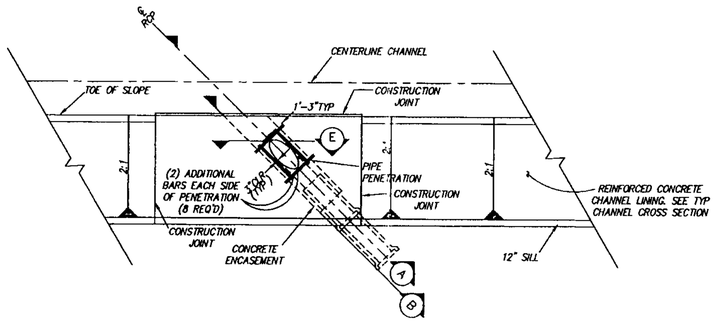


NOTE: CUT TYPICAL CHANNEL REINFORCING @ RCP PENETRATION FIELD BEND CUT-BARS INTO CONCRETE ENCASEMENT 1'-3" MAINTAIN 3" CLR. (MIN) ON ALL SIDES.

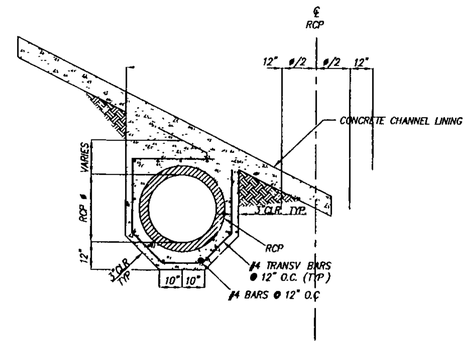
TYPICAL PIPE PENETRATION (PLAN VIEW)

N.T.S.

TABLE OF DIMENSIONS								
CHANNEL STATION	PIPE DIAMETER	SLOPE	SKEW	CHANNEL DEPTH	INVERT TO INVERT A	B	C	D
	45	0.39	60°	8.0	0.0	0.0	9.20	3.0
	45	1.00	45°	8.0	1.0	2.0	9.20	3.0
	4.5	1.00	90°	7.5–8.0	0.0	0.0	9.20	3.0
	2.0	1.00	45°	7.5–8.0	1.0	2.0	7.07	3.0
	2.0	1.00	45°	7.5–8.0	1.0	2.0	7.07	3.0
	2.0	1.00	45°	7.5–8.0	1.0	2.0	7.07	3.0
	5.5	1.36	45°	7.5–8.0	0.0	0.0	9.20	3.0
	5.0	2.40	45°	7.5–8.0	0.0	0.0	9.20	3.0
	2.5	1.97	45°	7.5–7.7	0.0	0.0	7.07	3.0
	2.0	1.61	45°	7.5–7.7	1.0	2.0	7.07	3.0
	2.5	0.40	45°	7.5–7.7	0.0	0.0	7.07	3.0
	FEET	PERCENT	DEGREES	FEET	FEET	FEET	FEET	FEET

