CITY OF ALBUQUERQUE

Planning Department
Alan Varela, Director

Mayor Timothy M. Keller

March 16, 2023

Ronald Bohannan, P.E.
Tierra West, LLC
5571 Midway Park Place NE
Albuquerque, NM 87109

RE: Golf Course & Westside Commercial Development
Grading & Drainage Plans and Drainage Report
Engineer's Stamp Date: 02/15/23
Hydrology File: A12D008B2

Dear Mr. Bohannan:

Based upon the information provided in your submittal received 02/16/2022, the Grading & Drainage Plans and Drainage Report **are not** approved for Grading Permit, Work Order and for action by the Development Hearing Officer (DHO) on Preliminary/Final Plat. The following comments need to be addressed for approval of the above referenced project:

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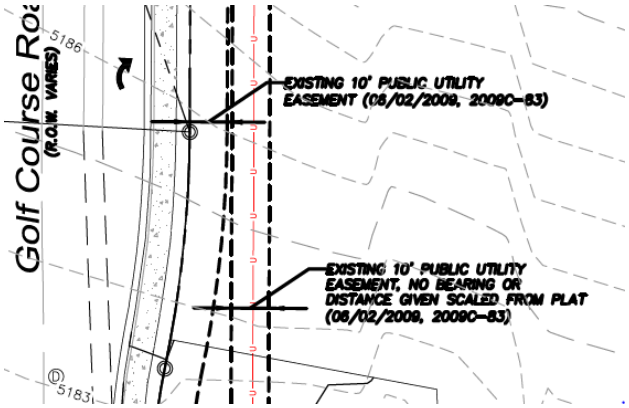
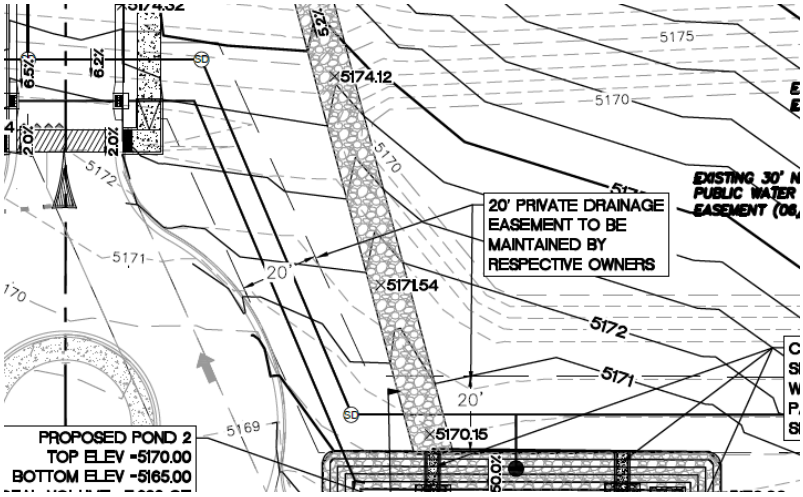
General

1. The overall drafting needs some serious attention. There are existing easements with labels that are too thick in pen width. These need to be shaded back.



2. There are proposed easements which just fade into the background. These need a little bit more pen width to them.



3. It appears that the entrances for Tracts D-1-A & D-1-B are too close to Westside Blvd. Please check with Transportation Section to verify the distance requirements.

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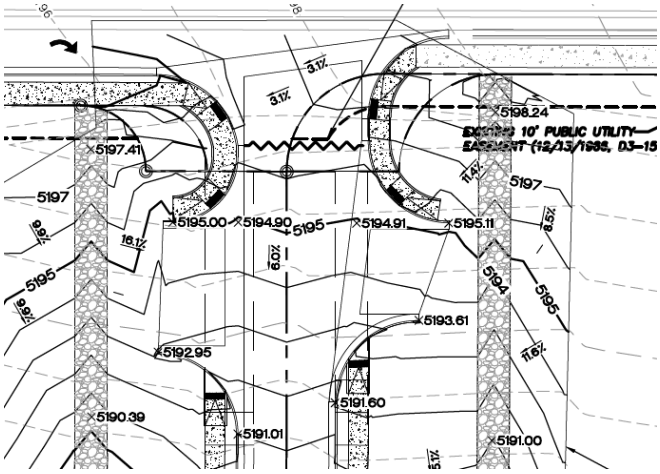
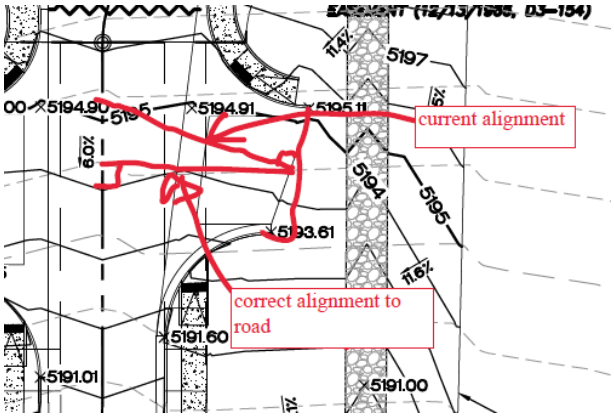
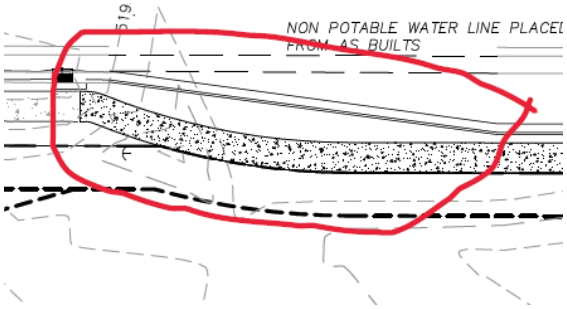


4. Please make all drives perpendicular to the private drives or public streets. There are several that are askew and need to be fixed.



5. The proposed sidewalk in this area appears not to conform to construction conventions. Please verify with Transportation Section.



Sheet C2

6. All the storm drain within the development is private. There are call outs for HDPE and then there are call outs for RCP. Since this is all private storm sewer, please stick with only one material type.

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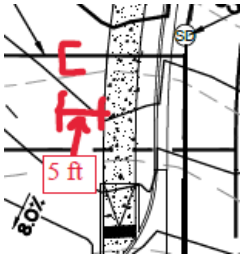
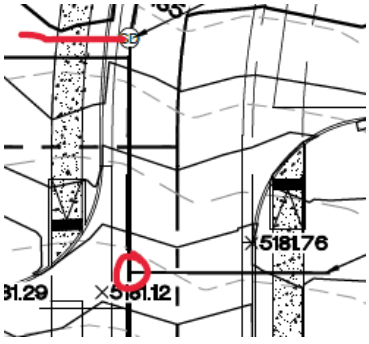
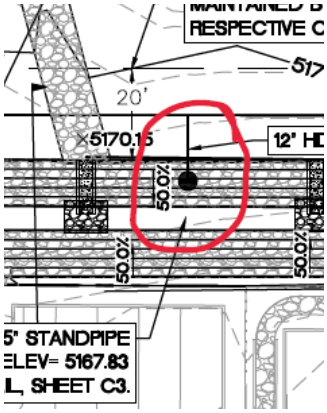
7. All stub outs should be only 5 feet beyond the proposed sidewalk and should have a plug with an inv elevation.

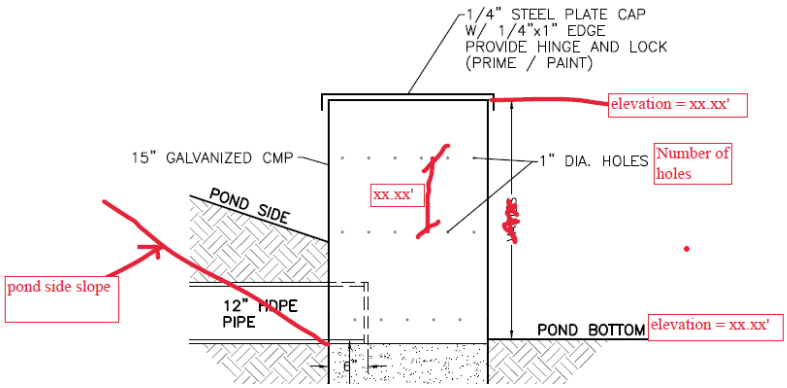


8. Depending on the material that is to be used, please fix the stub out connections. If RCP is to be used, then you will need manholes for the connections. If you use HDPE, then that is not needed since they do make Tee connections. If HDPE is to be used, please ensure that the tee connections are at lease 5 feet from all manholes and inlets for buildability.



9. The proposed stand pipe will not functions as shown. It needs to be at the bottom of the detention pond in order to work since the 1" dia holes will be drilled 360 degrees around the pipe. Also, the detail has information missing in order to build it as designed.





Drainage Report

10. Future Conditions. Please include the future conditions for Drainage Area D3. This drainage area is missing in the calculations.

Future Conditions

Future Conditions															
					Basin Descriptions								10-Year, 6-Hour (DPM Ch 6)		
					Treatment A		Treatment B		Treatment C		Treatment D				
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	%	(acres)	%	(acres)	%	(acres)	%	(acres)	Weighted E (in)	Volume (ac-ft)	Flow cfs
D1	D-1	301,896	6.93	0.01083	0%	0.000	0%	0.000	15%	1.040	85%	5.891	2.047	1.182	27.25
Total		301,896	6.93	0.01083		0.000		0.000		1.040		5.891		1.182	27.255

11. The AHYMMO calculations for the detention pond were only run for the proposed conditions and not the future conditions. Please run this for the future conditions to in sure that the allowable discharge is only 19.5 cfs and please show what the size of the detention pond would be for the future conditions.

As a reminder, if the project total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Dough Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.

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If you have any questions, please contact me at 924-3995 or rbrissette@cabq.gov.

Sincerely,

Renée C. Brissette

Renée C. Brissette, P.E. CFM
Senior Engineer, Hydrology
Planning Department

PO Box 1293

Albuquerque

NM 87103

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City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET

Project Title: Golf Course & Westside Blvd **Building Permit #**_____ **Hydrology File #**_____

DRB#_____ **EPC#**_____

Legal Description: TR D-1 Plat of TRS D-1, E-1 AMAFCA Black Arroyo Channel Row Paradise Heights Unit 1 City Address OR Parcel 10120665048211303

Applicant/Agent: Tierra West, LLC **Contact:** Luis Noriega

Address: 5571 Midway Park Place NE Albuquerque, NM 87109 **Phone:** (505) 858-3100

Email: LNORIEGA@TIERRAWESTLLC.COM

Applicant/Owner: Dennis & George LLC **Contact:** Dennis Carpenter

Address: 8618 Menaul Suite H Albuquerque, NM 87109 **Phone:** (505) 269-1812

Email: denniscarpenter1@aol.com

TYPE OF DEVELOPMENT: X PLAT (#of lots) 4 RESIDENCE __DRB SITE ___ ADMIN SITE: ____

RE-SUBMITTAL: X YES _____ NO

DEPARTMENT: _____TRANSPORTATION X HYDROLOGY/DRAINAGE

Check all that apply:

TYPE OF SUBMITTAL:

___ENGINEER/ARCHITECT CERTIFICATION
___PAD CERTIFICATION
___CONCEPTUAL G&D PLAN
___GRADING PLAN
X DRAINAGE REPORT
___DRAINAGE MASTER PLAN
___FLOOD PLAN DEVELOPMENT PERMIT APP.
___ELEVATION CERTIFICATE
___CLOMR/LOMR
___TRAFFIC CIRCULATION LAYOUT (TCL) ADMINISTRATIVE
___TRAFFIC CIRCULATION LAYOUT FOR DRB APPROVAL
___TRAFFIC IMPACT STUDY (TIS)
___STREET LIGHT LAYOUT
___OTHER (SPECIFY)
___PRE-DESIGN MEETING?

TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

___BUILDING PERMIT APPROVAL
___CERTIFICATE OF OCCUPANCY
___CONCEPTUAL TCL DRB APPROVAL
___PRELIMINARY PLAT APPROVAL
___SITE PLAN FOR SUB'D APPROVAL
___SITE PLAN FOR BLDG PERMIT APPROVAL
X FINAL PLAT APPROVAL
___SIA/RELEASE OF FINANCIAL GUARANTEE
___FOUNDATION PERMIT APPROVAL
___GRADING PERMIT APPROVAL
___SO-19 APPROVAL
___PAVING PERMIT APPROVAL
___GRADING PAD CERTIFICATION
___WORK ORDER APPROVAL
___CLOMR/LOMR
___FLOOD PLAN DEVELOPMENT PERMIT
___OTHER (SPECIFY)_____

DATE SUBMITTED: 02.15.2023

TIERRA WEST, LLC

5571 Midway Park Pl. NE Albuquerque, NM 87109
(505) 858-3100 fax (505) 858-1118 1-800-245-3102
tierrawestllc.com

February 15, 2023

Mr. James D. Hughes
City of Albuquerque – Principal Engineer, Planning Dept.
600 2nd St. NW
Albuquerque, NM. 87102

RE: GOLF COURSE & WESTSIDE COMMERCIAL SUBDIVISION
10850 GOLF COURSE R. NW
GRADING PLAN AND DRAINAGE REPORT
ENGINEER'S STAMP DATE: 11/16/22
HYDROLOGY FILE: A12D008B2

Dear Mr. Hughes:

Per the correspondence dated January 10, 2023, please find the following responses addressing the comments listed below:

1. The owner information is required on the DTIS form.
   Response: Owner information added to DTIS form.

2. Remove the word "Conceptual" from the title of the G&D Plan. Conceptual G&D Plans are "Not for Construction," but this plan must show the actual grading and drainage construction that will occur now for this subdivision.
   Response: "Conceptual" word removed from plans.

3. Please provide the Benchmark information on the grading plan (location, description, and elevation) for the survey contour information provided. AGRS monument is mentioned on the topo survey in the report, but the location and description are missing. This information is required on all Grading Plans.
   Response: Benchmark information added to Grading Plan (Top-Left).

4. The legal description and Vicinity map must be included on the Grading Plan.
   Response: Legal Description and Vicinity Map Added.

5. The existing "Blanket Cross Access and Drainage Easement between Tracts D-1 and E-1", granted on the plat recorded on 6/2/2009 in Book 2009C Page 0083, should be replaced with Drainage Easements in the specific locations of all cross-lot drainage both surface and subsurface. Show the easements on the Grading Plan.
   Response: Easements added to grading plan.

6. Since the subdivision grading will fill in the existing ponds that currently protect the downstream property, provide a Grading Plan and Drainage Report for the infrastructure and grading to be constructed with this subdivision that ensures no increase in surface flows to the downstream property. As indicated by the grading plan, significantly larger portions of lots D-1-A, D-1-B, and D-1-C drain past the ponds on those lots than is indicated on the Basin Map. The subdivision grading now should accomplish the basin boundaries intended as the Masterplan Basin Boundaries and prevent excess cross-lot drainage.
   Response: Grading plan updates, the proposed infrastructure and grading does not increase surface flows to the downstream property.

