MCMAHON BOULEVARD EXTENSION

PRELIMINARY DRAINAGE REPORT

July 2009

Prepared for:
City of Albuquerque
Department of Municipal Development
Transportation Division
One Civic Plaza
Albuquerque, New Mexico 87102

Prepared by:
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6501 Americas Parkway NE, Suite 900
Albuquerque, NM 87110

URS Project Number: 24343019

URS

1. INTRODUCTION

This drainage report is for the two lane extension of McMahon Boulevard to Universe Boulevard and the extension of Universe Boulevard to McMahon Boulevard. Both streets will eventually be median-divided, four lane roads with two lanes in each direction. However, this project is providing construction plans for just the west half of Universe Boulevard and the north half of McMahon Boulevard. The purpose of this drainage report is to allow phased construction to proceed. This project is located on City of Albuquerque Zone Atlas page A-10. The project limits are shown on Figure 1 below.

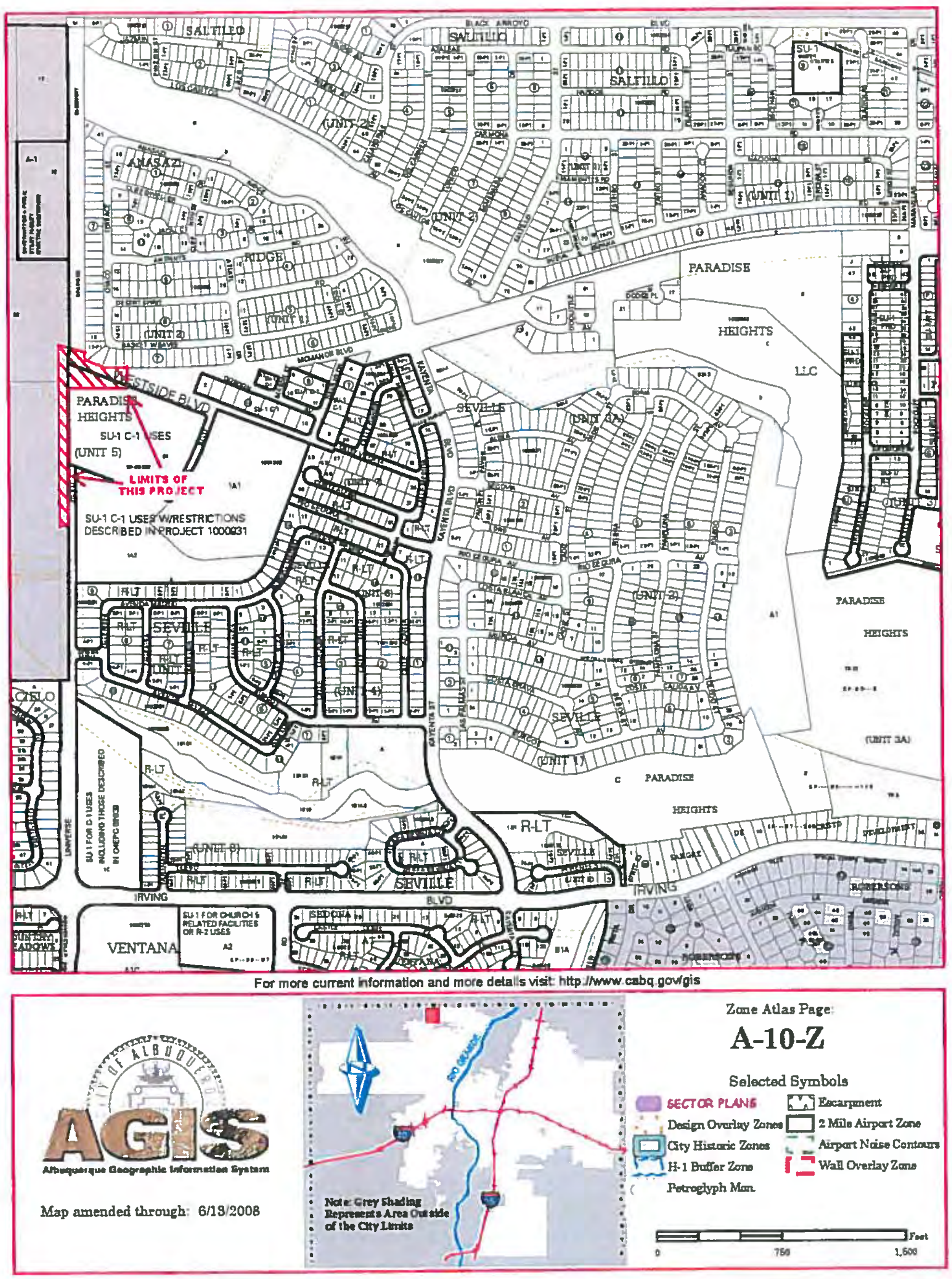


Figure 1 - Vicinity Map

2. PLANNING HISTORY

The *Albuquerque Technical Vocational Institute (TVI aka CNM) North West Side Master Drainage Plan* (TVI MDP) dated December 27, 2001 was prepared by, John Andrews, PE of Larkin Group NM, Inc., (see Appendix B for the 2001 TVI MDP and Figure 2 for Existing Watershed Boundaries of this project) and was approved by both the City of Albuquerque and Bernalillo County. The TVI MDP included the TVI North West Side Campus, 108 acres, bounded on the east by proposed Universe Boulevard, on the west by proposed Rainbow Boulevard, on the north by proposed McMahon Boulevard, and on the South by the West Branch of the Calabacillas Arroyo. The TVI MDP also planned for the future diversion of offsite basins OS-1, OS-2, OS-3, and OS-4 located north of McMahon Boulevard and west of Rainbow Boulevard. These offsite basins historically drained through the TVI campus. The TVI MDP identified storm sewer in McMahon Boulevard from Rainbow Boulevard to Universe Boulevard and in Universe Boulevard from McMahon Boulevard to the West Branch of the Calabacillas Arroyo which was sized to handle 100-YR runoff from future developed conditions in the upstream offsite basins. The MDP identified 5 phases. Only the first phase was constructed according to plan.

Construction Plans for the *TVI Northwest Site – Offsite Improvements* were prepared by John Andrews, PE, of Larkin Group NM, Inc., May 28, 2002. A Work Order was received from the City of Albuquerque, City Project # 6839.81, in October 2002 (see Appendix B for TVI Northwest Site Record Drawings dated May 15, 2003 by Larkin Group). The Record Drawings indicate that a 60 inch reinforced concrete pipe was constructed in Universe Boulevard from the West Branch of the Calabacillas Arroyo to about 150 feet north of the TVI entrance. The record drawings indicate that the design flow is 249 cfs where the pipe discharges into the Calabacillas Arroyo. The north end of the storm trunk line has a temporary plug 10 feet beyond a 36inch RCP lateral which is connected to the 36 inch storm drain line from the TVI site that collects all of the developed runoff from Phase 1 of the 2001 TVI MDP (about 40 cfs).

The Seville Subdivision Units 5 & 6 Basin Boundary Maps as received by City of Albuquerque Hydrology Section on January 6, 2003 were designed by Wilson and Company in Rio Rancho. This subdivision plan assumed that Universe Boulevard would prevent future developed flows from entering the Seville Subdivision, or any of the other undeveloped property east of Universe Boulevard, as shown for Basin F-1 in Appendix C on the 'Future Developed Conditions' map. The Seville Subdivision design extends an 18 inch storm sewer to the west end of Rio Segura Avenue to receive drainage from Basin F-1, not including any drainage from Universe Boulevard or any basins upstream of Universe Boulevard.

In 2003, Quail Ranch was annexed into the City of Rio Rancho including all of TVI's offsite basins. This changed the rate of stormwater runoff for future developed conditions in those basins. Randall Carroll, the City of Rio Rancho Floodplain Manager, met with URS and Floodplain Managers from the City of Albuquerque and Bernalillo County in April 2009 and provided copies of *Grading and Drainage Design Requirements and Policies for Land Development in Rio Rancho (revised 10-4-2007)*, located in Appendix D. The policy states that *"Unless restricted by specific infrastructure limitations, maximum discharge permitted from a developed property in the event of a 100-year, 6-hour storm shall be the amount of the historic or pre-developed runoff in all watersheds of the city."* This will limit the discharge from basin

OS-1 to the existing historic rate. Since the Rio Rancho annexation, increased flows from the TVI MDP offsite basins are no longer expected.

The *Albuquerque Technical Vocational Institute West Side Campus Phase 2* construction plans, dated 11-17-2005, were prepared by Van H. Gilbert Architect, and the associated Drainage Report, dated 11-18-2005, was prepared by Jeff Mulberry, PE, of Bohannan Huston, Inc. (see Appendix E). The report deviated significantly from the 2001 TVI MDP in that it did not include the second entrance on McMahon Boulevard and it did not provide for construction of any of the frontage improvements.

The *McMahon Blvd Inlet Calculations Affecting both Saltillo and Anasazi Subdivisions,* dated April 21, 2006, prepared by James D. Hughes, PE of Mark Goodwin and Associates, showed a high spot on McMahon Boulevard about 800 feet west of Universe Boulevard (see Appendix F). This implied that Basin OS-1 from the TVI MDP would drain along its historic path through the TVI campus instead of the Master Planned route east in McMahon Boulevard to Universe Boulevard and south in Universe Boulevard to the West Branch of the Calabacillas Arroyo. These calculations served as the basis for constructing the north half of McMahon Boulevard from the current west end of the pavement to the next high point which is located about 4,700 feet east of Universe Boulevard at Rockcliff Drive with very little storm sewer in McMahon Boulevard. The calculations demonstrated that McMahon Boulevard has adequate street drainage capacity in accordance with Section 22 of the City of Albuquerque Development Process Manual (DPM). These calculations have been verified as accurate for this design.

Additional planning history references are located in Appendix A.

3. Existing Drainage Conditions

Existing Watershed Boundaries are shown on Figure 2. Four existing drainage outfalls were constructed by previous projects.

1. Surface drainage in McMahon Boulevard, including runoff from Basins OS-1B and RW-1C (see Figure 3-2 for Existing Drainage Basins), flows east to existing storm inlets **located east of the Calabacillas Arroyo, which discharge into the arroyo through a 120 inch storm sewer below the bridge.**
2. Runoff from the Central New Mexico Community College (CNM) Westside Campus basin B-3 and upstream offsite basins OS-1 and RW-2, drain into **an existing 60 inch storm sewer located in Universe Boulevard about 150 feet north of the campus entrance which flows south and discharges into the West Branch of the Calabacillas Arroyo just below the bridge.** This pipe was constructed by CNM as part of the Phase 1 infrastructure as identified in their 2001 Master Drainage Plan. However, when CNM built Phase 2 in 2005 they did not construct any of the Master Planned infrastructure in Universe Boulevard or McMahon Boulevard. Phase 2 provided an onsite conveyance system rather than the Master Planned offsite conveyance system for runoff from offsite Basins OS-1 and RW-2.
3. Runoff from basin RW-1 drains east through the undeveloped property in the southeast corner of the intersection of McMahon Boulevard and Universe Boulevard and flows into **an 18 inch storm sewer at the west end of Rio Segura Avenue.**

4. Runoff from Basin OS-1A is conveyed north as **surface drainage in the drainage easement on the west side of Anasazi Ridge to the Calabacillas Arroyo.**

4. Developed Watershed Conditions

Both of the existing storm sewer outfalls in McMahon Boulevard and Universe Boulevard were sized to receive runoff from the Developed Drainage Basins. as shown on Figure 3. The only storm sewer being constructed with this project is 325 linear feet of 24 inch storm sewer trunk line to pick up drainage from the portion of Basin RW-1 that drains to Inlets #1, 3, and 5 at the Universe Boulevard sump. The new 24 inch storm trunk will discharge to the existing 60 inch storm sewer in Universe Boulevard. The design flow to each of the new inlets was calculated for Future Watershed Conditions by subdividing Basin RW-1 into the sub-basins as shown on Figure 5. This project will build inlets to receive drainage from the west half of Universe Boulevard and a stub out to the future inlets in the east half of Universe Boulevard.

5. Future Watershed Conditions

Future Watershed Boundaries are shown on Figure 4. Future development of Phase 3 of CNM is expected to accommodate existing historic flow rates from Basin OS-1 and RW-2 through the CNM campus instead as it was shown on the CNM 2001 Master Drainage Plan which consisted of a diversion around the campus (see Figure 4.6 of the 2001 TVI Master Drainage Plan in Appendix B for Future Drainage Basins). Luis Campos, CNM Executive Director of the Physical Plant, met with URS, the City of Albuquerque, and Bernalillo County on April 24, 2009. In the meeting, Mr. Campos agreed to the new alignment for drainage from Basin OS-1 and RW-2 through the campus with the idea that it would be less expensive than the previous longer route around the campus. The future construction of the east half of Universe Boulevard and the south half of McMahon Boulevard will include the construction of inlets at the sumps in the two streets which will be connected to pipe stubs being installed as part of this construction and previous construction projects respectively and are sized to receive developed 100-YR runoff from the future developed condition.

6. Hydrology Calculation Procedures

The City of Albuquerque DPM procedures and Arid Land Hydrologic Modeling (AHYMO) are used to calculate the peak 10-YR and 100-YR flow rates for post-project conditions and includes a sediment bulking factor of 1.10 for 10% sediment by volume. The 100-YR precipitation values are P_{60}=1.90", P_{360}=2.26", and P_{24}=2.75" according to the DPM Section 22.2, Figures C-1, C-2, and C-3. Existing land uses are estimated based on 2008 aerial photos and 2005 topography from the Bernalillo County GIS website. The hydrology input data and 100-YR peak flow rates are summarized in Table 1. Appendix A contains the AHYMO input and output data.

Table 1 - Summary of Hydrology

BASIN ID	AREA		LAND TREATMENT (%)				t_p	PEAK 100-YR FLOW(2)		PEAK 10-YR FLOW(2)	
	(AC)	(SQ MI)	A	B	C	D	(HR)	Inc. (cfs)	Cum (cfs)	Inc. (cfs)	Cum (cfs)
EXISTING CONDITIONS (See Figure 2)											
RW-1	3.7	0.0058	25	0	75	0	0.13	10.15	199.80	4.62	102.32
OS-1	29.9	0.0467	100	0	0	0	0.22	28.90		5.58	
RW-2	5.0	0.0078	85	0	15	0	0.13	8.50	35.67	2.13	7.32
B-3	47.7	0.0745	25	5	30	40	0.13	159.12	189.65	86.79	92.80
OS-1A	12.1	0.0189	90	0	10	0	0.13	19.72		4.61	
OS-1B	3.8	0.0059	90	0	10	0	0.13	6.16		1.44	
RW-1C	11.6	0.0181	20	0	55	25	0.13	37.42	43.58	19.80	21.24
Subtotal	113.8	0.1777									
DEVELOPED CONDITIONS (See Figure 3)											
RW-1	3.7	0.0058	0	0	87	13	0.13	12.71	202.36	7.00	99.80
OS-1	29.9	0.0467	100	0	0	0	0.22	28.90		5.58	
RW-2	5.0	0.0078	85	0	15	0	0.13	8.50	35.67	2.13	7.32
B-3	47.7	0.0745	25	5	30	40	0.13	159.12	189.65	86.79	92.80
OS-1A	12.1	0.0189	90	0	10	0	0.13	19.72		4.61	
OS-1B	3.8	0.0059	90	0	10	0	0.13	6.16		1.44	
RW-1C	11.6	0.0181	20	0	50	30	0.13	38.36	44.52	20.70	22.14
Subtotal	113.8	0.1777									
FUTURE CONDITIONS (See Figure 5)											
RW-1.1	0.38	0.0005	0	0	33	67	0.13	1.39		0.87	
RW-1.2	0.38	0.0005	0	0	33	67	0.13	1.39		0.87	
RW-1.3A	1.64	0.0027	0	0	100	0	0.13	5.56		2.92	
RW-1.3B	0.51	0.0011	0	0	33	67	0.13	2.89		1.82	
RW-1.4	0.50	0.0011	0	0	33	67	0.13	2.89		1.82	
FUTURE CONDITIONS (See Figure 4)											
RW-1	3.7	0.0058	0	0	74	26	0.13	13.48	163.97	7.72	101.62
OS-1	29.9	0.0467	100(1)	0	0	0	0.22	28.90		5.58	
RW-2	5.0	0.0078	0	0	40	60	0.13	20.83	45.64	12.91	16.80
B-3	35.5	0.0555	0	10	20	70	0.13	150.49	163.97	93.90	101.62
OS-1A	12.1	0.0189	75	0	20	5	0.13	23.49		7.54	
OS-1B	3.8	0.0059	75	0	20	5	0.13	7.35		2.36	
RW-1C	11.6	0.0181	0	0	40	60	0.13	48.32	55.67	29.95	32.31
Subtotal	113.8	0.1777									

Notes:

(1) Future conditions OS-1 will be limited to historic runoff rate. Thus Group A is appropriate for Existing, Developed, and Future Conditions.

(2) All flow rates are bulked by a factor of 1.10 for 10% sediment by volume.

7. HYDRAULIC CALCULATION PROCEDURES

The City's DPM Section 22 is used to establish the drainage design criteria for this project. It requires that the 10-YR water spread will allow for one lane to remain open in both directions. In order to keep one lane open, the allowable depths may not exceed 0.33 foot for 10-YR flows on

Universe Boulevard. Street flow depths and inlet capacities are summarized in Table 2 below, and the DPM nomographs used to determine the depths and capacities are at the end of Appendix A. Inlets #5 and #6 are sump inlets with a capacity of 3.43 cfs at 0.33 foot depth and a capacity of 10.44 cfs at 0.67 foot depth per broad crested weir calculations shown on Plate D-5, and the depths and lengths used for sump calculations grate are on DWG 2207 and 2220 respectively also located at the end of Appendix A.

The DPM Section 22.2.D.3.a states that *"Sump designs for catch basins should normally be limited to local streets and only those situations where terrain or grading considerations warrant their use. When specifying a sump catch basin(s) the designer shall ensure that surrounding properties are protected from the occurrence of system clogging by demonstrating that one of the following emergency backup conditions exist:*

> *1) The design storm peak flow rate will release to either a public R.O.W. or public easement without rising above any adjacent structure pad elevations; or*
>
> 2) *Sufficient storage is available within a combination of public R.O.W., public easement, and non-structurally occupied private properties to hold 100% of the design event volume, without inflicting damage to structures, until such time as the underground system can be unclogged."*

The emergency criteria can not be met but emergency overflow is not likely because, the grates have more than enough capacity even if they become 50% clogged. This sump is necessary in this minor arterial street to fit the terrain. If the road were raised enough (about 6 feet) to drain south, the access to the property east of Universe Boulevard would be unduly restricted. The property east of Universe Boulevard does not currently have a drainage easement to receive emergency overflow from the sump inlets, but the historic path of drainage does run through that property.

At least one inlet must be placed at the low spot on both sides of the right-of-way. Additional inlets are required because the 10-YR flows exceed the capacity of a single grate. So additional inlets are placed on both sides of the sump at locations where the slope flattens to the point where the 10-YR spread of water exceeds the allowable spread of 12 feet (where the slope is 0.30% about 25 feet to the south of both sumps and about 25 feet north of the east sump, and where the slope is about 1.7% about 135 feet north of the west sump). The northern most inlet on the west side is also located so that it will catch most of the flow from CNM (Basin RW-1.3A) where it enters the street.

The type of inlets selected at each location is in accordance with DPM Section 22.2.D.3.b. *"'Type A' basins are used as the first basin in a battery of basins. The 'Type A' basin performs the function of sweeping debris of the street upstream of the grating and minimizing clogging. 'Type C' basins are generally placed downstream of and/or in conjunction with 'Type A' basins. If 'Type C' basins are used without a 'Type A' within 150 feet upstream, the capacity shown in Plates 22.3 D-5 and 22.3 D-6 should be reduced 15% for clogging."*

Table2 - Street Drainage Capacities

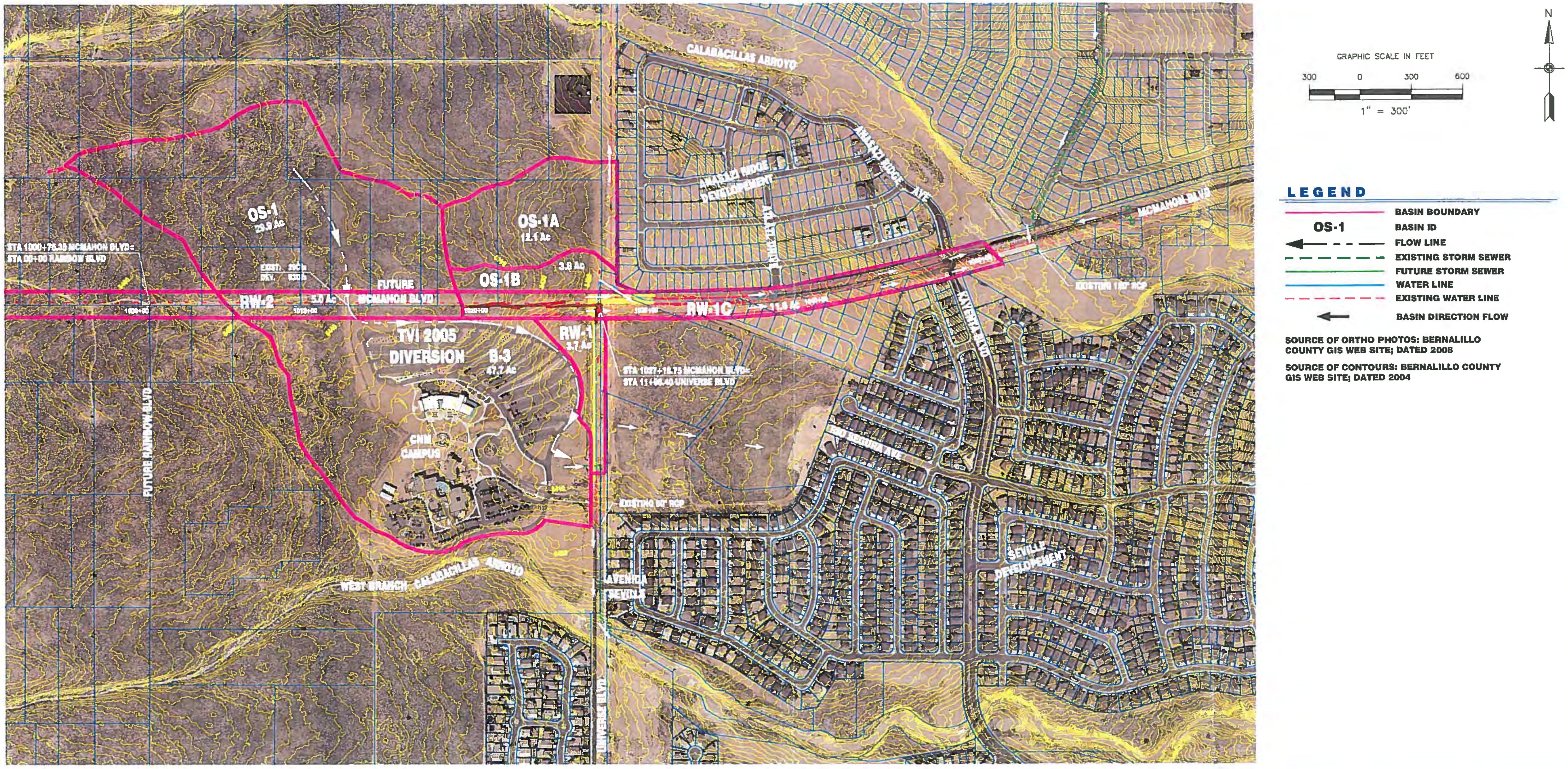
Inlet #	Contributing Basins	Flow Approaching Grate (cfs)	Curb Type & Slope	Flow Depth[1] (ft)	Flow Into Grate[2] (cfs)	Flow Bypassing Grate (cfs))	Downstream grate #	Location
1	RW-1.1	0.87 cfs 10-Yr	48' Std 0.3%	0.27	0.87	0	5	112+80 Lt Universe
2	RW-1.2	0.87 cfs 10-Yr	48' Std 0.3%	0.27	0.87	0	6	112+80 Rt. Universe
3	RW-1.3A & RW-1.3B	4.74 cfs 10-Yr	48' Std 1.74%	0.33	3.20	1.54	5	114+40 Lt. Universe
4	RW-1.4	1.82 cfs 10-Yr	48' Std 0.3%	0.33	1.60	0.22	6	113+30 Rt. Universe
5	RW1.1 & RW-1.3A & B	1.54 cfs 10-Yr	48' Std 0.0%	<0.33[3]	1.54	0	N/A	113+05 Lt. Universe
6	RW-1.2 & RW-1.4	0.22 cfs 10-Yr	48' Std 0.0%	<0.33[3]	0.22	0	N/A	113+05 Rt. Universe
1	RW-1.1	1.39 cfs 100-Yr	48' Std 0.3%	0.30	1.30	0.09	5	112+80 Lt Universe
2	RW-1.2	1.39 cfs 100-Yr	48' Std 0.3%	0.30	1.30	0.09	6	112+80 Rt. Universe
3	RW-1.3A & RW-1.3B	8.45 cfs 100-Yr	48' Std 1.74%	0.40	4.80	3.65	5	114+40 Lt. Universe
4	RW-1.4	2.89 cfs 100-Yr	48' Std 0.3%	0.38	2.25	0.64	6	113+30 Rt. Universe
5	RW1.1 & RW-1.3A & B	3.74 cfs 100-Yr	48' Std 0.0%	<0.67[3]	3.74	0	N/A	113+05 Lt. Universe
6	RW-1.2 & RW-1.4	0.73 cfs 100-Yr	48' Std 0.0%	<0.67[3]	0.73	0	N/A	113+05 Rt. Universe

Notes:
(1) Flow depths are taken from Plate 22.3 D-3 (Appendix A) of the DPM.
(2) Grate Capacities are taken from Plate 22.3 D-5 (Appendix A) of the DPM.
(3) Sump Grate Capacities calculations are discussed above.

