CITY OF ALBUQUERQUE

Richard J. Berry, Mayor

November 23, 2015

Ronald R. Bohannan
Tierra West, LLC
5571 Midway Park Pl, NE
Albuquerque, NM, 87109

RE: **La Orilla Estates**
SW Corner La Orilla Road & Coors Blvd
Engineer's Stamp Date 10-12-2015 (File: E12D024)

Dear Mr. Bohannan:

Based upon the information provided in your submittal received 10-23-2015, the above-referenced grading plan and Drainage Report proposes to drain to the pond along Coors Blvd. This concept had been previously approved by the City (approvals dated August 7, 2006, and February 19, 2009). Since the plan has not substantially changed from previously approved information, it is adequate and approved for Work Order. A Grading Permit will not be needed from the City since the on-site work is outside of the City's limits. The Work Order approval does not substitute any re-approvals from NMDOT District III that may be needed for work on NM 448.

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

Sincerely,

Abiel Carrillo, P.E.
Principal Engineer, Planning Dept.
Development Review Services

Orig: Drainage file

PO Box 1293
Albuquerque
New Mexico 87103
www.cabq.gov

City of Albuquerque

Planning Department

Development & Building Services Division

DRAINAGE AND TRANSPORTATION INFORMATION SHEET (REV 09/2015)

Project Title: La Orilla Estates Building Permit #: _____ City Drainage #: _____

DRB#: _____ EPC#: _____ Work Order#: _____

Legal Description: Tracts A & B Plat of Tracts A & B La Orilla Estates

City Address: SW Corner Coors Blvd. and La Orilla Rd.

Engineering Firm: Tierra West, LLC Contact: Ronald R. Bohannan

Address: 5571 Midway Park Pl. NE

Phone#: 505-858-3100 Fax#: _____ E-mail: rrb@tierrawestllc.com

Owner: Jude Baca Contact: Jude Baca

Address: 3913 72nd NW

Phone#: 505-379-7877 Fax#: _____ E-mail: _____

Architect: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Other Contact: _____ Contact: _____

Address: _____

Phone#: _____ Fax#: _____ E-mail: _____

Check all that Apply:

DEPARTMENT:

X HYDROLOGY/ DRAINAGE

_____ TRAFFIC/ TRANSPORTATION

_____ MS4/ EROSION & SEDIMENT CONTROL

TYPE OF SUBMITTAL:

_____ ENGINEER/ ARCHITECT CERTIFICATION

_____ CONCEPTUAL G & D PLAN

X GRADING PLAN

_____ DRAINAGE MASTER PLAN

_____ DRAINAGE REPORT

_____ CLOMR/LOMR

_____ TRAFFIC CIRCULATION LAYOUT (TCL)

_____ TRAFFIC IMPACT STUDY (TIS)

_____ EROSION & SEDIMENT CONTROL PLAN (ESC)

_____ OTHER (SPECIFY) _____

CHECK TYPE OF APPROVAL/ACCEPTANCE SOUGHT:

_____ BUILDING PERMIT APPROVAL

_____ CERTIFICATE OF OCCUPANCY

_____ PRELIMINARY PLAT APPROVAL

_____ SITE PLAN FOR SUB'D APPROVAL

_____ SITE PLAN FOR BLDG. PERMIT APPROVAL

_____ FINAL PLAT APPROVAL

_____ SIA/ RELEASE OF FINANCIAL GUARANTEE

_____ FOUNDATION PERMIT APPROVAL

_____ GRADING PERMIT APPROVAL

_____ SO-19 APPROVAL

_____ PAVING PERMIT APPROVAL

_____ GRADING/ PAD CERTIFICATION

X WORK ORDER APPROVAL

_____ CLOMR/LOMR

_____ PRE-DESIGN MEETING

_____ OTHER (SPECIFY) _____

IS THIS A RESUBMITTAL?: _____ Yes _____ No

DATE SUBMITTED: 10/22/2015 By: Vinny Perea

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: ___

JN

TIERRA WEST, LLC

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

October 22, 2015

Ms. Rita Harmon, Senior Engineer
City of Albuquerque Hydrology
Public Works Department
P.O. Box 1293
Albuquerque, New Mexico 87103

RE: TRACTS A & B OF LA ORILLA ESTATES DRAINAGE SUBMITTAL
ACCEPTANCE OF DISCHARGE TO CITY POND

Dear Ms. Harmon:

Please find enclosed the drainage report and grading plan for the SW corner of Coors Boulevard and La Orilla Road. This property falls in the jurisdiction of Bernalillo County with the proposed developed runoff conveyed towards the city-maintained detention pond south of the subject site and west of Coors.

A previous grading plan and drainage report was submitted for this site in July 2006. At that time a letter was received from Curtis Cherne approving the submittal for work order. The previously designed discharge to the pond that was approved was 50.41 cfs from the site, the current developed discharge to the pond is 50.62 cfs, which we find to still be acceptable.

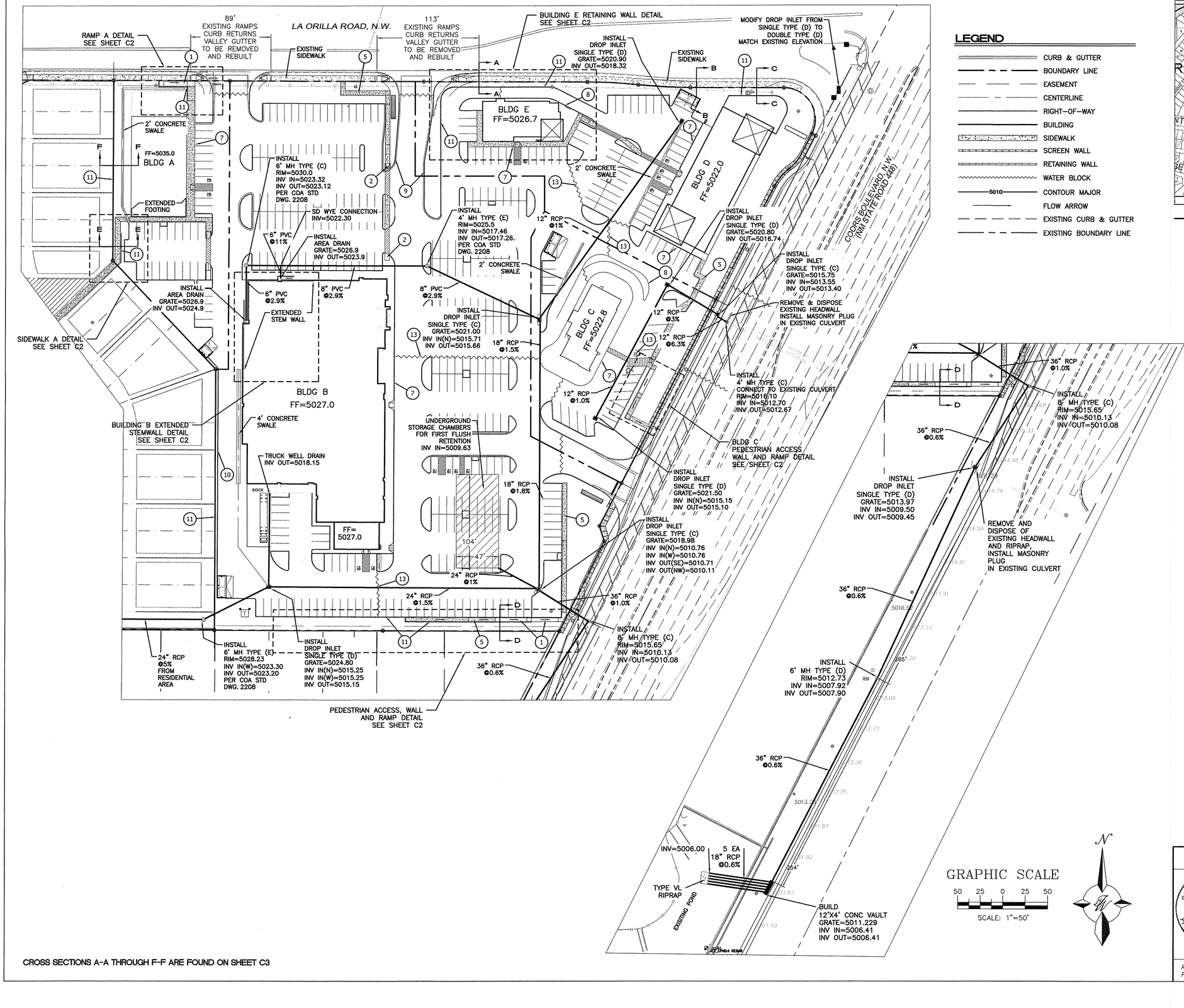
We have submitted this drainage report and grading plan to Bernalillo County. Don Briggs, with the Hydrology Section of the County, requested an updated letter from the City indicating acceptance of the discharge to this pond (similar to the letter found in Appendix G of the drainage report) prior to his approval of the grading and drainage plans. Our plat approval for the site is contingent upon approval of the grading and drainage plan by Don Briggs.

Please review the drainage report and grading plan and upon your approval, provide a letter of acceptance of discharge to this pond. If you have any questions or need additional information regarding this matter, please do not hesitate to contact me.

Sincerely,

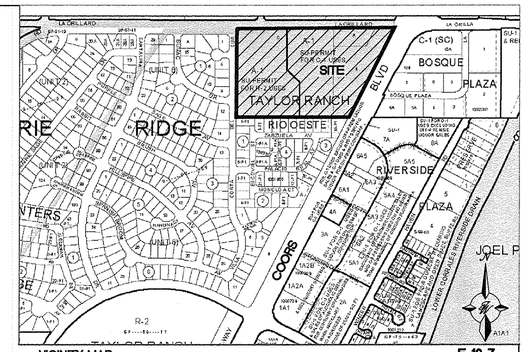
Ronald R. Bohannan, PE

JN: 2012005
RRB/vp



LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- SCREEN WALL
- RETAINING WALL
- WATER BLOCK
- 5010 CONTOUR MAJOR
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE



VICINITY MAP: E-12-Z

SITE LEGEND

1. 5' HC PEDESTRAIN RAMP (12:1 MAX SLOPE)
2. UNIDIRECTIONAL HC RAMP (SEE DETAIL SHEET C3)
3. 6' EXISTING SIDEWALK
4. 5' PEDESTRIAN CROSSWALK (SEE SHEET C3)
5. 5' PEDESTRAIN SIDEWALK
6. ZERO CURB (ADA PARKING AREA)
7. TURNDOWN CURB (SEE DETAIL SHEET C3)
8. TYPE "A" CURB AND GUTTER (SEE DETAIL SHEET C3)
9. STANDARD CURB AND GUTTER (PER COA STD DWG 2415A)
10. 6" HEADER CURB (SEE DETAIL SHEET C3
11. RETAINING WALL (SEE DETAIL SHEET C3)
12. VALLEY GUTTER (PER COA STD DWG 2420)
13. WATER BLOCK
14. SIDEWALK RAMP (SEE DETAIL SHEET C3)

EROSION CONTROL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TOPSOIL DISTURBANCE PERMIT PRIOR TO BEGINNING WORK.
2. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING RUN-OFF ON SITE DURING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR CLEANING ALL SEDIMENT THAT GETS INTO EXISTING RIGHT-OF-WAY.
4. REPAIR OF DAMAGED FACILITIES AND CLEANUP OF SEDIMENT ACCUMULATIONS ON ADJACENT PROPERTIES AND IN PUBLIC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR.
5. ALL EXPOSED EARTH SURFACES MUST BE PROTECTED FROM WIND AND WATER EROSION PRIOR TO FINAL (CITY) ACCEPTANCE OF ANY PROJECT.