7. Typical sections are required on the G&D Plan.
   a. Show the proximity of walls and slopes to the lot lines and the maximum heights and slopes of each. The grades indicate that a retaining wall is needed between Tracts D-1-A and D-1-D.
   Response: Retaining walls deleted with this submittal.

b. The private road section shown on the Grading Plan must include the specification of the curb type as 8" Std C&G per DWG 2415A and the Landscape Buffer Swale per DWG 2414. The 6" dimension on the section should be changed to 7.5" per the detail. The gutter depression needs to be corrected in the street hydraulic calculations from 0.96" to 1.5" (0.08' to 0.125') in the report.
Response: Details added to plan and report.

c. Add typical sections of Westside Blvd. specifying cross-slopes, dimensions, C&G Types, and Landscape Buffers. Add a 0.87' water block at the driveway on Westside Blvd. per DWG 2426. Verify water block height after considering vertical curves for traffic safety.
Response: Typical section and details added to grading plan.

8. The locations of retaining walls and the stabilization of slopes must be shown on the Grading Plan.
Response: Retaining walls deleted with this submittal.

9. Label the tracts on the G&D Plan.
Response: Tracts labeled.

10. Label the slopes of the roads on the grading plan, especially near inlets.
Response: Slopes labeled.

11. The report doesn't include calculations to show how this subdivision will drain. The calculations are for a hypothetical future development. The Grading Plan shows hypothetical future ponds that don't tie onto the grades around them and significant portions of the lots don't drain to the ponds. Revise the plans and report for this subdivision to show what it's the developer will build and provide a narrative description of the Master Drainage Management Plan for Tracts D-1-A, D-1-B, D-1-C, and D-1-D, stating that there will be a pond on each lot sized for retention of the SWG Volume plus detention of the volume to limit the 100-year peak discharge to 2.67 cfs/acre flow rate. Drainage from this site will go through the ponds and into the storm drain. Oversized ponds may be constructed with this subdivision in anticipation of hypothetical future development.
Response: Acknowledged see updated grading report and plan.

Preliminary Plat Approval by Hydrology

12. The Infrastructure List must include descriptions of the pipes, inlets, manholes, and each pond with volumes, stabilization, outlet structures, and drainage covenants for all private drainage infrastructure. A footnote should be added stating that "final design calculations must verify the sizes of the drainage structures in a revised Drainage Report and the Infrastructure List must be corrected if any sizes change prior to Work Order."
Response: Acknowledged.

Work Order Approval

13. Provide construction details of the outlet structures along with hydraulic calculations for each pond. Revise the pond routing input parameters in AHYMO accordingly. Include the construction details of each outlet structure in the Work Order Plans.
Response: Acknowledged.

14. Provide grading and stabilization specifications for each pond in the Work Order Plans.
Response: Acknowledged.

15. Provide rundowns or other drainage structures to get the drainage from each lot into the ponds non-erosive and provide details and specifications on the Work Order Plans.
Response: Acknowledged.

16. Provide detailed hydraulic calculations for all of the storm drain pipes, including inlet, exit, and other minor losses. Show the HGL, flow rate, velocity, size, and slope of each storm drain pipe in the profile view of the Work Order Plans.
Response: Acknowledged.

17. As a reminder, if the project's total area of disturbance (including the staging area and any work within the adjacent Right-of-Way) is 1 acre or more, then an Erosion and Sediment Control (ESC) Plan and Owner's certified Notice of Intent (NOI) is required to be submitted to the Stormwater Quality Engineer (Doug Hughes, PE, jhughes@cabq.gov, 924-3420) 14 days prior to any earth disturbance.
Response: Acknowledged.

PRIOR TO RELEASE OF THE FINANCIAL GUARANTEES ASSOCIATED WITH THE IIA

18. Engineer's Certification, per the DPM Part 6-14 (G): *Engineer's Certification Checklist For Subdivision is required.*
Response: Acknowledged.

19. Please provide the Drainage Covenant with Exhibit A for each SWQ pond per Article 6-15(C) of the DPM prior to the release of the IIA and Financial Guarantees. Please submit the original copies along with the **$ 25.00** recording fee check made payable to Bernalillo County to Carrie Compton (cacompton@cabq.goc) on the 4th floor of Plaza de Sol.
Response: Acknowledged.

If you have any questions or need additional information regarding this matter, please do not hesitate to contact me.

Sincerely,

Ronald R. Bohannan, P.E

JN: 2022055
RRB/ln/ca

DRAINAGE REPORT FOR

Golf Course and Westside Commercial Development

SE Corner of Golf Course Rd and Westside Blvd

Prepared by:

Tierra West, LLC
5571 Midway Park Place NE
Albuquerque, New Mexico 87109

TW# 2022055

February 2022

I certify that this report was prepared under my supervision, and I am a registered Professional Engineer in the State of New Mexico in good standing.

Ronald R. Bohannan
PE # 7868

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Map Pocket

Conceptual Grading and Drainage Plan

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Purpose

The purpose of this report is to outline the Drainage Plan intent and present a solution for the subdivision plat and development of the vacant Tract D-1 of Paradise Heights, Unit 1 Albuquerque, New Mexico. The project site is a 7.67-acre multi-pad commercial development project, located at 10850 Golf Course Rd, Albuquerque NM 87114 (the “project site”). The project site is in precipitation zone 1 per the city of Albuquerque Development Process Manuel (DPM) Ch 6, west of the Rio Grande River. The project site is located north of the Wintergreen Apartments on Tract E-1 (Hydronum: A12D008D) and the AMAFCA Black Arroyo Channel. The project site is currently zoned MX-M and is legally described as TRACT D-1 PLAT OF TRS D-1, E-1 AMAFCA BLACK ARROYO CHANNEL ROW PARADISE HEIGHTS UNIT 1 CONT 7.6716 AC.

Context

Most of the project site has not been previously graded and remains vacant. The southern portion of the project site contains sediment ponds meant to retain the storm water discharge from the project site and protect the southern apartment development (Hydronum: A12D008D). To the north, the site is bordered by a variety of single-family homes with the City of Rio Rancho. To the south lays a new apartment complex and to the east lays single-family residential developments. West of the project site is zoned MX-M for a variety of multi-family and commercial developments. The proposed site lays within hydrology number A12D008B2. The boundary of the proposed site is located on the Zone atlas page H-13-Z as shown on **Figure 1.**

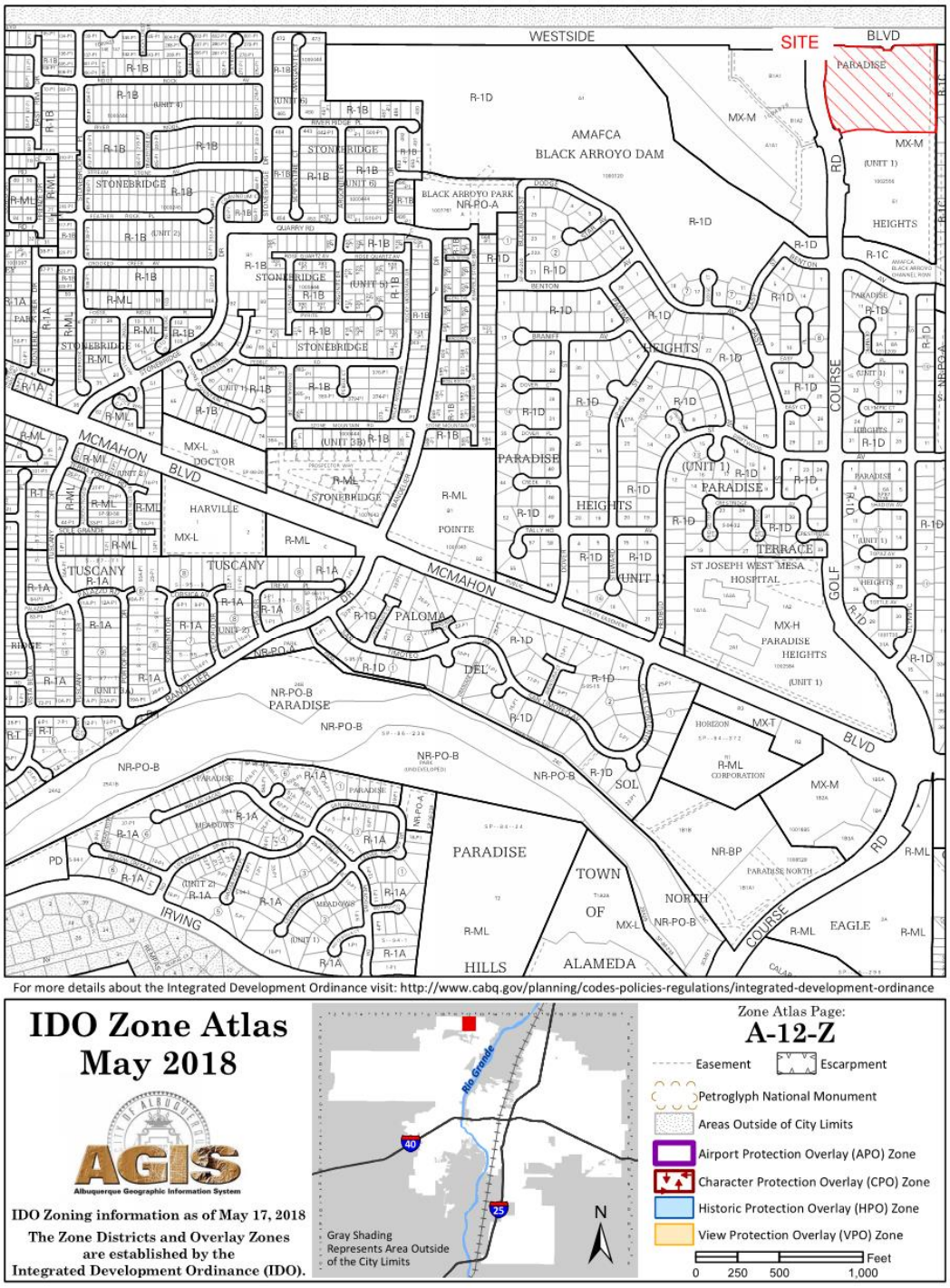


Figure 1 – Vicinity Map

Figure 2 – Site Aerial Image

Floodplain

The floodplain information is published for the site by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Bernalillo County, New Mexico and Incorporated Areas. The subject site is detailed on Community Panel Number 35001C0108G dated August 26, 2008, and is shown below.

The subject site is located within Flood Zone X, which is which is defined as, “Areas determined to be outside the 0.2% annual chance floodplain”. The site does not lie within a Flood Hazard Area as shown on the FEMA map requiring no further flood-proofing or other flood mitigation.

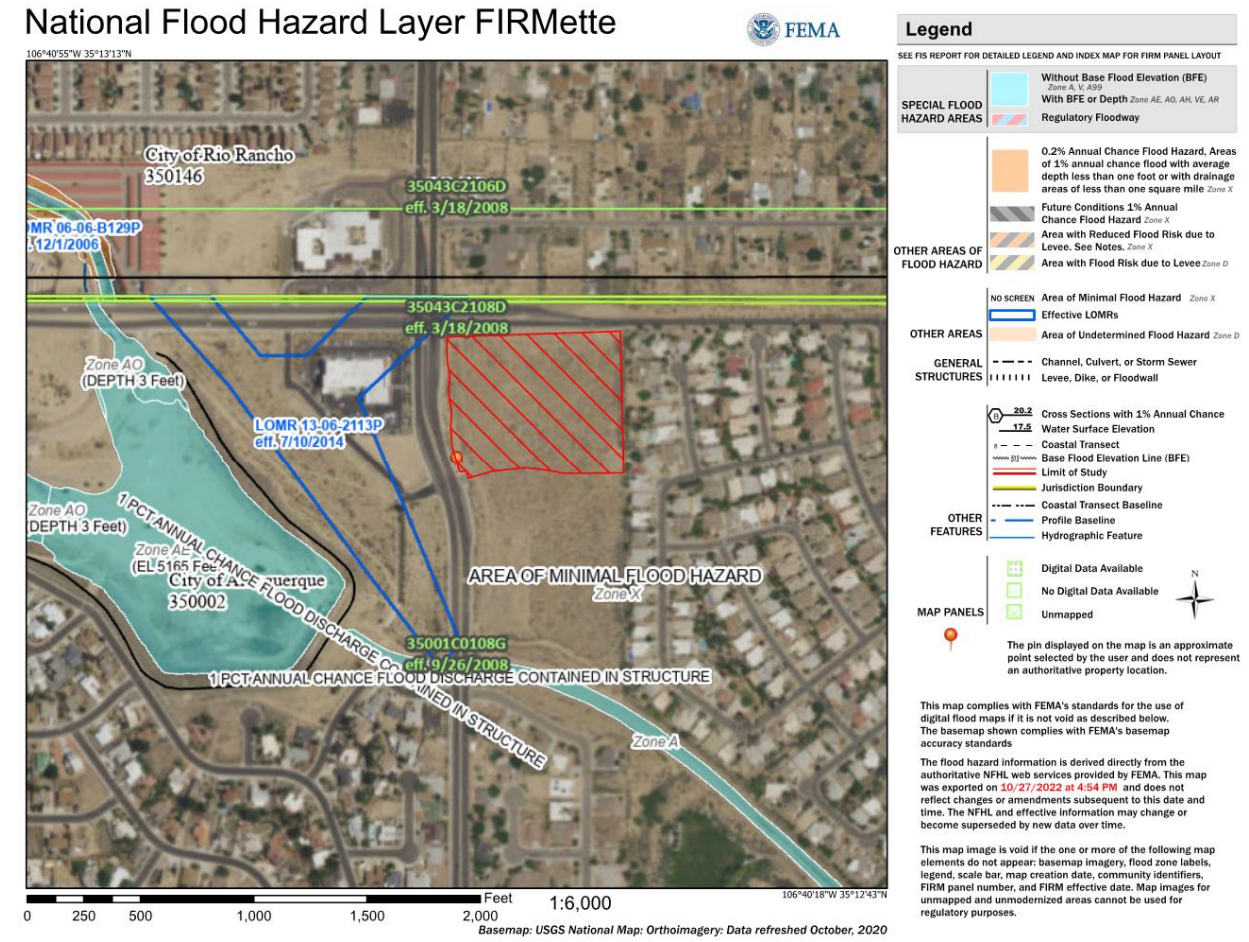


Figure 3 – FIRM Map

Calculations

The hydrology calculation follows the guidance of the DPM's Chapter 6 Part 6-2(C). Point precipitation frequency estimates were obtained from the NOAA Atlas 14, Precipitation – Frequency Atlas of the United States, Vol 1 Version 5 Semiarid Southwest, see appendix A for precipitation frequency data and study location. The principal design storm is the 100-year, 6-hour event. The appropriate land treatments A through D, as defined in the DPM Chapter 6 Section 2.A.2, will be applied to the various pervious and impervious areas for the proposed site.

AHYMO-S4 is the computer program used to determine the existing and proposed development flows for the principle 100-year, 6-hour storm event. Using the ROUTE RESERVOIR command, the AHYMO program was used to model the detention pond system and was used to determine the outflow discharge.

The proposed commercial site is located west of the Rio Grande River and according to Article 6-12 of the DPM new development site are required to retain the 0.42-inch storm runoff. Therefore, the required storm water quality volume to be captured and infiltrated is the product of the impervious area multiplied by 0.42 inches.