The 100-YR Hydraulic Grade Line (HGL) is shown on the final construction plans located in Appendix A. The calculations used equations from the DPM Section 22.3.B and started at the existing 60 inch pipe on the downstream end with the original design flow rates (100-YR) and corresponding HGL elevation from the 2002 TVI offsite improvement record drawings, City Project No. 6839.81. Since the 2002 peak flow rate of 242 cfs is more conservative than either the developed 100-YR rate of 202.36 cfs or the future 100-YR rate of 163.97 cfs then CNM may discharge higher peak flow rates than currently planned without exceeding the capacity of the Universe Boulevard storm drainage system. Peak flow rates in the new pipes being constructed by this project are so small that minimum pipe sizes of 24 inches for the main and 18 inches for the laterals will keep the 100-YR HGL about 4 geet below the surface and inside the pipe at the upstream end.

8. Soils

Soils are mapped by the National Resource Conservation Service (NRCS) as Loamy Fine Sand (see Appendix G - NRCS Soil Report). The non-cohesive fine sand is highly susceptible to erosion when exposed to concentrated flows, but there are no eroded arroyo thalwags in these drainage basins. The watershed drains from west to east with slopes ranging from 2% to 6%.

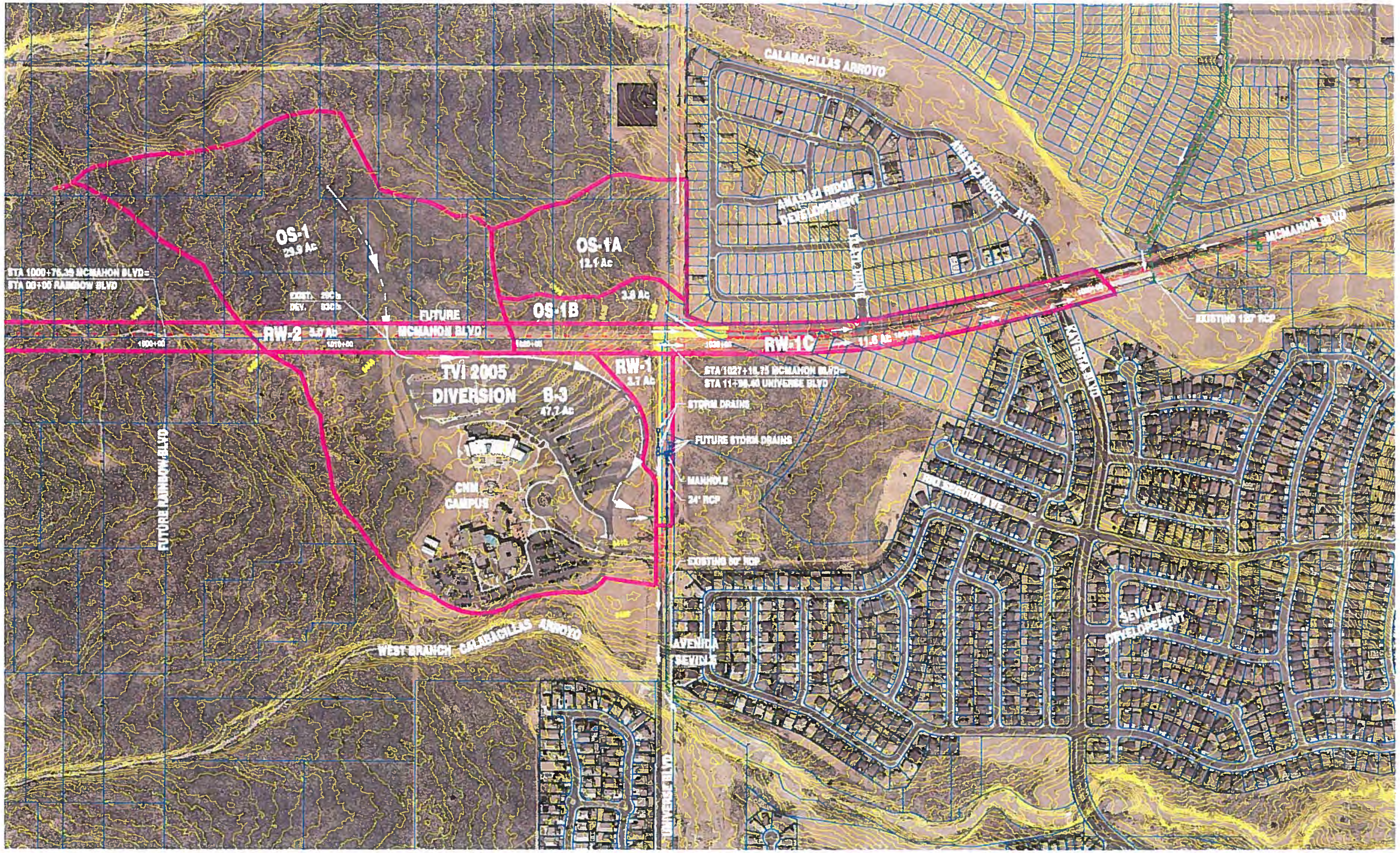


CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPEMENT

DRAINAGE BASIN MAP
EXISTING CONDITIONS

Figure 2

URS



GRAPHIC SCALE IN FEET

300 0 300 600

1" = 300'

N

LEGEND

- BASIN BOUNDARY
- OS-1 BASIN ID
- FLOW LINE
- EXISTING 60" STORM SEWER
- EXISTING 24" STORM SEWER
- FUTURE STORM SEWER
- WATER LINE
- EXISTING WATER LINE
- BASIN DIRECTION FLOW

SOURCE OF ORTHO PHOTOS: BERNALILLO COUNTY GIS WEB SITE; DATED 2008

SOURCE OF CONTOURS: BERNALILLO COUNTY GIS WEB SITE; DATED 2004

CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPEMENT

DRAINAGE BASIN MAP
DEVELOPED CONDITIONS

Figure 3

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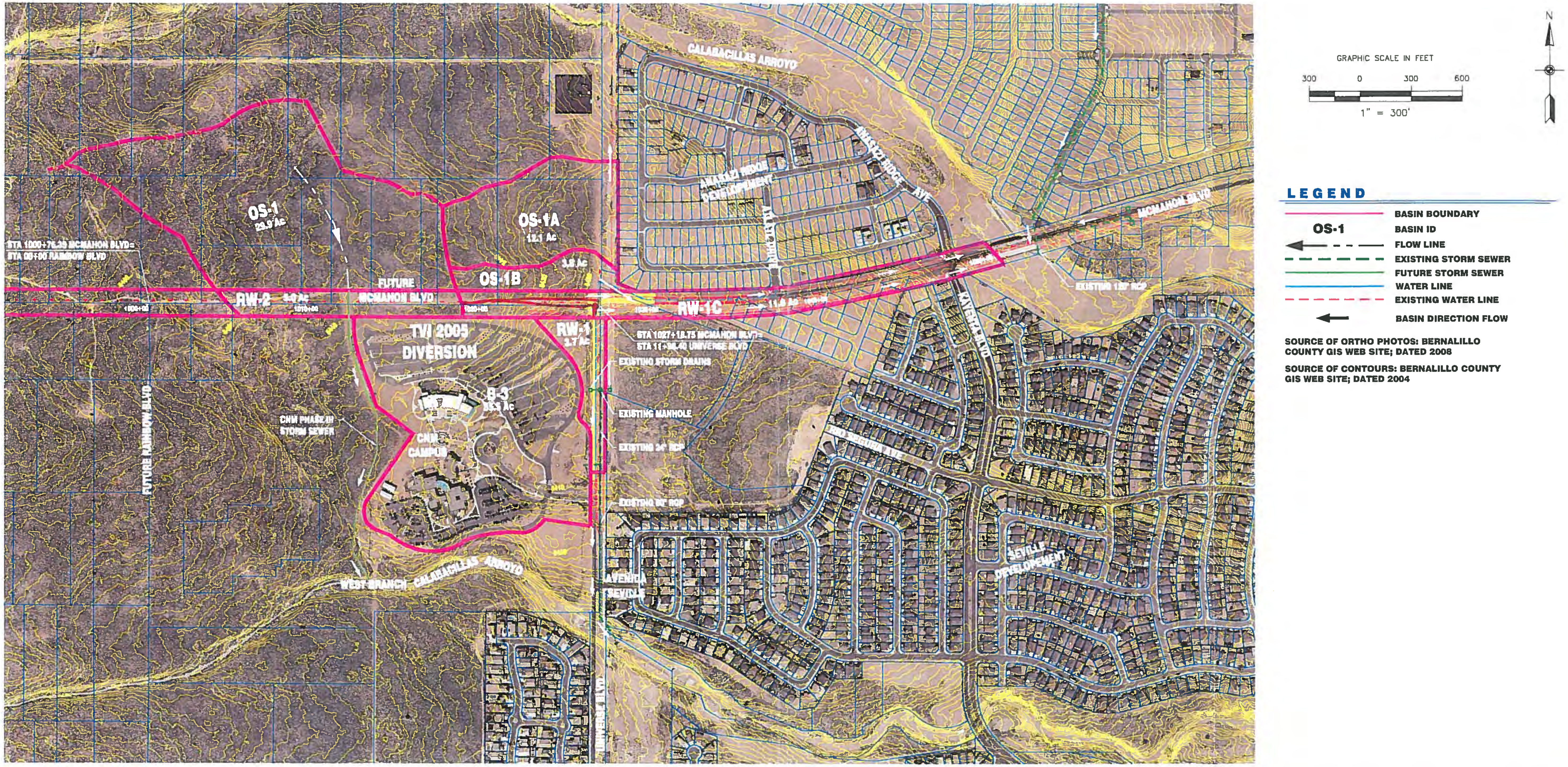

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DRAINAGE BASIN MAP
FUTURE CONDITIONS

Figure 4

URS

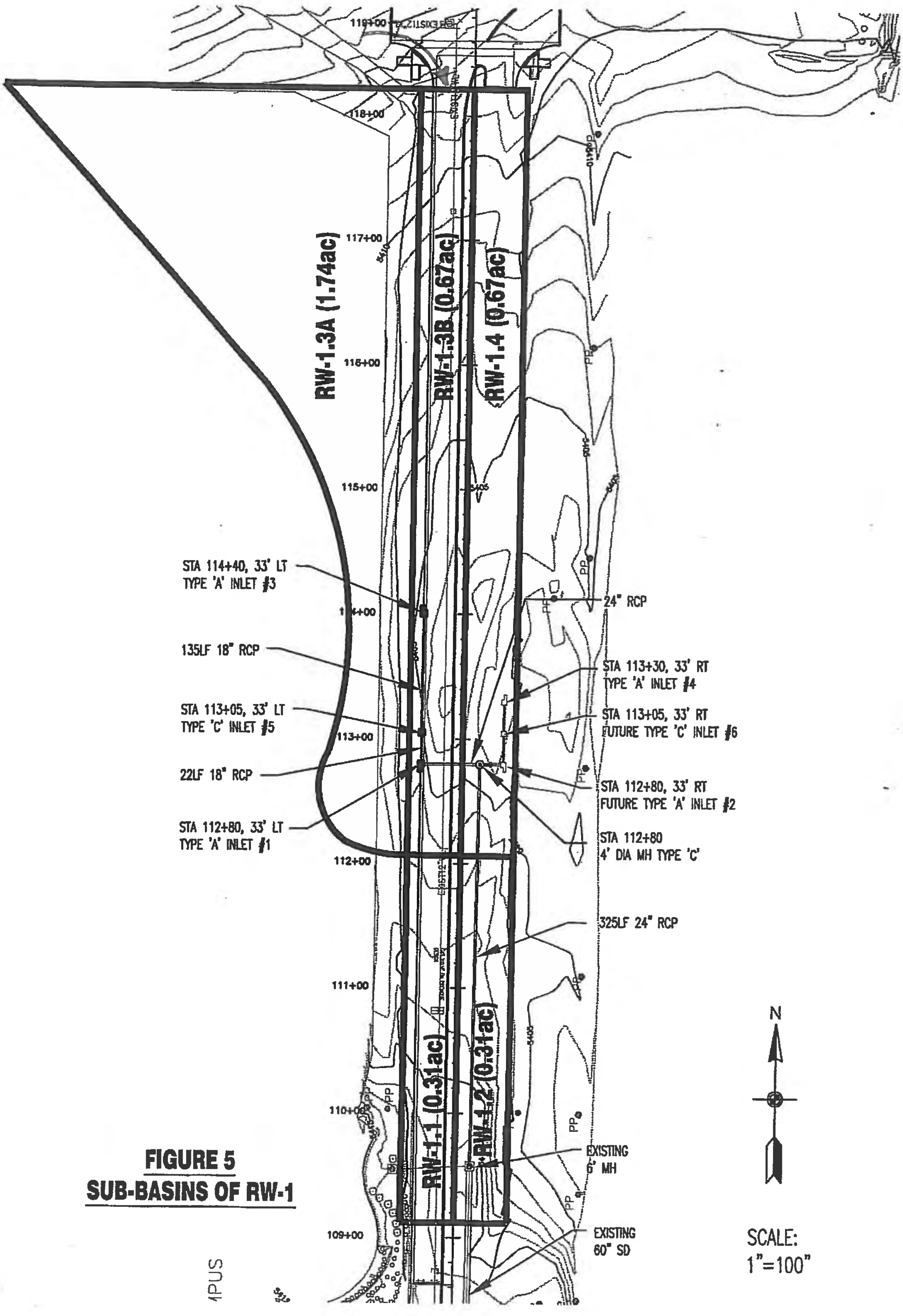
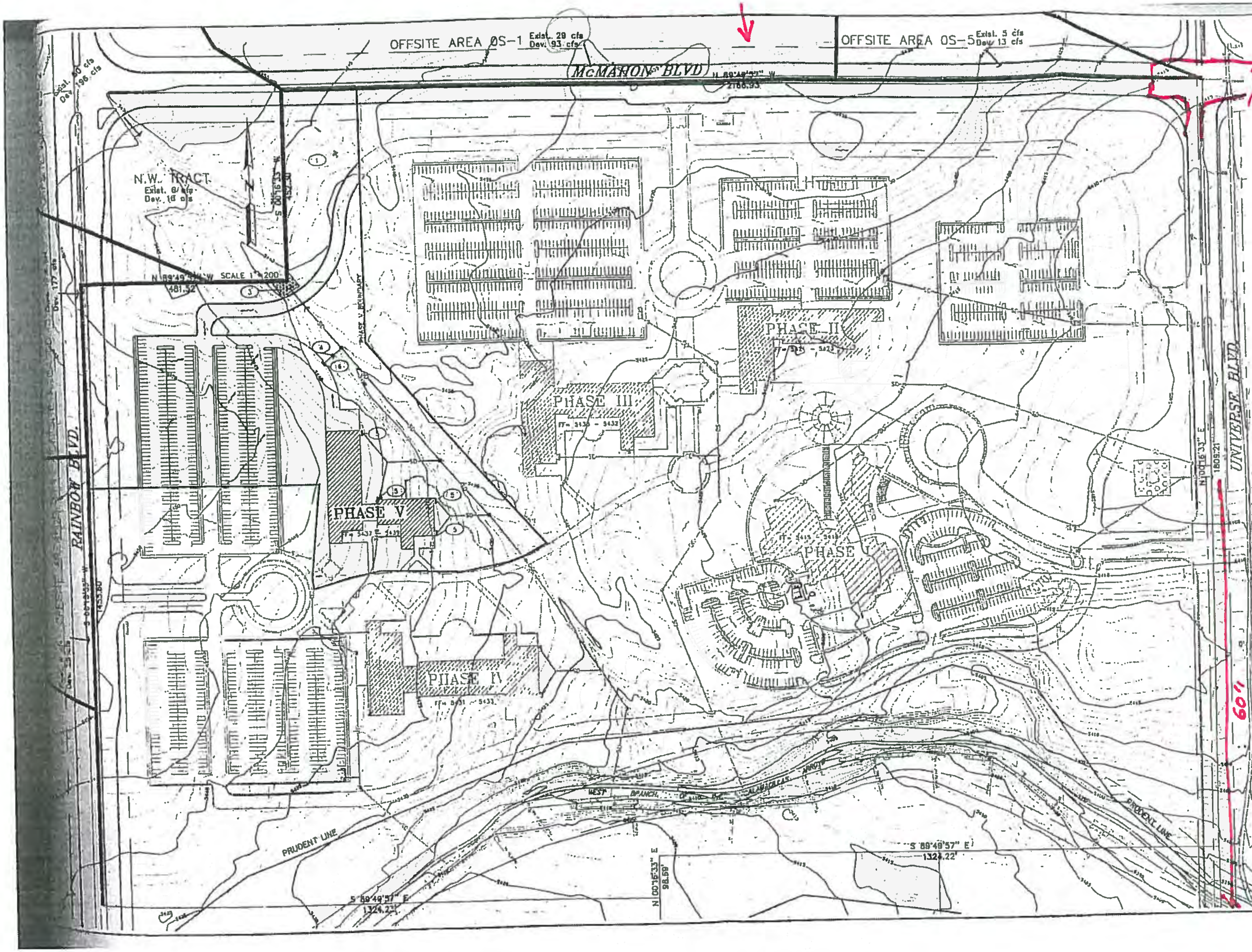


FIGURE 5
SUB-BASINS OF RW-1

RR | BC



KEYED NOTES

1. DO NOT DISTURB AREA
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS
7. ARROYO DROP STRUCTURES (TYPICAL)

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ON TE B

DWL ARCHITECTS

DWL ARCHITECTS & PLANNERS, INC OF NEW MEXICO

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TELEPHONE (505) 275-7500
FAX (505) 275-8748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE V

DRAWN BY: P.H.	DESIGNED BY: K.B.	CHECKED BY: J.A.A.
DATE: OCT. 2001	SHEET	PLATE 5

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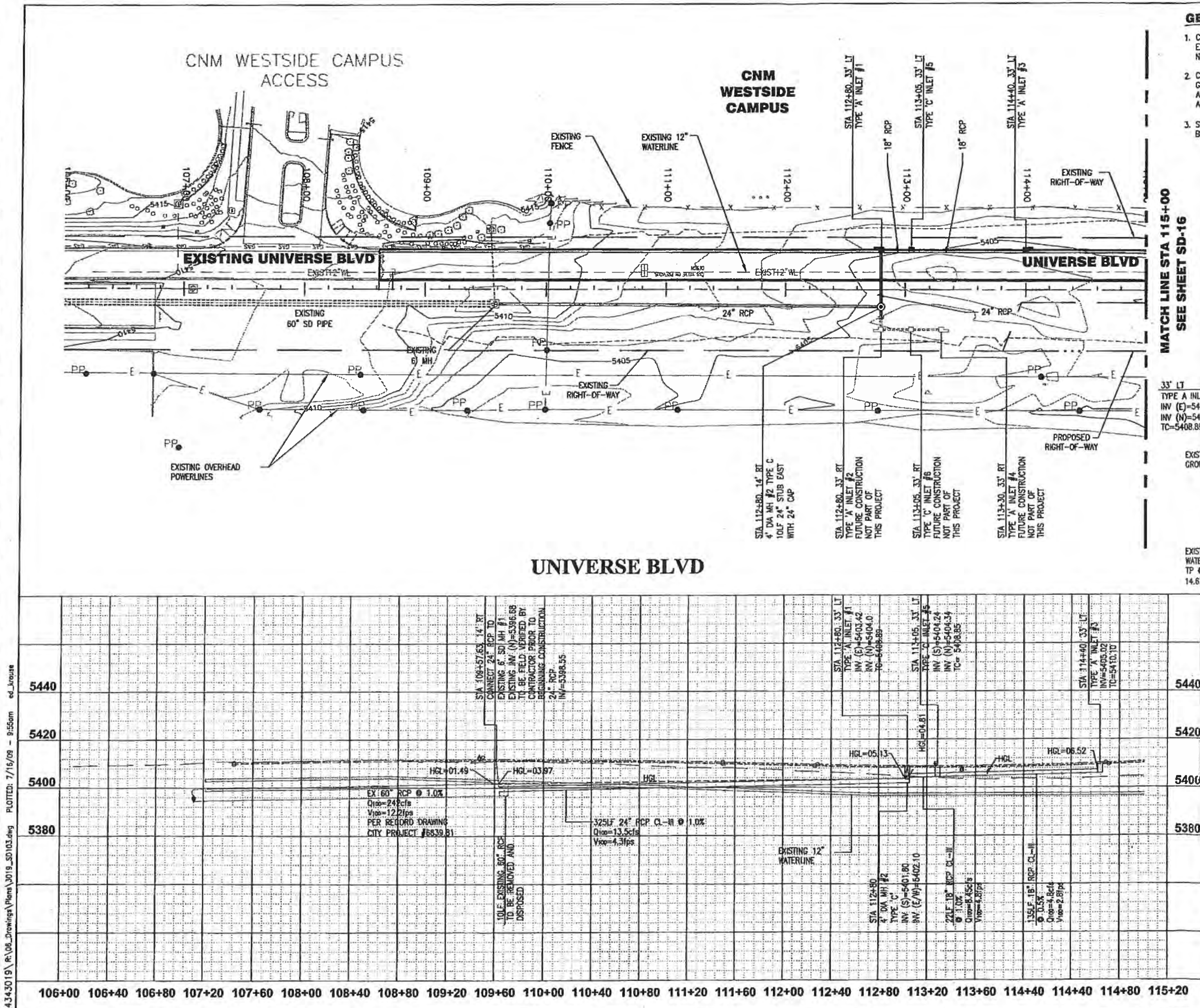


GENERAL NOTES

1. CONTRACTOR TO FIELD VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO BEGINNING CONTRUCTION AND NOTIFY ENGINEER OF ANY CONFLICTS.
2. CONTRACTOR IS RESPONSIBLE FOR PREPARATION OF NEW GRADE AT PNM POWER POLES TO BE RELOCATED BY PNM AND FOR COORDINATING CONSTRUCTION ACTIVITIES TO ACCOMODATE PNM POWER POLE RELOCATION.
3. SWPPP IS CONTRACTOR'S RESPONSIBILITY. THIS PROJECT MAY BE EXEMPT IF CONSTRUCTED DURING DRY SEASON.