CROSS SECTIONS A-A THROUGH F-F ARE FOUND ON SHEET C3

ENGINEER'S SEAL

RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER

RONALD R. BOHANNAN P.E. #7868

LA ORILLA ESTATES
COORS AND LA ORILLA
COMMERCIAL GRADING AND DRAINAGE PLAN

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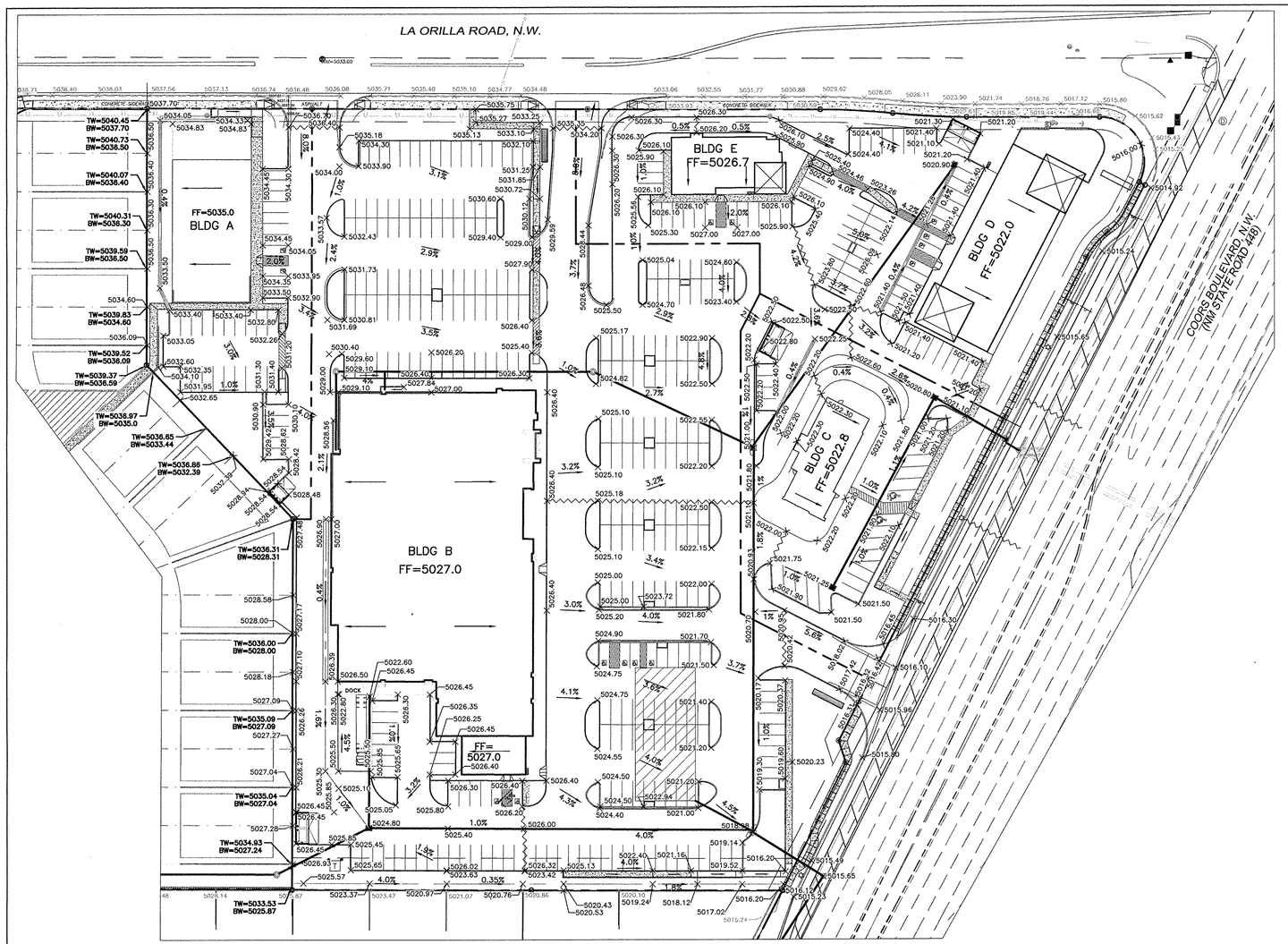
DRAWN BY: BJF

DATE: 10/05/15

2012005_GR_COM

SHEET # C1

JOB # 2012005



LEGEND

- CURB & GUTTER
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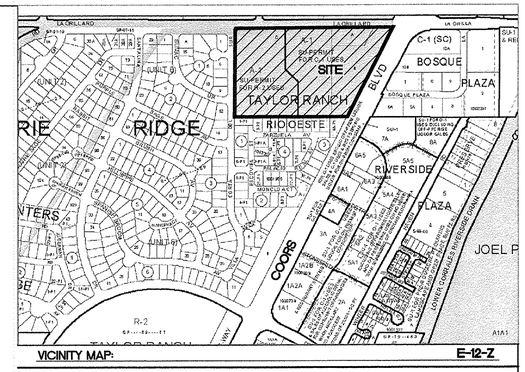
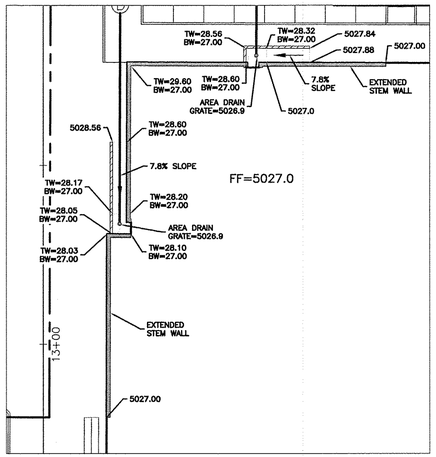
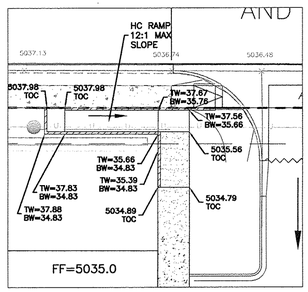
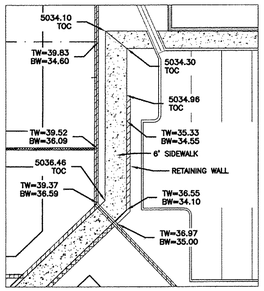




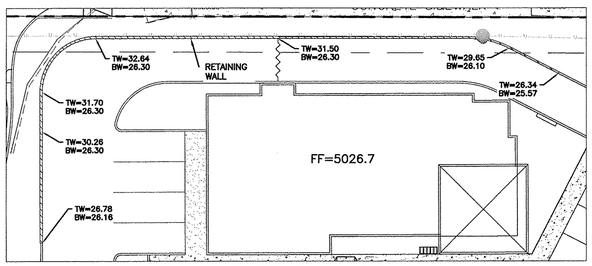
BUILDING B - EXTENDED STEM WALL DETAIL



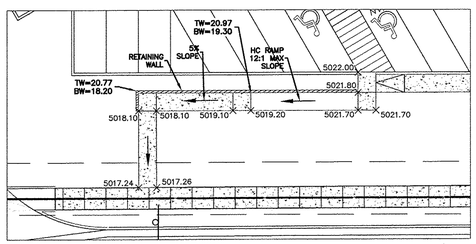
RAMP A DETAIL



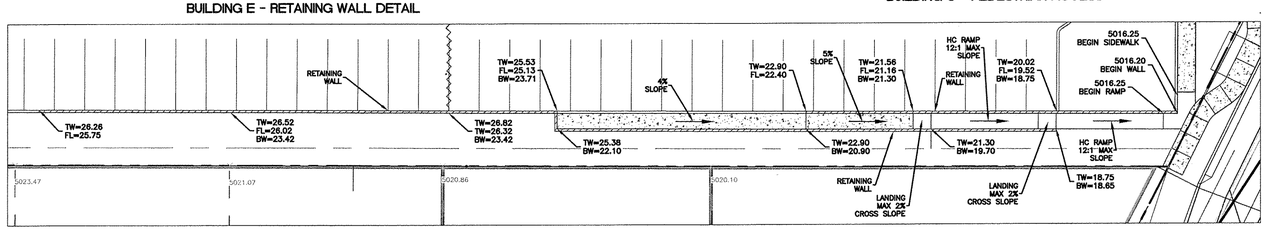
SIDEWALK A DETAIL



BUILDING E - RETAINING WALL DETAIL



BUILDING C - PEDESTRIAN ACCESS



PEDESTRIAN ACCESS, WALL AND RAMP DETAIL

GRAPHIC SCALE

50 25 0 25 50

SCALE: 1"=50'

ALL SPOT ELEVATION ARE AT FLOWLINE UNLESS OTHERWISE SPECIFIED.

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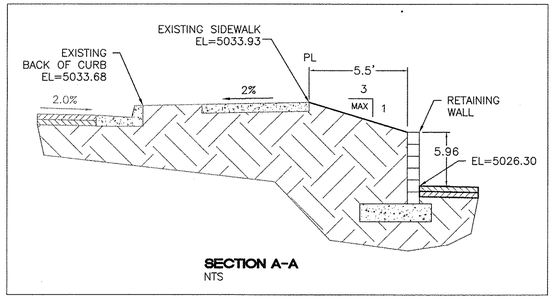
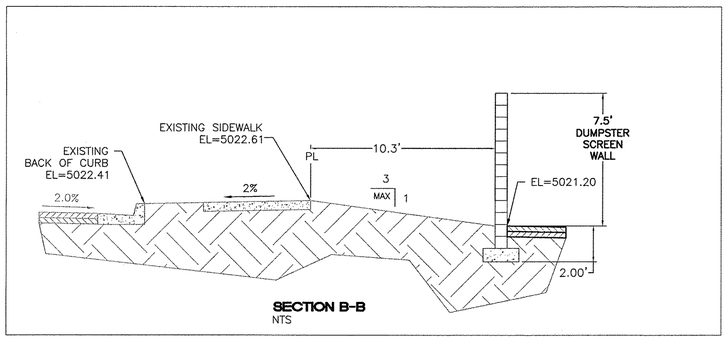
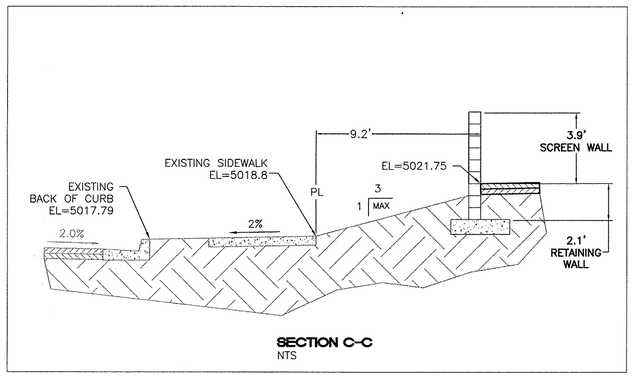


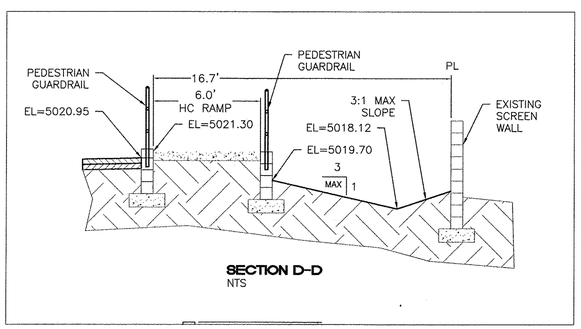
SECTION A-A
NTS



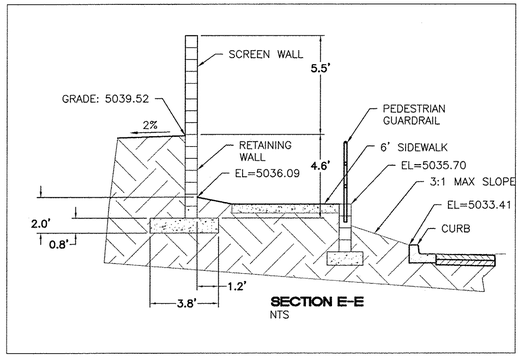
SECTION B-B
NTS



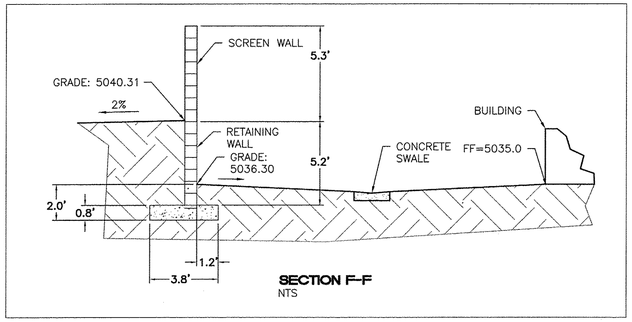
SECTION C-C
NTS



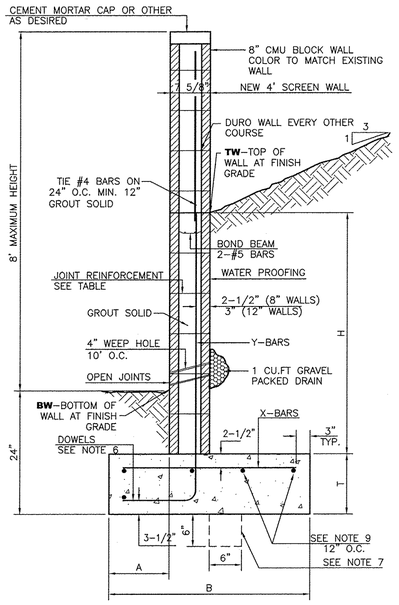
SECTION D-D
NTS



SECTION E-E
NTS



SECTION F-F
NTS



RETAINING WALL DETAIL
NTS

8 INCH REINFORCED CONCRETE MASONRY WALL

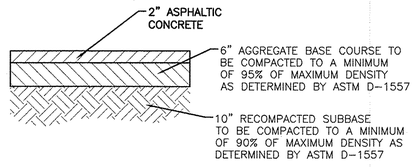
H	A	B	T	Y-BARS	X-BARS
ft.-in.	in.	ft.-in.	in.		
2'-0"	8"	2'-0"	9"	#4 @32" O.C.	
2'-8"	8"	2'-0"	9"	#4 @32" O.C.	#4 @24" O.C.
3'-4"	8"	2'-4"	9"	#4 @32" O.C.	#4 @24" O.C.
4'-0"	10"	2'-8"	9"	#4 @32" O.C.	#4 @24" O.C.
4'-8"	12"	3'-4"	10"	#5 @32" O.C.	#4 @18" O.C.
5'-4"	14"	3'-10"	10"	#6 @16" O.C.	#4 @18" O.C.
6'-0"	16"	4'-8"	12"	#6 @ 8" O.C.	#4 @12" O.C.