Existing Conditions

The subdivision is located within the Black Arroyo Detention Dam Basin Area L11 as shown in Appendix C of the report. Currently the subdivision lies in an undeveloped condition with vegetation typical of the west mesa. The southern portion of Tract D-1 contained sediments ponding and an access road with roundabout (Hydronum: A12D008D). The subdivision slopes consistently from the north to the south with the flows predominately overland with a moderately defined drainage course along the east side of Golf Course Rd and along the east side of the subdivision adjacent to the residential dwellings. The sheet flow is directed to the sediment ponds currently being constructed under (Hydronum: A12D008D) and is completely retained on site for the 100 yr. – 10 day. storm event. The subdivision is allocated mainly as treatment A with no offsite flows entering the subdivision parcels of Tract D-1 and E-1. Offsite flows are contained in the surrounding roadway and directed to curb inlets along Golf Course Rd. before discharging to the Black Arroyo Channel at the overpass. Flows from the access road and roundabout are managed by the apartment site (Hydronum: A12D008D). The site is divided into 2 drainage basins as shown in Figure 4.

A 24-inch storm drainpipe is being extended up to the project site with the construction of the apartment site to the south (Hydronum: A12D008D). The overall site is characterized as free discharge per the City of Albuquerque online mapping system and the Black Arroyo Detention Dam Hydrology Report but due to capacity constraints in the 24-inch pipe the project site is allowed to discharge at an allowable flow of 19.5 CFS per (Hydronum: A12D008D). The allowable flow rate can be increased with a developer funded plan to increase the size of the 24-inch storm drainpipe. AMAFCA approval is also required with the increase in flow.

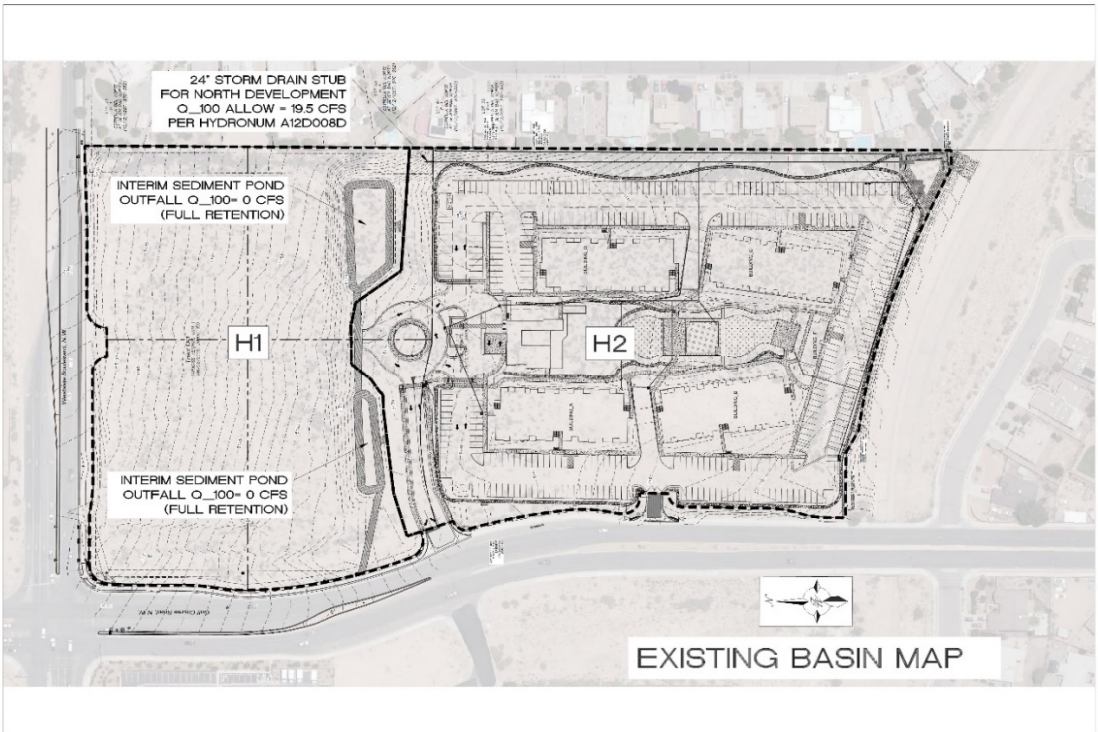


Figure 4 – Existing Basin Map

Proposed Conditions

The developed project site has been analyzed to determine the peak flow, storm water volume and drainage pipe system requirements. The project site was divided into three basins one of the basins (Basin D2) being the center access road as depicted on **Figure 5** below. Basins D1 and D3 represent the east and west portions of the project site currently undeveloped. Storm water runoff from basin D1 will be routed into the existing sediment pond on the southwest corner of the overall property constructed under (Hydronum: A12D008D). the volume of the sediment pond is 0.349 acre-ft and the required storage for basin D-1 is 0.270 acre-ft (1-year,

10-day volume). Basins D2 and D3 will be routed to a new detention pond on the southeast corner of the site via storm drain pipe and surface flow respectfully. As shown in the AHYMO calculations in Appendix A of the report the proposed detention pond reduces the peak flow from 10.78 CFS to 6.89 CFS and per the Wintergreen Apartment drainage report (Hydronum: A12D008D) the overall site is allowed to discharge at a rate of 19.5 CFS.

Future Conditions

At fully developed conditions the developed peak flow is expected to be roughly 27.25 CFS with an average 85% impervious surface. Per the drainage report prepared for the apartment site on Tract E-1 south of the project site (Hydronum: A12D008D) the allowable discharge is to be 19.5 CFS. As mentioned above the flow rate can be increased with a developer funded plan to increase the size of the 24-inch storm drainpipe along Tract E-1 to the south and requires AMAFCA approval for the increase in flow or each new development shall be allowed to discharge at a rate of 2.67 CFS per acre. Each development shall contain a flow rate control structure such as a detention pond and shall discharge into an underground storm drainpipe system under an easement to be granted by the subdivision plat. Stormwater from Basin D2 (the center road) will discharge into the proposed detention pond on the southeast corner of the site in order to retain the storm water quality volume. After the detention ponds the storm water will then be routed to the 24” storm drain system along Tract E-1 where the stormwater will discharge into the Black Arroyo Channel to the south.

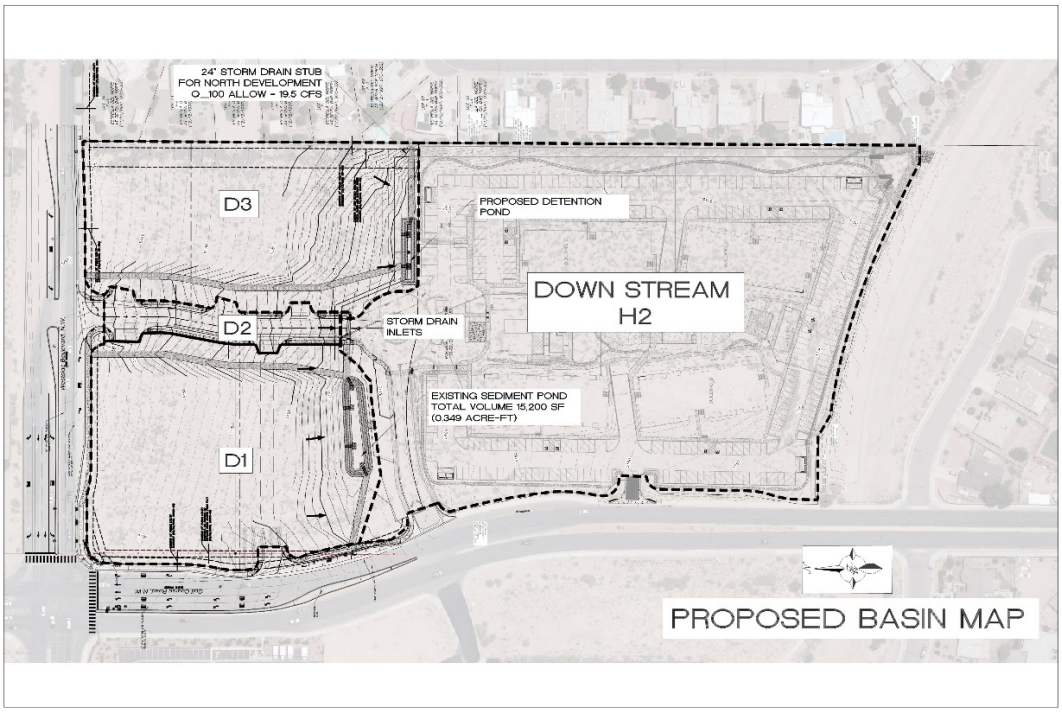


Figure 5 – Developed Basin Map

Stormwater Quality Volume Management

As this site is a new development, the water quality volume is calculated based on the 0.42-inch storm. he methodology used in the EPA Report, Estimating Predevelopment Hydrology in the Middle Rio Grande Watershed, New Mexico, TetraTech, April 2014, EPA Publication Number 832-R-14-007, yields a runoff value of 0.42 inches for the 90th percentile storm. Therefore, to calculate the Stormwater Quality Volume the impervious area is multiplied by 0.42 inches. The formula used is SWQV= I*43,560*0.42*(1/12) where I is the impervious area in acres. The impervious areas and SWQV ponding required for Tract D-1 is detailed on the design calculations in Appendix A of the report.

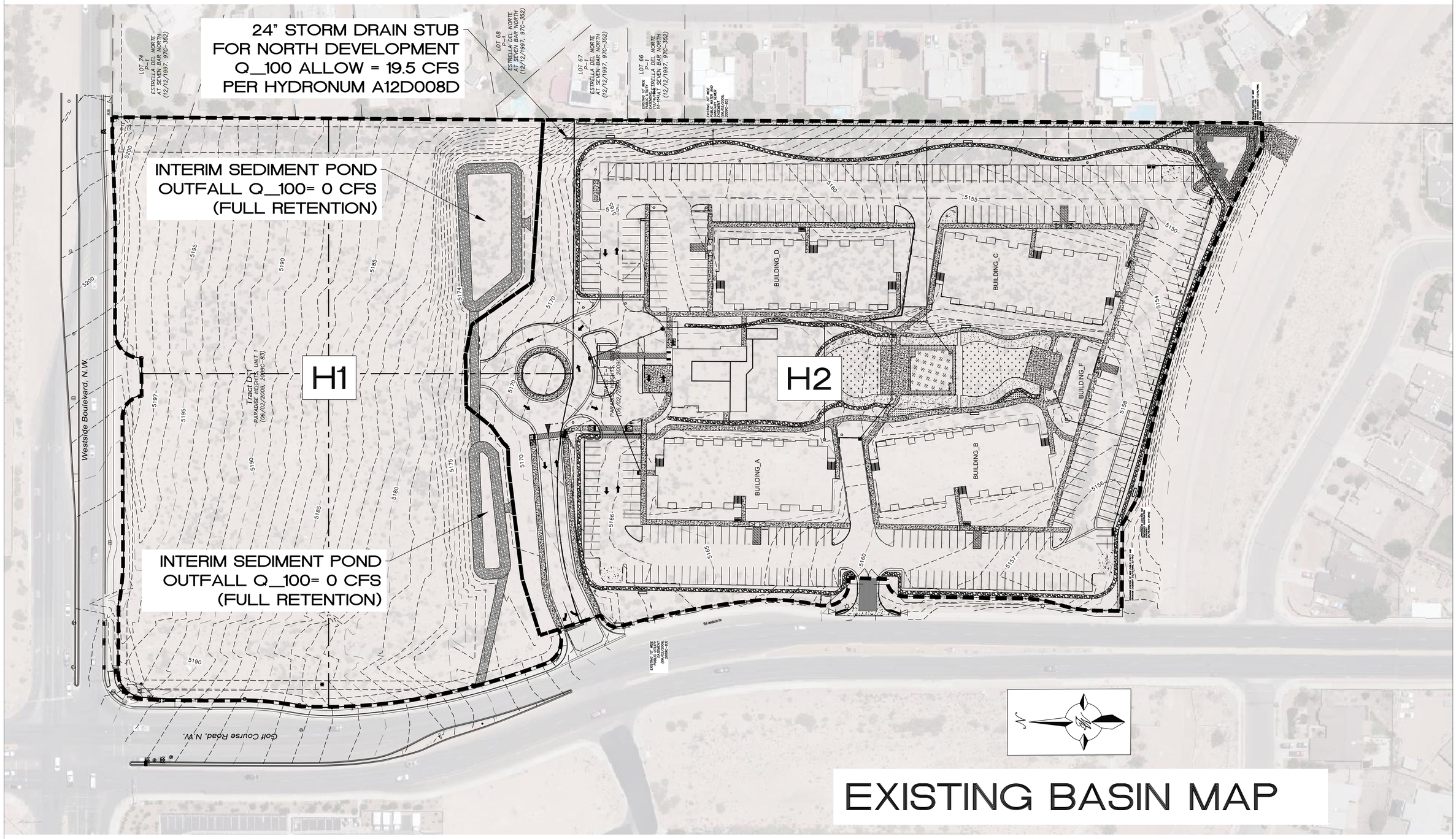
Summary

This report outlines the Drainage Management Plan for the Golf Course and Westside Commercial Subdivision and presents the on-site best management practices, storm water quality ponding, and drainage improvements needed to safely convey the future developed flows for Tract D-1. The required storm water quality volume ponding for Tract D-1 is achieved with a suitable sized pond located within each future lot. Developed stormwater runoff from the

center road shall be collected through combination of curb inlets and discharged to the storm water quality pond at the southeast corner of the project site, before passing directly into the Black Arroyo Channel.

APPENDIX A

EXISTING/PROPOSED HYDROLOGY TABLE, POND DISCHARGE-ORIFICE CLACULATIONS AND DRAINAGE BASIN MAPS



EXISTING BASIN MAP

24" STORM DRAIN STUB
FOR NORTH DEVELOPMENT
Q_100 ALLOW = 19.5 CFS

D3

PROPOSED DETENTION
POND

DOWN STREAM
H2

D2

STORM DRAIN
INLETS

EXISTING SEDIMENT POND
TOTAL VOLUME 15,200 SF
(0.349 ACRE-FT)

D1

Westside Boulevard, N.W.

Golf Course Road, N.W.