AS BUILT INFORMATION: CONTRACTOR / DATE; WORK STAKED BY / DATE; INSPECTOR'S ACCEPTANCE BY / DATE; FIELD VERIFICATION BY / DATE; DRAWINGS CORRECTED BY / DATE

MICRO-FILM INFORMATION: RECORDED BY / DATE

BENCH MARKS

SURVEY INFORMATION — FIELD NOTES: No. | By | Date

ENGINEER'S SEAL

PRELIMINARY DESIGN SUBMITTAL

NOT FOR CONSTRUCTION

REVISIONS — No. | Remarks | By

DESIGN — Designed By / Date; Drawn By / Date; Checked By / Date

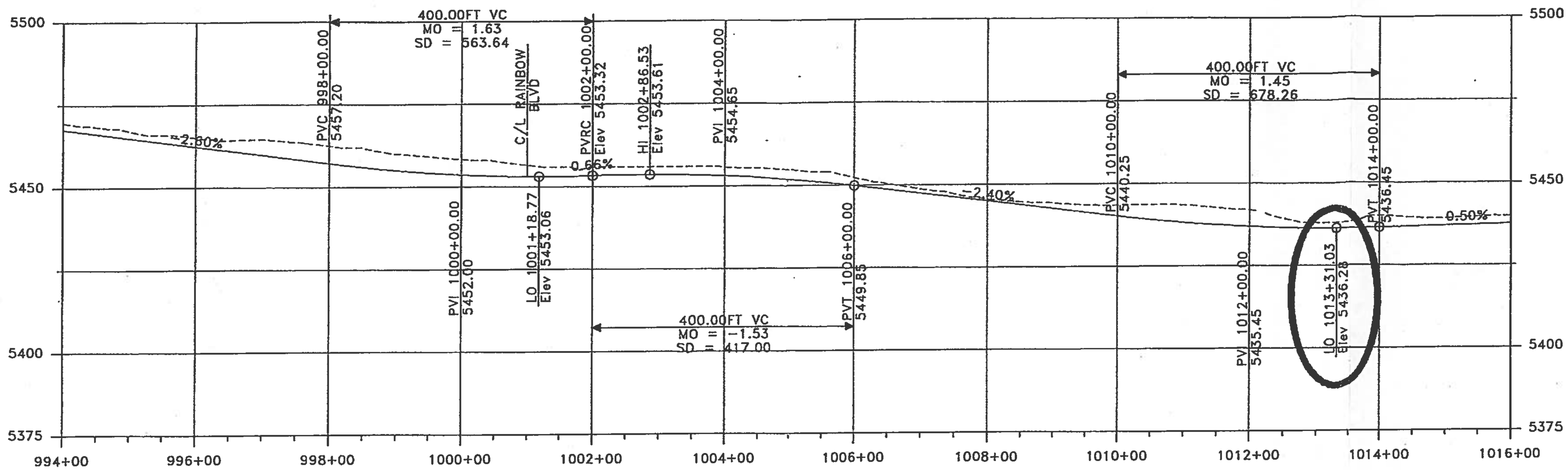
URS — ONE PARK SQUARE, 6501 AMERICAS PARKWAY, NE, SUITE 900, ALBUQUERQUE, NM 87110, (505) 855-7500

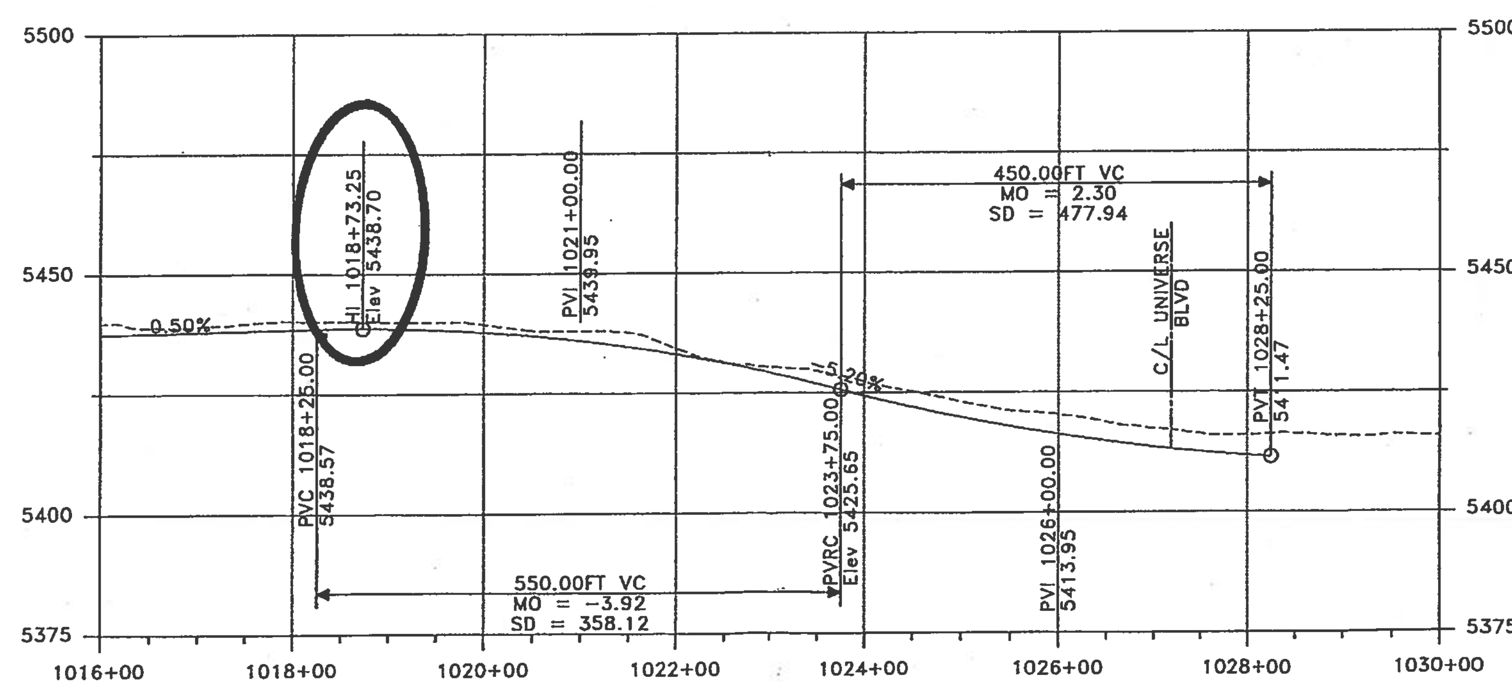
CITY OF ALBUQUERQUE
DEPARTMENT OF MUNICIPAL DEVELOPMENT

TITLE: **MCMAHON BLVD EXTENSION**
UNIVERSE BLVD STORM DRAIN PLAN & PROFILE
STA 106+00 TO STA 115+00

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

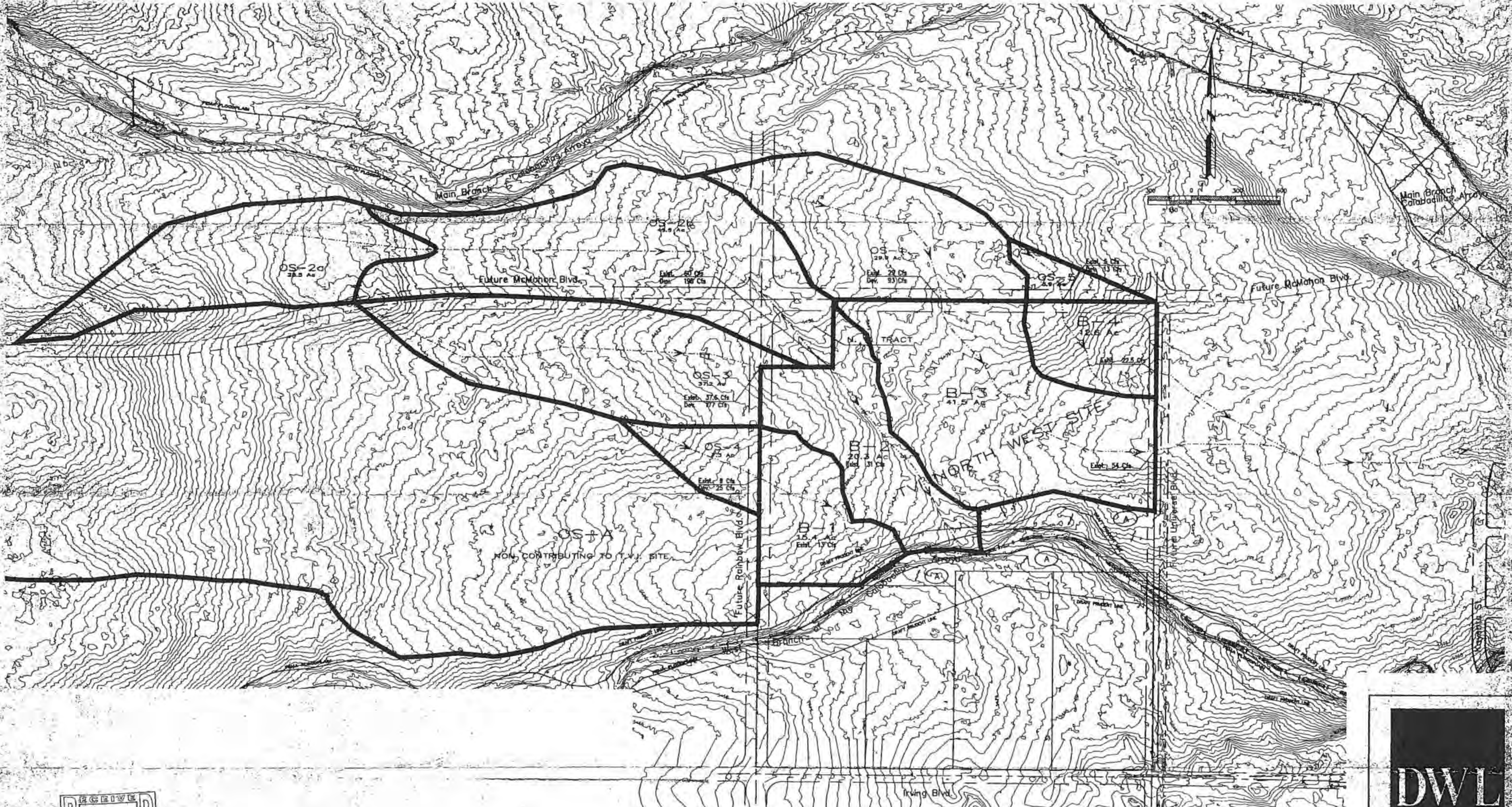
City Project No.	Zone Map No.	Sheet	Of	
6816.04	A-9, A-10	15	24	SD-15





McMahon Blvd.

Conceptual Profile



EXISTING CONDITIONS DRAINAGE BASINS

SCALE: 1" = 300'

GENERAL NOTES

1. SEE FIGURE 1 OF REPORT FOR VICINITY MAP
2. LOWER OFFSITE BASIN BOUNDARIES AND UPPER ONSITE BASIN BOUNDARIES ARE SITE PROPERTY LINE
3. FEMA FLOODPLAIN BASED ON LATEST MAPPING AVAILABLE FROM BERNALILLO COUNTY PUBLIC WORKS DEPARTMENT

KEYED NOTE

(A) AREA DRAINS DIRECTLY TO WEST BRANCH OF THE CALABACILLAS ARROYO

LEGEND

- EXISTING FLOW PATH
- SITE BOUNDARY
- DRAINAGE BASIN BOUNDARY
- FEMA FLOOD PLAIN
- DRAFT PRUDENT LINE
- PROPOSED DROP STRUCTURES
- EXISTING DRAINAGE

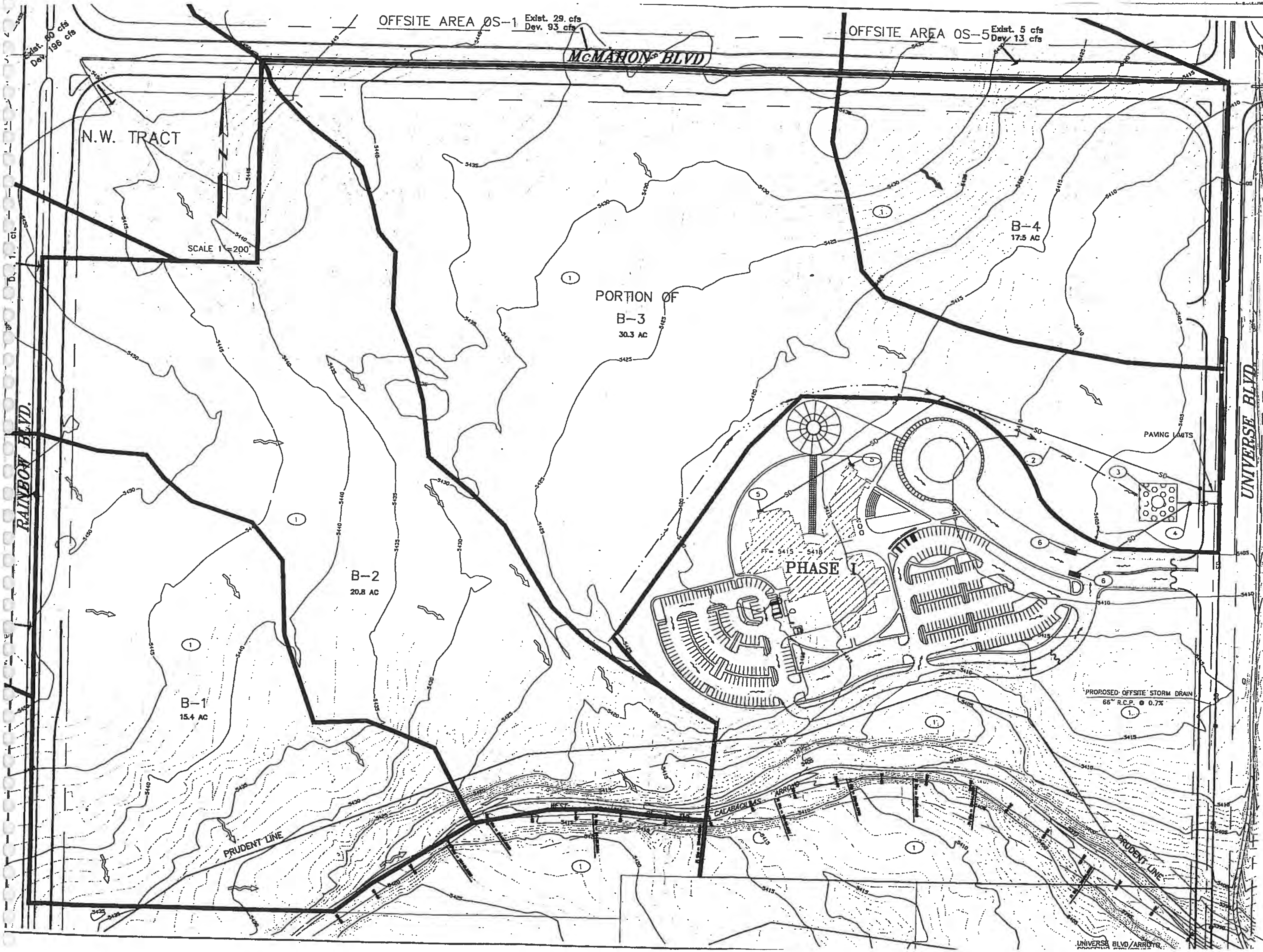
LARKIN GROUP
8500 MENAUL NE, SUITE A-440
ALBUQUERQUE, NEW MEXICO 87112
TELEPHONE (505) 275-7500
FAX (505) 275-0748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
EXISTING CONDITIONS
DRAINAGE BASINS

DRAWN BY: P.R.	DESIGNED BY: K.B.	CHECKED BY: J.A.A.
DATE: OCT. 2001	SHEET: FIGURE 2	

DWL ARCHITECTS
DWL ARCHITECTS & PLANNERS, INC. OF NEW MEXICO
202 CENTRAL AVE. SE
WEST COURTYARD
ALBUQUERQUE, NEW MEXICO 87102
FAX (505) 242-4159
VOICE (505) 242-6202
E-MAIL DWLNM@RT66.COM



KEYED NOTES

1. DO NOT DISTURB AREA
2. INTERIM DIVERSION SWALE
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- SD — STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ONSITE BASIN ID

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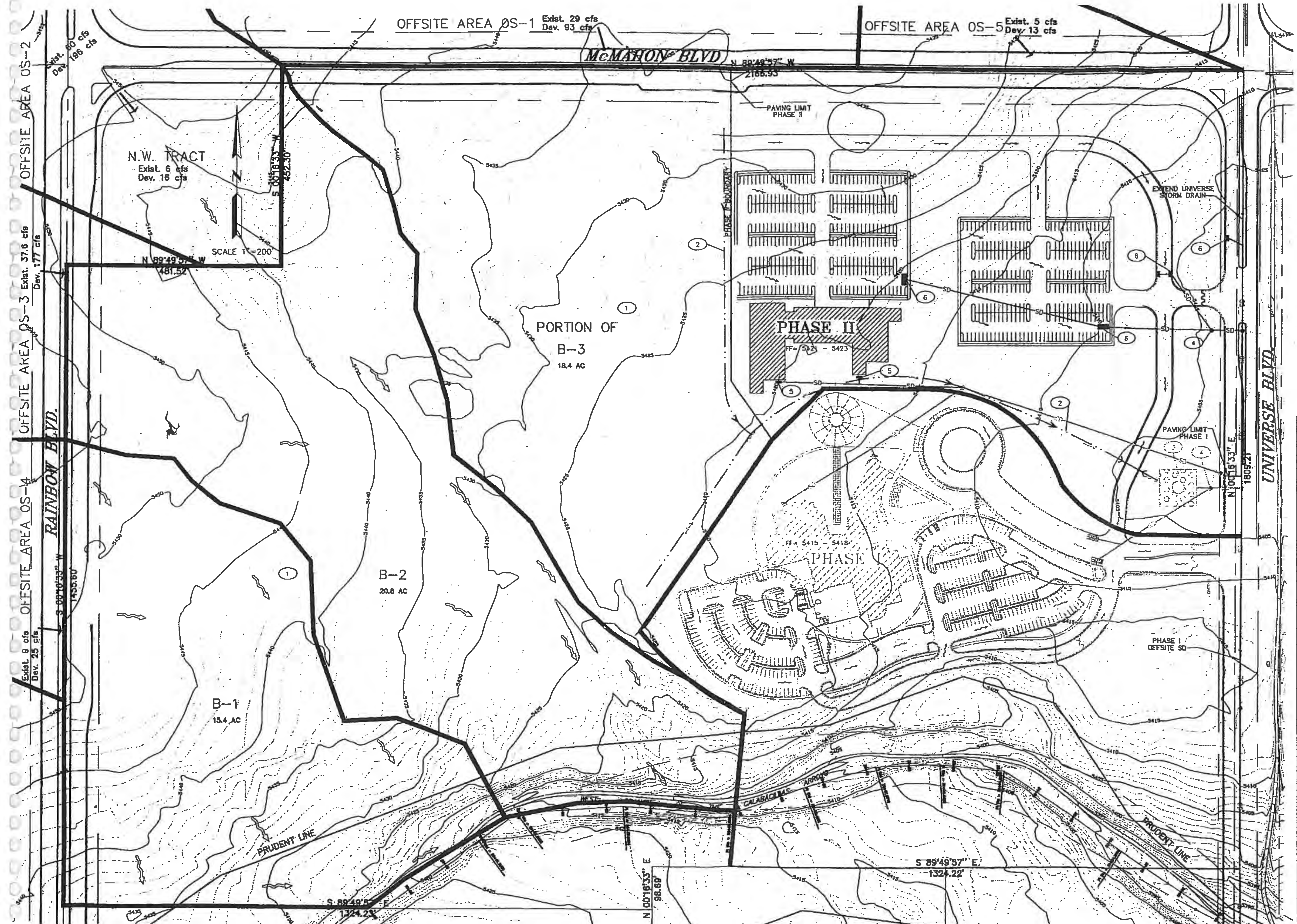
FAX (505) 275-0748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE I

DRAWN BY: P.R.	DESIGNED BY: K.B.	CHECKED BY: J.A.A.
DATE:	SHEET:	



KEYED NOTES

1. DO NOT DISTURB AREA
2. INTERIM DIVERSION SWALE
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- —SD— STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ON SITE BASIN ID

DWL ARCHITECTS

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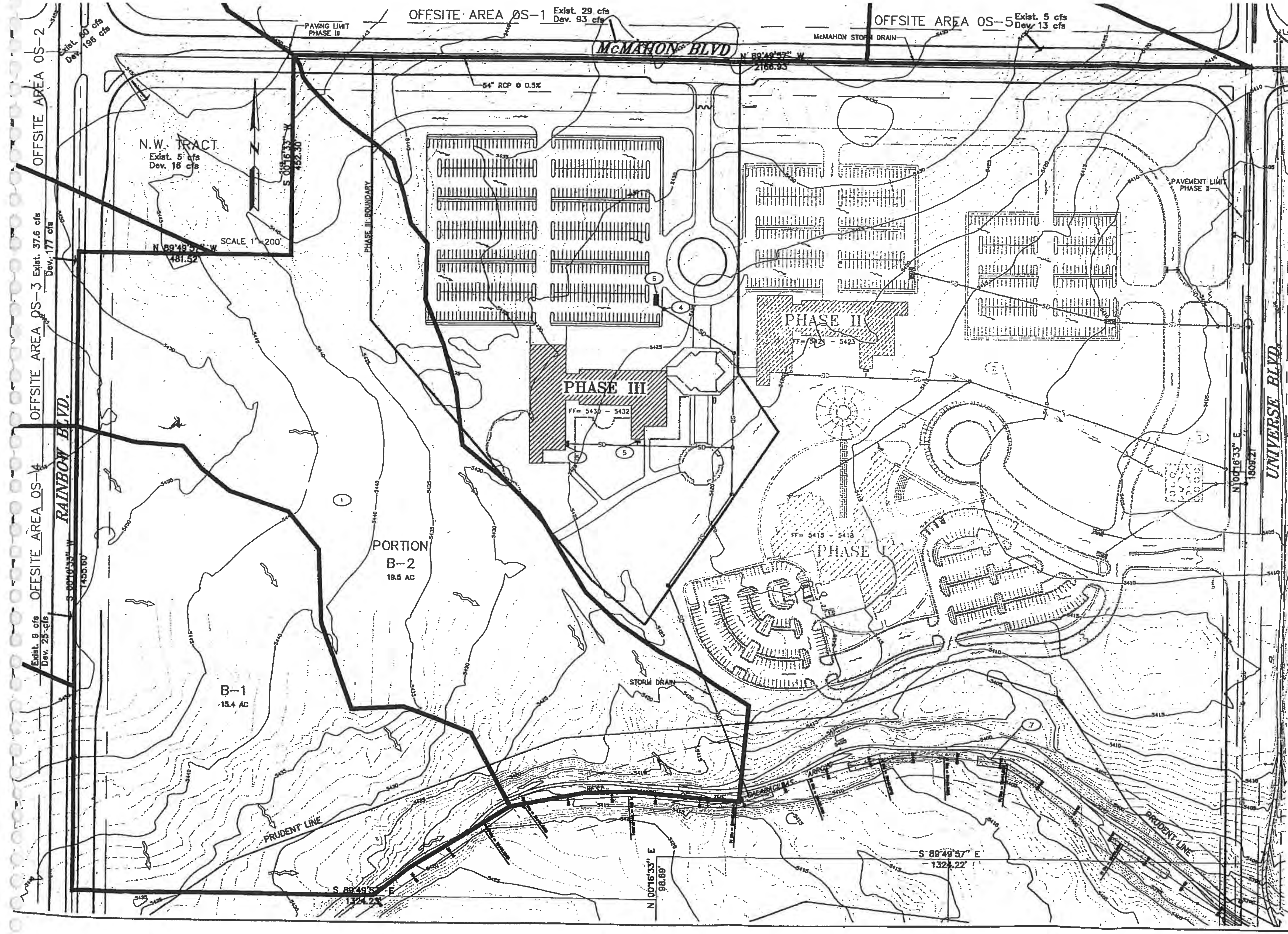
ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE II