12 INCH REINFORCED CONCRETE MASONRY WALL

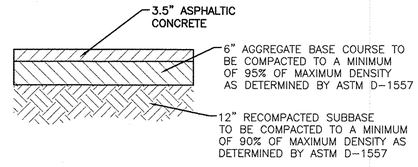
H	A	B	T	Y-BARS	X-BARS
ft.-in.	in.	ft.-in.	in.		
5'-4"	14"	3'-8"	10"	#6 @18" O.C.	#4 @24" O.C.
6'-0"	15"	4'-2"	12"	#4 @16" O.C.	#4 @18" O.C.
6'-8"	16"	4'-6"	12"	#6 @24" O.C.	#5 @18" O.C.
7'-4"	18"	4'-10"	12"	#6 @16" O.C.	#5 @18" O.C.
8'-0"	20"	5'-4"	12"	#7 @18" O.C.	#6 @12" O.C.
8'-8"	20"	5'-8"	12"	#7 @16" O.C.	#6 @12" O.C.

GENERAL NOTES:

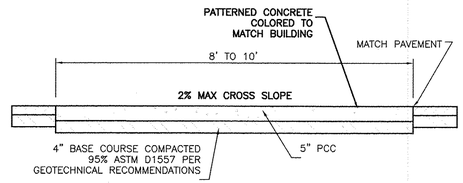
1. ALL CONCRETE IS TO BE 4000 PSI @ 28 DAYS.
2. MINIMUM COMPACTION UNDER FOOTINGS IS TO BE 95% PER ASTM. D 1557 FOR A DEPTH OF 12" MOISTURE CONTENT IS TO BE ± 2.0%.
3. BACK FILL AGAINST WALLS IS TO BE HAND-PLACED AND COMPACTED.
4. ALL BARS ARE TO BE GRADE 60, ASTM 615.
5. TRUSS TYPE DUR-O-WALL EVERY OTHER COURSE.
6. DOWELS SHALL BE AT LEAST EQUAL IN SIZE AND SPACING TO V-BARS, SHALL PROJECT A MINIMUM OF 30 BAR DIA. INTO THE FILLED BLOCK CORES, AND SHALL EXTEND TO THE TOE OF THE FOOTING.
7. PROVIDE KEY FOR 8" AND 12" WALLS WHERE H EXCEEDS 6'-0"
8. USE EITHER EXPANSION JOINTS ON 20' CENTERS OR PILASTERS EVERY 16'.
9. BOND BEAM, 1-#4 BARS FOR WALLS UNDER 3'-4", 2-#4 BARS FOR WALLS UNDER 5'-4", 2-#5 BARS FOR WALLS OVER 5'-4".



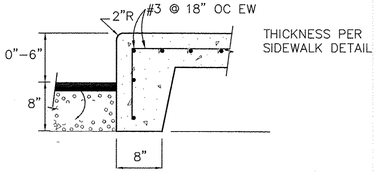
DRIVE AISLE/PARKING PAVING SECTION
OR 3.5" ASPHALT OVER NATIVE



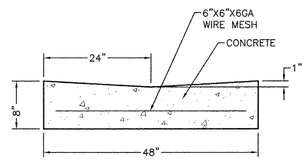
SERVICE AREA PAVING SECTION
OR 5" ASPHALT OVER NATIVE



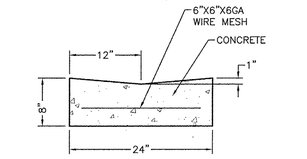
PEDESTRIAN CROSSING
NTS



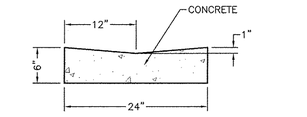
TURN DOWN CURB DETAIL
NTS



4' CONCRETE SWALE DETAIL
IN PARKING LOT

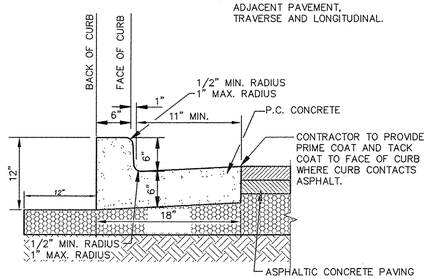


2' CONCRETE SWALE DETAIL
IN PARKING LOT

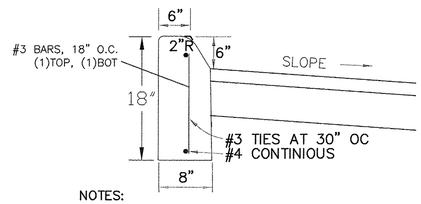


2' CONCRETE SWALE DETAIL
IN LANDSCAPE AREA

NOTE: GUTTER SLOPE TO MATCH ADJACENT PAVEMENT. TRAVERSE AND LONGITUDINAL.



TYPE 'A' CONCRETE CURB AND GUTTER



NOTES:
1. 1/2 INCH CAULKABLE EXPANSION JOINTS SHALL BE PROVIDED AT INTERVALS NOT TO EXCEED 50 FEET AT THE ENDS AND MIDPOINT OF RETURNS, AND AT ANY POINT WHERE THE NEW CURB AND GUTTER ABUTS OTHER CONCRETE STRUCTURES.
2. 5 FOOT LONG TRANSITIONS SHALL BE PROVIDED BETWEEN NORMAL GUTTER AND PITCHED GUTTER UNLESS OTHERWISE NOTED.

6" HEADER CURB DETAIL
NTS

ENGINEER'S SEAL

RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER

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LA ORILLA ESTATES
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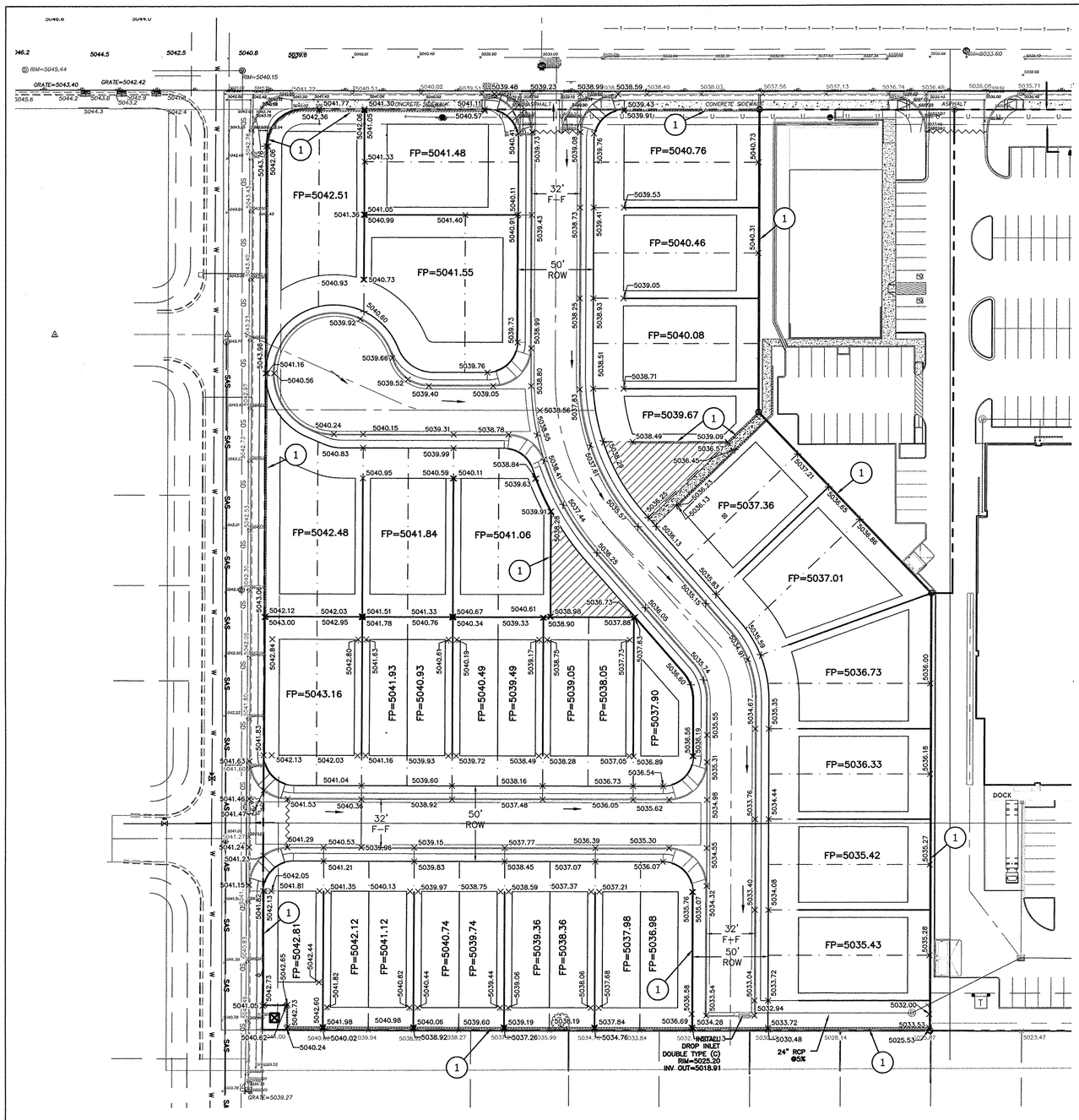
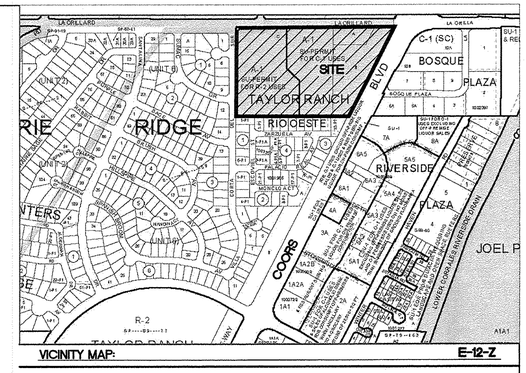


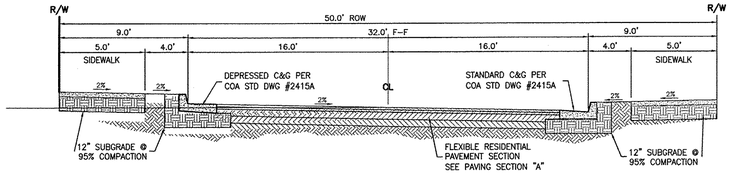
LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- SCREEN WALL
- RETAINING WALL
- WATER BLOCK
- 5010 CONTOUR MAJOR
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- (1) RETAINING WALL



EROSION CONTROL NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR OBTAINING A TOPSOIL DISTURBANCE PERMIT PRIOR TO BEGINNING WORK.
2. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING RUN-OFF ON SITE DURING CONSTRUCTION.
3. CONTRACTOR IS RESPONSIBLE FOR CLEANING ALL SEDIMENT THAT GETS INTO EXISTING RIGHT-OF-WAY.
4. REPAIR OF DAMAGED FACILITIES AND CLEANUP OF SEDIMENT ACCUMULATIONS ON ADJACENT PROPERTIES AND IN PUBLIC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR.
5. ALL EXPOSED EARTH SURFACES MUST BE PROTECTED FROM WIND AND WATER EROSION PRIOR TO FINAL (CITY) ACCEPTANCE OF ANY PROJECT.