PROPOSED BASIN MAP

Existing Conditions

Existing Conditions

Basin Descriptions												100-Year, 6-Hr (AHYMO-S4)		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	Time To Peak (Hours)	Volume (ac-ft)	Flow cfs
H1	D-1	297,705	6.83	0.01068	90%	6.151	0%	0.000	10%	0.683	0%	0.000	1.560	0.363	11.14
H2	E-1	418,883	9.62	0.01503	0%	0.000	7%	0.673	18%	1.731	75%	7.212	1.550	1.414	35.87
Total		**716,588**	**16.45**	**0.02570**		**6.151**		**0.673**		**0.000**		**7.212**		**1.777**	**47.01**

Proposed Conditions

Proposed Conditions

Basin Descriptions												100-Year, 6-Hr (AHYMO-S4)		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	Time To Peak (Hours)	Volume (ac-ft)	Flow cfs
D1	D-1	148,725	3.41	0.00533	0%	0.000	0%	0.000	100%	3.414	0%	0.000	1.500	0.284	9.91
D2	E-1	21,971	0.50	0.00079	0%	0.000	0%	0.000	10%	0.050	90%	0.454	1.500	0.081	2.03
D3	E-1	131,200	3.01	0.00471	0%	0.000	0%	0.000	100%	3.012	0%	0.000	1.500	0.251	8.76
H2	E-1	409,960	9.41	0.01471	0%	0.000	0%	0.000	20%	1.882	80%	7.529	1.500	1.399	35.45
Total		**711,856**	**16.34**	**0.02553**		**0.000**		**0.000**		**8.359**		**7.983**		**2.015**	**56.150**

SWQV Pond Volume Calculation				
BASIN ID	AREA D (AC)	AREA D (SF)	SWQV (CF) REQUIRED	SWQV (CF) PROVIDED
D1	-	-	-	-
D2	0.45	19,773.90	692.09	-
D3	-	-	-	2,831.00
Total	0.45	19,773.90	692.09	**2,831.00**

Retention Volume Calculation

Basin Descriptions												10-Year, 10-day (DPM Ch 6)		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	Weighted E (in)	Volume (ac-ft)	Flow cfs
D1	E-1	148,725	3.41	0.00533	0%	0.000	0%	0.000	100%	3.414	0%	0.000	0.950	0.270	9.80
Total		**148,725**	**3.41**	**0.00533**		**0.000**		**0.000**		**3.414**		**0.000**		**0.270**	**9.799**

Sediment Pond Volume Calculation		
Area at Mid Depth	3,800	Sq. Ft.
Depth of Pond	4	Ft.
Total Volume	15,200	Cubic Ft. (0.349 Acre-ft)
Required Volume	11,761	Cubic Ft. (0.270 Acre-ft)

Future Conditions

Future Conditions

Basin Descriptions												10-Year, 6-Hour (DPM Ch 6)		
Basin ID	Tract	Area (sf)	Area (acres)	Area (sq miles)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	Weighted E (in)	Volume (ac-ft)	Flow cfs
D1	D-1	301,896	6.93	0.01083	0%	0.000	0%	0.000	15%	1.040	85%	5.891	2.047	1.182	27.25
Total		**301,896**	**6.93**	**0.01083**		**0.000**		**0.000**		**1.040**		**5.891**		**1.182**	**27.255**

Detention Pond Storage-Discharge Calculations

POND VOLUME CALCULATIONS				
ELEVATION (ft)	AREA (sf)	VOLUME (cf)	CUMULATIVE VOLUME (cf)	
65	443	0	0	
66	820	631.5	632	
67	1229	1024.5	1656	
67.833	1592	1174.947	2831	INV
68	1670	272.377	3103	
69	2141	1905.5	5009	
70	2638	2389.5	7398	

POND STORAGE FUNCTION					
ACTUAL ELEV.	H (FT)	VOLUME (CF)	Q (CFS)	VOLUME (AC-FT)	
65	0.00	0	0.00	0.0000	
66	0.00	632	0.00	0.0145	
67	0.00	1656	0.00	0.0380	
67.833	0.00	2831	0.00	0.0650	INV
68	0.17	3103	2.41	0.0712	
69	1.17	5009	6.38	0.1150	
70	2.17	7398	8.70	0.1698	

Pond Orifice Equation	
Q =	CA(2gh)^(1/2)
C =	0.6
DIA (Ft)	1.25
A (SF) =	1.2272
H (Ft) =	Head
Q (CFS)=	Flow

NOAA Atlas 14, Volume 1, Version 5
Location name: Albuquerque, New Mexico, USA*
Latitude: 35.2168°, Longitude: -106.6758°
Elevation: 5184.48 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.167** (0.143-0.196)	**0.217** (0.184-0.253)	**0.291** (0.248-0.342)	**0.349** (0.296-0.409)	**0.429** (0.363-0.502)	**0.492** (0.414-0.575)	**0.559** (0.467-0.652)	**0.629** (0.522-0.734)	**0.725** (0.595-0.846)	**0.801** (0.653-0.934)
10-min	**0.255** (0.218-0.298)	**0.329** (0.281-0.386)	**0.443** (0.377-0.520)	**0.532** (0.451-0.622)	**0.653** (0.552-0.764)	**0.749** (0.631-0.875)	**0.850** (0.710-0.993)	**0.957** (0.794-1.12)	**1.10** (0.905-1.29)	**1.22** (0.993-1.42)
15-min	**0.315** (0.270-0.370)	**0.408** (0.348-0.478)	**0.548** (0.467-0.644)	**0.659** (0.560-0.771)	**0.810** (0.684-0.947)	**0.928** (0.782-1.08)	**1.05** (0.880-1.23)	**1.19** (0.984-1.38)	**1.37** (1.12-1.60)	**1.51** (1.23-1.76)
30-min	**0.425** (0.363-0.498)	**0.550** (0.469-0.644)	**0.739** (0.629-0.868)	**0.887** (0.753-1.04)	**1.09** (0.921-1.28)	**1.25** (1.05-1.46)	**1.42** (1.18-1.66)	**1.60** (1.32-1.86)	**1.84** (1.51-2.15)	**2.04** (1.66-2.37)
60-min	**0.525** (0.450-0.616)	**0.680** (0.580-0.797)	**0.914** (0.779-1.07)	**1.10** (0.932-1.28)	**1.35** (1.14-1.58)	**1.55** (1.30-1.81)	**1.76** (1.47-2.05)	**1.98** (1.64-2.31)	**2.28** (1.87-2.66)	**2.52** (2.05-2.94)
2-hr	**0.617** (0.523-0.740)	**0.791** (0.668-0.949)	**1.05** (0.884-1.26)	**1.26** (1.06-1.49)	**1.54** (1.29-1.83)	**1.78** (1.47-2.10)	**2.02** (1.66-2.39)	**2.28** (1.86-2.69)	**2.65** (2.14-3.12)	**2.94** (2.35-3.48)
3-hr	**0.669** (0.572-0.797)	**0.850** (0.726-1.01)	**1.12** (0.953-1.32)	**1.33** (1.13-1.57)	**1.62** (1.37-1.92)	**1.86** (1.56-2.19)	**2.11** (1.76-2.49)	**2.38** (1.97-2.80)	**2.75** (2.25-3.24)	**3.06** (2.48-3.61)
6-hr	**0.771** (0.665-0.910)	**0.975** (0.843-1.15)	**1.26** (1.09-1.48)	**1.48** (1.28-1.74)	**1.79** (1.53-2.10)	**2.03** (1.73-2.37)	**2.29** (1.93-2.67)	**2.55** (2.14-2.97)	**2.92** (2.42-3.40)	**3.22** (2.65-3.76)
12-hr	**0.857** (0.749-0.986)	**1.08** (0.945-1.24)	**1.37** (1.20-1.58)	**1.60** (1.39-1.84)	**1.91** (1.65-2.19)	**2.15** (1.85-2.46)	**2.40** (2.06-2.75)	**2.66** (2.26-3.04)	**3.01** (2.54-3.45)	**3.29** (2.75-3.78)
24-hr	**0.974** (0.859-1.12)	**1.22** (1.08-1.40)	**1.53** (1.35-1.75)	**1.78** (1.56-2.02)	**2.11** (1.85-2.40)	**2.37** (2.06-2.69)	**2.63** (2.29-2.99)	**2.90** (2.51-3.29)	**3.27** (2.80-3.70)	**3.55** (3.03-4.03)
2-day	**1.02** (0.908-1.16)	**1.28** (1.14-1.45)	**1.61** (1.43-1.82)	**1.86** (1.65-2.10)	**2.21** (1.94-2.48)	**2.47** (2.17-2.78)	**2.74** (2.40-3.08)	**3.02** (2.62-3.39)	**3.38** (2.93-3.81)	**3.67** (3.16-4.14)
3-day	**1.15** (1.04-1.28)	**1.44** (1.30-1.59)	**1.78** (1.61-1.97)	**2.05** (1.85-2.26)	**2.41** (2.17-2.66)	**2.68** (2.41-2.96)	**2.96** (2.65-3.27)	**3.24** (2.89-3.58)	**3.62** (3.21-4.00)	**3.90** (3.44-4.32)
4-day	**1.28** (1.18-1.40)	**1.59** (1.46-1.74)	**1.95** (1.79-2.12)	**2.23** (2.05-2.43)	**2.61** (2.39-2.84)	**2.90** (2.65-3.15)	**3.18** (2.90-3.46)	**3.47** (3.15-3.77)	**3.85** (3.48-4.19)	**4.13** (3.73-4.50)
7-day	**1.47** (1.35-1.60)	**1.82** (1.68-1.98)	**2.22** (2.04-2.40)	**2.52** (2.32-2.73)	**2.92** (2.69-3.16)	**3.22** (2.96-3.47)	**3.52** (3.22-3.79)	**3.80** (3.48-4.10)	**4.16** (3.80-4.50)	**4.43** (4.03-4.79)
10-day	**1.61** (1.48-1.75)	**2.00** (1.84-2.16)	**2.44** (2.25-2.64)	**2.78** (2.57-3.01)	**3.24** (2.99-3.50)	**3.58** (3.29-3.86)	**3.92** (3.60-4.22)	**4.25** (3.89-4.58)	**4.68** (4.27-5.05)	**4.99** (4.55-5.40)
20-day	**2.01** (1.85-2.18)	**2.49** (2.30-2.71)	**3.02** (2.79-3.27)	**3.42** (3.16-3.70)	**3.93** (3.62-4.24)	**4.29** (3.95-4.62)	**4.64** (4.26-4.99)	**4.96** (4.56-5.35)	**5.37** (4.92-5.78)	**5.65** (5.18-6.09)
30-day	**2.41** (2.22-2.60)	**2.98** (2.75-3.22)	**3.58** (3.31-3.86)	**4.02** (3.71-4.32)	**4.57** (4.22-4.90)	**4.96** (4.57-5.32)	**5.32** (4.90-5.70)	**5.66** (5.20-6.06)	**6.06** (5.57-6.50)	**6.33** (5.81-6.79)
45-day	**2.93** (2.71-3.16)	**3.62** (3.36-3.90)	**4.31** (3.99-4.63)	**4.79** (4.44-5.15)	**5.37** (4.98-5.77)	**5.76** (5.35-6.18)	**6.11** (5.67-6.54)	**6.41** (5.95-6.86)	**6.73** (6.27-7.19)	**6.92** (6.45-7.38)
60-day	**3.36** (3.12-3.63)	**4.16** (3.85-4.48)	**4.94** (4.59-5.32)	**5.50** (5.11-5.91)	**6.17** (5.73-6.63)	**6.62** (6.16-7.10)	**7.03** (6.54-7.54)	**7.38** (6.88-7.92)	**7.77** (7.25-8.34)	**8.00** (7.49-8.58)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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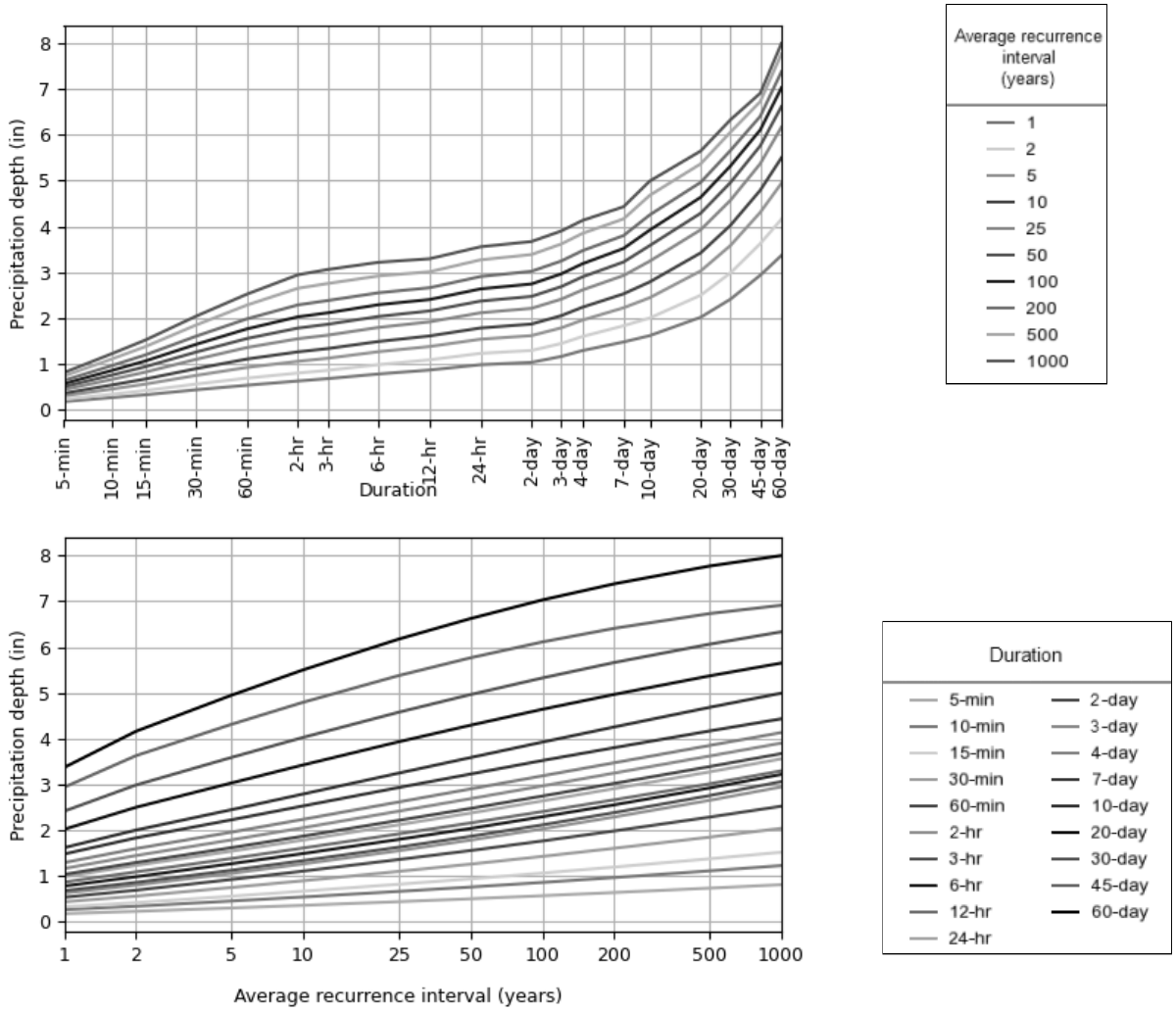
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.2168°, Longitude: -106.6758°



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Oct 27 21:09:43 2022

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Maps & aerials

Small scale terrain

Large scale terrain

AHYMO-S4 INPUT

```
**************************************************************
*                GOLF COURSE AND WESTSIDE (COMERCIAL)        *
**************************************************************
*          100-YEAR 6-HR STORM (UNDER EXISTING CONDITIONS)   *
**************************************************************
*Zone 1                                                      *
*NOAA ATLAS 14, VOLUME 1, VERSION 5                          *
*LATITUDE: 35.2168°                                          *
*LONGITUDE: -106.6758°                                       *
*ELEVATION: 5184.48 FT                                       *
**************************************************************
START               TIME=0.0

*
RAINFALL            TYPE=1 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.76 IN RAIN SIX=2.29 IN
                    RAIN DAY=2.63 IN DT=0.01 HR
*
* H1
*
COMPUTE NM HYD      ID=1 HYD NO=H1 AREA=0.01068 SQ MI
                    PER A=90.00 PER B=0.00 PER C=10.00 PER D=0.00
                    TP= 0.15 HR MASS RAINFALL=-1

PRINT HYD           ID=1 CODE=1

*
* H2
*
COMPUTE NM HYD      ID=1 HYD NO=H2 AREA=0.01503 SQ MI
                    PER A=0.00 PER B=7.00 PER C=18.00 PER D=75.00
                    TP= 0.15 HR MASS RAINFALL=-1

PRINT HYD           ID=1 CODE=1

**************************************************************
*      100-YEAR 6-HR STORM (UNDER PROPOSED CONDITIONS)       *

**************************************************************
START               TIME=0.0
*
*
RAINFALL            TYPE=1 RAIN QUARTER=0.0 IN
                    RAIN ONE=1.76 IN RAIN SIX=2.29 IN
                    RAIN DAY=2.63 IN DT=0.15 HR
*
* D1
*
COMPUTE NM HYD      ID=1 HYD NO=D1 AREA=0.00533 SQ MI
                    PER A=0.00 PER B=0.00 PER C=100.00 PER D=0.00
                    TP=0.15 HR MASS RAINFALL=-1

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