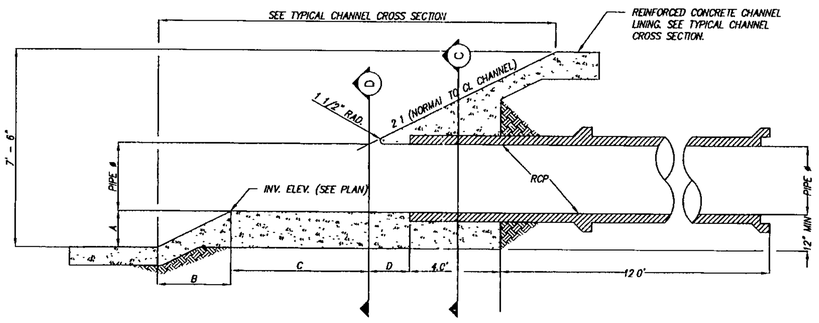
NOTES

1. THE PIPE PENETRATION DETAILED HEREIN SHALL BE PAID FOR UNDER PIPE PENETRATION, (EACH) AND SHALL BE COMPENSATED FOR THE PENETRATION COMPLETE AND IN PLACE. INCLUDED IN THIS WORK (BUT NOT LIMITED TO) IS GRADING, SUBGRADE PREPARATION, REINFORCED CONCRETE, CONSTRUCTION JOINTS, CONCRETE PLACEMENT, 16' OF PROPER SIZE RCP, PRECAST PLUG IF NO CONNECTION IS MADE WITH THIS PROJECT, BACKFILL, AND FINISHING NOTE: THE MEASUREMENT FOR CONCRETE CHANNEL LINING IS CONTINUOUS AND UNINTERRUPTED AT THE PENETRATION LOCATION
2. THE TYPICAL TRANSVERSE AND LONGITUDINAL REINFORCEMENT SHALL BE CONTINUOUS THRU THE CONSTRUCTION JOINT LAPPED BAR SPLICES ADJACENT TO THE JOINT IS PERMITTED
   #8 BAR LAP = 4'-2"
   #7 BAR LAP = 3'-2"
   #5 BAR LAP = 2'-2"



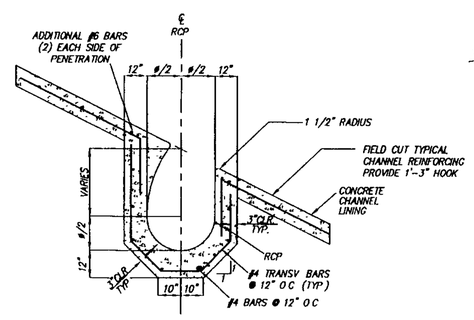
SECTION C – C

N.T.S



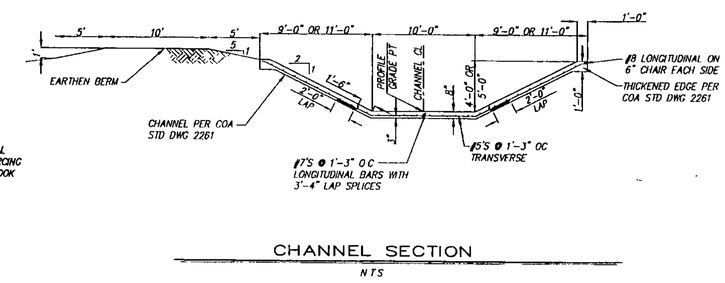
SECTION A – A

N.T.S



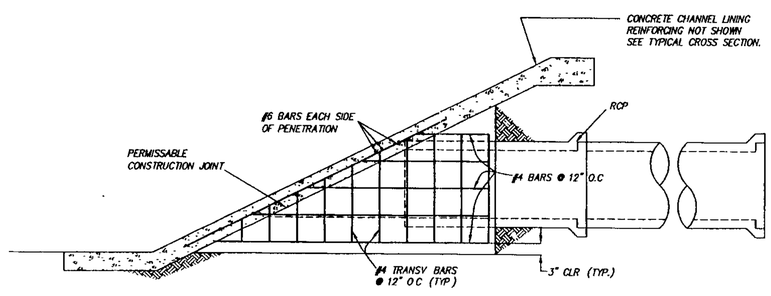
SECTION D – D

N.T.S



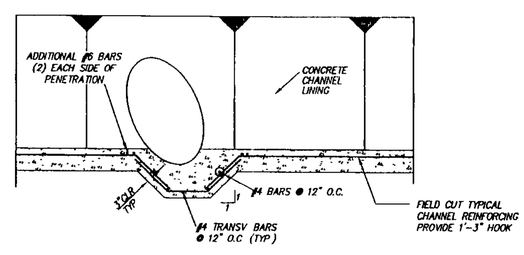
CHANNEL SECTION

N.T.S



SECTION B – B

N.T.S.



SECTION E – E

N.T.S.

AS BUILT INFORMATION
CONTRACTOR
WORK STAKED BY
INSPECTOR'S ACCEPTANCE BY
DATE
VERIFICATION BY
DATE
CORRECTED BY
MICRO-FILM INFORMATION
RECORDED BY
DATE
NO

BENCH MARKS
STATION "2-P10" IS LOCATED 4.9 MI. SW OF DOWNTOWN ALBUQUERQUE TO REACH STATION FROM INT. OF COORS AND DENS CHAVEZ BLVD. (FORMERLY RIO BRAVO), GO N. ON COORS 0.1 MI. TO FLORA VISTA AND GO WEST ON FLORA VISTA 0.5 MI. TO CONDERSHIRE, THEN GO S. ON CONDERSHIRE 0.4 MI. TO A POINT APPROX. 50 FT. W. OF THE STATION. STATION MARK IS AN ACS 3 1/4" ALUM. CAP STAMPED "2-P10, 1987" RIVETED TO A PIPE PROJECTING 0.25 FT. ABOVE THE GROUND. X=1536411.13, Y=1484348.24 (NAD. 27) Z=4991 (NGVD. 29).