TYPICAL STREET SECTION
NTS

GRAPHIC SCALE
40 20 0 20 40
SCALE: 1"=40'

N

ALL SPOT ELEVATION ARE AT FLOWLINE UNLESS OTHERWISE SPECIFIED.

ENGINEER'S SEAL
RONALD R. BOHANNAN NEW MEXICO 12115 PROFESSIONAL ENGINEER
RONALD R. BOHANNAN P.E. #7868

LA ORILLA ESTATES
COORS AND LA ORILLA
RESIDENTIAL GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
www.tierrawestllc.com

DRAWN BY: BJF
DATE: 10/05/15
2012005_GR_RES
SHEET #: R1
JOB #: 2012005

DRAINAGE REPORT

For

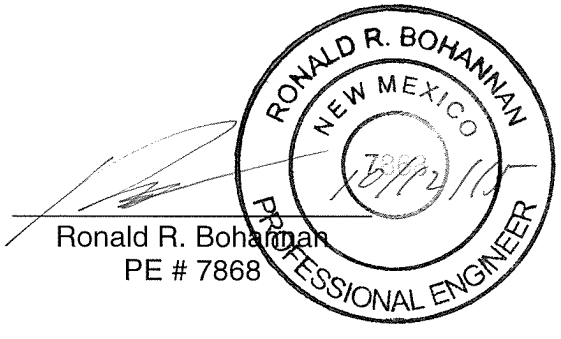
La Orilla Estates

Prepared by:

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

October 9, 2015

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

Job No. 2012005

TABLE OF CONTENTS

Appendices

Map Pocket

Grading and Drainage Plan

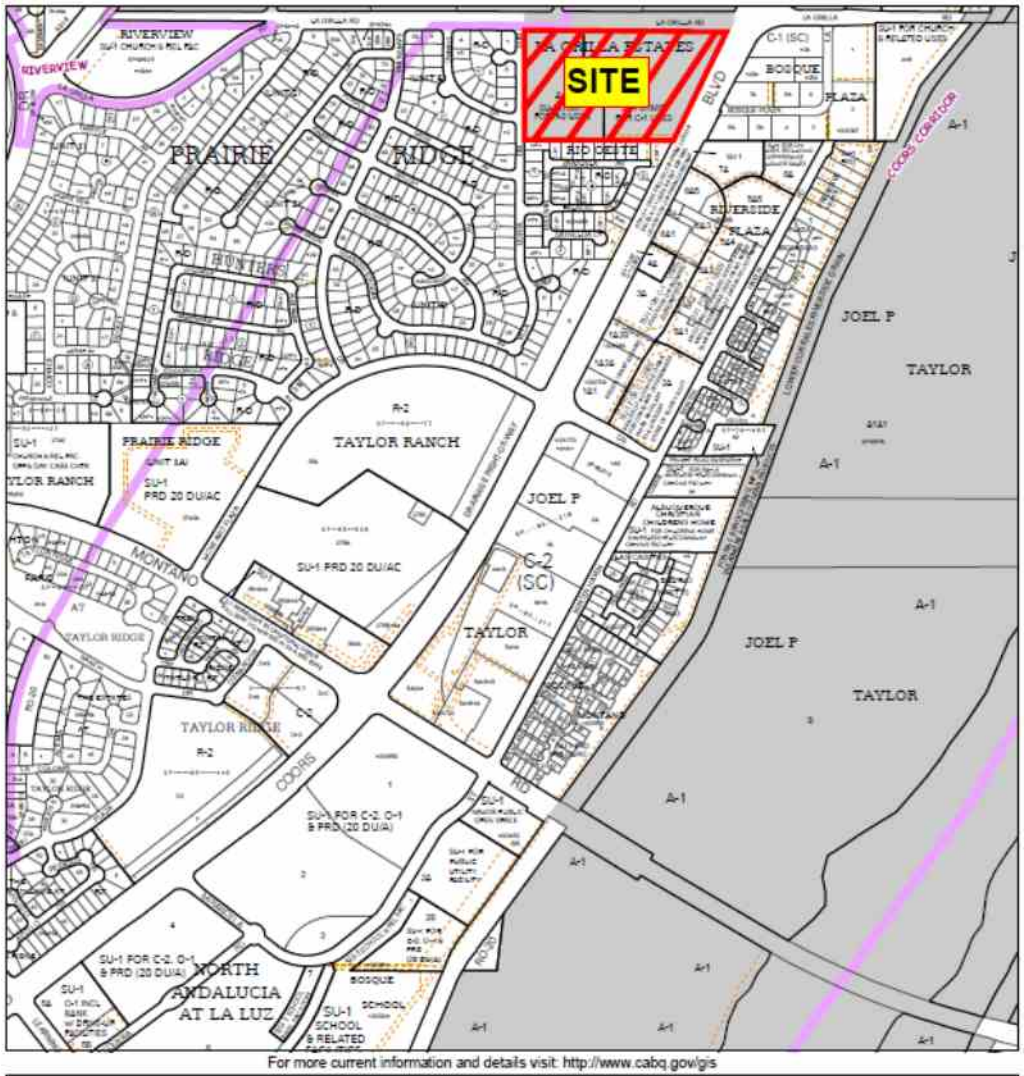
Purpose

The purpose of this report is to develop a Drainage Management Plan for a 13.50 acre parcel of land, entitled La Orilla Estates. The 13.50 acres will include 8.00 acres of commercial development and 5.50 acres of residential development.

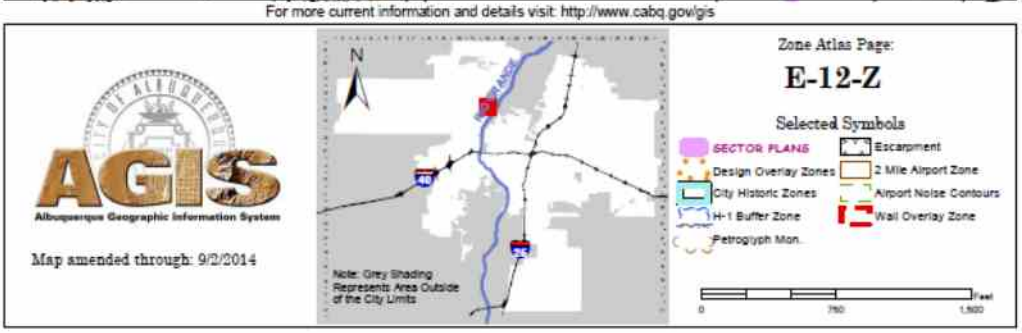
Location

The site is located on the southwest corner of La Orilla Road and Coors Boulevard. The site consists of 4 commercial lots (8.00 acres) and 1 residential parcel of land (5.50 acres) which will be developed into 49 town home lots. The site is shown on the Zone Atlas Page, E-12-Z found in Exhibit A.

Exhibit A – Vicinity Map



For more current information and details visit: http://www.cabq.gov/gis



Existing Conditions

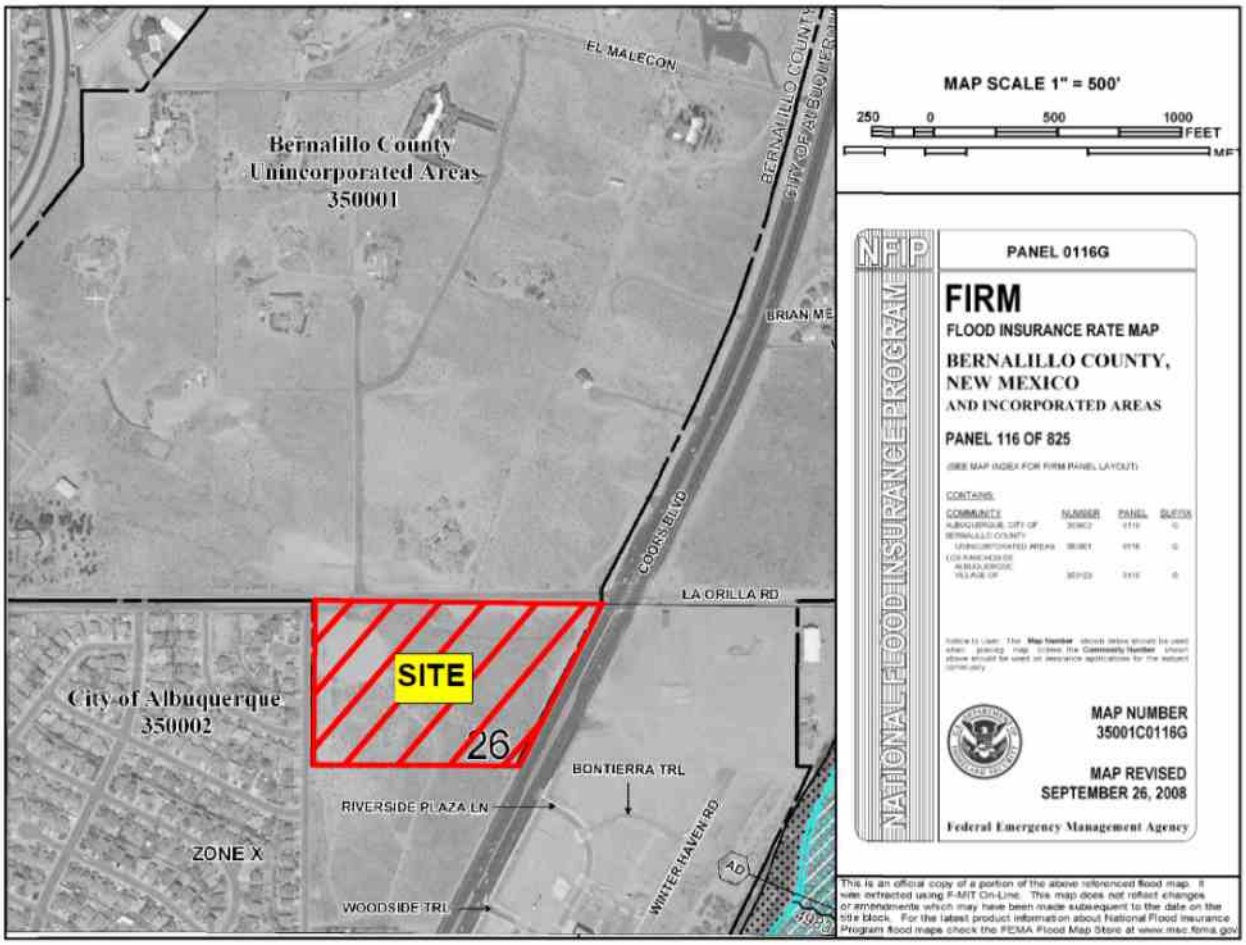
The site is undeveloped and drains naturally from west to east. No dirt work has taken place on the site. The site currently drains to existing culverts in Coors Boulevard, which drain across and under Coors. With the development of this project, the site will no longer drain to the existing culverts adjacent to the east property line, but will drain to the existing pond south of the Rio Oeste Subdivision, west of Coors.

The site was previously analyzed in a drainage study prepared by Easterling & Associates, Inc. In the drainage study entitled, “La Orilla Drainage Plan”, dated July 1994, the site was included in an analysis which encompassed an area of approximately 175 acres. According to the drainage study, the site lies within basin 4A as shown in Appendix F. The same drainage study included infrastructure improvements which would prevent off-site drainage from entering the site from the upper northwest corner and from north of La Orilla Road.

Flood Plain

The site is located on FIRM Map 35001C0116G. The map indicates that the site does not lie within a 100-year flood plain. This FIRM Map can be found in Exhibit B.

Exhibit B – FIRM Map



Proposed Conditions

The entire site will be graded and all of the surface improvements will be built out in their entirety. The enclosed grading plan shows the grades for the entire project.

The proposed development consists of both commercial and residential development; 5.50 acres residential and 8.00 acres commercial. The residential site will be developed into 49 lots and the commercial will be developed into 4 lots. The site was developed into 11 on-site basins and 3 off-site basins to analyze the future drainage conditions.