```
* D2
*
COMPUTE NM HYD      ID=2 HYD NO=D2 AREA=0.00079 SQ MI
                    PER A=0.00 PER B=0.00 PER C=10.00 PER D=90.00
                    TP=0.15 HR MASS RAINFALL=-1

PRINT HYD           ID=2 CODE=1
*
* D3
*
COMPUTE NM HYD      ID=3 HYD NO=D3 AREA=0.00471 SQ MI
                    PER A=0.00 PER B=0.00 PER C=100.00 PER D=0.00
                    TP=0.15 HR MASS RAINFALL=-1

PRINT HYD           ID=3 CODE=1
*
* H2
*
COMPUTE NM HYD      ID=14 HYD NO=H2 AREA=0.01433 SQ MI
                    PER A=0.00 PER B=0.00 PER C=20.00 PER D=80.00
                    TP=0.15 HR MASS RAINFALL=-1

PRINT HYD           ID=14 CODE=1
*
* ADD BASINS D2, D3
*
ADD HYD             ID =5 HYD = 100.1 ID I = 2 ID II = 3

PRINT HYD           ID=5 CODE=1
*
*****************************************************
* ROUTE BASINS TO POND 4                            *
*****************************************************
ROUTE RESERVOIR     ID=6 HYD NO=POND.4 INFLOW ID=5 CODE=1
                    OUTFLOW(CFS) STORAGE(AC-FT) ELEVATION(FT)
                    0.0000       0.0000         65.00
                    0.0100       0.0650         67.83
                    2.4100       0.0712         68.00
                    6.3800       0.1150         69.00
                    8.7000       0.1698         70.00


*
PRINT HYD           ID=6 CODE=1
*
FINISH
```

AHYMO-S4 OUTPUT

```
    AHYMO PROGRAM SUMMARY TABLE (AHYMO-S4)                        - Ver. S4.01a, Rel: 01a      RUN DATE (MON/DAY/YR)
=02/15/2023
    INPUT FILE = S\Z_Drive\2022\2022055 Golf Course & Westside Blvd\Drainage\2022055-Hymo.txt USER NO.=
AHYMO_Temp_User:20122010