SURVEY INFORMATION
FIELD NOTES
NO | BY | DATE

ENGINEER'S SEAL
JAMES E. HUGHES, 7974, NEW MEXICO, REGISTERED PROFESSIONAL ENGINEER
9-26-03

NO | DATE | REMARKS | BY
REVISIONS
DESIGNED BY JDH DESIGN DATE 5/03
DRAWN BY NHE DATE 5/03
CHECKED BY DMG DATE 5/03

dmg MARK GOODWIN & ASSOCIATES, P.A.
CONSULTING ENGINEERS
P.O. BOX 90606
ALBUQUERQUE, NEW MEXICO 87199
(505) 828-2200, FAX (505) 797-9539

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT

TITLE
ANDERSON HILLS
DETAIL SHEET
PRELIMINARY CHANNEL IMPROVEMENTS

DESIGN REVIEW COMMITTEE | CITY ENGINEER APPROVAL | LAST DESIGN UPDATE | MO./DAY/YR. | MO./DAY/YR.

CITY PROJECT NO #
ZONE MAP NO P-9
SHEET 7 OF 7

2106ANH/DWG/2106-DETAIL1 5-21-03 NHE

VI. SEDIMENT TRANSPORT

A. DEVELOPED CONDITIONS

Fully developed conditions are not the most critical condition for bed load transport because most of the conveyance systems in this watershed will be hard lined thus providing no source of bed material. Ponds at 118th Street will remove bed load from any natural channels west of the South Power Line that may remain natural after development.

Wash load will also be decreased to near zero in fully developed conditions. A 3% bulking factor applied to the fully developed flows will conservatively account for suspended material that is not likely to deposit either in the ponds or in the Rio Bravo Channel. The factor is applied in the computer model of the Hydrology.

B. INTERIM CONDITIONS

Bed material may be likely to be deposited in the new flat reach of the channel immediately after its construction, while there is still a source of bed material flowing into the channel from the undeveloped upstream property and while developed clear water, which will dilute and help transport the bed material, is at a minimum. A separate AHYMO run for interim conditions provides the Hydrology calculations as well as the wash load volumes and the bed load volumes. Peak capacities are checked at every HEC-RAS cross section in an Excel spreadsheet to be sure that incoming peak rate is exceeded everywhere in the concrete channel (see table 4).

The main purpose of this analysis is to determine if sediment will accumulate in the flat reach of the concrete channel just below the 98th Street box culvert. Deposition will occur in the first place where the transport capacity is less than the supply reach. First, the natural channel west of the subdivision will be assumed to actually transport its full capacity (6.67 cfs). Then it is checked against the capacity of the diversion swale berm (7.95 cfs). Since the two Transport Capacities are nearly equal, they should be in equilibrium with each other. Small changes in bed slope may occur due to erosion or deposition that will correct any imbalance in equilibrium.