DRAWN BY:	DESIGNED BY:	CHECKED BY:
P.R.	K.B.	J.A.A.
DATE: OCT. 2001	SHEET: PLATE 2	



KEYED NOTES

1. DO NOT DISTURB AREA
2. INTERIM DIVERSION SWALE
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS
7. ARROYO DROP STRUCTURES (TYPICAL)

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- SD — STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ON SITE BASIN ID

DWL ARCHITECTS

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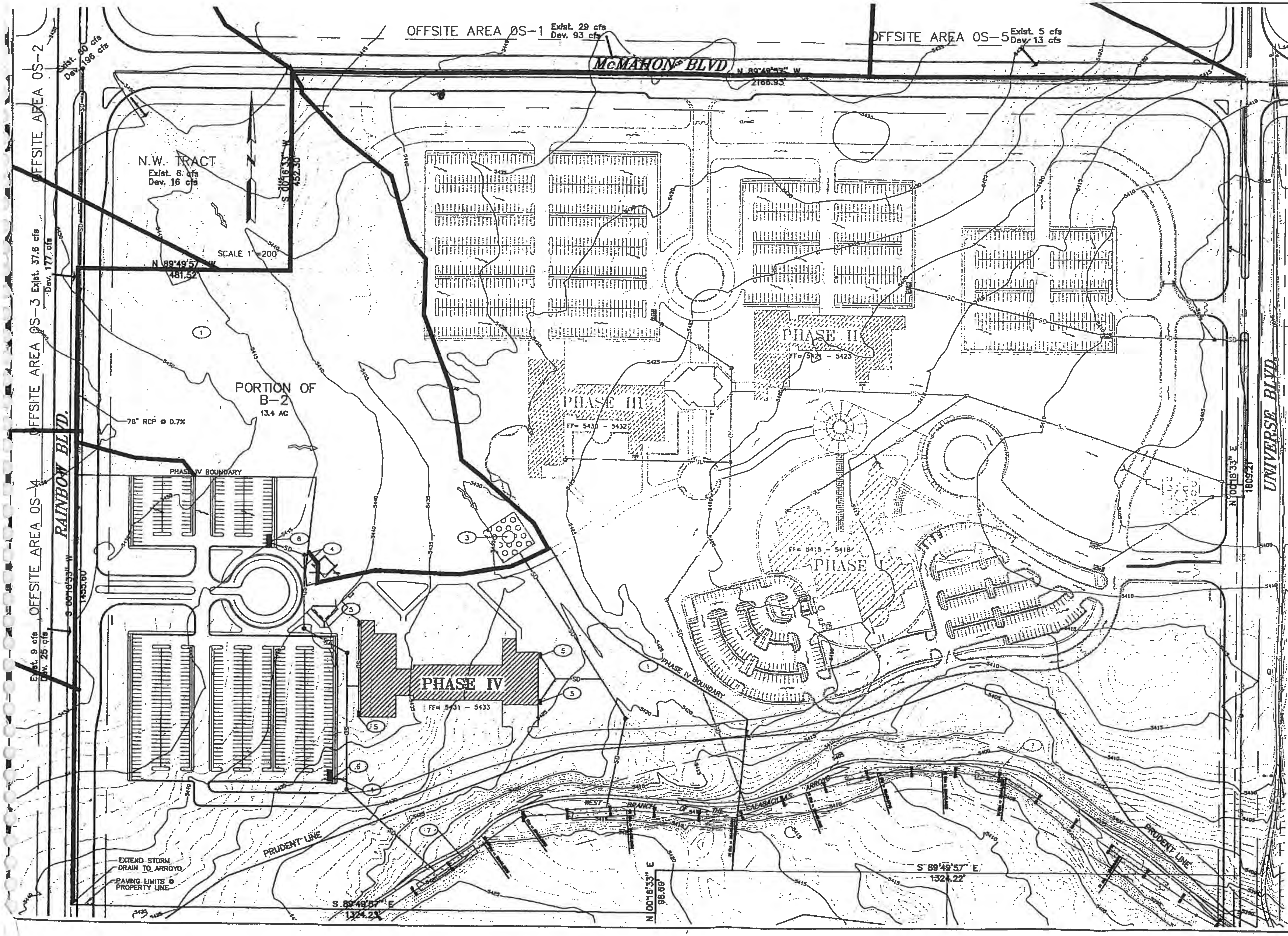
FAX (505) 275-0748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE III

DRAWN BY:	DESIGNED BY:	CHECKED BY:
P.R.	K.B.	J.A.A.
DATE: OCT. 2001	SHEET: PLATE 3	



KEYED NOTES

1. DO NOT DISTURB AREA
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS
7. ARROYO DROP STRUCTURES (TYPICAL)

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- SD — STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ON SITE BASIN ID

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OF NEW MEXICO

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87102

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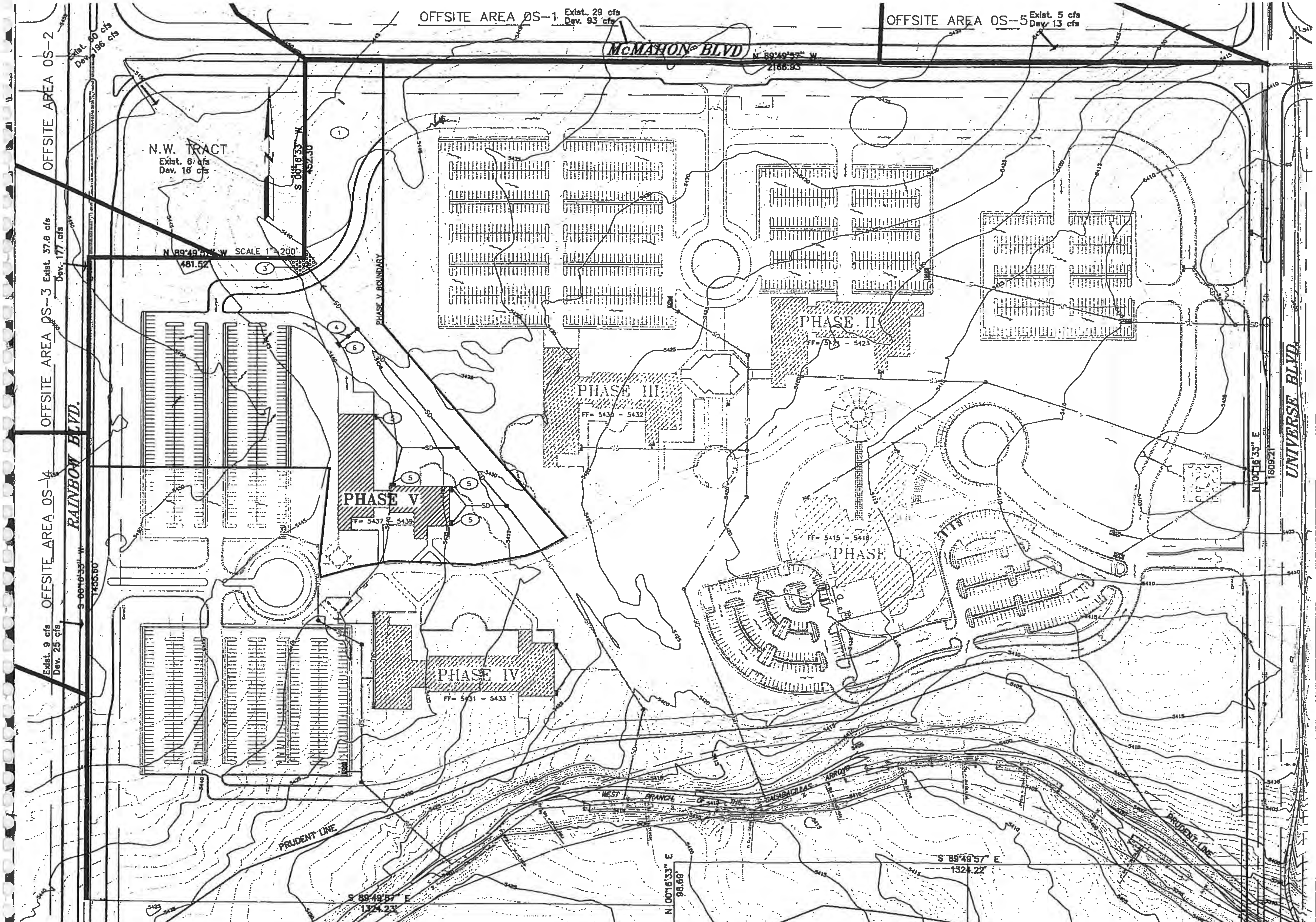
FAX (505) 275-0748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE IV

DRAWN BY:	DESIGNED BY:	CHECKED BY:
P.R.	K.B.	J.A.A.
DATE: OCT. 2001	SHEET: PLATE 4	



KEYED NOTES

1. DO NOT DISTURB AREA
3. INTERIM DESILTING BASIN
4. AMAFCA APPROVED WATER QUALITY ENHANCEMENT FACILITY
5. ROOF DRAINS
6. STORM DRAIN INLETS
7. ARROYO DROP STRUCTURES (TYPICAL)

LEGEND

- HISTORIC FLOW
- DESIGN FLOW
- WATER BLOCK
- SD — STORM DRAIN
- BASIN BOUNDARY
- PHASE BOUNDARY
- B-4 ON SITE BASIN ID

DWL ARCHITECTS

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WEST COURTYARD
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87102

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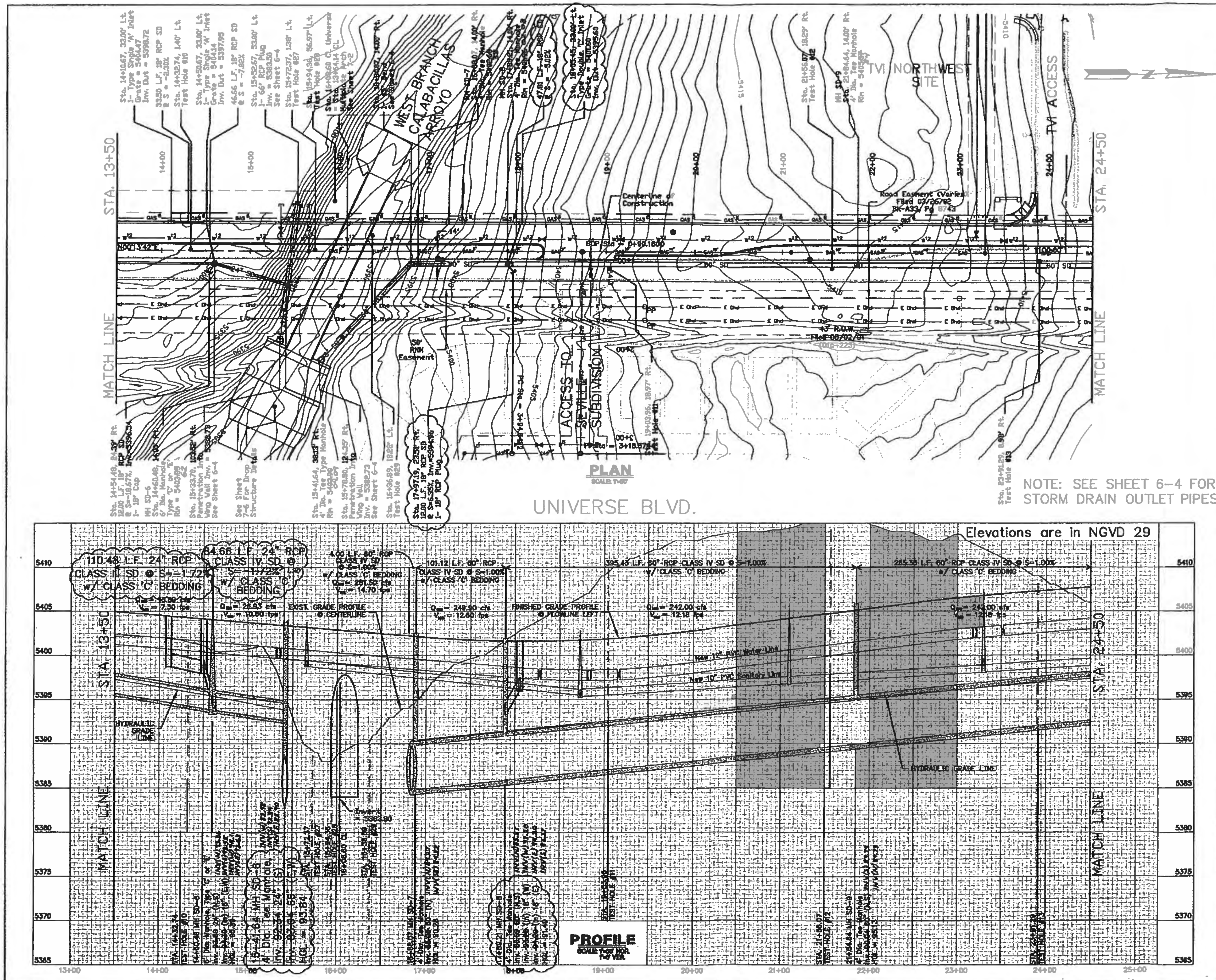
FAX (505) 275-0748

ALBUQUERQUE TVI
NORTHWEST SITE

MASTER DRAINAGE PLAN
PHASE V

DRAWN BY:	DESIGNED BY:	CHECKED BY:
P.R.	K.B.	J.A.A.
DATE: OCT. 2001	SHEET: PLATE 5	



NOTE: All Stubouts Are Not Asbuilt Verified.

AS BUILT INFORMATION	
CONTRACTOR	SALLS BROTHERS CONSTRUCTION
STAKED BY	SERV-TECH
INSPECTOR'S ACCEPTANCE BY	WILSON & CO.
FIELD VERIFICATION BY	SERV-TECH
DRAWINGS CORRECTED BY	LARKIN GROUP NM, INC.

MICRO-FILM INFORMATION

BENCH MARKS

A.C.S. Station 1-A10 Standard Brass Tablet Set In Concrete Post. From the Intersection of Paradise Blvd. And Universe Blvd. Go North 1.9 Miles along the Overhead Electric Power Line to the Bernalillo County and Sandoval County line, Go East 0.25 Miles and South 280 Feet To Station.
NM State Plane Coordinates: X=358933.85, Y=1534880.24
Elevation = 5418.16 (1929 MSLD)

SURVEY INFORMATION		
FIELD NOTES		
NO.	BY	DATE
1		
2		
3		
4		
5		
6		
7		

ENGINEER'S SEAL

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E-MAIL ADDRESS • www.cbiarchitects.com

LARKIN GROUP NM, INC.
CONSULTING ENGINEERS AND SURVEYORS
(505) 275-7500

NO.	DATE	REMARKS	BY
4			
3			
2	12/13/02	Revise Storm Drain to SD 8	R.S.
1	11/26/02	Revise Storm Drain	R.S.

REVISIONS

DESIGN
DESIGNED BY: R.W.M. DATE: JUNE 2002
DRAWN BY: R.J.S. DATE: JUNE 2002
CHECKED BY: J.A.A DATE: JUNE 2002

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TITLE: TVI NORTHWEST SITE-OFFSITE IMPROVEMENTS
UNIVERSE BLVD.
STORM DRAIN PLAN & PROFILE

Design Review Committee | City Engineer Approval

RECORD DRAWING

City Project No. 6839.81 | Zone Map No. A-10 | Sheet 6-2.1 of 6-6

30 OF 48

THIS SHEET REPLACES SHEET 6-2
REVISED 11/26/02

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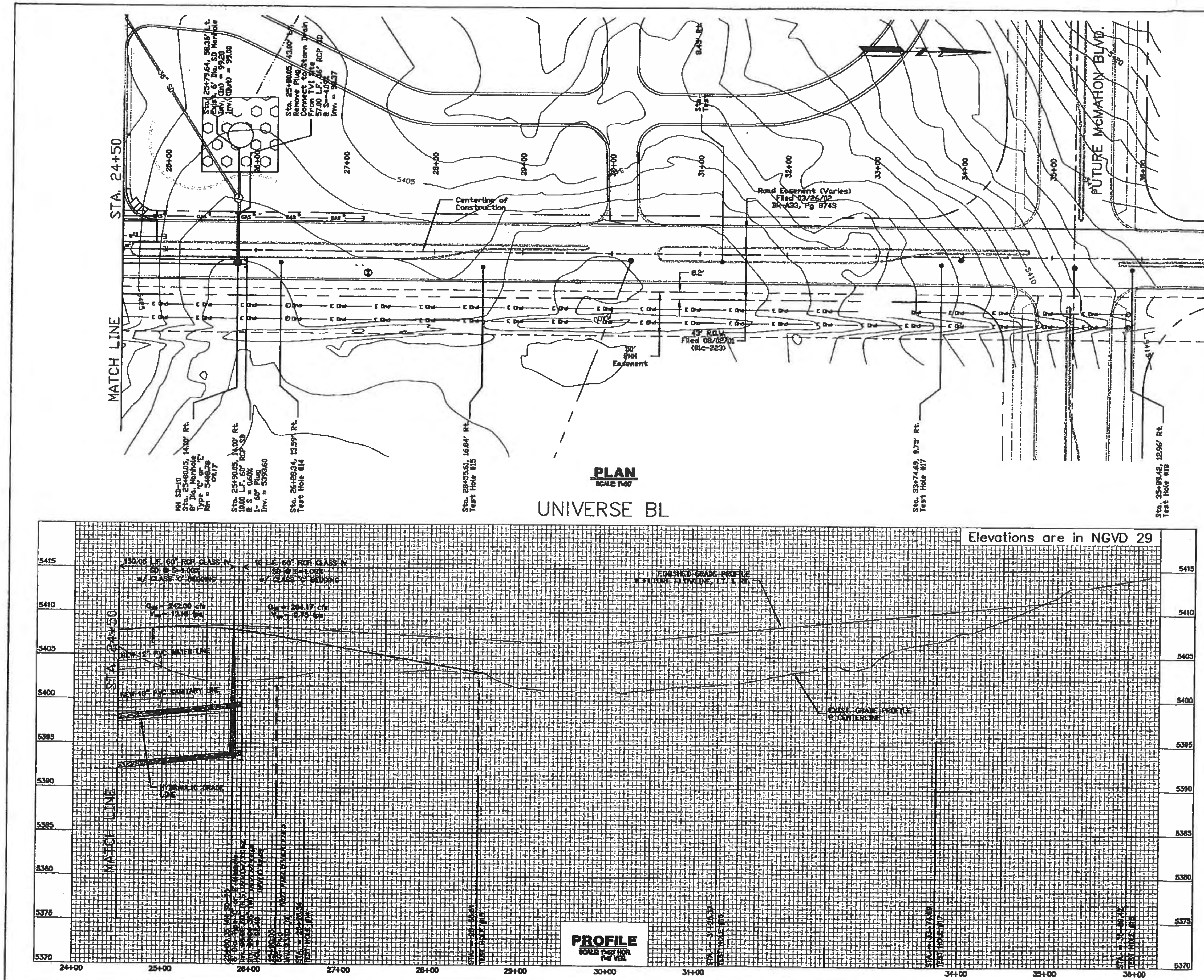

RECORD DRAWING

ENGINEER'S SEAL

5-28-02

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8500 MENAUL BLVD. NE A-440
(505) 275-7500

SURVEY INFORMATION		
FIELD NOTES		
NO.	BY	DATE
1		
2		
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7		

BENCH MARKS

A.C.S. Station 1-A10 Standard Brass Tablet Set in Concrete Post. From the Intersection of Paradise Blvd. And Universe Blvd. Go North 1.9 Miles along the Overhead Electric Power Line to the Bernalillo County and Sandoval County line, Go East 0.25 Miles and South 260 Feet To Station.
NM State Plane Coordinates: X=358933.85, Y=1534860.24
Elevation = 5415.16 (1929 MSLD)

AS BUILT INFORMATION

CONTRACTOR SALLS BROTHERS CONSTRUCTION
WORK STAKED BY SERV-TECH
INSPECTOR'S ACCEPTANCE BY WILSON & CO.
FIELD VERIFICATION BY SERV-TECH
DRAWINGS CORRECTED BY LARKIN GROUP NM, INC.