                                    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

    START                                                                                                    TIME=
   0.00
    RAINFALL  TYPE= 1 NOAA 14                                                                                RAIN6=
  2.290
    COMPUTE NM HYD             H1    -     1       0.01068       11.14       0.363      0.63715    1.560    1.629 PER
IMP=   0.00
    COMPUTE NM HYD             H2    -     1       0.01503       35.87       1.414      1.76353    1.550    3.729 PER
IMP=  75.00
    START                                                                                                    TIME=
   0.00
    RAINFALL  TYPE= 1 NOAA 14                                                                                RAIN6=
  2.290
    COMPUTE NM HYD             D1    -     1       0.00533        9.91       0.284      0.99987    1.500    2.905 PER
IMP=   0.00
    COMPUTE NM HYD             D2    -     2       0.00079        2.03       0.081      1.93412    1.500    4.008 PER
IMP=  90.00
    COMPUTE NM HYD             D3    -     3       0.00471        8.76       0.251      0.99987    1.500    2.905 PER
IMP=   0.00
    COMPUTE NM HYD             H2    -    14       0.01433       35.45       1.399      1.83031    1.500    3.865 PER
IMP=  80.00
    ADD HYD               100.10  2& 3    5       0.00550       10.78       0.333      1.13399    1.500    3.063
    ROUTE RESERVOIR       POND.4    5     6       0.00550        6.89       0.333      1.13387    1.650    1.957 AC-FT=
  0.127
    FINISH
```

APPENDIX B

GUTTER DEPTH CALCULATION,

STORM DRAIN AND INLET SCHEMEMATIC MAP

24" STORM DRAIN STUB
FOR NORTH DEVELOPMENT
Q_100 ALLOW = 19.5 CFS

D3

D2

D1

PIPE A

PIPE B

ORIFICE 4

PROPOSED DETENTION
POND

ORIFICE 3

PIPE B

PIPE E

PIPE D

PIPE C

PIPE D

INLET 2

STORM DRAIN
INL

PIPE D

INLET 1

PIPE D

PIPE D

ORIFICE 1

ORIFICE 2

DOWN STREAM
H2

EXISTING SEDIMENT POND
TOTAL VOLUME 15,200 SF
(0.349 ACRE-FT)

Westside Boulevard, N.W.

Golf Course Road, N.W.

PROPOSED BASIN MAP

Private Road Gutter Calculations

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.065 ft/ft
Discharge	2.03 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.67
0+00	0.67
0+01	0.00
0+03	0.13
0+16	0.38
0+29	0.13
0+31	0.00
0+31	0.67
0+31	0.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.67)	(0+31, 0.67)	0.017

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	2.1 in
Roughness Coefficient	0.017
Elevation	0.17 ft
Elevation Range	0.0 to 0.7 ft
Flow Area	0.6 ft²
Wetted Perimeter	9.4 ft
Hydraulic Radius	0.7 in
Top Width	9.07 ft
Normal Depth	2.1 in
Critical Depth	2.8 in
Critical Slope	0.010 ft/ft
Velocity	3.49 ft/s
Velocity Head	0.19 ft

Private Road Gutter Calculations

Results	
Specific Energy	0.36 ft
Froude Number	2.434
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.1 in
Critical Depth	2.8 in
Channel Slope	0.065 ft/ft
Critical Slope	0.010 ft/ft

Private Road Gutter Calculation CS

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.065 ft/ft
Normal Depth	2.1 in
Discharge	2.03 cfs

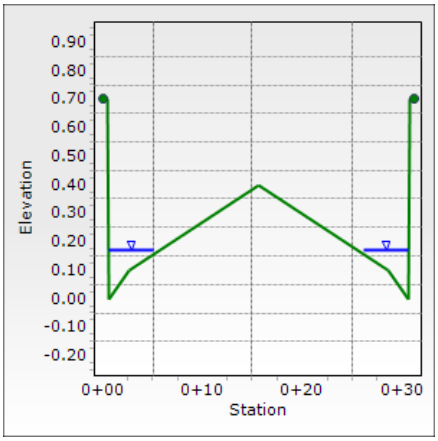
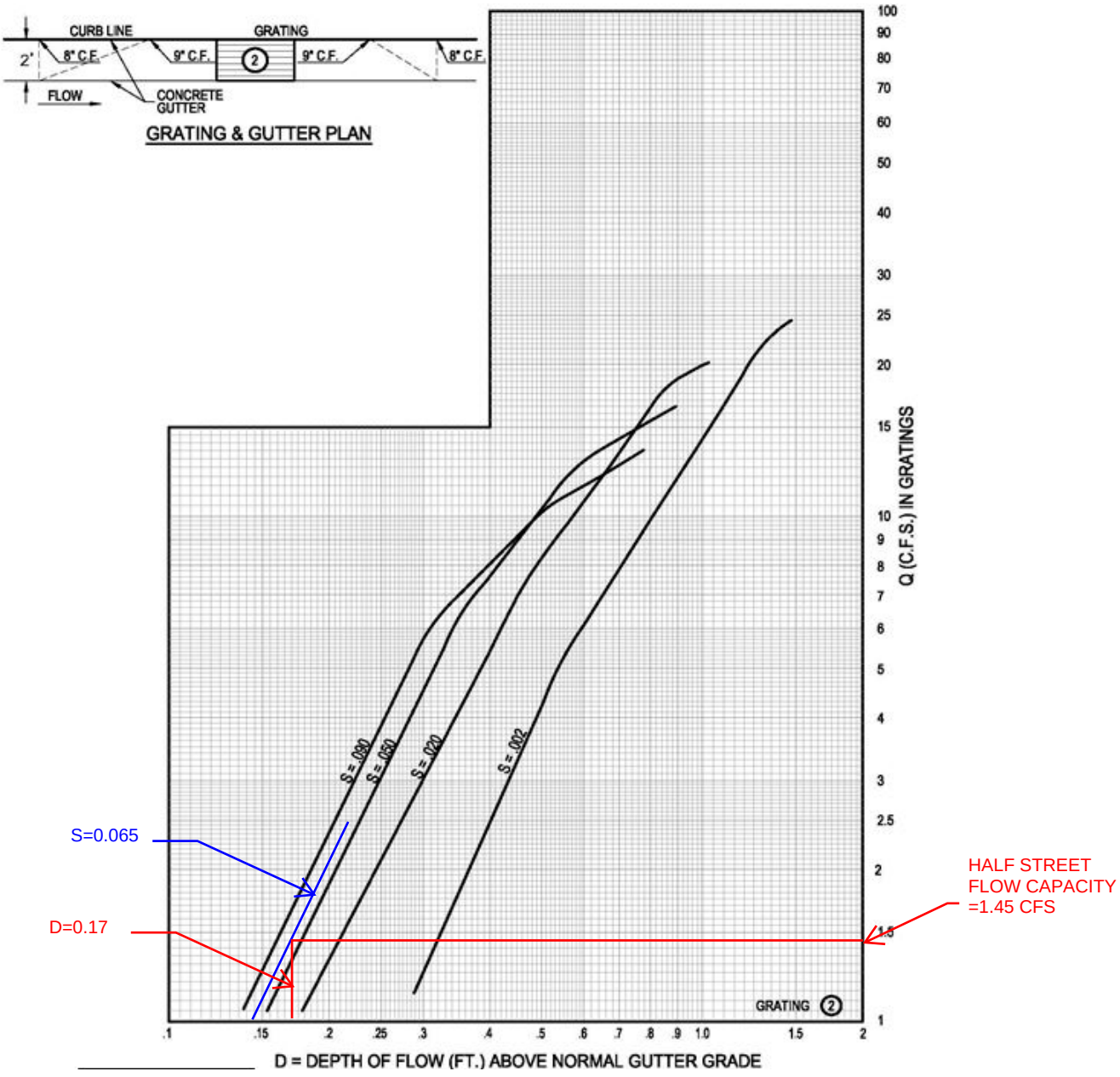


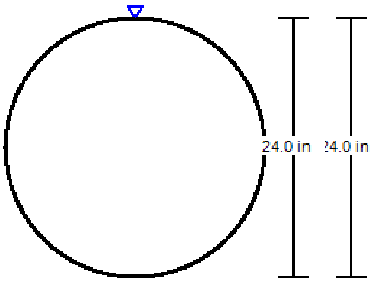
FIGURE 6.9.9 **Grate Capacities for Types " A," "C," and "D"**



STORM DRAIN PIPE A CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.040 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	45.24 cfs

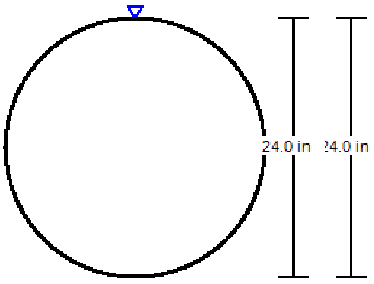


V: 1
H: 1

STORM DRAIN PIPE B CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.021 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	32.78 cfs

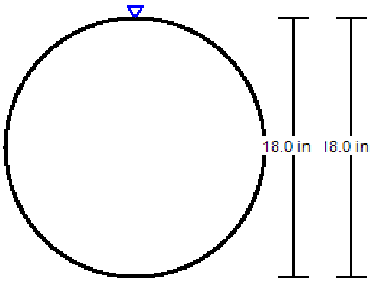


V: 1
H: 1

STORM DRAIN PIPE C CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.023 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	15.93 cfs

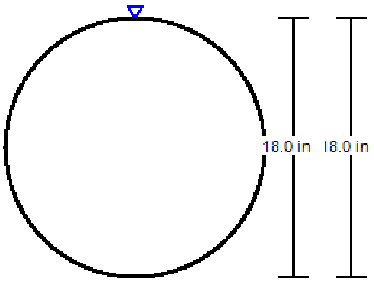


V: 1
H: 1

STORM DRAIN PIPE D CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.020 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	14.85 cfs

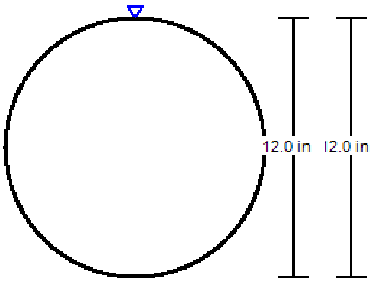


V: 1
H: 1

STORM DRAIN PIPE E CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

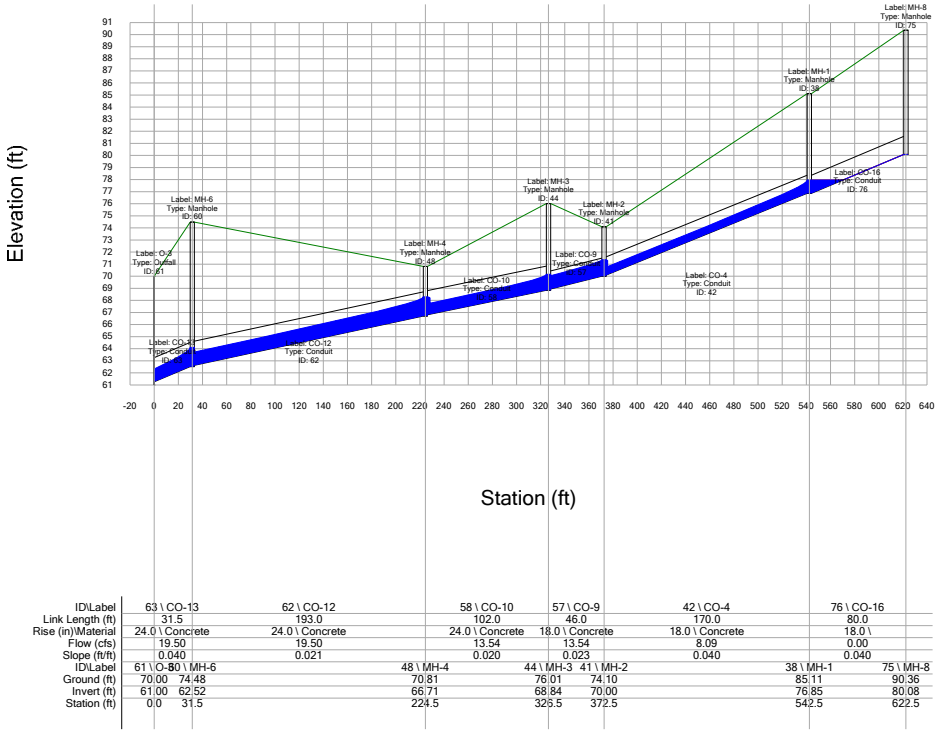
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.030 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Discharge	8.02 cfs



Profile Report
Profile: Profile - 1

FULLY DEVELOPED CONDITION

Profile - 1 - Base

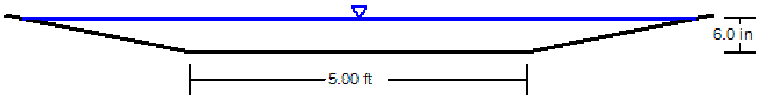


ID\Label	63 \ CO-13		62 \ CO-12		58 \ CO-10		57 \ CO-9		42 \ CO-4		76 \ CO-16	
Link Length (ft)	31.5		193.0		102.0		46.0		170.0		80.0	
Rise (in)\Material	24.0 \ Concrete		24.0 \ Concrete		24.0 \ Concrete		18.0 \ Concrete		18.0 \ Concrete		18.0 \	
Flow (cfs)	19.50		19.50		13.54		13.54		8.09		0.00	
Slope (ft/ft)	0.040		0.021		0.020		0.023		0.040		0.040	
ID\Label	61 \ CO-3	60 \ MH-6		48 \ MH-4		44 \ MH-3	41 \ MH-2			38 \ MH-1		75 \ MH-8
Ground (ft)	70.00	74.48		70.81		76.01	74.10			85.11		90.36
Invert (ft)	61.00	62.52		66.71		68.84	70.00			76.85		80.08
Station (ft)	0.0	31.5		224.5		326.5	372.5			542.5		622.5

EMERGENCY SPILLWAY CAPACITY

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.041
Channel Slope	0.100 ft/ft
Normal Depth	6.0 in
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	5.00 ft
Discharge	22.20 cfs

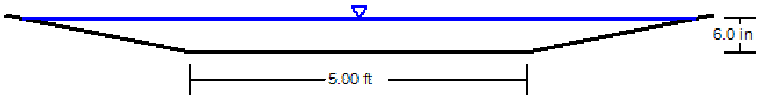


V: 1
H: 1

ROCK SWALE CAPACITY

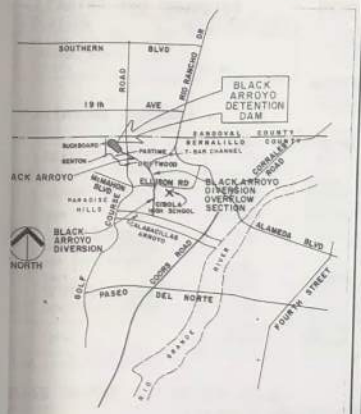
Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.041
Channel Slope	0.020 ft/ft
Normal Depth	6.0 in
Left Side Slope	5.000 H:V
Right Side Slope	5.000 H:V
Bottom Width	5.00 ft
Discharge	9.93 cfs



APPENDIX C

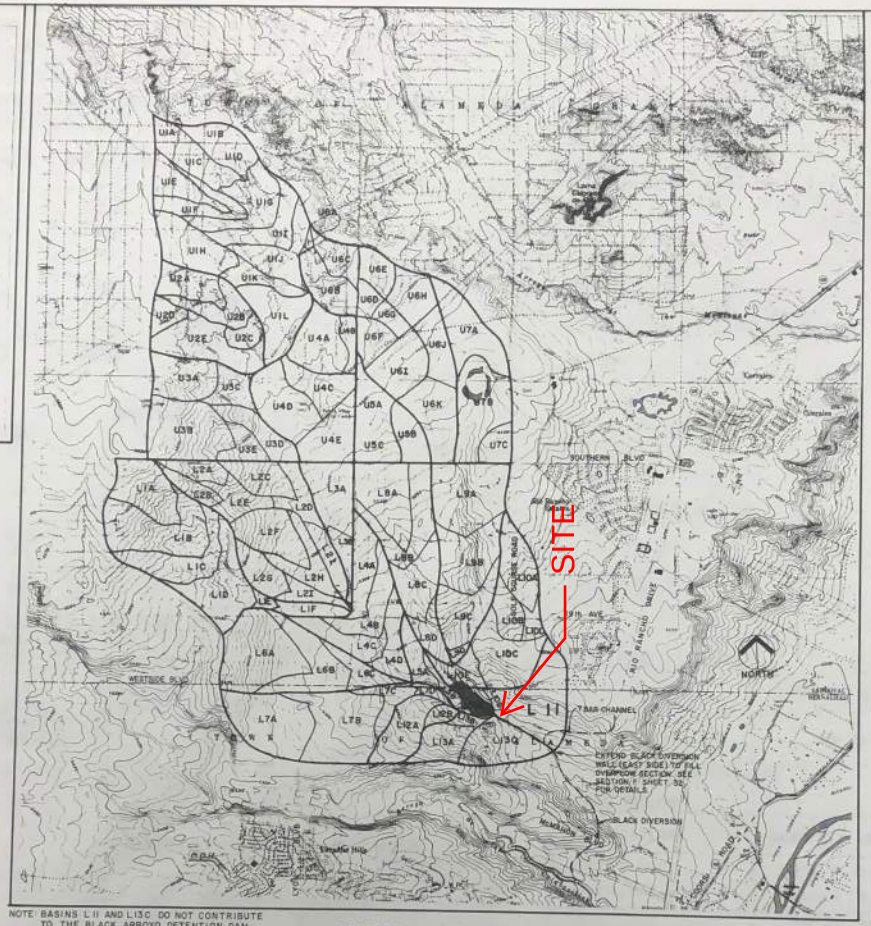
PAGES FROM BLACK ARROYO DRAINAGE REPORT



LOCATION MAP
NO SCALE

LEGEND

- SECTION LINE OR GRANT BOUNDARY LINE
- A.M.A.F.C.A. RIGHT - OF - WAY
- FOUND SECTION CORNER
- BUILDINGS
- EXISTING CONTOUR LINE
- LIMITS OF CUT / FILL
- FINISH CONTOUR LINE
- FLOW LINE
- PAVED ROAD
- UNPAVED ROAD
- SLOPE INDICATOR
- LIMITS OF SLOPE
- LIMITS OF EXCAVATION AND BACKFILL
- CENTERLINE
- DRAINAGE BASIN BOUNDARY
- L-4 DRAINAGE BASIN
- SAS EXISTING SANITARY SEWER MAIN
- W EXISTING WATER MAIN
- SECTION DESIGNATION
- SHEET SECTION IS SHOWN
- SHEET SECTION IS CUT



NOTE: BASINS L11 AND L13C DO NOT CONTRIBUTE TO THE BLACK ARROYO DETENTION DAM WATERSHED.

DRAINAGE AREA MAP
Scale : 1" = 2000'

GENERAL NOTES

1. New Mexico State Highway Department "Standard Specifications for Road and Bridge Construction, Edition of 1964", and supplemental specifications and special provisions thereto shall govern construction of this project.
2. Elevations are shown in feet above mean sea level datum.
3. All stationing for the Dam and Channels refer to the measured horizontal distance. Left and right of centerline are looking in the direction of increasing stations.
4. Where wire fence is shown along property lines, construct the centerline of the fence posts six (6) inches to the inside of the property line.
5. When coordinates are shown, herein (N,E) they refer to the New Mexico State Plane Coordinate System. Coordinates are based on true ground distances and state grid bearings. Grid Distance = Field Distance x 0.9996593.
7. Additional construction at wire gates and walk gaps shall be considered incidental to the cost of the construction of the fence.
8. Right-of-Way shown on the plans define "Limits of Work" for this project. The Contractor shall confine his operations to the construction limits of the project and will be held responsible for any agreements necessary or damage by his operation to public or private property including utilities.
9. Fill materials from excavation or borrow which requires more than one handling prior to final placement, including stockpiling and blending to meet gradation requirements or stockpiling for later disposal, will be considered incidental to the contract unit price for unclassified excavation. No separate payment shall be made for blending or multiple handling and final payment shall be made on the basis of quantities removed from the original location.