INTERIM BED LOAD TRANSPORT CAPACITY

River Sta	Q (cfs)	Depth (ft)	Vel (ft/s)	Width (ft)	Q_s (cfs)
76.20226	135.12	0.84	15.94	13.25	**322.01**
74.20500	135.12	1.01	12.39	14.13	**113.79**
72.20925	135.12	1.01	12.48	14.11	**117.35**
70.21300	135.12	0.85	15.67	13.30	**299.89**
68.21500	135.12	0.87	15.10	13.42	**257.13**
67.21705	135.12	0.90	14.51	13.56	**218.25**
64.21780	149.19	0.62	19.95	12.00	**770.27**
63.21955	149.19	0.91	13.65	12.00	**147.31**
62.21980	325.57	1.29	16.37	19.86	**564.74**
61.22030	325.57	1.94	12.49	18.75	**165.96**
60.22200	325.57	2.39	9.30	21.01	**51.01**
59.22321	325.57	2.39	9.34	20.97	**51.09**
58.22500	325.57	1.45	18.73	16.26	**850.82**
56.22650	325.57	1.29	21.82	15.48	**1581.35**
54.22800	325.57	1.45	18.76	16.25	**856.37**
52.23000	375.57	1.66	17.97	17.31	**762.51**
50.23300	375.57	1.71	17.49	16.52	**646.84**
48.23500	375.57	1.69	17.74	16.44	**684.94**
46.23800	375.57	1.63	18.63	16.18	**835.45**
44.24100	375.57	1.74	17.56	16.46	**657.07**
42.24200	375.57	1.74	17.56	16.45	**656.67**
40.24442	397.57	1.83	17.43	16.81	**652.17**
39.24527	397.57	1.85	17.90	12.00	**524.59**
38.24606	397.57	1.84	17.98	12.00	**534.85**
37.24693	397.57	1.84	18.03	12.00	**541.50**
36.24718	613.16	1.99	17.66	22.65	**938.58**
35.24768	613.16	2.60	16.66	19.77	**647.45**
34.24800	613.16	2.58	16.87	19.68	**680.98**
32.25000	613.16	2.50	17.64	19.35	**814.36**
30.25200	613.16	2.74	15.53	20.31	**488.90**
28.25400	613.16	2.78	15.22	20.47	**451.05**
26.25600	613.16	2.81	15.24	20.08	**445.48**
24.25650	613.16	2.72	15.68	20.24	**508.17**
22.25900	613.16	2.61	16.58	19.81	**635.23**
20.26000	613.16	2.65	16.12	20.17	**571.44**
18.26200	640.31	2.80	15.60	20.79	**511.57**
16.26300	640.31	2.42	19.20	19.19	**1174.11**
14.26500	640.31	2.19	21.96	18.26	**2012.82**
12.26700	640.31	2.36	19.81	18.97	**1330.96**
10.26776	640.31	2.38	19.63	18.96	**1278.28**
8.26925	640.31	2.93	18.24	12.00	**594.51**
7.27150	640.31	1.70	31.47	12.00	**6411.53**
6.27219	640.31	2.07	25.73	12.00	**2663.64**
5.27249	640.31	1.77	25.19	18.65	**7.95 cfs**

B. *INTERIM CONDITIONS* cont.....

The peak transport capacity in the concrete channel (49.86 cfs) from AHYMO is much higher than the peak supply from upstream thus indicating that deposition is highly unlikely. The concrete channel capacity can be increased by steepening the sluggish reaches, but the upstream supply will soon be eliminated by development of the property west of Anderson Hills.

BED LOAD TRANSPORT

Sediment transport capacity is determined using the following MPM-Woo method (equation 3.41 from AMAFCA's "Erosion and Sediment Design Guide").

$$qs = aV^b Y^c (1-C_f/10^6)^d$$

Where the particle size, d_{50}=0.64mm and from figure 3.10. Erosion & Sediment Design Guide.

a=0.0001, b=4.45, c=0.09, and d=-2.6

The existing natural channel 600' upstream from the berm has about a 7' wide flat bottom with 5:1 side slopes and a 3.6% longitudinal slope. The 100 yr flow is about 78 cfs, and n=0.035.

At the next reach downstream, the man made berm has a 10' wide flat bottom with 3:1 side slopes and a longitudinal slope of 2.84%. The 100 yr flow is still about 78 cfs and n=0.030. Hydraulic parameters are input into AHYMO as follows for each channel. Then AHYMO calculates the total sediment.