MICRO-FILM INFORMATION

RECORDED BY
RECORDED BY
RECORDED BY

NO.	DATE	REMARKS	BY
4			
3			
2			
1			
▲		R E V I S I O N S	▲
		DESIGN	

DESIGNED BY: R.W.M. DATE: JUNE 2002
DRAWN BY: R.J.S. DATE: JUNE 2002
CHECKED BY: J.A.A. DATE: JUNE 2002

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TITLE: TVI NORTHWEST SITE-OFFSITE IMPROVEMENTS
UNIVERSE BLVD.
STORM DRAIN PLAN & PROFILE

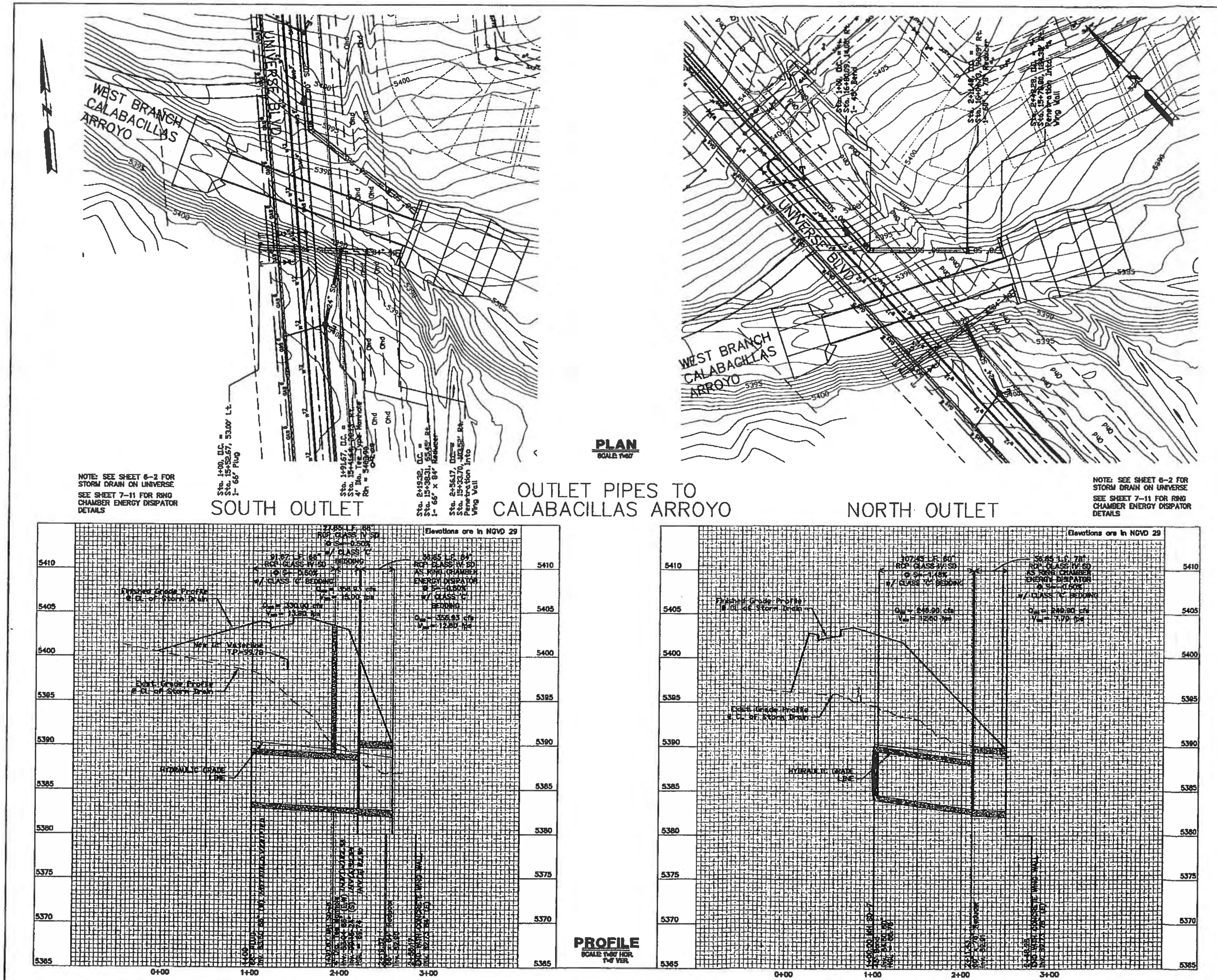
APPROVED — DESIGN REVIEW COMMITTEE — JUN 11 2002
APPROVED — CITY ENGINEER

Last Design Update — Mo./Day/Yr. — Mo./Day/Yr.

City Project No. 6839.81 | Zone Map No. A-10 | Sheet 6-3 of 6-6

31 OF 48

26 6839.81 3/04



RECORD DRAWING

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CONSULTING ENGINEERS AND SURVEYORS
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CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TITLE: TVI NORTHWEST SITE-OFFSITE IMPROVEMENTS
OUTLET PIPES TO CALABACILLAS ARROYO
STORM DRAIN PLAN & PROFILE

City Project No. 6839.81 | Zone Map No. A-10 | Sheet 6-4 of 6-6

32 OF 48

AG 6839.81 3204

AS BUILT INFORMATION

CONTRACTOR	SALLS BROTHERS CONSTRUCTION		
WORK STAKED BY	SERV-TECH	DATE	
INSPECTOR'S ACCEPTANCE BY	WILSON & CO.	DATE	5/9/02
FIELD VERIFICATION BY	SERV-TECH	DATE	5/9/02
DRAWINGS CORRECTED BY	LARKIN GROUP NM, INC.	DATE	5/15/02

MICRO-FILM INFORMATION

RECORDED BY		DATE	
RECORDED BY		DATE	
RECORDED BY		DATE	

BENCH MARKS

A.C.S. Station 1-A10 Standard Brass Tablet Set in Concrete Post. From the Intersection of Paradise Blvd. And Universe Blvd. Go North 1.9 Miles along the Overhead Electric Power Line to the Bernalillo County and Sandoval County line, Go East 0.25 Miles and South 250 Feet To Station.
NM State Plane Coordinates: X=358933.85, Y=1534660.24
Elevation = 5418.16 (1929 MSLD)

SURVEY INFORMATION

FIELD NOTES		
NO.	BY	DATE
1		
2		
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ENGINEER'S SEAL

5-28-02

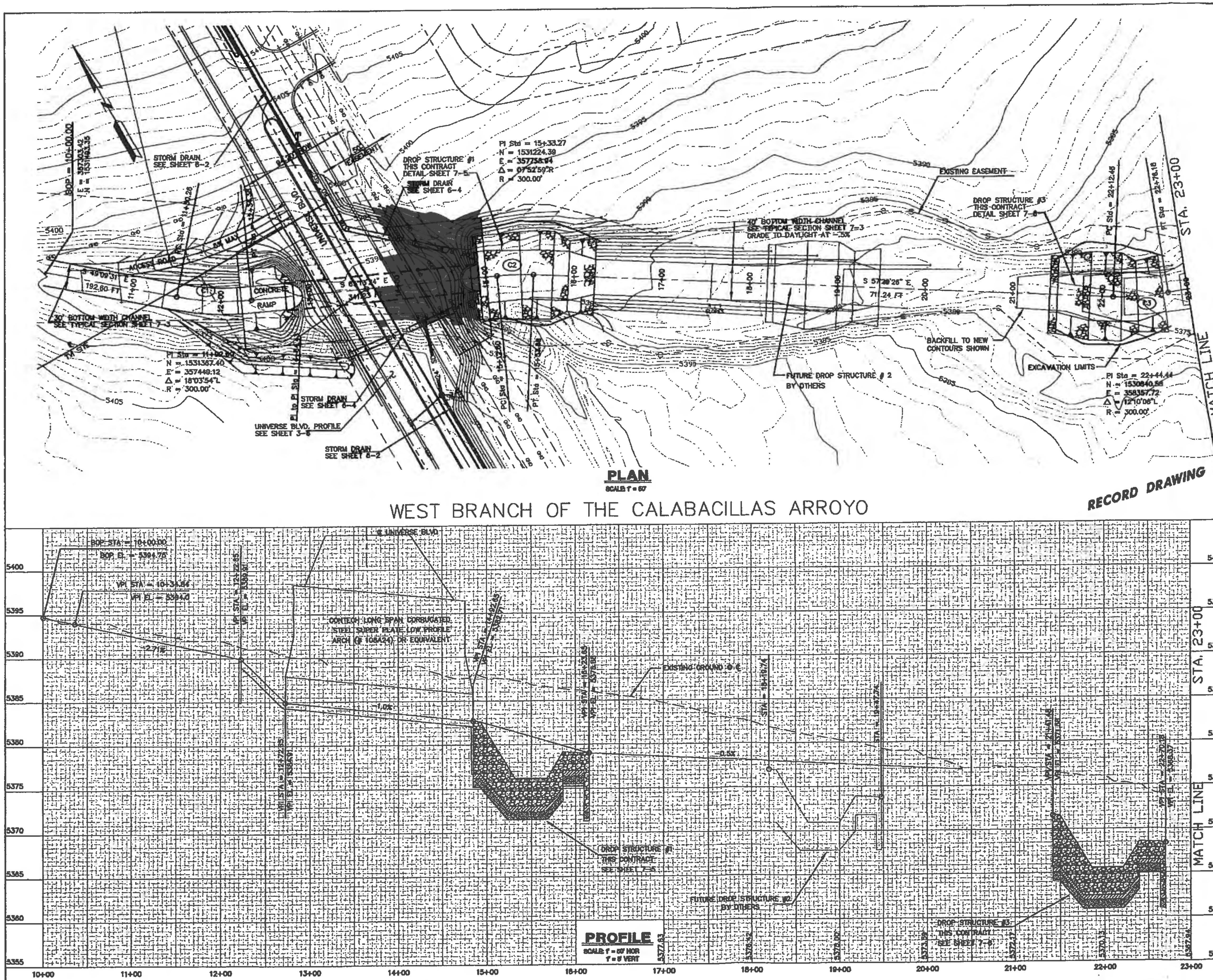
REVISIONS

NO.	DATE	REMARKS	BY
4			
3			
2			
1			
		DESIGN	

DESIGNED BY: R.W.M. DATE: JUNE 2002
DRAWN BY: R.J.S. DATE: JUNE 2002
CHECKED BY: J.A.A. DATE: JUNE 2002

Last Design Update | Mo./Day/Yr. | Mo./Day/Yr.

K:\AL2K-0026 – CUSTER BASARICH – TVI – Northwest Site Phase I\Arroyo-Plans\Sheet7-1.dwg, 06/07/02 08:31:11 AM, cbpr



WEST BRANCH OF THE CALABACILLAS ARROYO

PLAN LEGEND

- ——5390—— MAJOR CONTOURS
- ------- MINOR CONTOURS
- — — — — EASEMENTS
- ——-—— RIGHT OF WAY
- ———— FILTER FABRIC
- 6" GRAVEL FILTER MATERIAL
- D_{50} =2'-0" RIP-RAP
- 12" COMPACTED SOIL
- F.V.M.E. FIELD VERIFY MATCH EXISTING
- ———— NEW FINISHED GRADE CONOURS
- SLOPE LIMITS

GENERAL NOTES

1. AMAFCA FIELD ENGINEER SHALL BE NOTIFIED 48-HOURS PRIOR TO ANY WORK WITHIN THE AMAFCA R/W TEL. JERRY LOVATO 884-2215.
2. ALL SUBGRADE, BACKFILL AND EMBANKMENT SHALL BE COMPACTED TO 95% (MODIFIED PROCTOR) WITHIN THE AMAFCA R/W. TESTING REPORTS SHALL BE PROVIDED TO AMAFCA FIELD ENGINEER.
3. AMAFCA FIELD ENGINEER SHALL BE NOTIFIED 48 HOURS PRIOR TO ANY WORK OF ANY FACILITIES WITHIN THE AMAFCA R/W.
4. CONSTRUCTION SHALL MINIMIZE DISTURBANCE TO EXISTING VEGETATION.
5. AFTER DROP STRUCTURE'S FINAL APPROVAL CONTRACTOR SHALL BURY DROP STRUCTURE TO ORIGINAL GRADES. REGRADE ARROYO FLOWLINE TO DIRECT FLOWS ALONG DROP STRUCTURE CENTERLINE & RESEED DISTURBED AREAS.
6. ALL COORDINATES SHOWN ARE STATE PLANE COORDINATES, SEA LEVEL, NGVD 29 DATUM, CONVERTED TO GROUND COORDINATES.
7. SEE SHEET 7-12 FOR RIPRAP GRADATION

℄ CURVE DATA

NUMBER	RADIUS	ARC LENGTH	DELTA ANGLE	TANGENT
C1	300.00	84.12	16°03'54"	42.34
C2	300.00	41.28	07°52'59"	20.67
C3	300.00	63.71	12°10'06"	31.98

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LARKIN GROUP
CONSULTING ENGINEERS AND SURVEYORS
8500 MENAUL BLVD. NE A-440
(505) 275-7500

APPROVED FOR CONSTRUCTION WITHIN AMAFCA RIGHT-OF-WAY
AMAFCA Approval — Date: 6-7-02

CITY OF ALBUQUERQUE
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

TITLE: TVI NORTHWEST SITE-OFFSITE IMPROVEMENTS
WEST BRANCH OF THE CALABACILLAS ARROYO
PLAN & PROFILE STA 10+00 TO 23+00

Design Review Committee — APPROVED
City Engineer Approval — APPROVED — CITY ENGINEER

Project No.	Zone Map No.	Sheet	Of
6839.81	A-10	7-1	7-12

35 OF 48

AS BUILT INFORMATION

CONTRACTOR	SALLS BROTHERS CONSTRUCTION	
WORK STARTED BY	SERV-TECH	DATE 5/2/02
INSPECTOR'S ACCEPTANCE BY	WILSON & CO.	DATE 5/?/02
FIELD VERIFICATION BY	SERV-TECH	DATE
DRAWINGS CORRECTED BY	LARKIN GROUP NM, INC.	DATE 5/?/02

MICRO-FILM INFORMATION

RECORDED BY	DATE
RECORDED BY	DATE
RECORDED BY	DATE

BENCH MARKS

A.C.S. Station 1-A10 Standard Brass Tablet Set In Concrete Post. From the Intersection of Paradise Blvd. And Universe Blvd. Go North 1.9 Miles along the Overhead Electric Power Line to the Bernalillo County and Sandoval County line, Go East 0.25 Miles and South 280 Feet To Station.
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Elevation = 5415.16 (1929 MSLD)

SURVEY INFORMATION

FIELD NOTES		
NO.	BY	DATE
1		
2		
3		
4		
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7		

ENGINEER'S SEAL — 5-28-02

NO.	DATE	REMARKS	BY
4			
3			
2			
1			

REVISIONS

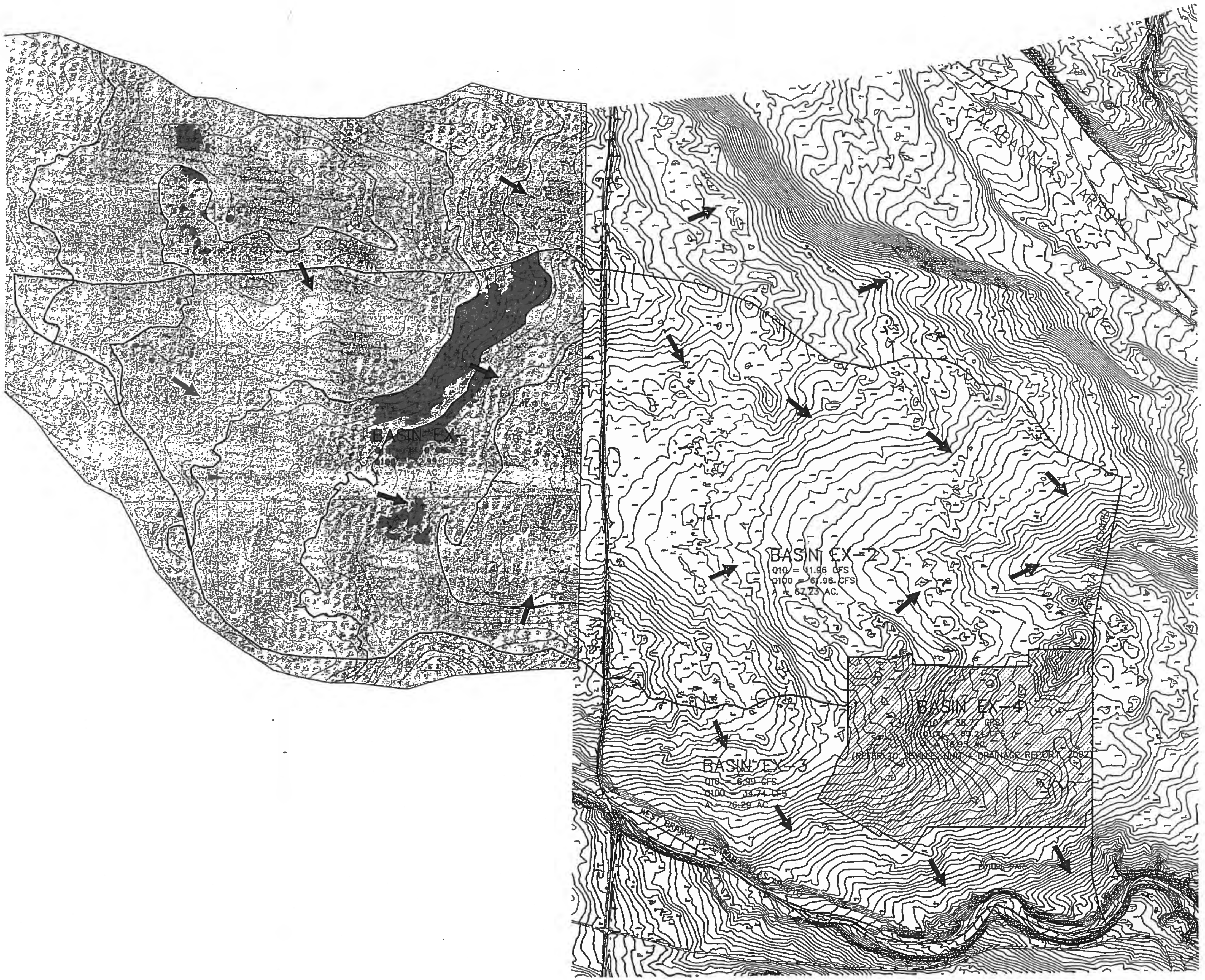
DESIGN

DESIGNED BY: K.B.	DATE: MAY 2002
DRAWN BY: P.R.	DATE: MAY 2002
CHECKED BY: J.A.A.	DATE: MAY 2002

Last Design Update	Mo./Day/Yr.	Mo./Day/Yr.

26 6839.81 3504

T:\PROJECTS\X2218009\\DRAINAGE\EXIST DRAINAGE.DWG\11-19-02\JRW



LEGEND

DRAINAGE FLOW ARROW

BASIN BOUNDARY

HIGH POINT IN EXISTING ROADWAY

HYDROLOGIC DATA – EXISTING

BASIN	AREA (acres)	LAND TREATMENT PERCENTAGES BY TYPE				YIELD (cfs/ac)	Q_{100} (cfs)	V_{100-6} (ac-ft)
		A	B	C	D			
EX-1	71.47	95	0	5	0	1.02	72.99	2.93
EX-2	67.23	95	0	5	0	0.92	61.96	2.75
EX-3	26.29	95	0	5	0	1.32	34.74	1.08
EX-4	16.95	0	10	30	60	3.73	63.24	2.21

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

RECEIVED
JAN 06 2003
HYDROLOGY SECTION

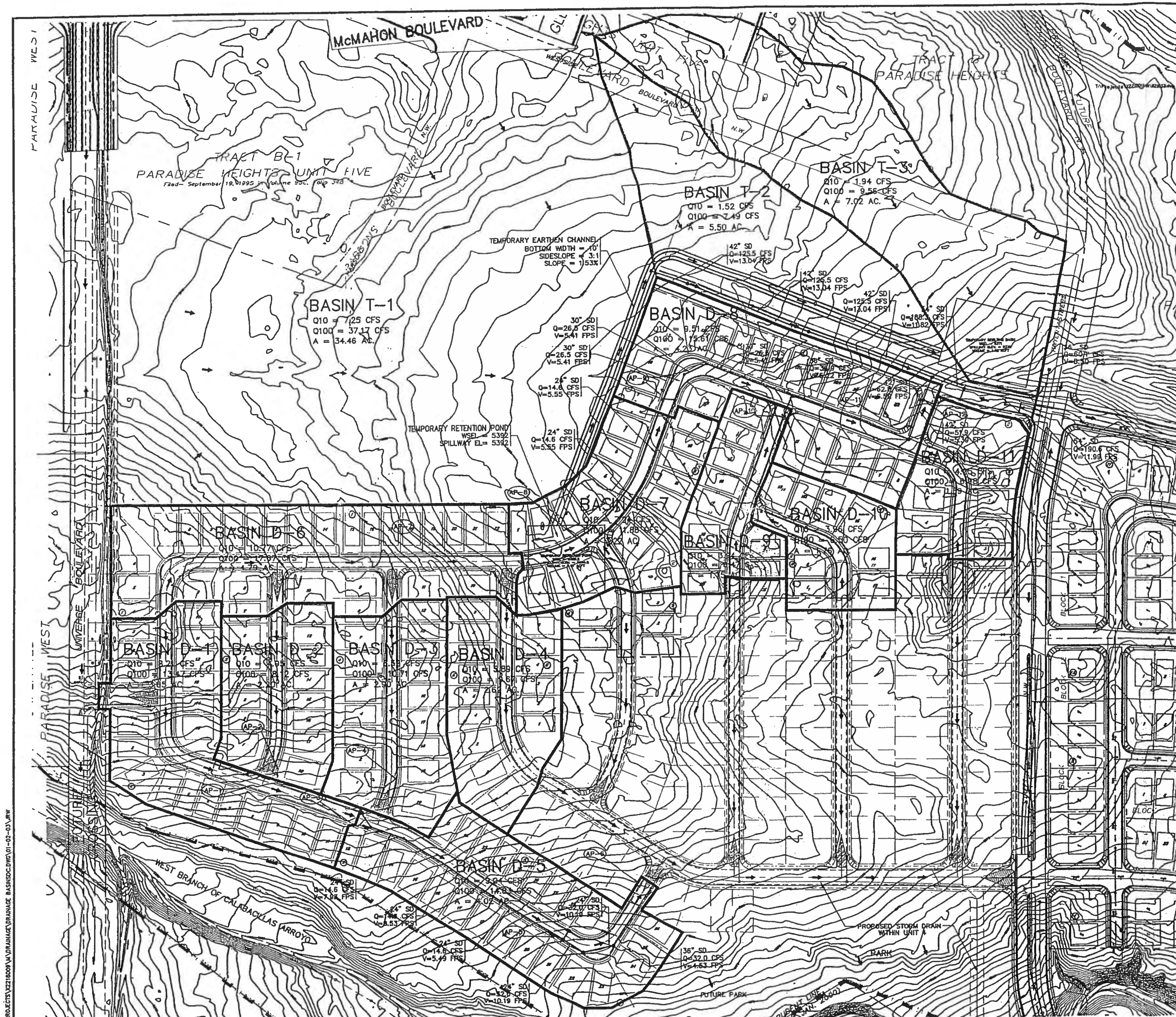
SEVILLE SUBDIVISION UNIT 5 & 6

BASIN BOUNDARY MAP EXISTING CONDITIONS

REVISIONS	NO.	DATE	REMARKS	BY

DESIGN	JRW	WCEA NO.	X2218009	DATE	NOV 2002
DRAWN	JRW	PROJECT NO.	N/A	SHEET NO.	1 OF 1
CHECK	DSA				

PLATE 1



SCALE: 1 INCH = 100 FT.