The commercial site was separated into 10 basins (C1-C5) and the residential was separated into 1 basin (R1), there are also 3 off-site basins that are affected in this development (O1-O3). The land treatment types used for the basins are shown in the hydrology calculations section of the report. The total discharge generated by the 13.50 acre site is 48.75 cfs. According to the City of Albuquerque Hydrology department, the fully developed runoff from the site can discharge to the existing pond which is within public drainage right of way, just south of the existing Rio Oeste Subdivision, west of Coors. At the time the pond was constructed, it was built with the capacity to capture the future runoff from this site. Included in Appendix G is a letter from the City of Albuquerque regarding the Grading and Drainage Plan stamped 7-28-06, stating that Bernalillo County does need to approved the plan for Building Permit but the plan is adequate for work order because the site is draining to the pond along Coors. The work order was approved for a discharge to the existing pond of 50.41 cfs, which was used as the maximum allowable discharge to the pond for the current drainage analysis.

The runoff from Basins R1, C1-C4, C6, and C9-10 (46.29 cfs total) will be directed via new drop inlets towards a new 24” storm drain on the south side of the site that begins on the residential development side and continues to Coors Blvd. Basins C5 and O3 (4.33 cfs total) will be conveyed towards a new drop inlet along Coors ROW. This drop inlet will receive the flows from the previously mentioned 24” storm drain and convey all the collected flows towards the existing pond south of Rio Oeste via a new 36” storm drain. The total discharge to the existing pond will be 50.62 cfs, which is acceptable. Due to an existing 8” sanitary sewer line which runs north-south adjacent to the pond,

the 36” storm drain cannot be discharged directly into the pond due to potential pipe conflicts. The 36” storm drain will drain to an inlet structure in the Coors and to the pond via 5-18” RCP pipes in order to maintain clearance from the existing sanitary sewer line.

Basins C7, C8, and O2 (3.15 cfs total) will be conveyed via new drop inlets towards the two parallel existing culverts that cross underneath Coors Boulevard. Only one of the existing culverts will be utilized so a masonry plug will be placed on one of them and abandoned. Basin O1 (9.61 cfs) will be conveyed towards the existing drop inlet at the SE corner of the Coors/La Orilla intersection and travel underneath Coors in the existing culvert at this location. Since the impervious area will be increasing in Basin O1, the existing drop inlet will have to be modified from a single D to a Double D. According to the previously approved drainage report for “Lots 1, 2, 3, 4, 5, 6A, 7A, and 8 of the Lands of Martin Taylor”, when this site on the southwest corner of La Orilla and Coors was built, the flows to the culverts under Coors Blvd would be limited to 21.07 cfs which we will be under (12.76 cfs). An excerpt of this drainage report can be found in Appendix H.

Calculations

The Weighted E Method from the “City of Albuquerque Development Process Manual Volume I – Design Criteria, 2006 Revision” was used to calculate the runoff and volume for the site, the hydrology table can be found in Appendix B. Drainage capacities for the storm drains, inlet grates, and residential streets can be found in Appendix C and D. Bentley FlowMaster was used to determine the drainage characteristics of each storm pipe and residential street. Riprap calculations for the drainage outlets to the existing pond can be found in Appendix E. First flush retention per Bernalillo County requirements can be found in Appendix B with the weighted E hydrology table.

Summary

The entire site will be graded and all of the surface improvements will be built out in their entirety. The enclosed grading plan shows the grades for the entire project.

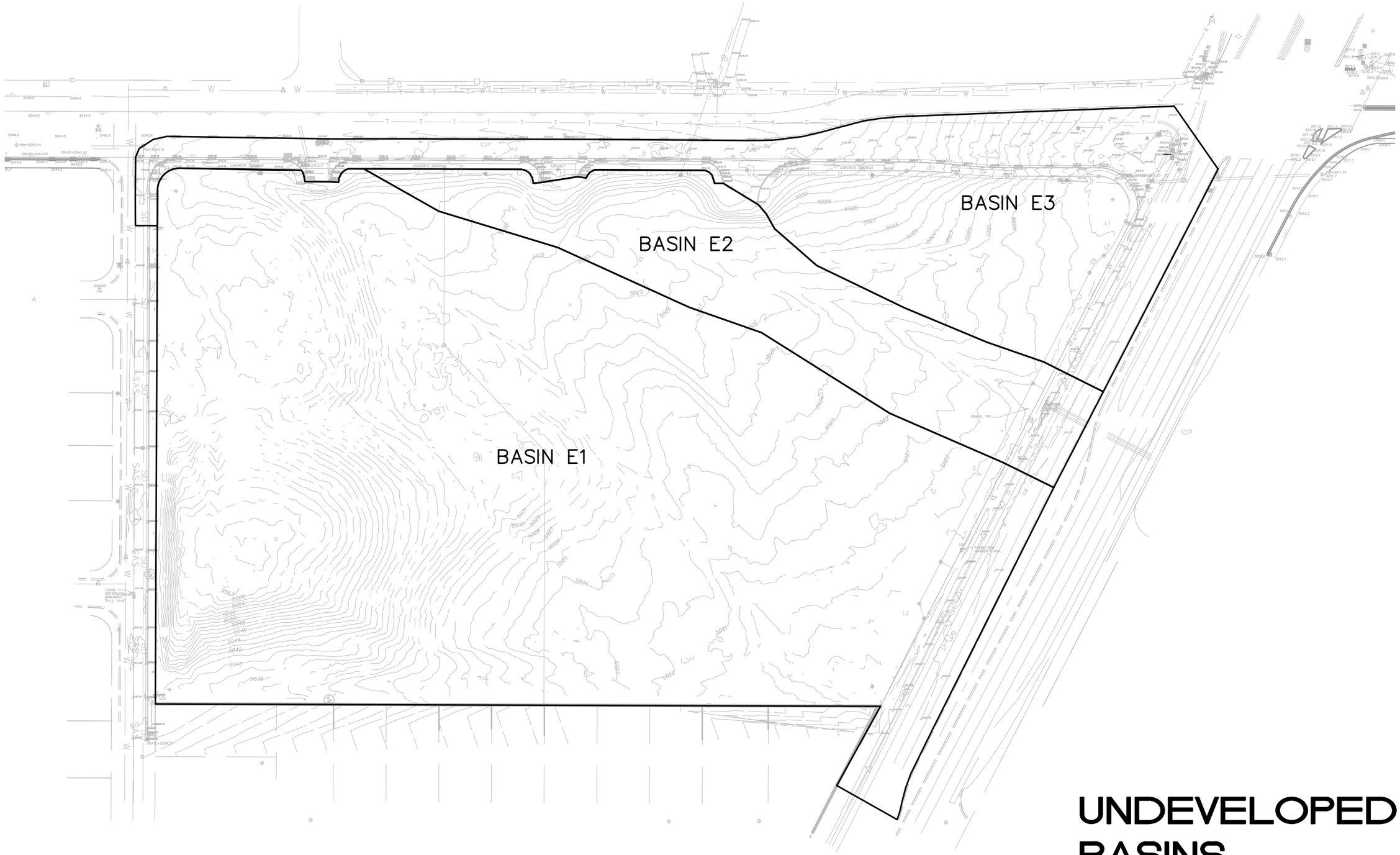
The proposed development consists of both commercial and residential development with the residential development containing 1 basin, the commercial containing 10 basins, and 3 off-site basins.

The residential basin, 8 commercial basins, and 1 off-site basin will be conveyed towards the existing pond along Coors via a series of storm drains that will discharge a total of 50.62 cfs. The City of Albuquerque Hydrology Department has considered this discharge rate acceptable for work order according to a previous drainage submittal for this site dated October 2010.

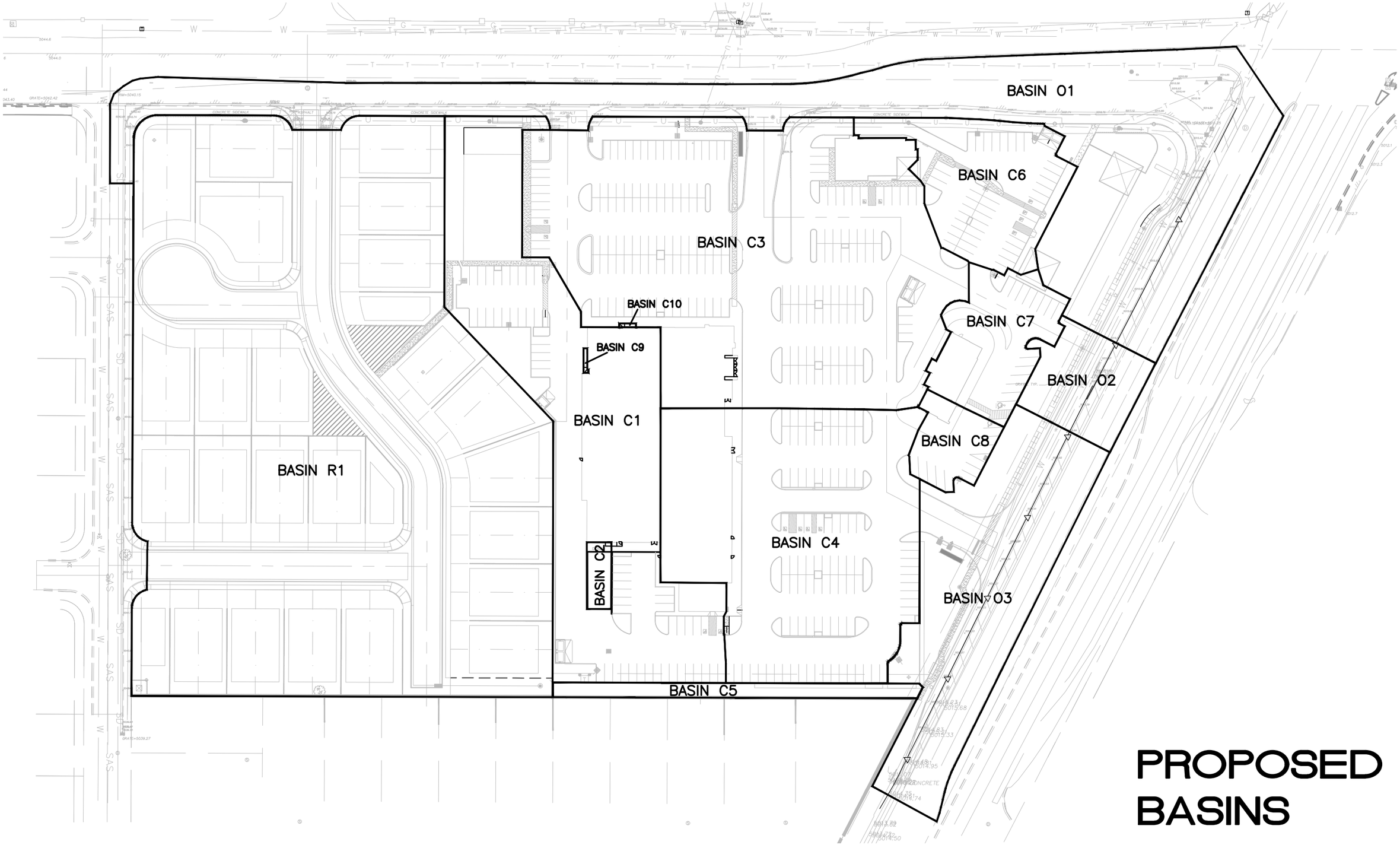
The remaining 2 commercial basins and 2 off-site basins will directed towards the existing drainage structures that currently convey flow underneath Coors Blvd. The development of this site limits the discharge allowed underneath Coors to 21.07 cfs which we will be under with 12.76 cfs.