10. Contractors' campsites, and any other disturbed areas not included on the plans shall be treated with Class "A" seeding, and no measurement or payment will be made therefore.
11. The Air Pollution Control Regulations of the Albuquerque - Bernalillo County Air Quality Control Board limit emission of particulate matter and the use of cut back asphalt. It is the responsibility of the Contractor to clarify these restrictions with the Environmental Health Department prior to submittal of bids to avoid conflicts with regulations.
12. Watering, as required for construction and dust control, shall be considered incidental to construction and no measurement or payment shall be made therefore. Construction areas shall be watered with equipment for dust pollution abatement as directed by the Engineer. The Contractor shall be responsible for locating and supplying water as required.
13. The Contractor will be responsible to replace at his own expense any and all property corners destroyed in the process of construction. All property corners must be set by a Registered Professional Surveyor.
14. No payment above the cost of excavation will be made for placement of surplus fill to any designated waste areas or the contractor located disposal site.
15. Place strippings over dam slopes and other disturbed areas prior to seeding as directed by the Project Manager. Cost of this work shall be incidental to the cost of the item clearing and grubbing.
16. The Contractor shall supply all labor, equipment, materials, services, insurance, bonds and permits necessary to carry out the removal of asbestos cement pipe in accordance with all applicable Federal, State and Local Regulations and the Specifications.
17. This project is constructed under the authority of the State Engineer, State of New Mexico. The State Engineer, or his designated agent shall have full power regarding inspection during construction, and full power to act if specifications are not met.
18. Minor changes in elevations and slopes for excavation and fill may be made to suit field conditions, as approved by the Project Manager.

RECORD DRAWINGS
DATE 11-9-82

BLACK ARROYO DETENTION DAM
LOCATION & DRAINAGE AREA MAPS, GENERAL NOTES & LEGEND

ALBUQUERQUE METROPOLITAN ARROYO FLOOD CONTROL AUTHORITY

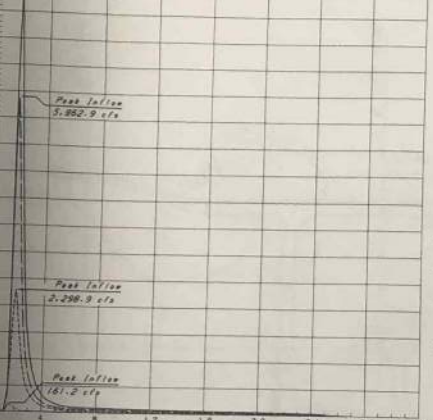
Job No. 90113.20 Sheet No. 2 of 39
Drawn By HBM Date 7/91
Checked By Scale

TABLE 6

ULTIMATE DEVELOPMENT CONDITION
DISCHARGE TABLE
HYDROLOGIC ANALYSIS FOR BLACK ARROYO

BASIN	AREA (SQ. MI.)	TIME TO PEAK (HRS.)	IMPERVIOUS AREA (SQ.MI.) SCE.1	SCE.2	SCE.3	SCS CURVE NO. (PERV.)	100-YEAR DISCHARGE RATE (CFS) SCEN. 1	SCEN. 2	SCEN. 3	SCEN. 4
U1	1.20	.591	.42	.42	.42	69	808	808	808	808
U2	.48	.292	.17	.17	.17	64	481	481	481	481
U3	.66	.325	.23	.23	.23	67	655	655	655	655
U4	.59	.300	.21	.21	.21	67	624	624	624	624
U5	.31	.239	.11	.11	.11	67	372	372	372	372
U6	.95	.523	.33	.33	.33	67	673	673	673	673
U7	.39	.401	.14	.14	.14	67	344	344	344	344
L1	.781	.447	.172	.258	.344	70	526	649	774	371
L2	.804	.409	.177	.265	.354	65	517	659	805	337
L3	.194	.331	.043	.064	.085	67	145	184	223	96
L4	.388	.298	.09	.128	.171	65	290	373	463 ~~120~~ *	179
L5	.074	.169	.016	.024	.033	63	67	88	112	41
L6	.524	.288	.115	.173	.231	66	409	528	647	264
L7	.574	.334	.126	.189	.253	63	366	492	619	212
L12	.194	.271	.043	.064	.085	59	124	173	223	62
L8	.554	.438	.122	.183	.244	65	316	414	512	193
L9	.534	.433	.117	.176	.235	66	318	411	506	202
L10	.574	.387	.126	.189	.253	68	399	503	610	270
L13	.264	.265	.058	.087	.116	64	201	265	330	122
L11	.214	.239	.047	.071	.094	63	166	222	277	98
Analysis Point 1							1345	1345	1345	1345
Analysis Point 2							624	624	624	624
Analysis Point 3							976	976	976	976
Analysis Point 4							2826	3298	3797 ~~3579~~ *	2278
Analysis Point 5							1691	1952	2206	1381
Analysis Point 6							4498	5239	5994 ~~5759~~ *	3639
Analysis Point 7							4506	5268	6061 ~~5826~~ *	3608
Downstream of Confluence with 7-Bar							5293	6095	~~6666~~ * 6922	4319

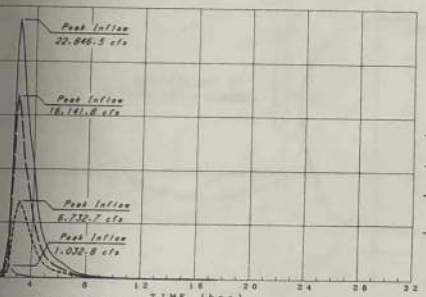
* Error in L4



LEGEND

- 100-Yr. Inflow East Branch
- 100-Yr. Inflow West Branch
- 100-Yr. Inflow Local Drainage
- 100-Yr. Inflow Combined

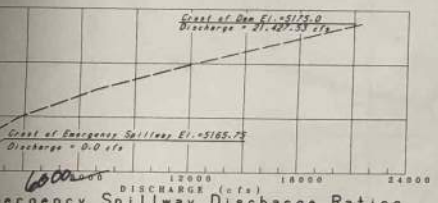
100- Year Inflow Hydrograph



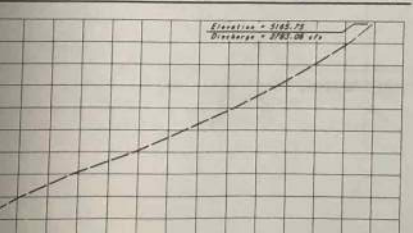
LEGEND

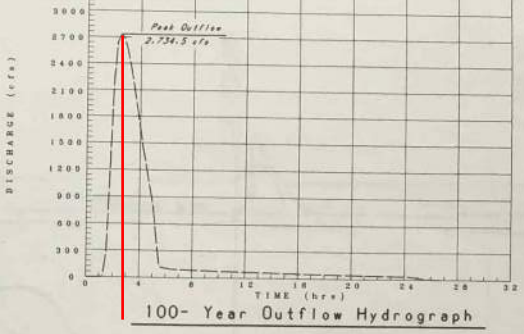
- 1/2 PMF Inflow East Branch
- 1/2 PMF Inflow West Branch
- 1/2 PMF Inflow Combined
- 1/2 PMF Inflow Local Drainage

1/2 PMF Inflow Hydrograph

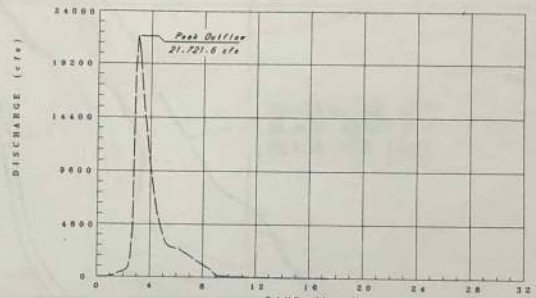


ergency Spillway Discharge Rating

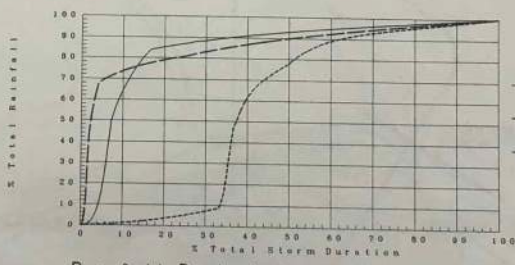




100- Year Outflow Hydrograph



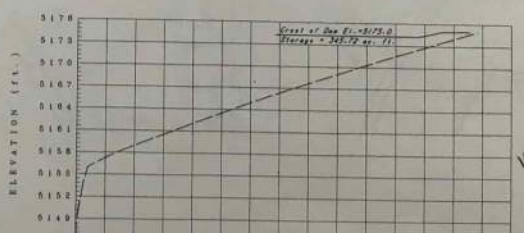
1/2 PMF Outflow Hydrograph



LEGEND

- 100-Yr. 6 Hr. Storm (2.2 in.)
- PMP 6 Hr. Storm (14.24 in.)
- 100-Yr. 24 Hr. Storm (2.68 in.)

Rainfall Distribution- 100 Yr. & PMP



WATER ELEVATION (ft.)	SURFACE AREA (ac.)	CUMULATIVE VOLUME* (ac.ft.)
5146	0	0
5148	3.63	3.63
5150	9.80	17.06
5152	16.31	43.17
5154	17.71	77.19
5156	18.26	113.16
5158	18.80	150.22
5160	19.35	188.37
5162	19.89	227.61
5164	20.44	267.94
5165.75	20.91	304.13
5166	20.98	309.36
5168	21.82	352.16
5170	22.57	396.55
5172	23.41	442.53
5174	24.42	490.36
5175	25.07	515.11

Sediment pool capacity = 34.50 ac ft.

Flood water storage (1) = 269.63**

Flood water storage (2) = ~~343.02**~~ 480.6**

(1) To emergency spillway crest**

(2) To top of dam

100-year pool elevation = 5165.20

1/2 PMF pool elevation = 5174.10

Top of dam effective elevation = 5175.00

Emergency spillway crest effective elevation = 5165.

Sediment pool elevation = 5151.63

Principal spillway inlet elevation = 5146.00

NOTE: Future Configuration Hydrology assumes Fully Develo

Conditions. See Reference 2 for further details.

* Includes sediment storage

** Does not include sediment storage

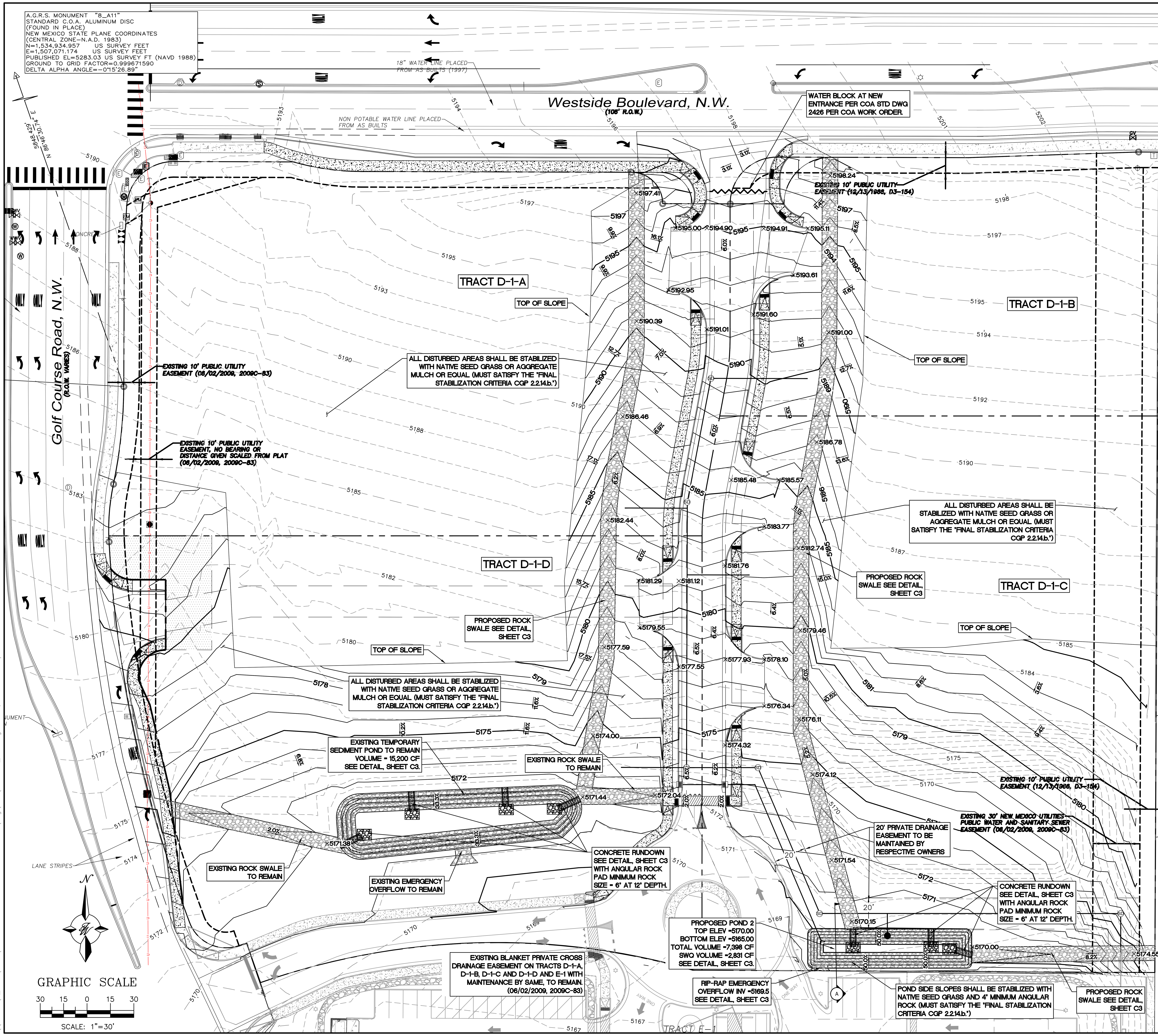
REFERENCES:

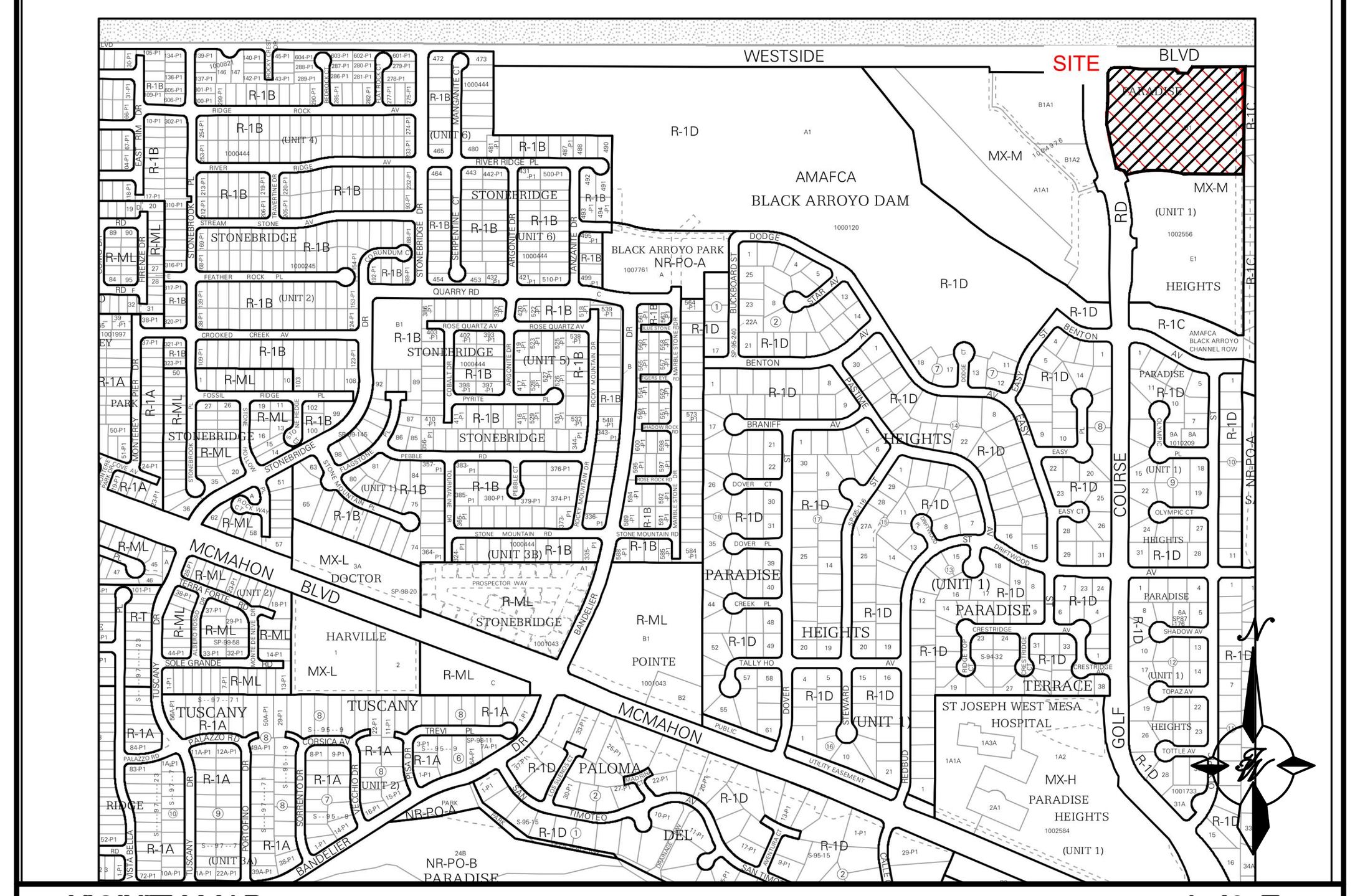
1. SECTION 22.2. HYDROLOGY of the Developm Process Manual Volume 2. Design Criteria for the City of Albuquerque. New Mexico. July 1991.
2. "BLACK ARROYO FINAL HYDROLOGY. SEDIMENT ISSUES. BOHANNAN - HUSTON INC., AUGUST 19
3. "GEOTECHNICAL INVESTIGATION BLACK ARROY DETENTION DAM," Vinyard & Associates, In February 1991.
4. "AN ANALYSIS OF THE BIOLOGY. ARCHAEOLOG AND NATURAL HISTORY OF BLACK ARROYO." EcoPlan Inc., March 1990.
5. "BLACK ARROYO DETENTION DAM ADDITIONAL CALCULATIONS: ADDENDUM TO FINAL BLACK ARROYO PROJECT. GOLF COURSE ROAD TO NOR OF THE COUNTY LINE. SEPTEMBER 1990," Bohannan-Huston Inc., January 1991.
6. "FINAL: BLACK ARROYO PROJECT. GOLF COUR ROAD TO NORTH OF THE COUNTY LINE". Boh Huston Inc., September 1990.
7. "BLACK ARROYO SEDIMENT ISSUES," Bohanna Huston Inc., May 1990.
8. "BLACK ARROYO DETENTION DAM FINAL CALCULATIONS."

Wrong Curve! ML 02/26

BLACK ARROYO DETENTION
HYDROLOGY DATA

ALBUQUERQUE METRO ARROYO FLOOD CO AUTHORITY





VICINITY MAP: A-12-Z

LEGAL DESCRIPTION:

TR D-1 PLAT OF TRS D-1, E-1 AMAFCA BLACK ARROYOCHANNEL ROW PARADISE HEIGHTS UNIT 1 CONT 7.6716 AC

LEGEND

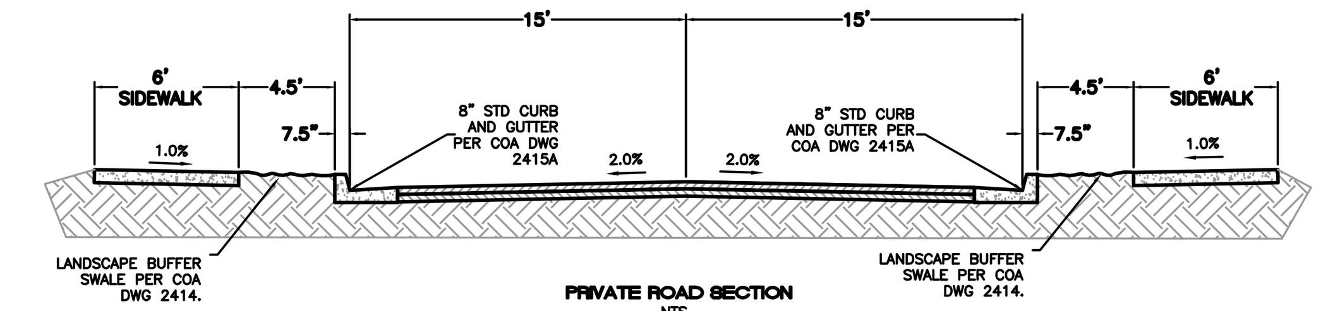
	CURB & GUTTER	x 5048.25	SPOT ELEVATION
	BOUNDARY LINE		FLOW ARROW
	EASEMENT		EXISTING CURB & GUTTER
	CENTERLINE		EXISTING BOUNDARY LINE
	BUILDING	5010	EXISTING CONTOUR MAJOR
	SIDEWALK	5011	EXISTING CONTOUR MINOR
	SCREEN WALL	x 5048.25	EXISTING SPOT ELEVATION
5010	CONTOUR MAJOR		STORM DRAIN (18"–24")
5011	CONTOUR MINOR		GRADE BREAK

NOTICE TO CONTRACTORS

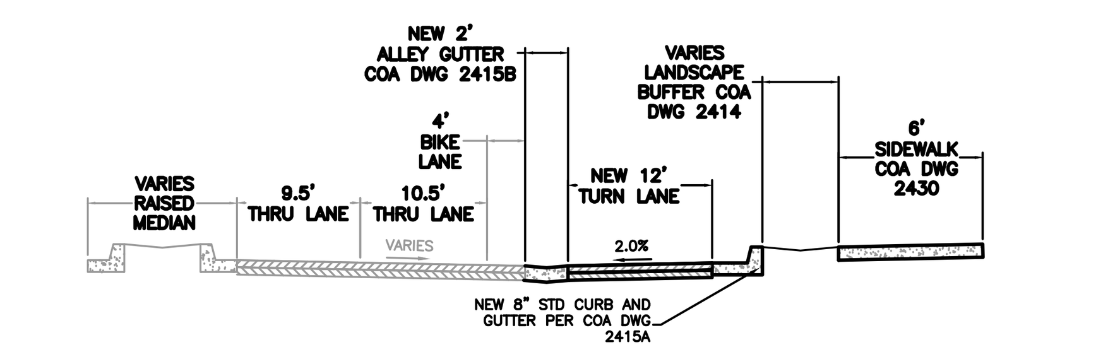
1. ALL WORK IN THE RIGHT-OF-WAY SHALL BE INCLUDED IN A WORK ORDER.
2. BUILD SIDEWALK CULVERT PER COA STD DWG 2236.
3. CONTACT STORM DRAIN MAINTENANCE AT (505) 857-8033 TO SCHEDULE A MEETING PRIOR TO FORMING.
4. AN EXCAVATION PERMIT WILL BE REQUIRED BEFORE BEGINNING ANY WORK WITHIN CITY RIGHT-OF-WAY.
5. ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
6. TWO WORKING DAYS PRIOR TO ANY EXCAVATION, THE CONTRACTOR MUST CONTACT **NEW MEXICO ONE CALL, DIAL "811"** [OR (505) 260-1990] FOR THE LOCATION OF EXISTING UTILITIES.
7. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE LOCATIONS OF ALL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY.
8. BACKFILL COMPACTION SHALL BE ACCORDING TO TRAFFIC/STREET USE.
9. MAINTENANCE OF THE FACILITY SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY BEING SERVED.
10. WORK ON ARTERIAL STREETS MAY BE REQUIRED ON A 24-HOUR BASIS.
11. CONTRACTOR MUST CONTACT STORM DRAIN MAINTENANCE AT (505) 857-8033 TO SCHEDULE A CONSTRUCTION INSPECTION. FOR EXCAVATING AND BARRICADING INSPECTIONS, CONTACT CONSTRUCTION COORDINATION AT (505) 924-3416.

CAUTION

ALL EXISTING UTILITIES/TOPOGRAPHY SHOWN WERE OBTAINED FROM RESEARCH, AS-BUILTS, SURVEYS OR INFORMATION PROVIDED BY OTHERS. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT ALL NECESSARY FIELD INVESTIGATIONS PRIOR TO AND INCLUDING ANY EXCAVATION, TO DETERMINE THE ACTUAL LOCATION OF UTILITIES AND OTHER IMPROVEMENTS, PRIOR TO STARTING THE WORK. ANY CHANGES FROM THIS PLAN SHALL BE COORDINATED WITH AND APPROVED BY THE ENGINEER.



PRIVATE ROAD SECTION
NTS



WESTSIDE BLVD EAST BOUND (LOOKING EAST)
NTS

ENGINEER'S SEAL RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER 02/15/2023 RONALD R. BOHANNAN P.E. #7868	GOLF COURSE + WESTSIDE ALBUQUERQUE, NM **GRADING & DRAINAGE PLAN** TIERRA WEST, LLC 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505) 858-3100 www.tierrawestllc.com	DRAWN BY RG DATE 02/15/2022 2022055_GRB SHEET # C1 JOB # 2022055

A.G.R.S. MONUMENT "8_A11"
STANDARD C.O.A. ALUMINUM DISC
(FOUND IN PLACE)
NEW MEXICO STATE PLANE COORDINATES
(CENTRAL ZONE-N.A.D. 1983)
N=1,534,934.957 US SURVEY FEET
E=1,507,071.174 US SURVEY FEET
PUBLISHED EL=5283.03 US SURVEY FT (NAVD 1988)
GROUND TO GRID FACTOR=0.99971590
DELTA ALPHA ANGLE=-0°15'26.89"

Westside Boulevard, N.W.
(106' R.O.W.)

Golf Course Road, N.W.
(R.O.W. VARIES)

18" WATER LINE PLACED FROM AS BUILTS (1997)

NON POTABLE WATER LINE PLACED FROM AS BUILTS

TRACT D-1-A

TRACT D-1-B

TRACT D-1-C

TRACT D-1-D

TRACT E-1

EXISTING 10' PUBLIC UTILITY EASEMENT (08/02/2009, 2009C-83)

EXISTING 10' PUBLIC UTILITY EASEMENT, NO BEARING OR DISTANCE GIVEN SCALED FROM PLAT (08/02/2009, 2009C-83)

EXISTING 10' PUBLIC UTILITY EASEMENT (12/13/1988, D3-154)

EXISTING 30' NEW MEXICO UTILITIES PUBLIC WATER AND SANITARY SEWER EASEMENT (08/02/2009, 2009C-83)

4 FT DIA STORM DRAIN (2209) MANHOLE PER COA STD DWGS
RIM ELEV= 5189.27
INV SOUTH= 5180.08

18" HDPE PIPE STUB (FOR FUTURE USE) SLOPE =2%

18" RCP PIPE

4 FT DIA STORM DRAIN (2209) MANHOLE PER COA STD DWGS
RIM ELEV= 5184.36
INV NORTH= 5176.84
INV SOUTH= 5176.74

18" HDPE PIPE STUB (FOR FUTURE USE) SLOPE =2%

ALL DISTURBED AREAS SHALL BE STABILIZED WITH NATIVE SEED GRASS OR AGGREGATE MULCH OR EQUAL (MUST SATISFY THE "FINAL STABILIZATION CRITERIA CGP 2.2.14.b.")

18" HDPE PIPE STUB (FOR FUTURE USE) SLOPE =2%

18" RCP PIPE

4 FT DIA STORM DRAIN (2209) MANHOLE PER COA STD DWGS
RIM ELEV= 5174.10
INV NORTH= 5170.10
INV WEST= 5170.10
INV EAST= 5170.00

18" HDPE PIPE STUB (FOR FUTURE USE) SLOPE =2%

18" RCP PIPE

4 FT DIA STORM DRAIN (2209) MANHOLE PER COA STD DWGS
RIM ELEV= 5176.01
INV WEST= 5168.73
INV SOUTHWEST= 5168.94
INV SOUTH= 5168.84

4 FT DIA STORM DRAIN (2208) MANHOLE PER COA STD DWGS
RIM ELEV= 5170.81
INV NORTH= 5166.81
INV EAST= 5166.71

24" RCP PIPE

4 FT DIA STORM DRAIN (2209) MANHOLE PER COA STD DWGS
RIM ELEV= 5174.48
INV WEST= 5162.62
INV SOUTH= 5162.52

24" RCP PIPE

STANDARD TYPE A INLET
STD DWG 2205
RIM ELEV= 5172.84
INVERT ELEV= 5169.34

STANDARD TYPE A INLET
STD DWG 2205
RIM ELEV= 5173.36
INVERT ELEV= 5168.44

18" RCP PIPE

20' PRIVATE DRAINAGE EASEMENT TO BE MAINTAINED BY RESPECTIVE OWNERS

12" HDPE PIPE

24" RCP PIPE

18" HEADWALL SEE DETAIL, SHEET C3

15" STANDPIPE INLET ELEV= 5167.83 SEE DETAIL, SHEET C3.

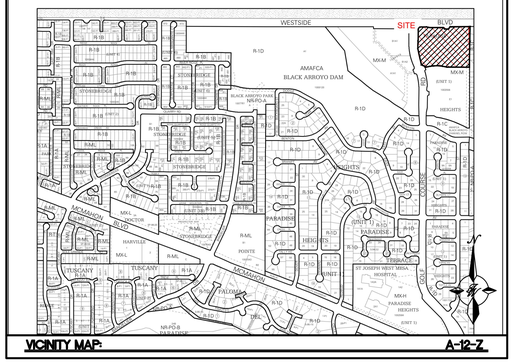
CONNECT TO 24" HDPE STUB INV. 5161.26 CONTRACTOR TO VERIFY INVERT.

EXISTING BLANKET PRIVATE CROSS DRAINAGE EASEMENT ON TRACTS D-1-A, D-1-B, D-1-C AND D-1-D AND E-1 WITH MAINTENANCE BY SAME, TO REMAIN. (06/02/2009, 2009C-83)

LANE STRIPES

CONCRETE

GRAPHIC SCALE
30 15 0 15 30
SCALE: 1"=30'



VICINITY MAP: A-12-Z

LEGAL DESCRIPTION:

TR D-1 PLAT OF TRS D-1, E-1 AMAFCA BLACK ARROYOCHANNEL ROW PARADISE HEIGHTS UNIT 1 CONT 7.6716 AC

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- BUILDING
- SIDEWALK
- SCREEN WALL
- 5010 CONTOUR MAJOR
- 5011 CONTOUR MINOR
- × 5048.25 SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- 5010 EXISTING CONTOUR MAJOR
- 5011 EXISTING CONTOUR MINOR
- × 5048.25 EXISTING SPOT ELEVATION
- STORM DRAIN (18"–24")
- GRADE BREAK

NOTICE TO CONTRACTORS

1. ALL WORK IN THE RIGHT-OF-WAY SHALL BE INCLUDED IN A WORK ORDER.
2. BUILD SIDEWALK CULVERT PER COA STD DWG 2236.
3. CONTACT STORM DRAIN MAINTENANCE AT (505) 857-8033 TO SCHEDULE A MEETING PRIOR TO FORMING.
4. AN EXCAVATION PERMIT WILL BE REQUIRED BEFORE BEGINNING ANY WORK WITHIN CITY RIGHT-OF-WAY.
5. ALL WORK ON THIS PROJECT SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS CONCERNING CONSTRUCTION SAFETY AND HEALTH.
6. TWO WORKING DAYS PRIOR TO ANY EXCAVATION, THE CONTRACTOR MUST CONTACT **NEW MEXICO ONE CALL, DIAL "811"** (OR (505) 260-1990) FOR THE LOCATION OF EXISTING UTILITIES.
7. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL EXCAVATE AND VERIFY THE LOCATIONS OF ALL OBSTRUCTIONS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE CONFLICT CAN BE RESOLVED WITH A MINIMUM AMOUNT OF DELAY.
8. BACKFILL COMPACTION SHALL BE ACCORDING TO TRAFFIC/STREET USE.
9. MAINTENANCE OF THE FACILITY SHALL BE THE RESPONSIBILITY OF THE OWNER OF THE PROPERTY BEING SERVED.
10. WORK ON ARTERIAL STREETS MAY BE REQUIRED ON A 24-HOUR BASIS.
11. CONTRACTOR MUST CONTACT STORM DRAIN MAINTENANCE AT (505) 857-8033 TO SCHEDULE A CONSTRUCTION INSPECTION. FOR EXCAVATING AND BARRICADING INSPECTIONS, CONTACT CONSTRUCTION COORDINATION AT (505) 924-3416.

CAUTION

ALL EXISTING UTILITIES/TOPOGRAPHY SHOWN WERE OBTAINED FROM RESEARCH, AS-BUILTS, SURVEYS OR INFORMATION PROVIDED BY OTHERS. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT ALL NECESSARY FIELD INVESTIGATIONS PRIOR TO AND INCLUDING ANY EXCAVATION, TO DETERMINE THE ACTUAL LOCATION OF UTILITIES AND OTHER IMPROVEMENTS, PRIOR TO STARTING THE WORK. ANY CHANGES FROM THIS PLAN SHALL BE COORDINATED WITH AND APPROVED BY THE ENGINEER.

ENGINEER'S SEAL
RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER
02/15/2023
RONALD R. BOHANNAN P.E. #7868

GOLF COURSE + WESTSIDE
ALBUQUERQUE, NM

STORM DRAIN PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
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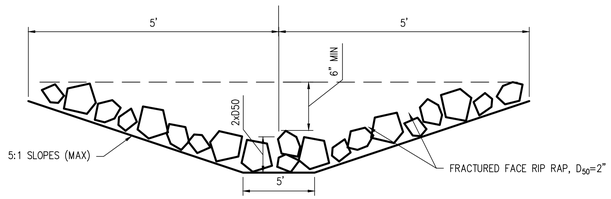
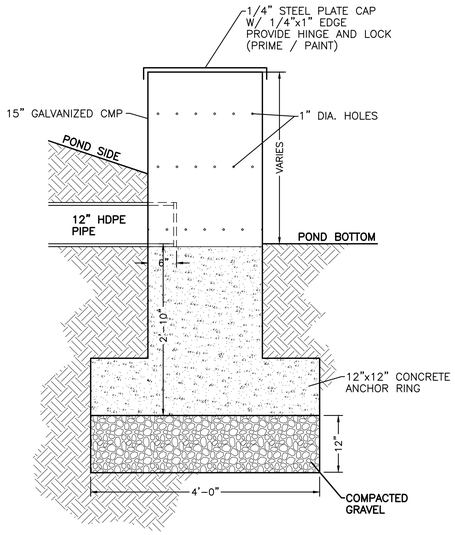
www.tierrawestllc.com

DRAWN BY: RG
DATE: 02/15/2022
2022055_GRB
SHEET #: C2
JOB #: 2022055

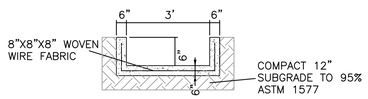
\\TWNAS\Z_Drive\2022\2022055 Golf Course & Westside Blvd\dwg\EPC\2022055_GRB.dwg Feb 15, 2023 - 1:48pm



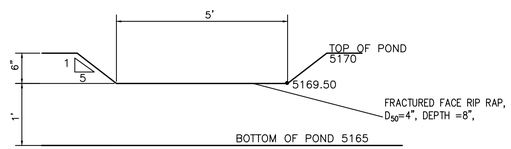
ROCK SWALE
NTS



STAND PIPE DETAIL
NTS



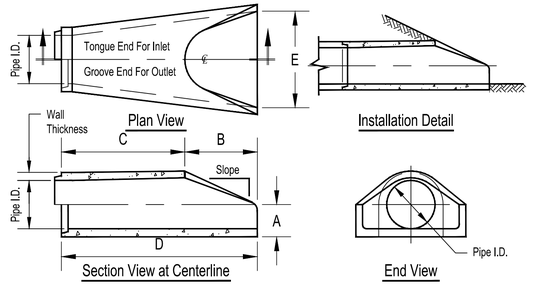
CONCRETE RUNDOWN (4000 psi)
NTS



DETENTION POND
EMERGENCY SPILLWAY DETAIL
NTS

Rinker MATERIALS
Concrete Pipe Division

Flared End Section
12" - 72" Diameter Pipe

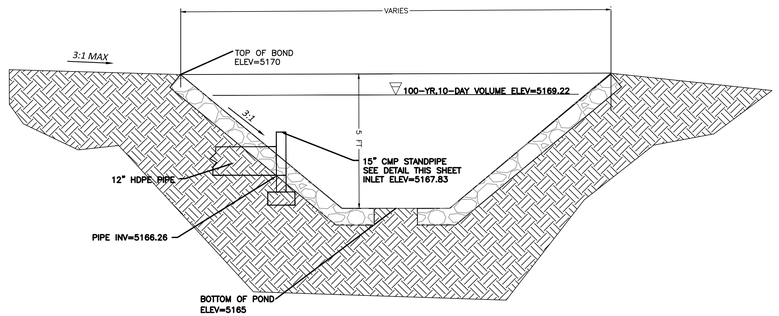


Pipe Inner Diameter (inches)	Wall Thickness (inches)	A (inches)	B (inches)	C (inches)	D (inches)	E (inches)	Slope
12	2	4	24	48 7/8	72 7/8	30	3:1
15	2 1/4	6	27	46	73	30	3:1
18	2 1/2	9	27	46	73	36	3:1
24	3	9 1/2	43 1/2	30	73 1/2	48	3:1
30	3 1/2	12	54	19 3/4	73 3/4	60	3:1
36	4	15	63	34 3/4	97 3/4	72	3:1
42	4 1/2	21	63	35	98	78	3:1
48	5	24	72	26	98	84	3:1
54	5 1/2	27	65	35	100	90	2.4:1
60	6	30	60	39	99	96	2:1
66	6 1/2	32	78	21	99	102	2:1
72	7	34	78	21	99	108	2:1

Dimensions may vary depending upon equipment availability.

Notes:
1. Produced to meet ASTM specifications.
2. Contact a Concrete Pipe Division representative for details not listed on this sheet. Rinker 024

CONCRETE FLARED END SECTION DETAIL
NTS



SECTION A (DETENTION POND DETAIL)
NTS

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