100 0 50 100 200

N

LEGEND

- → DRAINAGE FLOW ARROW
- ⇒ FUTURE FLOW ARROW
- HIGH POINT
- (AP-9) HYDRAULIC ANALYSIS POINT

HYDROLOGIC DATA – DEVELOPED

BASIN	AREA (acres)	LAND TREATMENT PERCENTAGES BY TYPE				YIELD (cfs/ac)	Q_{100} (cfs)	V_{100-24} (ac-ft)
		A	B	C	D			
D-1	3.65	0	10	30	60	3.69	13.47	0.27
D-2	2.20	0	10	30	60	3.69	8.12	0.16
D-3	2.90	0	10	30	60	3.69	10.71	0.22
D-4	2.62	0	10	30	60	3.69	9.67	0.19
D-5	4.02	0	10	30	60	3.69	14.83	0.30
D-6	4.79	0	10	30	60	3.69	17.67	0.36
D-7	3.22	0	10	30	60	3.69	11.88	0.24
D-8	4.23	0	10	30	60	3.69	15.61	0.31
D-9	1.75	0	10	30	60	3.69	6.47	0.13
D-10	1.76	0	10	30	60	3.69	6.50	0.13
D-11	1.89	0	10	30	60	3.69	6.98	0.14
T-1	34.46	95	0	5	0	1.08	37.17	1.32
T-2	5.50	95	0	5	0	1.36	7.49	0.21
T-3	7.02	95	0	5	0	1.36	9.56	0.27

STREET HYDRAULIC DATA

AP	⊙ INLET (#)	SLOPE (%)	Q_{100} (cfs)	Q_{INT} (cfs)	Q_{BYP} (cfs)	D_{100} (ft)	V_{100} (ft/sec)	D*V	Y_2 (ft)
AP-1	–	0.50	8.0	–	–	0.29	1.78	0.52	0.33
AP-2	–	0.66	8.12	–	–	0.28	2.03	0.57	0.33
AP-3	1A & 1B	1.85	21.6	14.6	7.0	0.42	3.93	1.65	0.61
AP-4	–	0.76	9.0	–	–	0.28	2.21	0.62	0.34
AP-5	2A & 2B	2.81	28.0	17.4	10.6	0.42	4.94	2.07	0.72
AP-6	3A & 3B	1.00	15.2	11.6	3.6	0.41	2.84	1.16	0.51
AP-7	–	1.06	15.0	–	–	0.41	2.88	1.18	0.51
AP-8	4A & 4B	1.06	21.0	14.3	6.7	0.45	3.23	1.45	0.58
AP-9	5A & 5B	1.00	16.0	12.0	4.0	0.42	2.98	1.28	0.54
AP-10	6A & 6B	2.64	13.0	10.4	2.6	0.35	3.70	1.96	0.52
AP-11	7A	1.00	21.5	15.0*	6.5	0.46	3.26	1.57	0.61
AP-12	8A & 8B	0.50	11.3	9.6	1.7	0.43	1.91	0.82	0.48

* SINGLE GRATE INLET WITHIN SUMP.

$$Y_2 = \left[\frac{V^2}{2g}\right] \times 0.8 + D_{100}$$

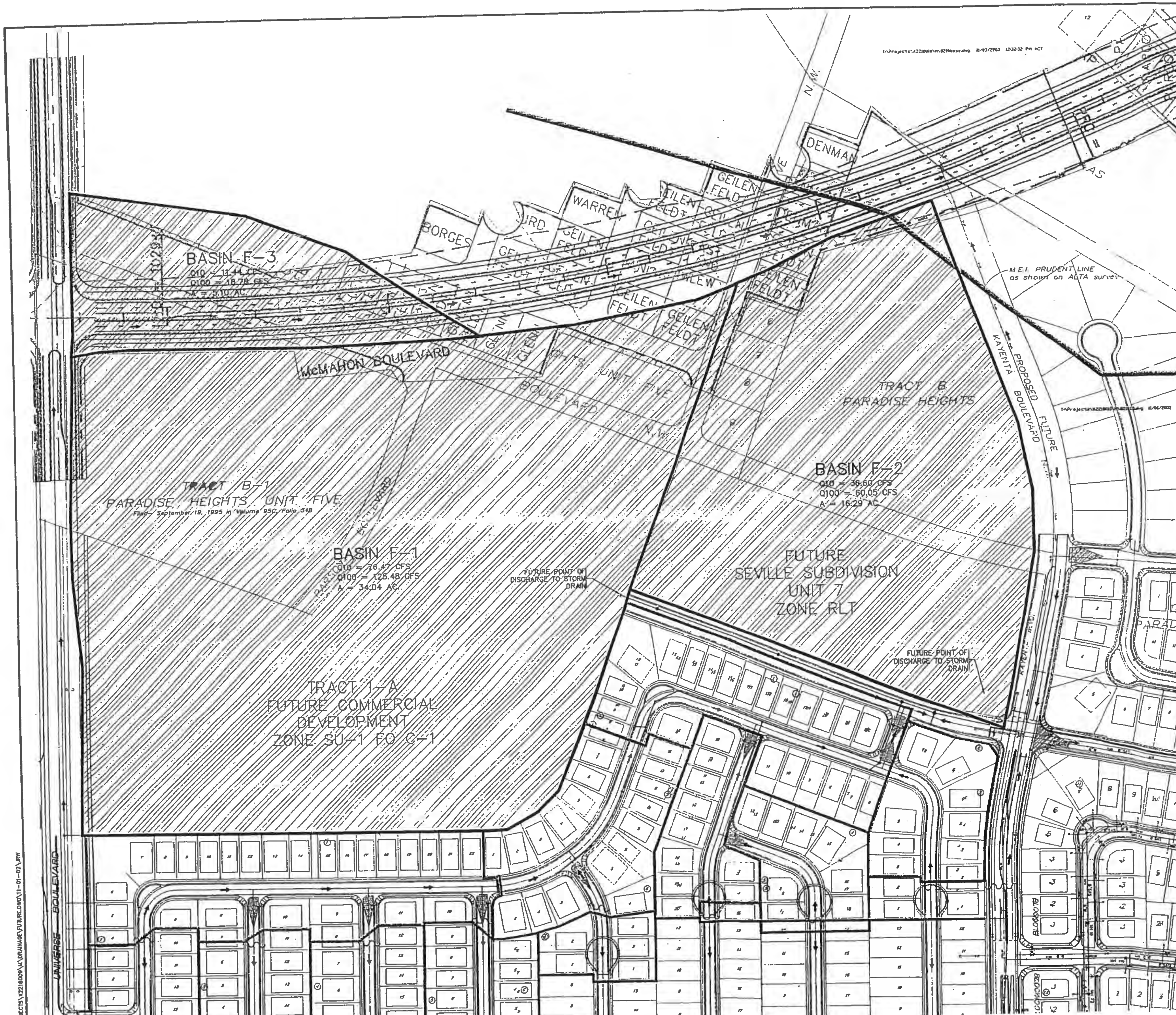
WILSON & COMPANY
2600 THE AMERICAN ROAD S.E.
SUITE 100
RIO RANCHO, NEW MEXICO 87124
(505) 898-8021

SEVILLE SUBDIVISION UNIT 5 & 6

BASIN BOUNDARY MAP DEVELOPED CONDITIONS

REVISIONS NO.	DATE	REMARKS	BY

DESIGN	JRW	WCEA NO. X2218009		DATE	JAN 2003
DRAWN	JRW	PROJECT NO.	N/A	SHEET NO.	1 OF 1
CHECK	DSA				



LEGEND

- FUTURE DEVELOPMENT
- DRAINAGE FLOW ARROW
- FUTURE FLOW ARROW
- HIGH POINT

HYDROLOGIC DATA – FUTURE OFFSITE CONDITIONS

BASIN	AREA (acres)	LAND TREATMENT PERCENTAGES BY TYPE				YIELD (cfs/ac)	Q_{100} (cfs)	V_{100-24} (ac-ft)
		A	B	C	D			
F-1	34.04	0	10	30	60	3.68	125.48	4.37
F-2	16.29	0	10	30	60	3.68	60.05	2.09
F-3	5.50	0	10	30	60	3.68	18.78	0.65

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87124
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HYDROLOGY SECTION

SEVILLE SUBDIVISION
UNIT 5 & 6
BASIN BOUNDARY MAP
FUTURE DEVELOPED CONDITIONS
(OFFSITE)

REVISIONS	NO.	DATE	REMARKS	BY

DESIGN	JRW	WCEA NO.	X2218009	DATE	NOV 2002
DRAWN	JRW	PROJECT NO.	N/A	SHEET NO.	1 OF 1
CHECK	DSA				

:\PROJECTS\X2218009\M\DRAINAGE\FUTURE.DWG\11-01-02\JRW

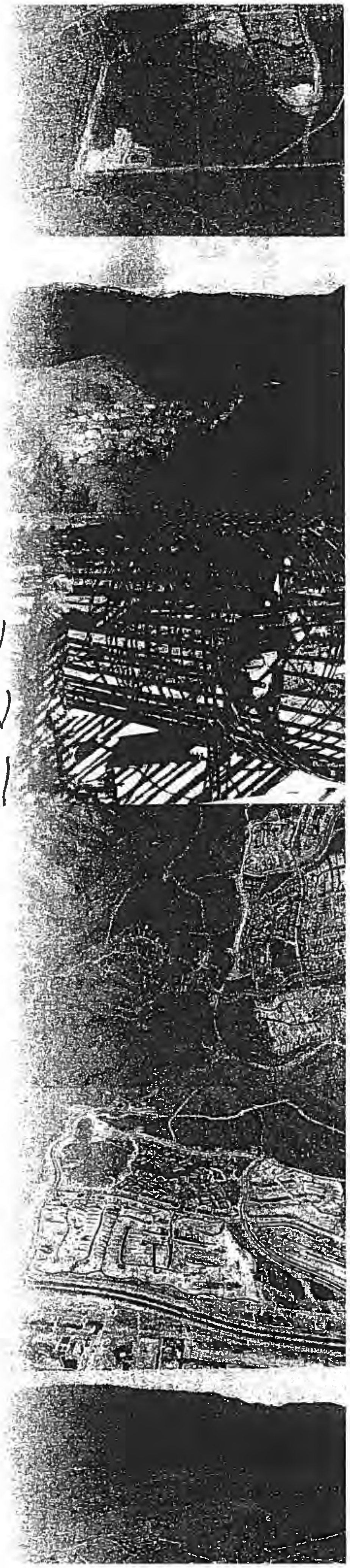
DRAINAGE REPORT FOR ALBUQUERQUE TECHNICAL VOCATIONAL INSTITUTE NORTH WEST SIDE PHASE II

NOVEMBER 18, 2005 2005 → 50096 PWDN

70113 PWDN

Socer Fld 80016 RWDN

Prepared for:
Van Gilbert Architects
2428 Baylor SE
Albuquerque, NM 87106



Bohannan Huston Inc.

ENGINEERING
SPATIAL DATA
ADVANCED TECHNOLOGIES

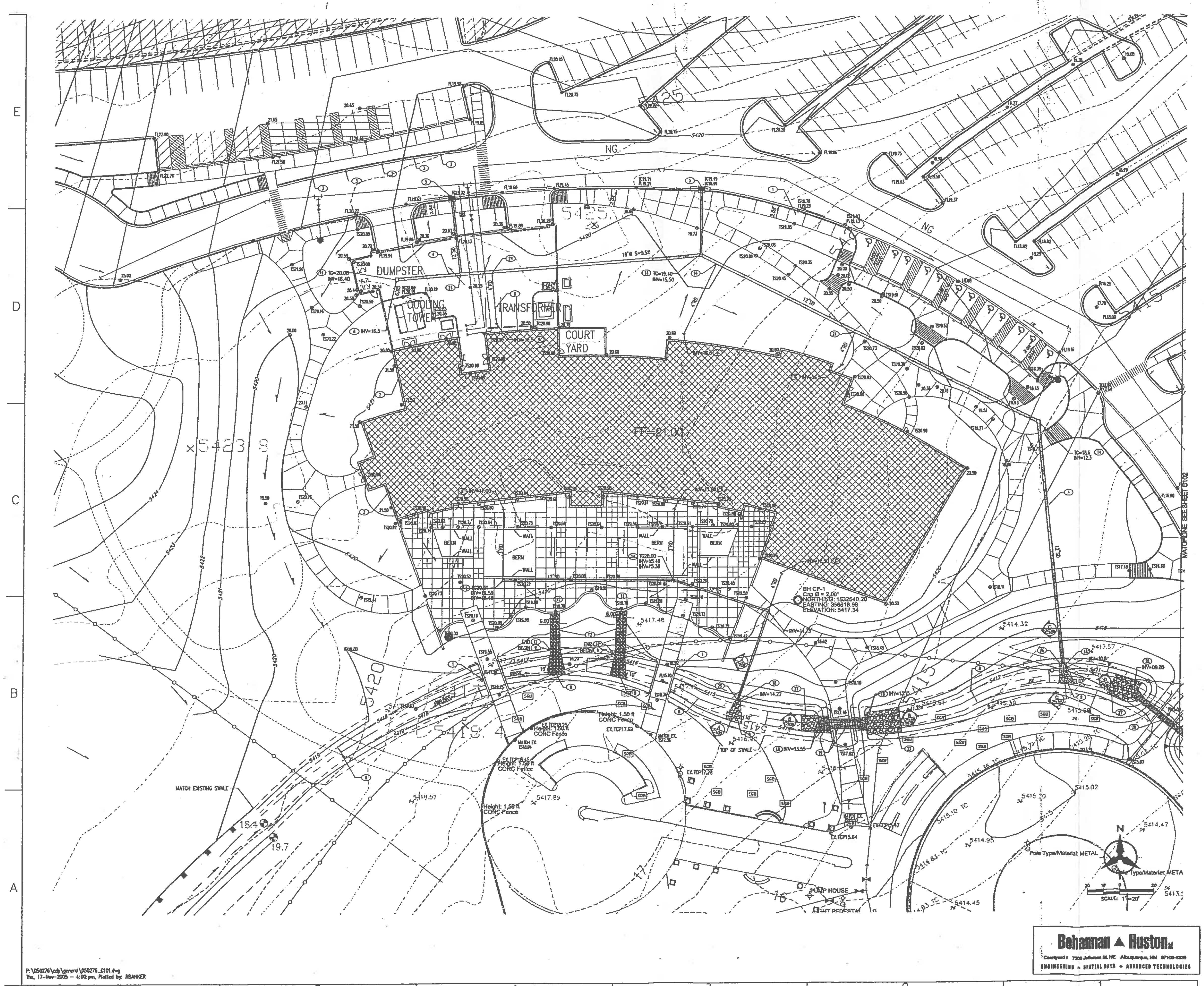
```
                                                                     AHYMO
AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) -                         - VERSION:  1997.02c      RUN DATE (MON/DAY/YR) =11/17/2005
INPUT FILE = TVI2.HYM                                                                      USER NO.= AHYMO-S-9702c1BohanHu-AH

                                    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  AHYMO FILE FOR TVI WESTSIDE PHASE II - BH PROJ # 05 0276
*S  ZONE 1, 100YR-24HR STORM
*S                 Note:
*S                 INPUT FILE -- P:\050276\CDP\HYDRO\AHYMO\TVI2.HYM
*S                 OUTPUT FILE -- P:\050276\CDP\HYDRO\AHYMO\TVI2.OUT
*S
*S TP'S WERE ASSUMED NOT TO CHANGE FOR THE EXISTING DELINEATED BASINS.
*S                 TP = 0.133 hours as a min.
*S
START                                                                                                  TIME=        .00
LOCATION                          BERNALILLO COUNTY
*S
*S*  100 YEAR RAINFALL TABLE
RAINFALL  TYPE= 2                                                                                      RAIN24=    2.660
*S
SEDIMENT BULK                                                                                          PK BF =     1.07
*S*   SWALE1 CALCULATIONS
COMPUTE NM HYD      BASIN.OS-1    -     1      .03513       30.92        .881      .47011    1.500    1.376 PER IMP=     .00
COMPUTE NM HYD        BASIN.F1    -     2      .02929       29.73        .841      .53844    1.500    1.586 PER IMP=     .00
COMPUTE NM HYD        BASIN.P3    -     3      .00181        3.46        .112     1.15701    1.500    2.979 PER IMP=   15.00
COMPUTE NM HYD        BASIN.P4    -     4      .00310        8.34        .372     2.25222    1.500    4.206 PER IMP=   80.00
COMPUTE NM HYD        BASIN.P5    -     5      .00149        4.02        .179     2.25221    1.500    4.214 PER IMP=   80.00
COMPUTE NM HYD        BASIN.P7    -     6      .00154        3.13        .109     1.32962    1.500    3.180 PER IMP=   25.00
*S
*S  ADD HYD'S TO SIZE SWALE AND CULVERTS
*S
ADD HYD                    AP1  1& 2    1      .06442       60.66       1.722      .50118    1.500    1.471
ADD HYD                    AP2  1& 3    1      .06623       64.11       1.834      .51914    1.500    1.513
ADD HYD                    AP3  1& 5    1      .06772       68.13       2.013      .55726    1.500    1.572
ADD HYD                    AP4  1& 4    1      .07082       76.47       2.385      .63141    1.500    1.687
ADD HYD                 SWALE1  1& 6    1      .07236       79.60       2.494      .64625    1.500    1.719
*S
*S* POND 2 - WEST OF MAIN ENTRANCE
*S* Invert of outfall=5407  Bottom of Pond=5406.50
*S* Orifice Diam (inches)=24
ROUTE RESERVOIR         POND-2    1    10      .07236       54.89       2.319      .60081    1.600    1.185 AC-FT=     .578
*S
*S*  SWALE2 CALCULATIONS
COMPUTE NM HYD      BASIN.OS-5    -     2      .00605        5.33        .152      .47011    1.500    1.377 PER IMP=     .00
COMPUTE NM HYD        BASIN.F2    -     3      .00942       12.15        .341      .67838    1.500    2.016 PER IMP=     .00
*S
*S  ADD HYD'S TO SIZE SWALE2
*S
ADD HYD                 SWALE2  2& 3    2      .01548       17.49        .493      .59689    1.500    1.766
*S
*S*  SHEET FLOW TO POND CALCULATIONS
COMPUTE NM HYD        BASIN.P1    -     3      .00594       16.75        .769     2.42468    1.500    4.402 PER IMP=   90.00
COMPUTE NM HYD        BASIN.P2    -     4      .00723       20.37        .935     2.42468    1.500    4.401 PER IMP=   90.00
COMPUTE NM HYD        BASIN.P6    -     5      .00664       18.71        .859     2.42468    1.500    4.402 PER IMP=   90.00
*S
                                    FROM  TO                    PEAK        RUNOFF                 TIME TO    CFS       PAGE =    2
                     HYDROGRAPH      ID   ID       AREA       DISCHARGE     VOLUME      RUNOFF      PEAK      PER
COMMAND            IDENTIFICATION   NO.   NO.     (SQ MI)       (CFS)       (AC-FT)    (INCHES)   (HOURS)    ACRE       NOTATION

*S  ADD HYD'S TO SIZE INLETS
*S
ADD HYD                  P1,P6  3& 5    3      .01258       35.45       1.627     2.42464    1.500    4.402
ADD HYD                PARKING  3& 4    3      .01982       55.82       2.563     2.42464    1.500    4.402
```

```
                                                          Q        AHYMO
*S
*S*  ADD ALL FLOWS INTO POND
ADD HYD             S1,PKNG 10& 3  11      .09217      98.12      4.881     .99292   1.550   1.663
ADD HYD          S1,PKNG,S2 11& 2  11      .10765     114.89      5.374     .93598   1.550   1.668
*S
*S* POND-1 - WEST OF UNIVERSE        Bottom of Pond=5397.7
*S* Invert of outfall=5399.88
*S* Orifice Diam (inches)=36
ROUTE RESERVOIR        POND-1   11  20      .10765      44.50      4.480     .78035   1.900    .646 AC-FT=    2.711
FINISH
```



SHEET KEYNOTES

1. CONSTRUCT BRIDGE STRUCTURE PER ARCHITECTURAL PLANS.
2. CONSTRUCT RETAINING WALL. SEE ARCHITECTURAL PLANS FOR DETAILS.
3. INSTALL 2' CURB OPENING PER DETAIL 2, SHEET C105.
4. INSTALL 18" STORM DRAIN, (ADS-N12 HDPE, OR APPROVED EQUAL).
5. INSTALL STORM DRAIN INLET TYPE "C" PER COA STD DWG 2205; OR NYOPLAST CURB INLET STRUCTURE W/STANDARD 2' x 2' (221.3 SQ. IN. APPROXIMATE DRAIN AREA INCLUDING HOOD) H-25 RATED GRATE (OR APPROVED EQUAL).
6. INSTALL ROOF DRAIN CONNECTION TO WITHIN 5' OF BLDG. SEE PLUMBING PLANS FOR CONTINUATION & SIZES PER PLANS.
7. INSTALL 12" STORM DRAIN PIPE (ADS-N12 HDPE, PVCSDR35, OR APPROVED EQUAL).
8. CONSTRUCT SWALE PER DETAIL 7, SHEET C105.
9. CONSTRUCT RIP-RAP PER DETAIL 4, SHEET C105.
10. REMOVE EXISTING WALL AS REQ'D. SEE ARCH PLANS FOR DETAILS.
11. INSTALL 6" DIA. WALL OPENING.
12. CONSTRUCT RIP-RAP CHANNEL PER DETAIL 3 SHEET C105.
13. INSTALL NYOPLAST 24" AREA DRAIN (OR APPROVED EQUAL). GRATE SHALL BE PEDESTRIAN (H-10) RATING.
14. INSTALL NYOPLAST 24" AREA DRAIN. (OR APPROVED EQUAL). GRATE SHALL BE STANDARD (H-25) LOADING.
15. INSTALL CONCRETE RUNDOWN PER DETAIL 6, SHEET C105. SIZE PER PLANS.
16. SAWCUT AND REMOVE EX ASPHALT, CURB AND GUTTER. CONSTRUCT DRIVE ENTRANCE, CURB AND GUTTER, HC RAMP, AND SIDEWALK PER ARCHITECTURAL PLANS. CONTRACTOR TO MATCH EXISTING GRADES.
17. REMOVE EXIST DROP INLET AND CAP EXIST 10" SD LINE.
18. INSTALL 24" RCP END SECTION.
19. INSTALL 24" RCP CULVERT PIPE.
20. INSTALL CONCRETE RUNDOWN PER DETAIL 9 SHEET C105.
21. INSTALL ASPHALT RUNDOWN w/ 6" ASPHALT CURBS AT EDGES. ASPHALT PAVING SECTION TO MATCH DRIVE LANE ASPHALT SECTION.
22. TIE BACK TO EXISTING GRADE; 3:1 MAX. SLOPE.
23. INSTALL 12"x12" TEE W/ 12"x9" REDUCER.
24. INSTALL PRE FABRICATED DRAINAGE FITTING, "INSERT-A-TEE". OR APPROVED EQUAL.
25. INSTALL SILT FENCE PER DETAIL 5, SHEET C105.
26. CONSTRUCT 6"-8" ANGULAR REP-RAP (PER DETAIL 4 SHEET C105) TO 2' (MIN) PAST THE CMP END SECTION AND 2' MIN ON EITHER SIDE.
27. CONSTRUCT RIP-RAP PER APPROPRIATE SECTION, SHEET C105.
28. INSTALL 36" RCP END SECTION.
29. INSTALL 36" RCP CULVERT PIPE.