See Table below:

d=	W	A	R	Q	V
Natural upstream channel where n=0.035 and S_o =3.6% (Basins B-2 and OS-2)					
0.1	2.0	0.2	0.1	0.35	1.75
0.3	6.0	1.8	0.3	6.5	3.61
0.5	10.0	6.0	0.5	30.5	5.08
0.9	16.0	10.35	0.65	62.6	6.05
1.3	20.0	17.55	0.88	130.1	7.41

d=	W	A	R	Q	V
Berm / Diversion channel where n=0.30 and S_O=2.84%					
0.1	2	0.2	.01	0.36	1.79
0.3	6	1.8	0.3	6.72	3.74
0.5	10	5.0	0.5	26.30	5.26
0.9	15.4	11.4	0.74	77.99	6.84
1.3	17.8	18.1	0.98	149.46	8.26
The concrete channel where n=0.015 and S_O=0.5%					
0.33	10.0	1.65	0.17	3.53	2.14
0.53	11.2	3.77	0.34	12.89	3.42
0.93	13.6	8.73	0.64	45.53	5.21
1.33	16.0	14.65	0.92	97.31	6.64
1.73	18.4	21.53	1.17	168.00	7.80
2.33	22.0	33.65	1.53	314.30	9.33
2.83	25.0	45.40	1.82	476.30	10.49

WASH LOAD FOR OFFSITE UNDEVELOPED (Basin B-2)

THE MODIFIED UNIVERSAL SOIL LOSS EQUATION (MUSLE) IS:

$$Y_s = R_w K (LS) C P$$

Where R_w = $285 (3.98 \text{ ac-ft} \times 84.91 \text{ cfs})^{0.56}$

= *7430 for 100-yr storm*

and K = *0.17 where the majority of the soil is bluepoint loamy fine sand*

and LS = *0.76 for 200' average length and 5% average slope from (table B-3)*

and C = *0.20 for no appreciable canopy and 20% grass ground cover from (table B-2)*

and P = *1.0 for range and wild-land*

and the watershed is an average of 10% impervious.

Y_s = *203 tons = 36,170 ppm (weight)*

Equivalent Bulking Factor = *1.4% (undeveloped)*

BF = *1.014*

WASH LOAD FOR DEVELOPED CONDITIONS BASIN 207.

Where R_w = $285 (2.51 \times 48.08)^{0.56}$

= *4,174 for 100-yr storm*

and K = *0.20 where the majority of the soil is bluepoint loamy fine sand*

and LS = *0.11 for 60' average sheet flow length and 1% average slope from (table B-3)*

and C = *0.2 for no appreciable canopy and 20% ground cover from (Table B-2)*

and P = *1 for no conservation practice*

and the watershed is 46% impervious and an additional 12% is xera-scaped with rock on filter cloth. Only 42% is exposed to erosion.

Y_s = *7.7 tons = 2,252 ppm (weight)*

Equivalent Bulking Factor = *0.08% (Developed)*

BF = *1.000*

SOILS

Most of the Basin is "BCC" Blueprint loamy fine sand K=0.17.

A small portion of the upper watershed is "BKD"-Bluepoint-Kokan Association. Kokan is a gravelly sand. This analysis conservatively assigns K=0.17 for Kokan so the predicted sediment yield may be slightly higher than expected from more detailed analysis giving Kokan a weighted fraction and calculating a composite K value.

**All K values are from USDA field office Corrinne Brooks (761-5444)*

SEDIMENT TRAP FOR BASIN OS-2

Basin OS-2 conveys 167.38 tons of sediment during the 100-yr 24hr storm. a pond two times that size will have a required volume of about 0.128 ac-ft where the density of the soil is 120 lb/ft^3. The pond has a volume of 0.19 ac-ft.

APPENDIX A.1 - HYDROLOGY (Developed Conditions)

A-4 Time of Concentration Calculations & Discussions

A-9 Revised Rio Bravo AHYMO Summary

A-16 Revised Rio Bravo AHYMO Input

A-27 Revised Rio Bravo AHYMO Output

A-95 Rio Bravo Pond #10 Volume Calculations

A-96 Revised Sacate Blanco AHYMO Summary

A-98 Revised Sacate Blanco AHYMO ~~Output~~ Input

A-101 Revised Sacate Blanco AHYMO ~~Input~~ Output

TIME OF CONCENTRATION DISCUSSION

Generally speaking, the longest path through the new basins is from the Northwest corner to the Southeast corner of each basin. Since the streets are typically oriented north/south and east/west, the length of the path is measured first along the north boundary at a 2% to 4% slope and then along the east boundary at a flat slope 0.5%. The resulting times of concentration are significantly longer than originally used in the DMP. The RTI flood plain study also uses longer times in Basin B-5. So even though the density of development and impervious cover were increased, the resulting peak flows were decreased due to the increased travel times through each basin.