APPENDIX A

Drainage Basin Maps



UNDEVELOPED BASINS



PROPOSED BASINS

APPENDIX B

Hydrology Calculations

DPM Weighted E Method

Precipitation Zone 1
SW Corner of Coors & La Orilla
La Orilla Estates, Albuquerque, NM
TWLLC **Date** 9/23/2015

Existing Conditions

Basin Descriptions											100-Year, 6-Hr			10-Year, 6-Hr		
Basin ID	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 (ac-ft)	Volume (ac-ft)	Flow cfs	Weighted E (ac-ft)	Volume (ac-ft)	Flow cfs
E1	478,497.68	10.98	0.01716	96%	10.545	0%	0.000	0%	0.000	4%	0.439	0.501	0.459	15.52	0.126	0.116	3.80
E2	87,730.50	2.01	0.00315	93%	1.873	0%	0.000	0%	0.000	7%	0.141	0.547	0.092	3.03	0.161	0.027	0.86
E3	139,918.35	3.21	0.00502	45%	1.445	0%	0.000	0%	0.000	55%	1.767	1.282	0.343	9.58	0.718	0.192	5.45
Total	**478,497.68**	**16.21**	**0.02533**										**0.894**	**28.14**		**0.335**	**10.11**

Proposed Conditions

Basin Descriptions											100-Year, 6-Hr			10-Year, 6-Hr		
Basin ID	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 (ac-ft)	Volume (ac-ft)	Flow cfs	Weighted E (ac-ft)	Volume (ac-ft)	Flow cfs
C1	75,732.57	1.74	0.00272	0%	0.000	10%	0.174	2%	0.035	88%	1.530	1.820	0.264	7.14	1.122	0.163	4.61
C2	1,807.28	0.04	0.00006	0%	0.000	0%	0.000	0%	0.000	100%	0.041	1.970	0.007	0.18	1.240	0.004	0.12
C3	113,930.74	2.62	0.00409	0%	0.000	7%	0.183	3%	0.078	90%	2.354	1.850	0.403	10.88	1.145	0.249	7.06
C4	69,349.07	1.59	0.00249	0%	0.000	5%	0.080	0%	0.000	95%	1.512	1.905	0.253	6.77	1.189	0.158	4.43
C5	5,986.83	0.14	0.00021	0%	0.000	70%	0.096	30%	0.041	0%	0.000	0.766	0.009	0.31	0.286	0.003	0.13
C6	22,196.07	0.51	0.00080	0%	0.000	3%	0.015	11%	0.056	86%	0.438	1.823	0.077	2.11	1.121	0.048	1.36
C7	15,276.01	0.35	0.00055	0%	0.000	5%	0.018	0%	0.000	95%	0.333	1.905	0.056	1.49	1.189	0.035	0.98
C8	6,588.95	0.15	0.00024	0%	0.000	0%	0.000	0%	0.000	100%	0.151	1.970	0.025	0.66	1.240	0.016	0.44
C9	107.27	0.00	0.00000	0%	0.000	0%	0.000	0%	0.000	100%	0.002	1.970	0.000	0.01	1.240	0.000	0.01
C10	70.99	0.00	0.00000	0%	0.000	0%	0.000	0%	0.000	100%	0.002	1.970	0.000	0.01	1.240	0.000	0.00
R1	237,821.79	5.46	0.00853	0%	0.000	34%	1.856	4%	0.218	62%	3.385	1.489	0.677	19.19	0.861	0.392	11.52
O1	102,736.41	2.36	0.00369	0%	0.000	4%	0.000	8%	0.189	88%	2.075	1.813	0.356	9.61	1.126	0.221	6.28
O2	11,682.66	0.27	0.00042	0%	0.000	5%	0.000	28%	0.075	67%	0.180	1.597	0.036	1.00	0.954	0.021	0.63
O3	45,992.84	1.06	0.00165	0%	0.000	6%	0.000	20%	0.211	74%	0.781	1.656	0.146	4.02	1.006	0.088	2.57
Total	**709,279.48**	**16.28**	**0.02544**										**2.309**	**63.39**		**1.399**	**40.14**

Equations:

Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)

Volume = Weighted D * Total Area

Flow = Qa*Aa + Qb*Ab + Qc*Ac + Qd*Ad

Excess Precipitation, E (in.)		
Zone 1	100-Year	10-Year
Ea	0.44	0.08
Eb	0.67	0.22
Ec	0.99	0.44
Ed	1.97	1.24

Peak Discharge (cfs/acre)		
Zone 1	100-Year	10-Year
Qa	1.29	0.24
Qb	2.03	0.76
Qc	2.87	1.49
Qd	4.37	2.89

First Flush

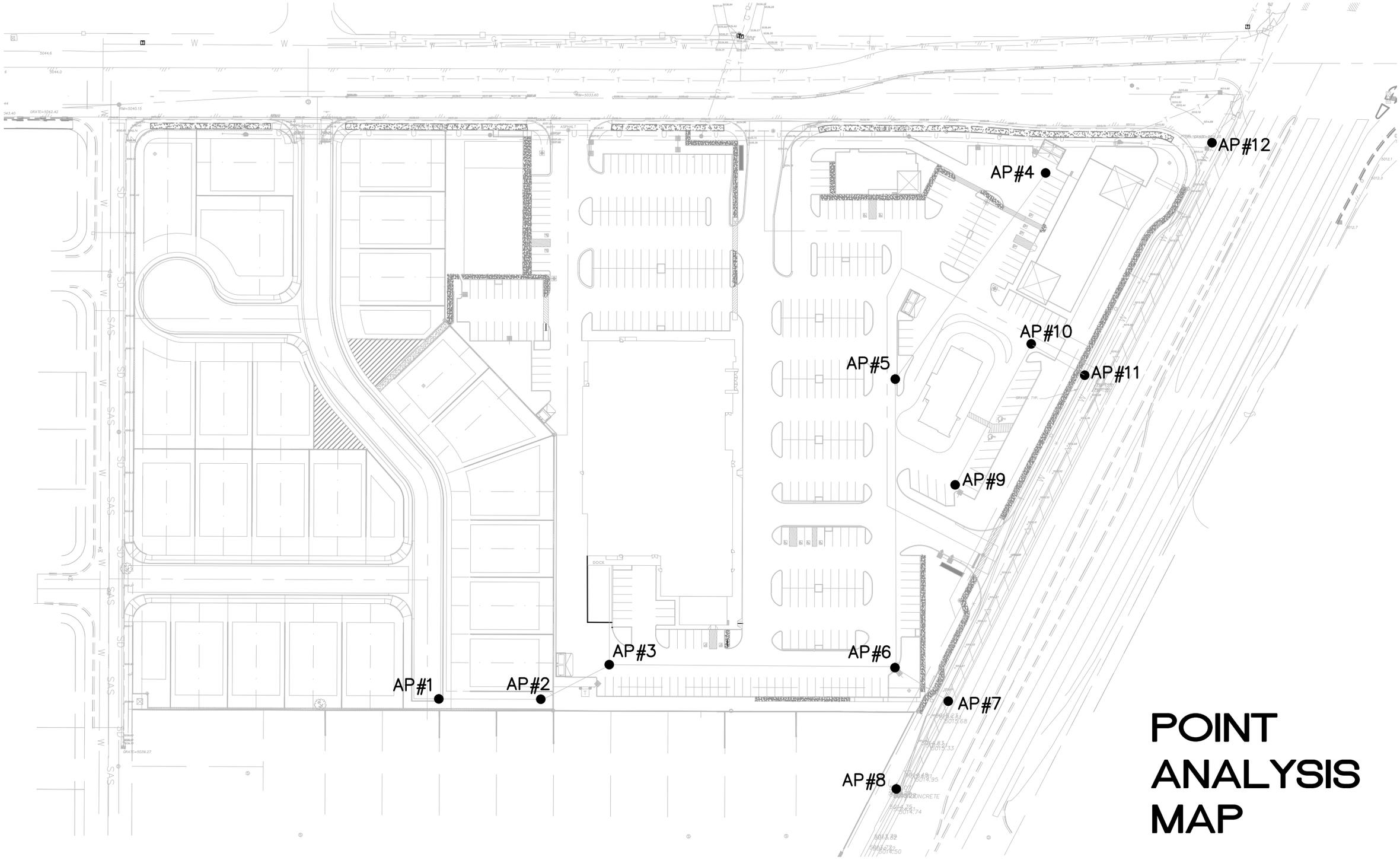
Total Impervious Area = 9.75 acres = 424710 SF

Retainage depth = 0.6" -IA = 0.6" - 0.1" = 0.5"=0.042'

Retention Volume = 0.042 * 424710 = **17837.8 CF = 0.41 ac-ft**

APPENDIX C

Pipe and Grate Capacities



POINT ANALYSIS MAP

La Orilla Estates Grate Capacities			
Analysis Point ID	**Inlet Type**	**Q Allowed (cfs)**	**Q Required (cfs)**
AP#1	Double C	21.63	19.19
AP#2	N/A	N/A	N/A
AP#3	Single D	8.24	7.14
AP#4	Single D	8.24	2.11
AP#5	Single C	11.61	10.88
AP#6	Single C	11.61	6.77
AP#7	N/A	N/A	N/A
AP#8	Single D	8.24	4.33
AP#9	Single D	8.24	0.66
AP#10	Single D	8.24	1.49
AP#11	Single C	11.61	1.00
AP#12	Double D	15.93	9.61

La Orilla Estates Pipe Capacities					
Pipe	**D (in)**	**Slope (%)**	**Q Provided (cfs)**	**Q Required (cfs)**	**Velocity (ft/s)**
AP#1 to AP#2	24	5.0	54.41	19.19	15.00
AP#2 to AP#3	24	5.0	54.41	19.19	15.00
AP#3 to AP#6	24	1.5	29.80	26.51	10.04
AP#4 to AP#5	12	1.0	3.83	2.11	4.73
AP#5 to AP#6	18	1.7	14.73	12.99	8.82
AP#6 to AP#7	36	1.0	71.74	46.29	10.19
AP#7 to AP#8	36	0.6	55.57	46.29	8.27
AP#8 to Vault	36	0.6	55.57	50.62	8.33
AP#9 to AP#10	12	1.0	3.83	0.66	3.47
AP#10 to AP#11	12	3.0	6.64	2.15	7.15

Capacity of a Single ‘C’ Storm Drop Inlet

Capacity of the grate:

L = 40” - 2(2"$_{ends}$) - 7(½” $_{middle\ bars}$)
= 32 1/2"
= 2.7083’

W = 25" - 13(½” $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 2.7083' x 1.54'
= 4.18 ft^2

Effective Area = 4.18- 4.18 (0.5 $_{clogging\ factor}$)
= 2.09 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*2.09*sqrt(2*32.2*0.67)
Q = 8.24 cfs

Capacity of the Throat:

L = 4.00’

H = 10 ¾” - 4 ½”
= 6 ¼”
= 0.5208'

Area = 4.00' x 0.5208'
= 2.08 ft^2 at the throat

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * 2.08 * 0.67^(3/2)
Q = 3.37 cfs

Total Capacity:

Q = 8.24$_{grate}$ + 3.37$_{throat}$
Q = 11.61 cfs

AP #5
Flow required = 10.88 cfs < 11.61cfs
Single C inlet has capacity

AP #6
Flow required = 6.77 cfs < 11.61 cfs
Single C inlet has capacity

AP #11
Flow required = 1.00 cfs < 11.61 cfs
Single C inlet has capacity

Capacity of a Double 'C' Storm Drop Inlet

Capacity of the grate:

L = 80" - 2(2"$_{ends}$) - 14(½" $_{middle\ bars}$) – 6" $_{center\ piece}$
= 66 1/2"
= 5.25'

W = 25" - 13(½" $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 5.25' x 1.54'
= 8.09 ft^2

Effective Area = 8.09- 8.09 (0.5 $_{clogging\ factor}$)
= 4.04 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*4.04*sqrt(2*32.2*0.50)
Q = 13.92 cfs

Capacity of the Throat:

L = 88.75"
=7.3958'

Weir Equation

Q = CLH^(3/2)
Q = 2.95 * 7.3958 * 0.50^(3/2)
Q = 7.71 cfs

Total Capacity:

Q = 13.92$_{grate}$ + 7.71$_{throat}$
Q = 21.63 cfs

AP #1
Flow required = 19.19 cfs < 21.63 cfs
Double C inlet has capacity

Capacity of a Single ‘D’ Storm Drop Inlet

Capacity of the grate:

L = 40” - 2(2"$_{ends}$) - 7(½” $_{middle\ bars}$)
= 32 1/2"
= 2.7083’

W = 25" - 13(½” $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 2.7083' x 1.54'
= 4.18 ft^2

Effective Area = 4.18- 4.18 (0.5 $_{clogging\ factor}$)
= 2.09 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*2.09*sqrt(2*32.2*0.67)
Q = 8.24 cfs

AP #3
Flow required = 7.14 cfs < 8.24 cfs
Single D inlet has capacity

AP #4
Flow required = 2.11 cfs < 8.24 cfs
Single D inlet has capacity

AP #8
Flow required = 4.33 cfs < 8.24 cfs
Single D inlet has capacity

AP #9
Flow required = 0.66 cfs < 8.24 cfs
Single D inlet has capacity

AP #10
Flow required = 1.49 cfs < 8.24 cfs
Single D inlet has capacity

Capacity of a Double ‘D’ Storm Drop Inlet

Capacity of the grate:

L = 80” - 2(2"$_{ends}$) - 14(½” $_{middle\ bars}$) – 6” $_{center\ piece}$
= 63"
= 5.25’