BID SET 11-17-05 R1

Albuquerque Technical Vocational Institute
Westside Campus Phase II

Van H Gilbert Architect PC
ARCHITECTURE · INTERIORS · PLANNING

VHGA Project No. 452.00
Date: 10-12-05

Bohannan ▲ Huston
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

GRADING AND DRAINAGE PLAN

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Sheet No.
C101

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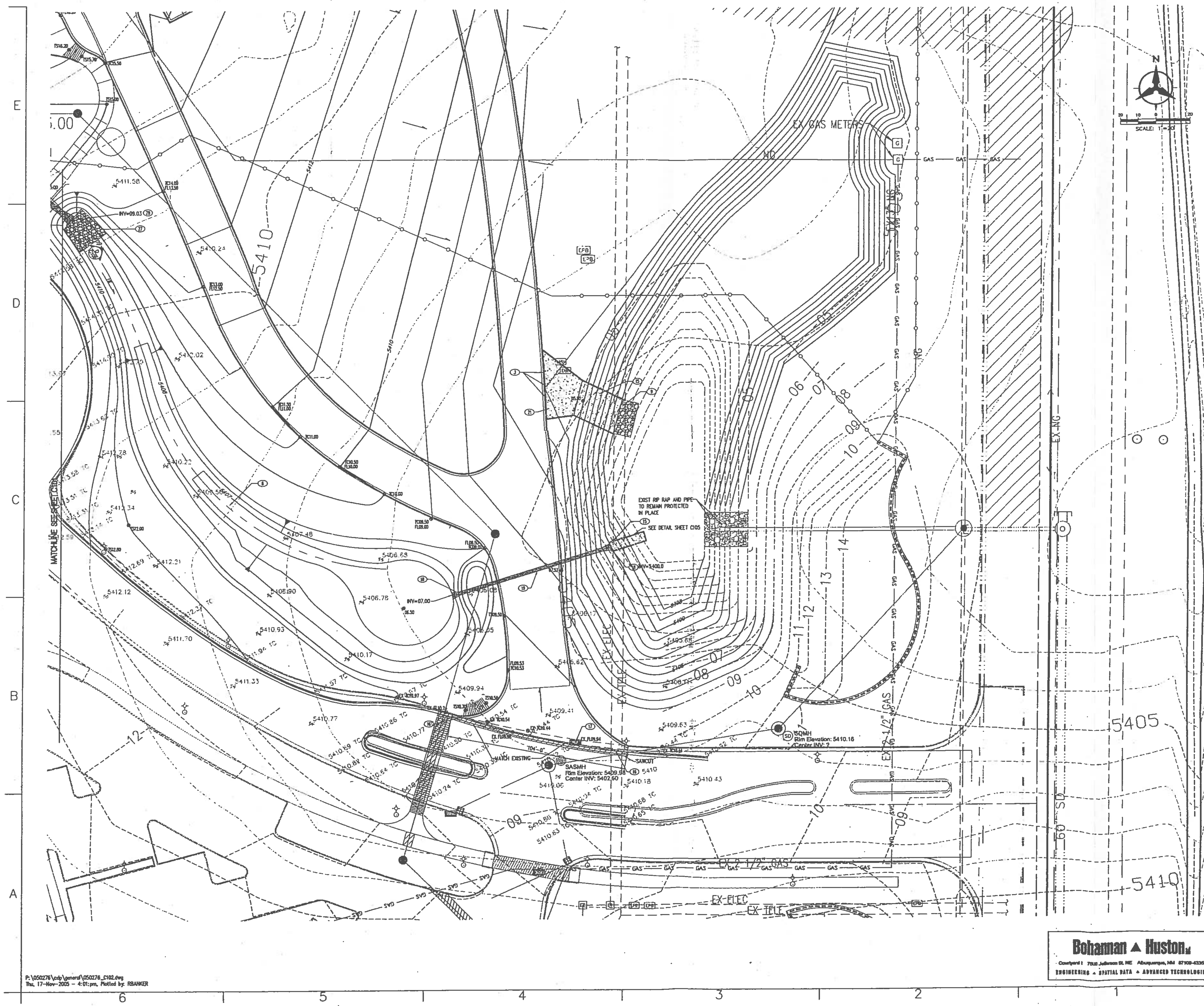
Thu, 17-Nov-2005 - 4:02pm, Plotted by: RBANKER



○ SHEET KEYNOTES

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9. CONSTRUCT RIP-RAP PER DETAIL 4, SHEET C105.
10. REMOVE EXISTING WALL AS REQ'D. SEE ARCH PLANS FOR DETAILS.
11. INSTALL 6" DIA. WALL OPENING.
12. CONSTRUCT RIP-RAP CHANNEL PER DETAIL 3 SHEET C105.
13. INSTALL NYOPLAST 24" AREA DRAIN (OR APPROVED EQUAL). GRATE SHALL BE PEDESTRIAN (H-10) RATING.
14. INSTALL NYOPLAST 24" AREA DRAIN. (OR APPROVED EQUAL). GRATE SHALL BE STANDARD (H-25) LOADING.
15. INSTALL CONCRETE RUNDOWN PER DETAIL 6, SHEET C105. SIZE PER PLANS.
16. SAWCUT AND REMOVE EX ASPHALT, CURB AND GUTTER. CONSTRUCT DRIVE ENTRANCE, CURB AND GUTTER, HC RAMP, AND SIDEWALK PER ARCHITECTURAL PLANS. CONTRACTOR TO MATCH EXISTING GRADES.
17. REMOVE EXIST DROP INLET AND CAP EXIST 10" SD LINE.
18. INSTALL 24" RCP END SECTION.
19. INSTALL 24" RCP CULVERT PIPE.
20. INSTALL CONCRETE RUNDOWN PER DETAIL 9 SHEET C105.
21. INSTALL ASPHALT RUNDOWN w/ 6" ASPHALT CURBS AT EDGES. ASPHALT PAVING SECTION TO MATCH DRIVE LANE ASPHALT SECTION.
22. TIE BACK TO EXISTING GRADE; 3:1 MAX. SLOPE.
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26. CONSTRUCT 6"-8" ANGULAR REP-RAP (PER DETAIL 4 SHEET C105) TO 2' (MIN) PAST THE CMP END SECTION AND 2' MIN ON EITHER SIDE.
27. CONSTRUCT RIP-RAP PER APPROPRIATE SECTION, SHEET C105.
28. INSTALL 36" RCP END SECTION.
29. INSTALL 36" RCP CULVERT PIPE.

BID SET 11-17-05 R1

Albuquerque Technical Vocational Institute
Westside Campus Phase II

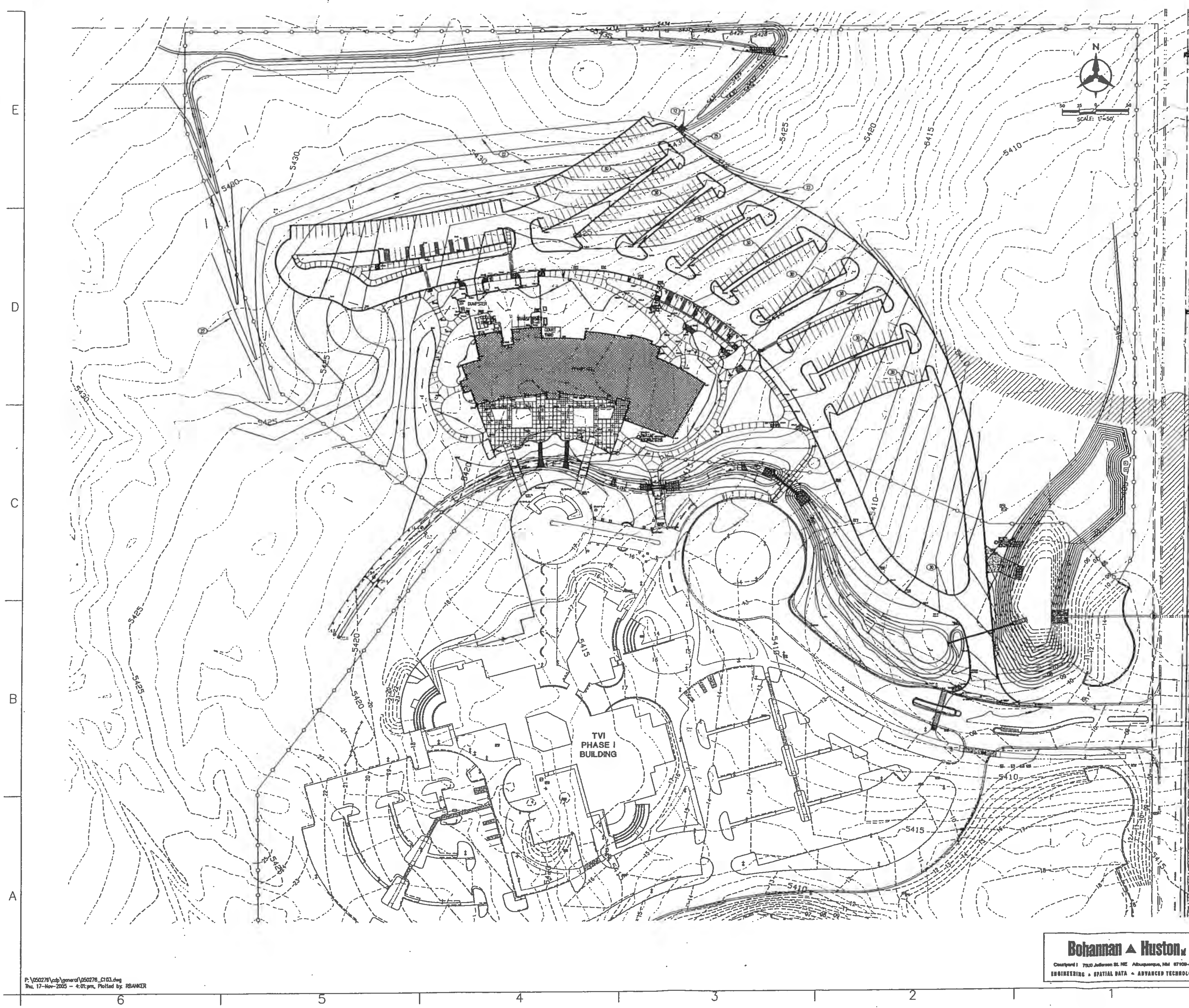
Van H Gilbert Architect PC
ARCHITECTURE · INTERIORS · PLANNING

Project No. 452.00
Date 10-12-05

Bohannan ▲ Huston
Courtyard I 7500 Jefferson St. NE Albuquerque, NM 87109-4335
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

GRADING AND DRAINAGE PLAN

Sheet No.
C102



◯ SHEET KEYNOTES

1. CONSTRUCT BRIDGE STRUCTURE PER ARCHITECTURAL PLANS.
2. CONSTRUCT RETAINING WALL. SEE ARCHITECTURAL PLANS FOR DETAILS.
3. INSTALL 2' CURB OPENING PER DETAIL 2, SHEET C105.
4. INSTALL 18" STORM DRAIN, (ADS-N12 HDPE, OR APPROVED EQUAL).
5. INSTALL STORM DRAIN INLET TYPE "C" PER COA STD DWG 2205; OR NYOPLAST CURB INLET STRUCTURE W/STANDARD 2'x 2' (221.3 SQ. IN. APPROXIMATE DRAIN AREA INCLUDING HOOD) H-25 RATED GRATE (OR APPROVED EQUAL).
6. INSTALL ROOF DRAIN CONNECTION TO WITHIN 5' OF BLDG. SEE PLUMBING PLANS FOR CONTINUATION & SIZES PER PLANS.
7. INSTALL 12" STORM DRAIN PIPE (ADS-N12 HDPE, PVCSDR35, OR APPROVED EQUAL).
8. CONSTRUCT SWALE PER DETAIL 7, SHEET C105.
9. CONSTRUCT RIP-RAP PER DETAIL 4, SHEET C105.
10. REMOVE EXISTING WALL AS REQ'D. SEE ARCH PLANS FOR DETAILS.
11. INSTALL 6" DIA. WALL OPENING.
12. CONSTRUCT RIP-RAP CHANNEL PER DETAIL 3 SHEET C105.
13. INSTALL NYOPLAST 24" AREA DRAIN (OR APPROVED EQUAL). GRATE SHALL BE PEDESTRIAN (H-10) RATING.
14. INSTALL NYOPLAST 24" AREA DRAIN. (OR APPROVED EQUAL). GRATE SHALL BE STANDARD (H-25) LOADING.
15. INSTALL CONCRETE RUNDOWN PER DETAIL 6, SHEET C105. SIZE PER PLANS.
16. SAWCUT AND REMOVE EX ASPHALT, CURB AND GUTTER. CONSTRUCT DRIVE ENTRANCE, CURB AND GUTTER, HC RAMP, AND SIDEWALK PER ARCHITECTURAL PLANS. CONTRACTOR TO MATCH EXISTING GRADES.
17. REMOVE EXIST DROP INLET AND CAP EXIST 10" SD LINE.
18. INSTALL 24" RCP END SECTION.
19. INSTALL 24" RCP CULVERT PIPE.
20. INSTALL CONCRETE RUNDOWN PER DETAIL 9 SHEET C105.
21. INSTALL ASPHALT RUNDOWN w/ 6" ASPHALT CURBS AT EDGES. ASPHALT PAVING SECTION TO MATCH DRIVE LANE ASPHALT SECTION.
22. TIE BACK TO EXISTING GRADE; 3:1 MAX. SLOPE.
23. INSTALL 12"x12" TEE W/ 12"x9" REDUCER.
24. INSTALL PRE FABRICATED DRAINAGE FITTING, "INSERT-A-TEE". OR APPROVED EQUAL.
25. INSTALL SILT FENCE PER DETAIL 5, SHEET C105.
26. CONSTRUCT 6"-8" ANGULAR REP-RAP (PER DETAIL 4 SHEET C105) TO 2' (MIN) PAST THE CMP END SECTION AND 2' MIN ON EITHER SIDE.
27. CONSTRUCT RIP-RAP PER APPROPRIATE SECTION, SHEET C105.
28. INSTALL 36" RCP END SECTION.
29. INSTALL 36" RCP CULVERT PIPE.

BID SET 11-17-05 R1

Albuquerque Technical Vocational Institute
Westside Campus Phase II

Van H Gilbert Architect PC
ARCHITECTURE · INTERIORS · PLANNING

WHCA Project No. 452.00
Date 10-12-05

Bohannan ▲ Huston
Courtyard I 7500 Jefferson St. NE Albuquerque, NM 87109-4335
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PARKING AREA
BASE PLAN

Sheet No
C103

SHEET KEYNOTES

1. CONSTRUCT BRIDGE STRUCTURE PER ARCHITECTURAL PLANS.
2. CONSTRUCT RETAINING WALL. SEE ARCHITECTURAL PLANS FOR DETAILS.
3. INSTALL 2' CURB OPENING PER DETAIL 2, SHEET C105.
4. INSTALL 18" STORM DRAIN, (ADS-N12 HDPE, OR APPROVED EQUAL).
5. INSTALL STORM DRAIN INLET TYPE "C" PER COA STD DWG 2205; OR NYOPLAST CURB INLET STRUCTURE W/STANDARD 2'x 2' (221.3 SQ. IN. APPROXIMATE DRAIN AREA INCLUDING HOOD) H-25 RATED GRATE (OR APPROVED EQUAL).
6. INSTALL ROOF DRAIN CONNECTION TO WITHIN 5' OF BLDG. SEE PLUMBING PLANS FOR CONTINUATION & SIZES PER PLANS.
7. INSTALL 12" STORM DRAIN PIPE (ADS-N12 HDPE, PVCSDR35, OR APPROVED EQUAL).
8. CONSTRUCT SWALE PER DETAIL 7, SHEET C105.
9. CONSTRUCT RIP-RAP PER DETAIL 4, SHEET C105.
10. REMOVE EXISTING WALL AS REQ'D. SEE ARCH PLANS FOR DETAILS.
11. INSTALL 6" DIA. WALL OPENING.
12. CONSTRUCT RIP-RAP CHANNEL PER DETAIL 3 SHEET C105.
13. INSTALL NYOPLAST 24" AREA DRAIN (OR APPROVED EQUAL). GRATE SHALL BE PEDESTRIAN (H-10) RATING.
14. INSTALL NYOPLAST 24" AREA DRAIN. (OR APPROVED EQUAL). GRATE SHALL BE STANDARD (H-25) LOADING.
15. INSTALL CONCRETE RUNDOWN PER DETAIL 6, SHEET C105. SIZE PER PLANS.
16. SAWCUT AND REMOVE EX ASPHALT, CURB AND GUTTER. CONSTRUCT DRIVE ENTRANCE, CURB AND GUTTER, HC RAMP, AND SIDEWALK PER ARCHITECTURAL PLANS. CONTRACTOR TO MATCH EXISTING GRADES.
17. REMOVE EXIST DROP INLET AND CAP EXIST 10" SD LINE.
18. INSTALL 24" RCP END SECTION.
19. INSTALL 24" RCP CULVERT PIPE.
20. INSTALL CONCRETE RUNDOWN PER DETAIL 9 SHEET C105.
21. INSTALL ASPHALT RUNDOWN w/ 6" ASPHALT CURBS AT EDGES. ASPHALT PAVING SECTION TO MATCH DRIVE LANE ASPHALT SECTION.
22. TIE BACK TO EXISTING GRADE; 3:1 MAX. SLOPE.
23. INSTALL 12"x12" TEE W/ 12"x9" REDUCER.
24. INSTALL PRE FABRICATED DRAINAGE FITTING, "INSERT-A-TEE". OR APPROVED EQUAL.
25. INSTALL SILT FENCE PER DETAIL 5, SHEET C105.
26. CONSTRUCT 6"-8" ANGULAR REP-RAP (PER DETAIL 4 SHEET C105) TO 2' (MIN) PAST THE CMP END SECTION AND 2' MIN ON EITHER SIDE.
27. CONSTRUCT RIP-RAP PER APPROPRIATE SECTION, SHEET C105.
28. INSTALL 36" RCP END SECTION.
29. INSTALL 36" RCP CULVERT PIPE.

BID SET 11-17-05 R1

Albuquerque Technical Vocational Institute
Westside Campus Phase II

Van H Gilbert Architect PC
ARCHITECTURE · INTERIORS · PLANNING

VHGA Project No. 432.00
Date 10-12-05

Bohannan ▲ Huston
Courtyard I 7500 Jefferson St. NE Albuquerque, NM 87109-4335
ENGINEERING ▲ SPATIAL DATA ▲ ADVANCED TECHNOLOGIES

PARKING AREA PLAN (ALTERNATE)

Sheet No. C104

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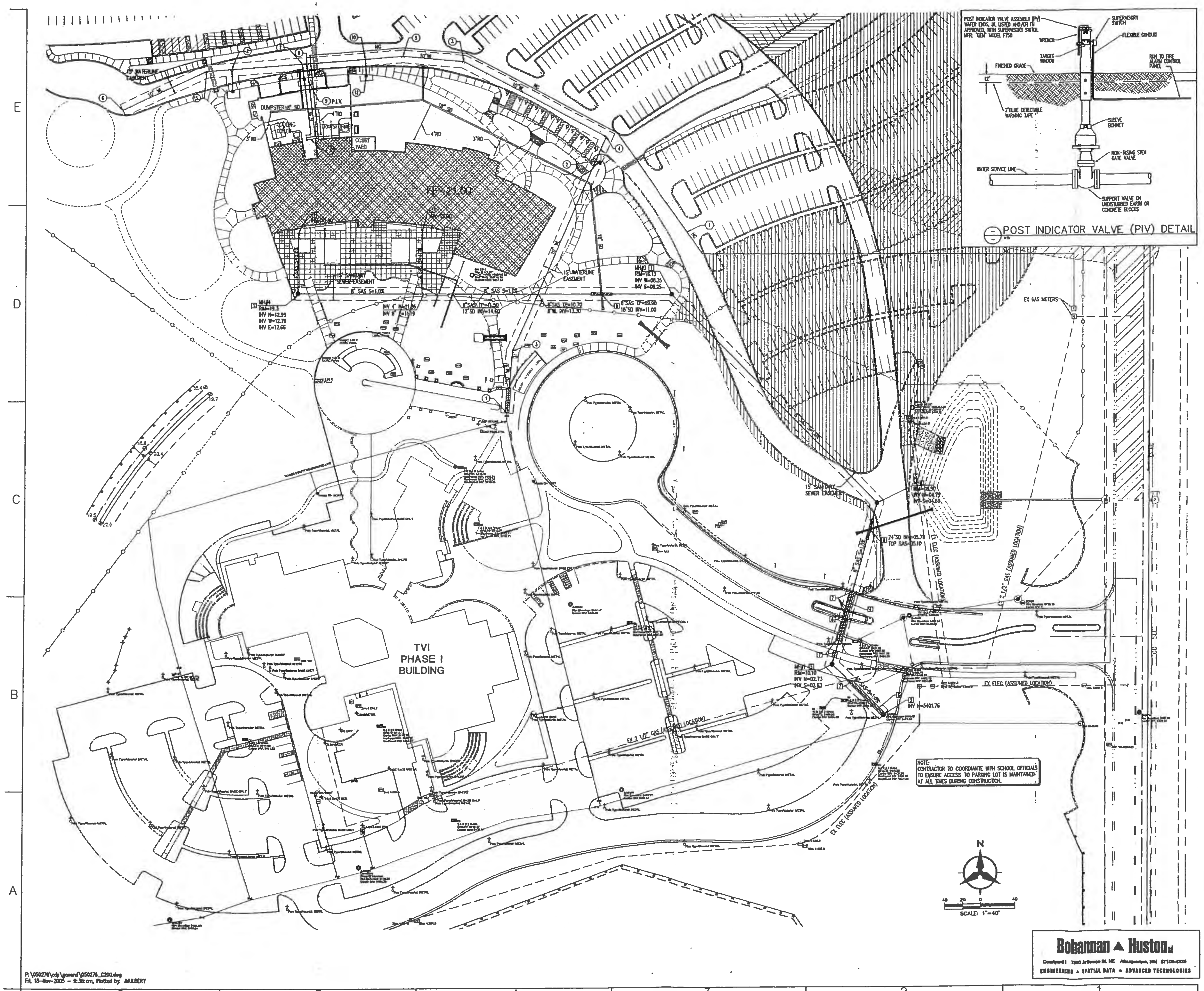
Thu, 17-Nov-2005 - 4:01pm, Plotted by: RBANKER



○ WATERLINE KEYED NOTES

1. CONNECT TO EXISTING 8" STUBOUT. CONTRACTOR TO VERIFY LOCATION AND CONTACT ENGINEER WITH ANY DISCREPANCIES.
2. INSTALL 8"x6" TEE, 1-6" GATE VALVE W/ BOX & LID PER COA STD DWG 2326, AND 1-FIRE HYDRANT COMPLETE PER COA STD DWG 2340.
3. INSTALL 8"x22.5° BEND W/ RESTRAINED JOINTS.
4. INSTALL 8"x90° BEND W/ RESTRAINED JOINTS.
5. INSTALL 8"x11.25° BEND W/ RESTRAINED JOINTS.
6. INSTALL 8" CAP W/ RESTRAINED JOINTS.
7. INSTALL 2" METERED SERVICE LINE PER COA STD DWG 2363 WITH METER BOX & COVER. INSTALL METERED SERVICE LINE TO WITHIN 5' OF BUILDING. SEE PLUMBING PLANS FOR CONTINUATION. FOR DOMESTIC USE ONLY.
8. INSTALL 8"x6" TEE W/ RESTRAINED JOINTS. 1-6" GATE VALVE W/ BOX & LID PER COA STD DWG 2326. INSTALL 6" FIRELINE TO WITHIN 5' OF BUILDING. INSTALL 6" CAP W/ RESTRAINED JOINTS. SEE FIRE PROTECTION PLANS FOR CONTINUATION.
9. INSTALL POST INDICATOR VALVE (PIV) PER DETAIL, THIS SHEET. CONTRACTOR SHALL PROVIDE CONDUIT & WIRE TO CONNECT TO FIRE ALARM PANEL.
10. INSTALL 2" METERED SERVICE LINE PER COA STD DWG 2363 WITH METER BOX & COVER. INSTALL METERED SERVICE LINE TO WITHIN 5' OF BUILDING. SEE PLUMBING PLANS FOR CONTINUATION. FOR LANDSCAPE USE ONLY.

○ GAS KEYED NOTES

1. INSTALL GAS LINE TO WITHIN 5' OF BUILDING. SIZE, LOCATION, & CONNECTION TO GAS MAIN SHALL BE COORDINATED WITH PNM. SEE MECHANICAL PLAN FOR CONTINUATION.

□ SANITARY SEWER KEYED NOTES

1. BUILD 4' DIA. TYPE "E" SAS MH PER COA STD DWG 2102.
2. CONNECT TO EXISTING MH PER COA STD DWG 2117.
3. INSTALL 4" SAS SERVICE PER COA STD DWG 2125 TO WITHIN 5' OF BUILDING. SEE PLUMBING PLANS FOR CONTINUATION.
4. INSTALL 4" SAS SERVICE PER COA STD DWG 2118 TO WITHIN 5' OF BUILDING. SEE PLUMBING PLANS FOR CONTINUATION.
5. INSTALL 4' DIA. TYPE "C" SAS MANHOLE PER COA STD DWG 2101.
6. SAWCUT, REMOVE & REPLACE EX. ASPHALT PER COA STD DWG 2465.
7. SAWCUT, REMOVE & REPLACE EX SIDEWALK AND CURB & GUTTER. REPLACEMENT SHALL MATCH EXISTING.
8. CONCRETE ENCASE SAS PER COA STD. DWG 2140

RESTRAINED JOINT TABLE

MECHANICAL JOINTS	LENGTH OF RESTRAINED JOINTS (6")	(8")	(10")
11.25° H BEND	2'	3'	3'
22.50° H BEND	4'	5'	6'
45° H BEND	8'	11'	13'
90° H BEND	20'	26'	31'
GATE VALVE/CAP	55'	72'	86'

NOTE:
1. ALL MECHANICAL JOINTS SHALL BE RESTRAINED AT THE FITTING.
2. THE CONTRACTOR SHALL PROVIDE A MINIMUM PIPE LENGTH OF 20 LF FROM ALL MECHANICAL JOINTS, UNLESS SPECIFIED DIFFERENTLY IN THE PLANS. ALL PIPE JOINTS WITHIN 20 LF OF AJAJ SHALL BE RESTRAINED AT THE CONTRACTORS EXPENSE.
3. THE CONTRACTOR SHALL RESTRAIN ALL PIPE JOINTS IN THE SPECIFIED DISTANCE LISTED IN THE TABLE ABOVE. (SEE NOTE 5 ABOVE)
4. THE CONTRACTOR SHALL RESTRAIN ALL FIRE HYDRANT JOINTS FROM THE TEE ON THE MAIN TO THE FIRE HYDRANT FLANGE.