The new "times to peak" in the new drainage basins vary from 0.13 hrs to 0.29 hrs in basins #208B and 214 respectively with peak flows of 3.31 cfs/ac and 2.31 cfs/ac at 47% and 57% respectively.

The old peak flow from basin B-5 (this site) is 2.85 cfs/ac at 34% impervious and with a "time to peak"of 0.17 hrs. The old DMP drainage patterns were probably on a diagonal (NW to SE). The new DMP accounts for some very long, very flat drainage paths along the east side of several of the basins. The new longer "times to peak" are based on actual layouts with actual lengths and slopes.

The Upland Method seems to be reasonable in predicting surface drainage velocities in the upper 2,000 feet of the watershed where flow depths are typically below top of curb in the streets. The factors of 0.7, 1.0 and 2.0 seem applicable for developed conditions for the first 100 feet draining through yards, the next 300 feet in the street and then the next 1,600 feet also in the street, respectively. But the velocities in 24" pipes and 1' deep channels are

under-predicted. At 2% slope the upland factors should be 7.0 to 11.0, respectively. This factor will be applied to reaches where all of the flow is in the pipe or channel. Reaches where the flow is divided between surface and pipe, a weighted average will be estimated. The factor of 11.0 applies to pipes 48" or larger and concrete channels flowing 1 foot deep or deeper. The factors of 7.0 and 11.0, also produce nearly the same velocity as mannings at 0.5% slope where the hydraulic radius is 0.5 and 1.0, respectively.

TIME OF CONCENTRATION COMPUTATIONS

SHEET. 1 OF 2

Basin ID	Length (ft)	Slope %	K	V (fps)	Tc (min)	Tp (hr)
60122	100	0.5	0.7	0.50	3 4	
	300	2.5	1.0	1.58	3.2	
	400	2.5	2.0	3.16	2.1	
	500	0.5	2 0	1.41	5 9	
					14 5	0.16
60123	100	0 5	0.7	0.50	3.4	
	300	4 0	1.0	2.00	2 5	
	300	4.0	2 0	4.00	1.3	
	1300	0.5	7.0	4.95	4.4	
	400	0.3	11.0	5.50	1.2	
					12.7	0.14
60124	100	0.5	0.7	0.50	3.4	
	300	2.5	1.0	1.58	3 2	
	1200	2.5	2 0	3 16	6.3	
	300	1.0	2.0	2.00	2.5	
	1200	0.5	11.0	7.78	2 6	
					17.9	0 20
60125	400	0 5	1.0	0.71	9.4	
	600	0.5	2.0	1 41	7.1	
					16.5	0.18

Basin ID	Length (ft)	Slope %	K	V (fps)	Tc (min)	Tp (hr)
60126	100	0 5	0 7	0.50	3.4	
	300	2.6	1 0	1.61	3.1	
	1600	2 6	2 0	3.22	8.3	
	400	2.6	7.0	11.29	0.6	
	1300	1.2	11.0	12.05	1 8	
					17.1	0.19
60127	400	1.0	1.0	1 00	6.7	
	900	1.0	2.0	2.00	7.5	
					14.2	0.16
60128	100	0 5	0 7	0.50	3.4	
	300	2.0	1.0	1.41	3.5	
	300	2.0	2 0	2.83	1.8	
	1200	0.6	7 0	5.42	3.7	
					12.4	0.14
201, 202	400	20.0	0 7	3.13	2 1	
, & 203	500	10.0	2.0	6.32	1.3	
	1100	7.0	2 0	5.29	3.5	
	2000	5.0	3 0	6.71	5.0	
					11.9	0.13
204	100	0.5	0.7	0.50	3.4	
	300	3.6	1.0	1.90	2.6	
	900	3.6	2.0	3.79	4 0	
	550	0 5	2.0	1.41	6.5	
	1150	2.8	7.0	11.71	1.6	
	650	1.0	11.0	11.00	1.0	
					19.1	0.21