W = 25" - 13(½” $_{middle\ bars}$)
= 18.5"
= 1.54'

Area = 5.25' x 1.54'
= 8.09 ft^2

Effective Area = 8.09- 8.09 (0.5 $_{clogging\ factor}$)
= 4.04 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*4.04*sqrt(2*32.2*0.67)
Q = 15.93 cfs

AP #12
Flow required = 9.61 cfs < 15.93 cfs
Double D inlet has capacity

Worksheet for 12" @ 1%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	1.00	ft
Discharge	2.11	ft³/s

Results

Normal Depth	0.55	ft
Flow Area	0.45	ft²
Wetted Perimeter	1.68	ft
Hydraulic Radius	0.27	ft
Top Width	0.99	ft
Critical Depth	0.62	ft
Percent Full	55.4	%
Critical Slope	0.00702	ft/ft
Velocity	4.73	ft/s
Velocity Head	0.35	ft
Specific Energy	0.90	ft
Froude Number	1.24	
Maximum Discharge	3.83	ft³/s
Discharge Full	3.56	ft³/s
Slope Full	0.00351	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	55.38	%
Downstream Velocity	Infinity	ft/s

Worksheet for 12" RCP @ 3%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03000	ft/ft
Diameter	1.00	ft
Discharge	2.15	ft³/s

Results

Normal Depth	0.41	ft
Flow Area	0.30	ft²
Wetted Perimeter	1.38	ft
Hydraulic Radius	0.22	ft
Top Width	0.98	ft
Critical Depth	0.63	ft
Percent Full	40.8	%
Critical Slope	0.00708	ft/ft
Velocity	7.15	ft/s
Velocity Head	0.79	ft
Specific Energy	1.20	ft
Froude Number	2.28	
Maximum Discharge	6.64	ft³/s
Discharge Full	6.17	ft³/s
Slope Full	0.00364	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	40.75	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" RCP @ 1.7%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01700	ft/ft
Diameter	1.50	ft
Discharge	12.99	ft³/s

Results

Normal Depth	1.17	ft
Flow Area	1.47	ft²
Wetted Perimeter	3.24	ft
Hydraulic Radius	0.46	ft
Top Width	1.25	ft
Critical Depth	1.35	ft
Percent Full	77.7	%
Critical Slope	0.01346	ft/ft
Velocity	8.82	ft/s
Velocity Head	1.21	ft
Specific Energy	2.37	ft
Froude Number	1.43	
Maximum Discharge	14.73	ft³/s
Discharge Full	13.70	ft³/s
Slope Full	0.01529	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	77.69	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24" RCP @ 1.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01500	ft/ft
Diameter	2.00	ft
Discharge	26.51	ft³/s

Results

Normal Depth	1.57	ft
Flow Area	2.64	ft²
Wetted Perimeter	4.35	ft
Hydraulic Radius	0.61	ft
Top Width	1.65	ft
Critical Depth	1.80	ft
Percent Full	78.3	%
Critical Slope	0.01210	ft/ft
Velocity	10.04	ft/s
Velocity Head	1.57	ft
Specific Energy	3.13	ft
Froude Number	1.40	
Maximum Discharge	29.80	ft³/s
Discharge Full	27.71	ft³/s
Slope Full	0.01373	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	78.34	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24" RCP @ 5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.05000	ft/ft
Diameter	2.00	ft
Discharge	19.19	ft³/s

Results

Normal Depth	0.85	ft
Flow Area	1.28	ft²
Wetted Perimeter	2.85	ft
Hydraulic Radius	0.45	ft
Top Width	1.98	ft
Critical Depth	1.58	ft
Percent Full	42.7	%
Critical Slope	0.00777	ft/ft
Velocity	15.00	ft/s
Velocity Head	3.50	ft
Specific Energy	4.35	ft
Froude Number	3.29	
Maximum Discharge	54.41	ft³/s
Discharge Full	50.58	ft³/s
Slope Full	0.00720	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	42.69	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36" RCP @ 0.6%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00600	ft/ft
Diameter	3.00	ft
Discharge	50.62	ft^3/s

Results

Normal Depth	2.41	ft
Flow Area	6.08	ft^2
Wetted Perimeter	6.66	ft
Hydraulic Radius	0.91	ft
Top Width	2.39	ft
Critical Depth	2.31	ft
Percent Full	80.2	%
Critical Slope	0.00650	ft/ft
Velocity	8.33	ft/s
Velocity Head	1.08	ft
Specific Energy	3.48	ft
Froude Number	0.92	
Maximum Discharge	55.57	ft^3/s
Discharge Full	51.66	ft^3/s
Slope Full	0.00576	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	80.20	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36" RCP @ 1%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	46.29	ft³/s

Results

Normal Depth	1.84	ft
Flow Area	4.54	ft²
Wetted Perimeter	5.40	ft
Hydraulic Radius	0.84	ft
Top Width	2.92	ft
Critical Depth	2.22	ft
Percent Full	61.3	%
Critical Slope	0.00600	ft/ft
Velocity	10.19	ft/s
Velocity Head	1.61	ft
Specific Energy	3.45	ft
Froude Number	1.44	
Maximum Discharge	71.74	ft³/s
Discharge Full	66.69	ft³/s
Slope Full	0.00482	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	61.30	%
Downstream Velocity	Infinity	ft/s

APPENDIX D

Residential Street Capacities

Worksheet for Res. Street Section - Minimum Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Discharge	19.19	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+00	0.00
0+32	-0.64
0+32	-0.14

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+32, -0.14)	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	0.55	ft
Elevation Range	-0.64 to 0.50 ft	
Flow Area	7.47	ft²
Wetted Perimeter	27.88	ft
Hydraulic Radius	0.27	ft
Top Width	27.33	ft
Normal Depth	0.55	ft
Critical Depth	0.52	ft
Critical Slope	0.00679	ft/ft

Worksheet for Res. Street Section - Minimum Slope

Results

Velocity		2.57	ft/s
Velocity Head		0.10	ft
Specific Energy		0.65	ft
Froude Number		0.87	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.55	ft
Critical Depth	0.52	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00679	ft/ft

Cross Section for Res. Street Section - Minimum Slope

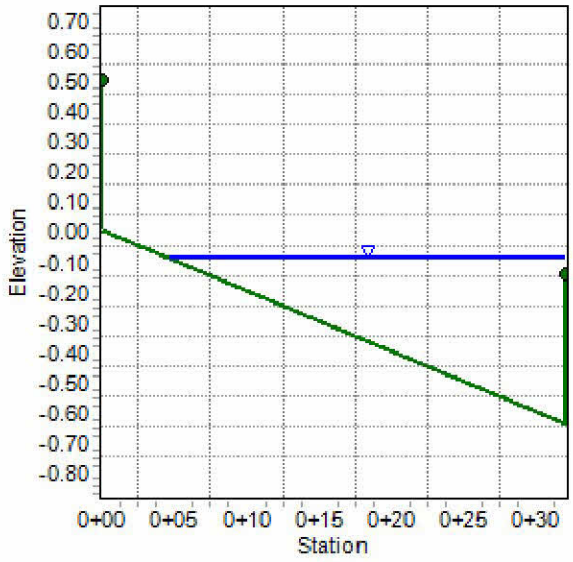
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00500	ft/ft
Normal Depth	0.55	ft
Discharge	19.19	ft^3/s

Cross Section Image



The minimum slope of all street sections was analyzed to determine the maximum depth of drainage in the street section. Although the area where the minimum slope (0.5%) is located does not convey all residential flows, the street capacity was analyzed using the entire residential basin as the runoff flow for conservative purposes. The maximum normal depth in this section, and subsequently every other street section is 0.55 feet.

The maximum depth is 0.05 feet above the curb, this height is acceptable as it is less than the 0.2 feet allowed over the curb and the maximum water surface is contained within the street ROW. This is acceptable according to the Albuquerque Development Process Manual, Chapter 22 Section E.

Worksheet for Res. Street Section - Maximum Slope

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03200	ft/ft
Discharge	19.19	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+00	0.00
0+32	-0.64
0+32	-0.14

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+32, -0.14)	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	0.39	ft
Elevation Range	-0.64 to 0.50 ft	
Flow Area	3.72	ft²
Wetted Perimeter	19.69	ft
Hydraulic Radius	0.19	ft
Top Width	19.30	ft
Normal Depth	0.39	ft
Critical Depth	0.52	ft
Critical Slope	0.00679	ft/ft

Worksheet for Res. Street Section - Maximum Slope

Results

Velocity		5.15	ft/s
Velocity Head		0.41	ft
Specific Energy		0.80	ft
Froude Number		2.07	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.39	ft
Critical Depth	0.52	ft
Channel Slope	0.03200	ft/ft
Critical Slope	0.00679	ft/ft

Cross Section for Res. Street Section - Maximum Slope

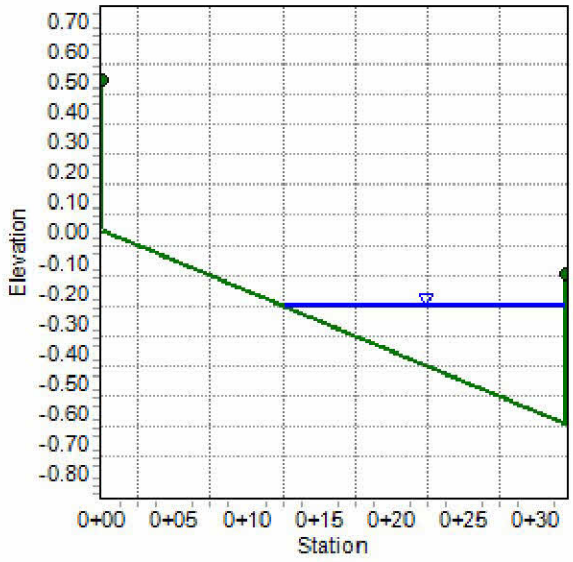
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03200	ft/ft
Normal Depth	0.39	ft
Discharge	19.19	ft^3/s

Cross Section Image



The maximum slope of all street sections was analyzed to determine the maximum velocity of drainage in the street section. Although the area where the maximum slope (3.2%) is located does not convey all residential flows, the street capacity was analyzed using the entire residential basin as the runoff flow for conservative purposes. The maximum velocity in this section, and subsequently every other street section is 5.15 ft/s.

The maximum velocity is 5.15 ft/s, the maximum velocity multiplied by the normal depth is 2.01, this is less than the allowable value of 6.5 outlined in the Albuquerque Development Process Manual, Chapter 22 Section E. This street section, and all other street sections, are acceptable for velocity.

APPENDIX E

Riprap Calculations

Riprap Requirements

Equation taken from Table 5-5 from the Urban Storm Drainage Criteria Manual Volume 2 by Wright-McLaughlin Engineers.

$$\frac{VS^{0.17}}{(S_S - 1)^{0.66}} = \frac{8.33 * 0.006^{0.17}}{(2.5 - 1)^{0.66}} = 2.67$$

Where:

V = Velocity (ft/s)

S = Slope (ft/ft)

S_s = Specific gravity of rock

From Table 5-5 use Rock Type VL with a d_{50} of 6".

Table 5-5
RIPRAP REQUIREMENTS FOR CHANNEL LININGS **

$VS^{0.17}/(S_s-1)^{0.66}$* $(ft^{\frac{1}{2}}/sec)$	Rock Type ***
1.4 to 3.2	VL
3.3 to 3.9	L
4.0 to 4.5	M
4.6 to 5.5	H
5.6 to 6.4	VH

* Use S_s = 2.5 unless the source of rock and its densities are known at the time of design.