MATERIALS:

SAS LINE: SDR-35 PVC
WATER LINE: C900-PVC

BID SET 11-17-05 R1

Albuquerque Technical Vocational Institute
Westside Campus Phase II

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VHGA Project No. 452.00
Date 10-12-05

UTILITY PLAN

Sheet No. C200

Anasazi Ridge McMahon

(s16.66H

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) - - VERSION: 1997.02d RUN DATE (MON/DAY/YR) =04/15/2006

INPUT FILE = C:\DOCUME~1\Doug\Desktop\MCMAHON.txt USER NO.= AHYMO-I-9702dGoodwinM-AH

PAGE = 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 PER ACRE	NOTATION
START				10 YR						TIME= .00
RAINFALL TYPE= 2										RAIN24= 1.770
COMPUTE NM HYD	1A	-	1	.01440	2.23	.063	.08231	1.550	.242	PER IMP= .00
COMPUTE NM HYD	1B	-	1	.00340	.53	.015	.08231	1.550	.243	PER IMP= .00
COMPUTE NM HYD	1C	-	1	.01590	21.66	.890	1.04941	1.500	2.129	PER IMP= 60.00
RAINFALL TYPE= 2				100 YR						RAIN24= 2.660
COMPUTE NM HYD	1A	-	1	.01440	11.88	.337	.43936	1.500	1.289	PER IMP= .00
COMPUTE NM HYD	1B	-	1	.00340	2.81	.080	.43936	1.500	1.291	PER IMP= .00
COMPUTE NM HYD	1C	-	1	.01590	36.19	1.512	1.78251	1.500	3.556	PER IMP= 60.00
FINISH										

(s10H

		10yr	100yr
Flow in the North ½ of McMahon is basins 1A plus 1B plus ½ of 1C		13.59 cfs	32.78
Flow in the South ½ of McMahon is just half of basin 1C		10.83	18.10
			50.88 Total
The west approach to the brige has a slope of 1.22%			
So the flow depth in the north ½ of McMahon is		0.48'	0.65'
and " " " " " south ½ " " "		0.45'	0.54'

The allowable 10 YR Spread/Depth is:
2' gutterpan 0.13' Deep
6' bike lane @ 2% 0.12'
12' lane @ 2% 0.24
20' at 0.49' depth
leaving one 12' lane open in each direction.

After crossing the bridge the slope is 2.51%
So the flow depth in the north Half of McMahon is: 0.45 0.61'
and the " " " " south Half: " " 0.47 0.53
at the higher flows at the low point.
(over)

Basin ID	Area ac	Area sq mi	Land Treatment A	B	C	D	10 YR Qcfs	100 YR Qcfs
OS-1A	9.2	0.0144	100	0	0	0		
OS 1B	2.2	0.0034	100	0	0	0		
OS 1C	10.2	0.0159	0	20	20	60		

Flows approaching low spot from West

The Mc Mahon Basin is increased by about 950' LF from the west side of the bridge to the low spot which is 3.4 acres or 33% increase in both area and flow.

10YR increase = 3.57 cfs in each half
100YR increase = $\frac{11.94 \text{ cfs}}{2}$ in each half = 5.97

Flows approaching low spot from east.

The Mc Mahon Basin is increased by 1500 LF from low point East to high point which is 5.37 ac or 53% increase in flow.

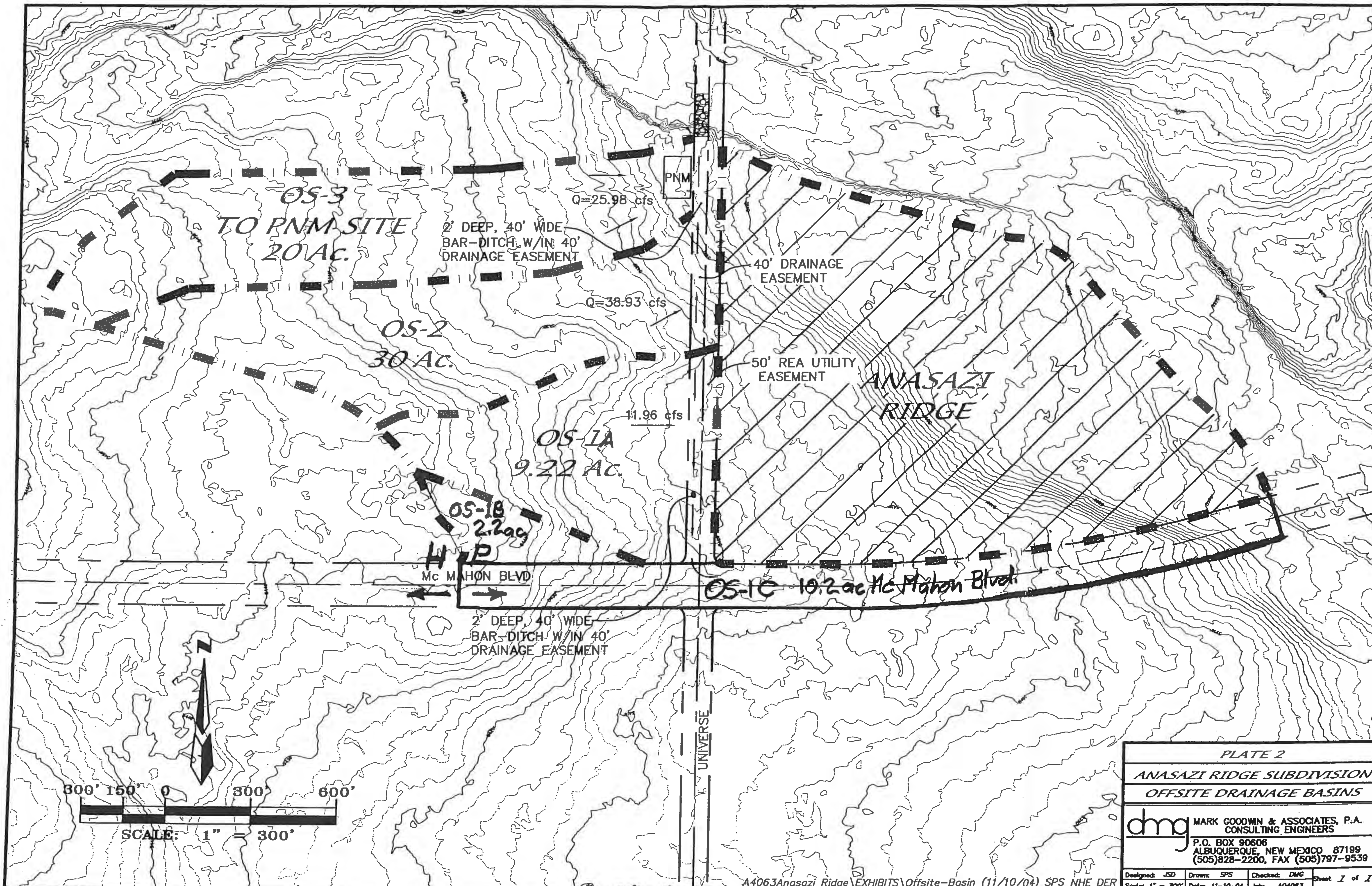
10 yr. increase = 11.48 cfs
100 yr. increase = 19.18 cfs   for a total flow at the sump of   10yr =
100yr = 82.00 cfs

10 YR capacity on the west approach to the low point is exceeded at begining of the vertical curve where the slope decreases Sta 1058+00 ±

10 YR capacity on the east approach to the low point is exceeded where the slope decreased to about 0.22% or 24' east of the low spot where the elevation is only 0.03' higher than the low spot.

The single grade inlets on grade to the west will each intercept about 9 or 10 cfs 100YR, leaving about 62 cfs at the sump. Use 2 double grate inlets on each side to provide about double the required 100yr capacity.

F:\A04JOBS\A4063 Anasazi Ridge\EXHIBITS\Offsite-basin.dwg, 11/10/2004 2:57:34 PM, PLOTTED BY: DER



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://soils.usda.gov/sqi/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

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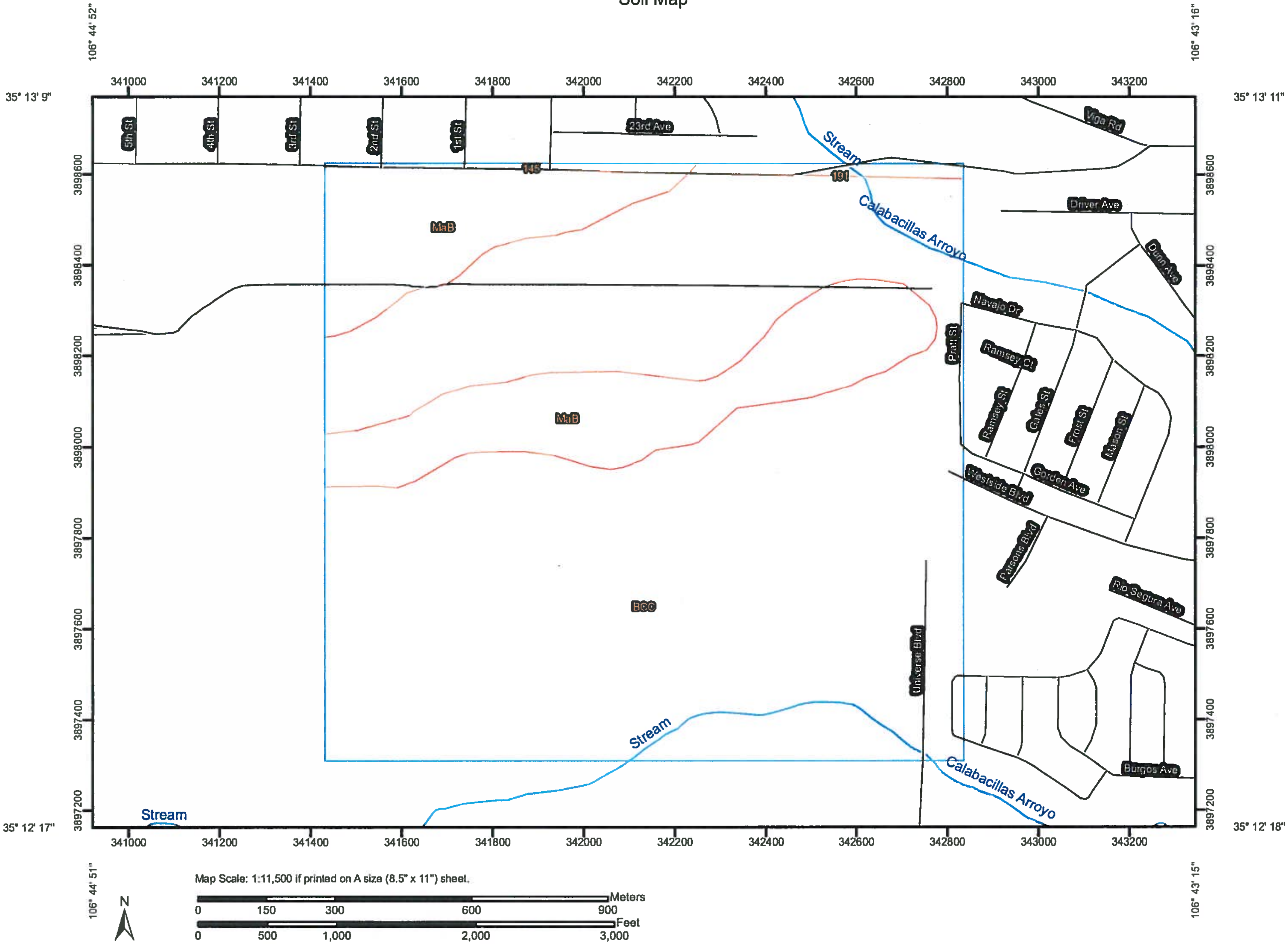
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:11,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 13N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico
Survey Area Data: Version 9, Dec 9, 2008

Soil Survey Area: Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties
Survey Area Data: Version 7, Dec 9, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 10/6/1996

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico (NM600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BCC	Bluepoint loamy fine sand, 1 to 9 percent slopes	357.4	78.3%
MaB	Madurez loamy fine sand, 1 to 5 percent slopes	92.3	20.2%
Subtotals for Soil Survey Area		**449.7**	**98.5%**
Totals for Area of Interest		**456.7**	**100.0%**

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties (NM656)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
145	Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes	3.0	0.7%
191	Sheppard loamy fine sand, 3 to 8 percent slopes	4.0	0.9%
Subtotals for Soil Survey Area		**7.0**	**1.5%**
Totals for Area of Interest		**456.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico

BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes

Map Unit Setting

Elevation: 4,850 to 6,000 feet
Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 170 to 195 days

Map Unit Composition

Bluepoint and similar soils: 85 percent

Description of Bluepoint

Setting

Landform: Flood plains, alluvial flats
Landform position (three-dimensional): Talf, rise
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy alluvium and/or eolian sands

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water capacity: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability (nonirrigated): 7s
Ecological site: Deep Sand (R042XA054NM)

Typical profile

0 to 8 inches: Loamy fine sand
8 to 20 inches: Stratified fine sand to gravelly loamy fine sand
20 to 60 inches: Loamy sand

MaB—Madurez loamy fine sand, 1 to 5 percent slopes

Map Unit Setting

Elevation: 4,850 to 6,000 feet

Mean annual precipitation: 7 to 10 inches
Mean annual air temperature: 58 to 60 degrees F
Frost-free period: 170 to 195 days

Map Unit Composition

Madurez and similar soils: 90 percent

Description of Madurez

Setting

Landform: Fan piedmonts, alluvial fans
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from igneous and sedimentary rock

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 7 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water capacity: Moderate (about 8.8 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Sandy (R042XA051NM)

Typical profile

0 to 4 inches: Loamy fine sand
4 to 21 inches: Sandy clay loam
21 to 60 inches: Sandy loam

Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties

145—Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes

Map Unit Setting

Elevation: 5,200 to 6,000 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days

Map Unit Composition

Grieta and similar soils: 55 percent
Sheppard and similar soils: 40 percent

Description of Grieta

Setting

Landform: Mesas, plateaus, ridges, fan remnants
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over fan alluvium derived from sandstone

Properties and qualities

Slope: 2 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 2.0
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Land capability (nonirrigated): 7e
Ecological site: Loamy (R042XA052NM)

Typical profile

0 to 7 inches: Loamy fine sand
7 to 14 inches: Sandy clay loam
14 to 21 inches: Sandy clay loam
21 to 38 inches: Coarse sandy loam
38 to 50 inches: Coarse sandy loam
50 to 60 inches: Coarse sandy loam

Description of Sheppard

Setting

Landform: Terraces, alluvial fans, benches, dunes, structural benches

Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Eolian deposits derived from sandstone

Properties and qualities

Slope: 3 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability (nonirrigated): 7s
Ecological site: Deep Sand (R042XA054NM)

Typical profile

0 to 5 inches: Loamy fine sand
5 to 27 inches: Loamy fine sand
27 to 60 inches: Loamy fine sand

191—Sheppard loamy fine sand, 3 to 8 percent slopes

Map Unit Setting

Elevation: 5,200 to 5,700 feet
Mean annual precipitation: 8 to 10 inches
Mean annual air temperature: 53 to 55 degrees F
Frost-free period: 140 to 160 days

Map Unit Composition

Sheppard and similar soils: 85 percent

Description of Sheppard

Setting

Landform: Structural benches, dunes, benches, alluvial fans, stream terraces
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Eolian deposits derived from sandstone

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability (nonirrigated): 7s
Ecological site: Deep Sand (R042XA054NM)

Typical profile

0 to 3 inches: Loamy fine sand
3 to 27 inches: Loamy fine sand
27 to 60 inches: Loamy fine sand

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Erosion

This folder contains a collection of tabular reports that present soil erosion factors and groupings. The reports (tables) include all selected map units and components for each map unit. Soil erosion factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

RUSLE2 Related Attributes

This report summarizes those soil attributes used by the Revised Universal Soil Loss Equation Version 2 (RUSLE2) for the map units in the selected area. The report includes the map unit symbol, the component name, and the percent of the component in the map unit. Soil property data for each map unit component include the hydrologic soil group, erosion factors Kf for the surface horizon, erosion factor T, and the representative percentage of sand, silt, and clay in the surface horizon.

Report—RUSLE2 Related Attributes

RUSLE2 Related Attributes– Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico							
Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes							
Bluepoint	85	A	.17	5	79.4	16.6	4.0
MaB—Madurez loamy fine sand, 1 to 5 percent slopes							
Madurez	90	B	.20	5	83.1	9.4	7.5

RUSLE2 Related Attributes– Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties							
Map symbol and soil name	Pct. of map unit	Hydrologic group	Kf	T factor	Representative value		
					% Sand	% Silt	% Clay
145—Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes							
Grieta	55	B	.20	5	83.5	9.5	7.0
Sheppard	40	A	.20	5	83.5	9.5	7.0
191—Sheppard loamy fine sand, 3 to 8 percent slopes							
Sheppard	85	A	.20	5	83.5	9.5	7.0

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash.

Engineering Properties– Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes												
Bluepoint	0-8	*Loamy fine sand	SM	A-4, A-2	0	0	100	100	75-85	25-45	0-20	NP-3
	8-20	*Stratified fine sand to gravelly loamy fine sand	SM	A-2	0	0	78-100	47-100	44-96	5-15	0-18	NP-3
	20-60	*Loamy sand, Loamy fine sand, fine sand	SM	A-2, A-4	0	0	100	100	65-85	25-45	0-19	NP-3
MaB—Madurez loamy fine sand, 1 to 5 percent slopes												
Madurez	0-4	*Loamy fine sand	SM	A-2	0	0	100	100	75-85	20-35	17-23	2-6
	4-21	*Sandy clay loam, Fine sandy loam	SC, SC-SM	A-4	0	0	100	100	50-65	35-50	29-37	6-18
	21-60	*Sandy loam, Loam	CL-ML, SC-SM, SC	A-4	0	0	100	100	55-70	40-55	27-35	6-17

Engineering Properties– Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties												
Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				*Pct*	*Pct*					*Pct*	
145—Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes												
Grieta	0-7	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	15-20	NP-4
	7-14	*Sandy clay loam	SC	A-6	0	0	100	100	75-90	40-50	25-35	10-25
	14-21	*Sandy clay loam	SC	A-6	0	0	90-100	90-100	75-90	40-50	25-35	10-25
	21-38	*Coarse sandy loam	SC-SM	A-2-4	0	0	90-100	85-100	55-75	20-40	15-30	4-7
	38-50	*Coarse sandy loam	SC-SM	A-2-4	0	0	100	95-100	55-75	20-40	15-30	4-7
	50-60	*Coarse sandy loam	SC-SM	A-2-4	0	0	100	95-100	55-75	20-40	15-30	4-7
Sheppard	0-5	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	5-15	NP-4
	5-27	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	5-15	NP-4
	27-60	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	5-15	NP-4
191—Sheppard loamy fine sand, 3 to 8 percent slopes												
Sheppard	0-3	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	15-20	NP-4
	3-27	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	15-20	NP-4
	27-60	*Loamy fine sand	SM	A-2-4	0	0	100	100	65-85	20-40	15-20	NP-4

Particle Size and Coarse Fragments

This table shows estimates of particle size distribution and coarse fragment content of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Total fragments is the content of fragments of rock and other materials larger than 2 millimeters in diameter on volumetric basis of the whole soil.

Fragments 2-74 mm refers to the content of coarse fragments in the 2 to 74 millimeter size fraction.

Fragments 75-249 mm refers to the content of coarse fragments in teh 75 to 249 millimeter size fraction.

Fragments 250-599 mm refers to the content of coarse fragments in the 250 to 599 millimeter size fraction.

Fragments >=600 mm refers to the content of coarse fragments in the greater than or equal to 600 millimeter size fraction.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion.

There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Physical Soil Properties– Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
BCC—Bluepoint loamy fine sand, 1 to 9 percent slopes														
Bluepoint	0-8	-79-	-17-	2- 4- 6	1.45-1.65	42.34-141.14	0.06-0.10	0.0-2.9	0.0-0.5	.17	.17	5	2	134
	8-20	-95-	- 1-	2- 4- 6	1.50-1.65	42.34-141.14	0.05-0.08	0.0-2.9	0.0	.10	.24			
	20-60	-79-	-17-	2- 4- 6	1.50-1.65	42.34-141.14	0.05-0.09	0.0-2.9	0.1-0.3	.17	.17			
MaB—Madurez loamy fine sand, 1 to 5 percent slopes														
Madurez	0-4	-83-	- 9-	5- 8- 10	1.40-1.50	42.34-141.14	0.09-0.10	0.0-2.9	0.4-0.7	.20	.20	5	2	134
	4-21	-60-	-18-	18-22- 25	1.35-1.45	4.23-14.11	0.14-0.16	3.0-5.9	0.2-0.3	.32	.32			
	21-60	-67-	-15-	18-18- 25	1.35-1.45	4.23-14.11	0.14-0.16	0.0-2.9	0.1-0.3	.32	.32			

Physical Soil Properties– Sandoval County Area, New Mexico, Parts of Los Alamos, Sandoval, and Rio Arriba Counties														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
145—Grieta-Sheppard loamy fine sands, 2 to 9 percent slopes														
Grieta	0-7	75-84- 95	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20	5	2	134
	7-14	50-55- 70	10-18- 25	20-27- 35	1.35-1.45	4.23-14.11	0.14-0.16	3.0-5.9	0.0-0.5	.32	.32			
	14-21	50-55- 70	10-18- 25	20-27- 35	1.35-1.45	4.23-14.11	0.14-0.16	3.0-5.9	0.0-0.5	.32	.32			
	21-38	55-68- 75	10-22- 30	5-10- 15	1.45-1.55	14.11-42.34	0.09-0.11	0.0-2.9	0.0-0.5	.20	.20			
	38-50	55-68- 75	10-22- 30	5-10- 15	1.45-1.55	14.11-42.34	0.09-0.11	0.0-2.9	0.0-0.5	.20	.20			
	50-60	55-68- 75	10-22- 30	5-10- 15	1.45-1.55	14.11-42.34	0.09-0.11	0.0-2.9	0.0-0.5	.20	.20			
Sheppard	0-5	75-84- 90	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20	5	2	134
	5-27	75-84- 90	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	27-60	75-84- 95	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
191—Sheppard loamy fine sand, 3 to 8 percent slopes														
Sheppard	0-3	75-84- 95	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20	5	2	134
	3-27	75-84- 95	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			
	27-60	75-84- 95	0-10- 15	5- 7- 10	1.45-1.55	42.34-141.14	0.08-0.10	0.0-2.9	0.0-0.5	.20	.20			