Basin ID	Length (ft)	Slope %	K	V (fps)	Tc (min)	Tp (hr)
205	100	0.5	0.7	0.50	3.4	
	300	4.6	1.0	2.14	2.3	
	250	4.6	2.0	4.29	1.0	
	500	0.5	2.0	1 41	5.9	
	800	4.2	7.0	14.35	0 9	
	2200	0 6	11.0	8.52	4 3	
					17.8	0.20
206	100	0 5	0.7	0 50	3.4	
	300	3 2	1.0	1.79	2 8	
	600	3.2	2 0	3.58	2.8	
	200	0.5	2 0	1.41	2.4	
					11 3	0 13
207	170	1.0	0 7	0.70	4 0	
	230	1.1	1.0	1.02	3.7	
	400	3.2	2.0	3.56	1.9	
	550	4.0	2.0	4.00	2.3	
	130	2.0	2.0	2.83	0 8	
	400	1 0	2.0	2.00	3.3	
					16.1	0.18
208A	100	0 5	0.7	0.50	3.4	
	200	1.6	1 0	1.26	2.6	
	100	1.3	1.0	1.14	1.5	
	1200	3.7	2 0	3 82	5.2	
	250	4 0	5 0	10 00	0.4	
	320	2.1	11.0	16.02	0.3	
					13.4	0 15

Basin ID	Length (ft)	Slope %	K	V (fps)	Tc (min)	Tp (hr)
208B	100	0 5	0 7	0 50	3.4	
	300	3.0	1 0	1.73	2.9	
	460	2.9	2.0	3.41	2.3	
	170	4 0	3.0	6.00	0.5	
	640	4.4	7.0	14.68	0.7	
	200	2.1	7.0	10.14	0 3	
					10.0	0.13
209	400	0 5	1.0	0 71	9.4	
	800	0.5	2 0	1.41	9.4	
	800	1 3	2.0	2.28	5.8	
					24.7	0.27
210	400	3 6	1 0	1.90	3.5	
	1600	3.6	2.0	3.79	7.0	
	1600	3.2	11.0	19.68	1.4	
					11.9	0.13
211 SW	100	0.5	0.7	0.50	3.4	
	300	0.6	1.0	0.77	6 5	
	380	0.6	2 0	1.55	4.1	
	700	5.0	2 0	4.47	2.6	
	460	2.0	7.0	9.90	0.8	
	1400	2 4	11.0	17.04	1.4	
					18 7	0.21
211 SE	100	0.5	0.7	0.50	3.4	
	180	1.0	1 0	1.00	3.0	
	1160	2.3	2.0	3.03	6.4	
	170	4.0	2.0	4.00	0.7	
	500	1.0	5 0	5.00	1.7	
	630	0 7	11 0	9.20	1.1	
					16.3	0 18