** Table valid only for Froude number of 0.8 or less and side slopes no steeper than 2h:1v.

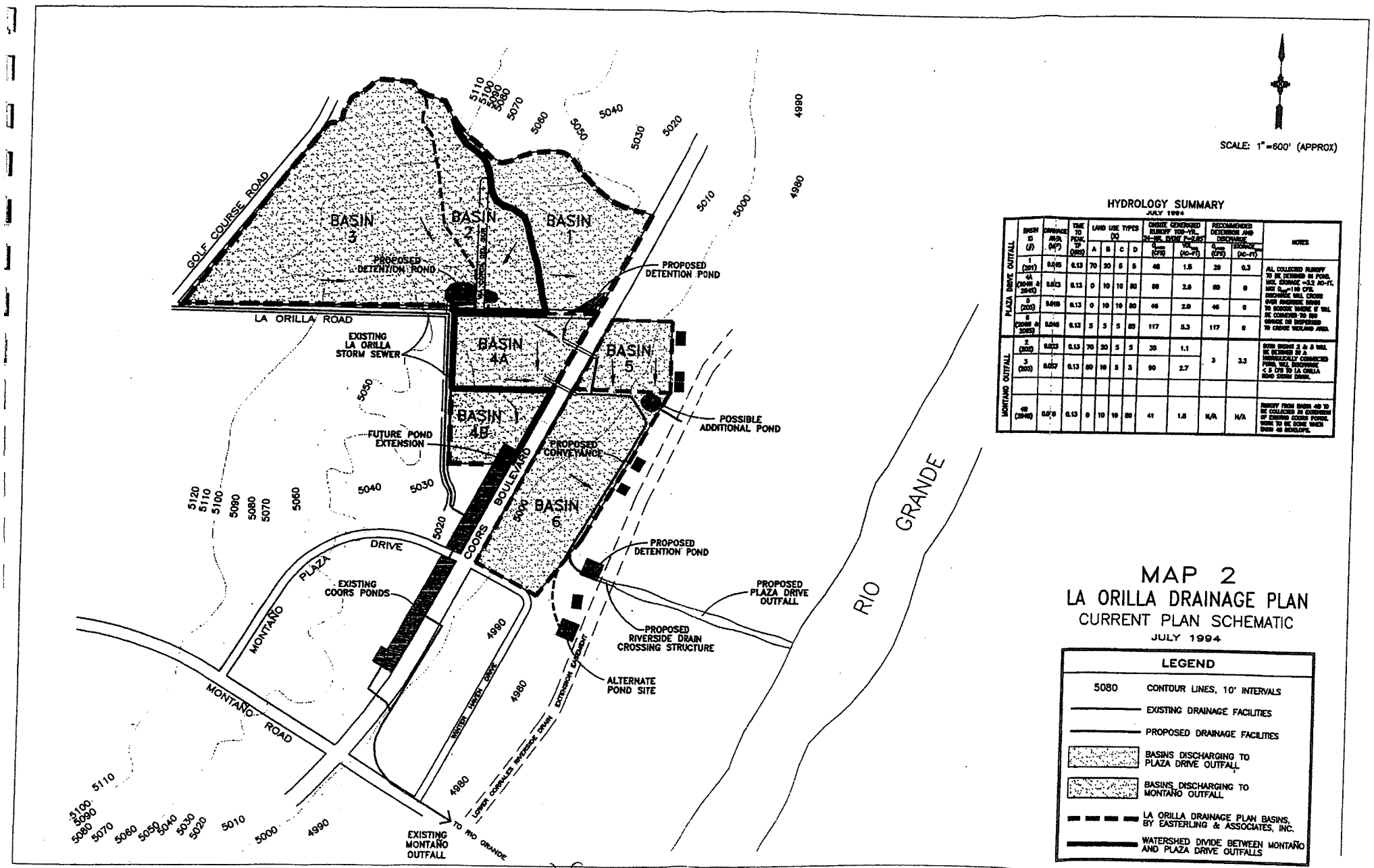
*** Type VL and L riprap shall be buried after placement to reduce vandalism.
SM9 slope mattress with toe protection may be substituted for Type VL or L riprap.
G12 gabion with toe protection may be substituted for Type M and Type H riprap.

5.4.3 Toe Protection

Where only the channel sides are to be lined, additional riprap is needed to provide for long term stability of the lining. In this case, the riprap blanket should extend at least 3 feet below the existing channel bed and the thickness of the blanket below the existing channel bed increased to at least 3 times d_{50} to accommodate possible channel scour during floods (see Figure 5-4a). For sandy soils, consult specific criteria for channels on sandy soils. If wire enclosed rock lining is used, the toe must be protected by placing riprap at the toe. This is needed to protect against frequently occurring abrasion, (see Figure 5-4b and 5-4c).

APPENDIX F

Basin Map from La Orilla Drainage Plan



HYDROLOGY SUMMARY

JULY 1994

	BASIN ID (#)	DRAINAGE AREA (ac)	TIME TO PEAK (hr)	LAND USE TYPES (%) A	B	C	D	ONSITE GENERATED RUNOFF 100-YR, 24-HR. STORM P_6=2.65" Q_{peak} (CFS)	Q_{peak} (ac-FT)	RECOMMENDED DETENTION AND DISCHARGE Q_{peak} (CFS)	STORAGE (ac-FT)	NOTES
PLAZA DRIVE OUTFALL	1 (201)	0.045	0.13	70	20	5	5	46	1.5	29	0.3	ALL COLLECTED RUNOFF TO BE DETAINED IN POND. MAX. DISCHARGE =1.4 AC-FT, MAX Q_{peak}=1.90 CFS. DISCHARGE WILL CROSS OVER ENCROACH BASIN TO BORROW WHERE IT WILL BE CONVEYED TO BE REMOVED OR DISPOSED TO CREATE WETLAND AREA.
	4A (204 & 205)	0.823	0.13	0	10	10	80	88	2.8	88	0	
	5 (203)	0.618	0.13	0	10	10	80	46	2.0	46	0	
	6 (206 & 207)	0.848	0.13	5	5	5	85	117	3.3	117	0	
MONTANO OUTFALL	2 (202)	0.023	0.13	70	20	5	5	35	1.1	3	3.5	BOTH BASINS 2 & 3 WILL BE DETAINED IN A HYDRAULICALLY CONNECTED POND, WITH DISCHARGE 4.5 CFS TO LA ORILLA ROAD STORM DRAIN.
	3 (200)	0.057	0.13	80	10	5	5	90	2.7			
	48 (2048)	0.078	0.13	0	10	10	80	41	1.8	N/A	N/A	RUNOFF FROM BASIN 48 TO BE COLLECTED IN EXPANSION OF EXISTING COORS POND. WORK TO BE DONE UNDER BASIN 48 DEVELOPE.

MAP 2
LA ORILLA DRAINAGE PLAN
CURRENT PLAN SCHEMATIC
JULY 1994

LEGEND

- 5080 — CONTOUR LINES, 10' INTERVALS
- EXISTING DRAINAGE FACILITIES
- PROPOSED DRAINAGE FACILITIES
- BASINS DISCHARGING TO PLAZA DRIVE OUTFALL
- BASINS DISCHARGING TO MONTANO OUTFALL
- LA ORILLA DRAINAGE PLAN BASINS, BY EASTERLING & ASSOCIATES, INC.
- WATERSHED DIVIDE BETWEEN MONTANO AND PLAZA DRIVE OUTFALLS

APPENDIX G

COA Work Order Approval Letter

CITY OF ALBUQUERQUE

25031
DRAINA

August 7, 2006

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

Re: La Orilla Market Center Grading and Drainage Plan
Engineer's Stamp dated 7-28-06 (E12/D24)

Dear Mr Bohannan,

Since the property is in the unincorporated area of Bernalillo County, they must approve the Building Permit. However, this submittal is adequate for Work Order because it drains to the pond along Coors Blvd. If this property had used the existing outfall crossing Coors Blvd., ponding on-site would have been required per the North Coors DMP. Prior to Work Order Sign-off, please analyze La Orilla Road and Coors Blvd for one-lane dry criteria per the DPM.

If you have any questions, you can contact me at 924-3695.

Sincerely,

Curtis A. Cherne, E.I.
Engineering Associate, Planning Dept.
Development and Building Services

C: file

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

APPENDIX H

Excerpts from Southeast Corner of La Orilla and Coors Lots 1, 2, 3, 5, 6A, 7A of Land of Martin L. Taylor

REVISED
DRAINAGE REPORT

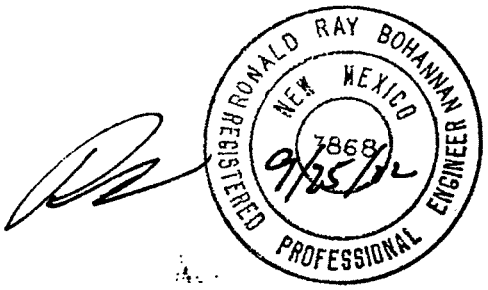
for

Southeast Corner of La Orilla and Coors
Lots 1, 2, 3, 4, 5, 6A, 7A, 8
Of The
Lands of Martin L. Taylor
Albuquerque, New Mexico

Prepared by

Tierra West, LLC
8509 Jefferson Blvd NE
Albuquerque, New Mexico 87113

Prepared for
Mr. Jim Shull Jr.
5445 Edith Boulevard NE, Unit F
Albuquerque, NM 87004



September 2002

boundary will capture the flow that cannot be conveyed down Winter Haven. This pond will discharge at a peak rate of 1.23 cfs through an existing 12" pipe located in a private drainage easement to the Lower Corrales Riverside Drain.

EXISTING CONDITIONS

The site slopes from west to east with average grades between 2% to 5%. The site is currently in an undeveloped state, and a local contractor is using it as a staging area for the Coors Boulevard Paving Improvement project. A copy of the offsite and onsite basins is located in appendix A. Off-site flows enter the site from the west at two point sources as well as sheet flow from the Coors and La Orilla roadways. Two sets of culverts located under Coors Boulevard discharge 58.25 cfs in the undeveloped condition. This flow will be reduced to 21.07 cfs when the property west of Coors is developed. The adjacent roadways discharge 2.89 CFS as sheet flow over the entire west and north property lines. The site, in its undeveloped condition, generates an additional 23.36 cfs during the predicted 100-year, 6-hour storm event. The combined onsite and offsite flows sheet flow off the site along its easten boundary. Once the flows leave the site it continues to flow across the adjacent Church parcel and enters the Middle Rio Grand Conservancy Right-of-Way, discharging to the Corrales Riverside Drain.

PROPOSED CONDITIONS

The development of this site shall be completed in phases. The initial phase will consist of the construction of the primary roadway, the detention facilities and the storm drain. Each parcel will be rough graded to conform to this drainage plan. Each individual lot must submit their grading plans for city of Albuquerque review and approval at the time of building Permit.

This site shall continue to allow the offsite flows to enterthe site from the west. In the interim condition the offsite flows entering the site includes 42.27 cfs that enters the site at the northwest corner through a 30" culvert under Coors Boulevard. A second set of two 30" culverts allows 15.98 cfs to enter the site at the approximate midpoint of the west property line. The Adjacent roadways discharge 2.89 cfs as sheet flow across the site. In the developed condition each lot will be allowed to have a storm water discharge equivalent to an 85% D and a 15% C surface treatment or else 4.06 cfs per acre. Each lot shall discharge the entire 100-year developed storm water to the main drive. An Onsite Drainage Basin Map and allowable discharge table is located in Appendix B.

A curb opening and concrete channel will be constructed from the main drive to the end of the existing Winter Haven Cul-de-sac. As shown in appendix C the curb opening acts as a weir limiting the flow leaving the site to 27.14 cfs, which is less than the rate of 27.64 allowed in the Riverside Plaza drainage study. The remaining flow that is unable to be captured by this channel will continue to drain within the roadway and enter a 1.5-acre foot detention pond located along the properties east boundary. As shown in Appendix B the rundown has the ability to pass 77.41 cfs, which is greater that the proposed discharge of 77.84 cfs. All of the flows entering the site will be discharged at a rate of 1.23 cfs through the existing 12" penetration to the Corrales Riverside Drain This outfall will consist of a oil and sediment trap as well as an orifice plat to control the discharge. The function of this pond has been modeled using AHYMO. The input and output files have been included in appendix D. Should this site incurany flows greater than the 100-year, 6-hour design storm event, the rundowns and weirs will overflow and the same drainage patterns will convey the flow to the downstream drainage facilities. The outfall structure will be constructed such that it will overflow prior to the pond breaching.

SUMMARY AND RECOMMENDATIONS

This site is a developed parcel within the City of Albuquerque. The initial proposed improvements will consist of the main roadway and all of the drainage facilities to handle the entire developed site. Each lot will be rough graded to drain to the main roadway. This site will continue to accept the interim offsite flow of 58.25 cfs as well as the reduced future offsite flow of 21.07 cfs. Each lot will be allowed to discharge 4.01cfs during fully developed conditions. The site will discharge 27.14 cfs to the Wine Haven Right-of-way with the remaining flow continue east until captured by a detention pond. This pond will drain at a rate of 1.23 cfs through an existing 12" penetration into the Corrales riverside drain. The development of this site is consistent with the DPM, Chapter 22, Hydrology section. Since this site encompasses more than 5 acres, a NPDES permit is required prior to any construction activity. Improvements are to occur within City Right-of-Way; therefore a Work Order will be required. It is recommended this development be approved for Rough Grading, Site Plan for Subdivision, Preliminary and Final Plat.