Basin ID	Length (ft)	Slope %	K	V (fps)	Tc (min)	Tp (hr)
211 N	100	0.5	0.7	0.50	3.4	
	170	0 6	1.0	0.77	3.7	
	730	3.5	2 0	3.74	3.3	
	260	0.6	2.0	1.55	2.8	
	1000	2.2	5.0	7.42	2.2	
	400	0.8	7.0	6.26	1.1	
	2150	0.7	11.0	9.20	3.9	
					20.3	0.23
212	400	1 0	1.0	1.00	6.7	
	1200	1.0	2.0	2 00	10.0	
					16.7	0.19
213	400	2.7	1 0	1.64	4.1	
	2300	2.7	11.0	18.07	2.1	
					6.2	0.13
214	100	0.5	0.7	0.50	3.4	
	300	3.1	1.0	1.76	2 8	
	100	3.1	2.0	3.52	0.5	
	770	0.6	2 0	1.55	8 3	
	1400	0.3	11 0	6.32	3.7	
					18.7	0.21
215	100	0.5	0.7	0.50	3.4	
	200	1 5	1 0	1.22	2.7	
	500	0.5	2 0	1.41	5.9	
	1950	0.4	7.0	4.43	7.3	
					19.3	0.21
216	400	2.7	1.0	1.64	4.1	
	1600	2.7	2.0	3.29	8.1	
					12.2	0.14

```
(s16.66H
 AHYMO P    AM SUMMARY TABLE (AHYMO_97) -                          ERSION:  1997.02d      RUN DATE (MON/DAY/YR) =08/25/20
 INPUT    _ = C:\DOCUME~1\DOUG~1.GOO\Desktop\RB_DMP.DAT                                   USER NO.= AHYMO-I-9702dGoodwir

                              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

                                                                                                          TIME=       .00
 START
 *S
 *S             RIO BRAVO
 *S
 *S
 *S
 *S 100-YR, 24-HR STORM WITHOUT SEDIMENT
 *S FILE NAME: RB_DMP.DAT
 *S BY: RICHARD STOCKTON
 *S REVISED BY JAMES D. HUGHES @MARK GOODWIN AND ASSOCIATES 8-25-03.
 *S LAST REVISION: 4-22-98
 *S*************************************************************************
 *S THE PURPOSE OF THIS MODEL IS TO CALCULATE THE RUNOFF FROM FROM THE
 *S SACATE BLANCO WATERSHED WEST OF THE POWERLINE EASEMENT (AKA SOUTH
 *S POWERLINE DIVERSION AND DETENTION FACILITY);
 *S AND THE RIO BRAVO WATERSHED.
 *S
 *S FLOWS FROM THIS WATERSHED ARE CONVEYED TO HUBBLE LAKE DETENTION
 *S FACILITY VIA THE HUBBLE LAKE/AMOLE DIVERSION CHANNEL.
 *S
 *S THE ORGINIAL RIO BRAVO MODEL WAS DEVELOPED BY AVID (AND ACCEPTED BY
 *S THE COUNTY).  ASSUMPTIONS MADE IN THE AVID MODEL ARE INVALID, AND HAVE
 *S BEEN CORRECTED WITH THE 4-25-03 REVISIONS. DIVERSIONS TO THE BOREGA DAM
 *S AND THE AMOLE CHANNEL REDUCE THIS BASIN AND 114 AC. OF THE SACATE BLANCO
 *S BELOW THE POWER LINE IS ADDED TO THE RIO BRAVO CHANNEL.
 *S PONDS 7 & 9 ARE DELETED AND POND 10 IS ADDED.
 *S*********************************************************************
 *S ANALYSIS ASSUMPTIONS:
 *S*********************************************************************
 *S 1. ALL LAND IN THE RIO BRAVO BASIN IS MODELED AS DEVELOPED CONDITION AT
 *S    6 DU/AC, EXCEPT ANDERSON HILLS WHERE LOWER DENSITIES ARE CERTAIN, AND
 *S    EXCEPT IN BASINS 201 AND 202 WHERE THERE IS NO LIGHT.
 *S 2. THE PUNCH HYD COMMAND WAS ADDED TO THE END OF THIS FILE SO THE OUTFALL
 *S    HYDROGRAPH COULD BE USED IN THE AMOLE DEL NORTE EXISTING CONDITIONS MODEL
 *S    AA100D1B.DAT, WHICH WILL BE USED IN THE ANALYSIS OF THE AMOLE ARROYO SYSTE
 *S
 *S 3. NO BULKING FACTORS WERE ADDED TO THE AREA TRIBUTARY TO THE RIO BRAVO
 *S    CHANNEL DUE TO THE INCORPORATION OF DETENTION PONDS. HOWEVER, BULKING FACT
 *S    HAVE BEEN ADDED TO BASINS TRIBUTARY TO HUBBELL CHANNEL AND LAKE.
 *S
 *S*************************************************************************
 *S RAINFALL FROM NOAA ATLAS 2
 *S THESE VALUES WERE REDUCED FOR AREA BY 12%, 5% AND 3% FOR 1, 6, AND 24 HOUR
 RAINFALL  TYPE= 2                                                                          RAIN24=    2.660
 *S*************************************************************************

 *S*******************************************************
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A-4

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*S ADD BASINS FROM SOUTH POWERLINE DIVERSION
*S TO THE RIO BRAVO RUN
*S
*S*******************************************************
*S
*S  APPLY A 3% SEDIMENT BULKING FACTOR TO ALL COMPUTED HYDROGRAPHS
SEDIMENT BULK                                                                                    PK BF =     1.03
*S CALCULATE THE FLOW FROM SUB-BASIN A60106
COMPUTE NM HYD        A60106   -     1        .05010        96.02        4.192      1.56878    1.500    2.995 PER IMP=  49.00
*S
```