CITY OF ALBUQUERQUE

September 9, 2016

Richard J. Berry, Mayor

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

RE: **La Orilla Estates**
Drainage Outfall into Coors Pond
Engineer's Stamp Date 5-18-16 (File: E12D024)

Dear Mr. Bohannan:

Based upon the information provided in your submittal received 8-9-2016, the above-referenced Grading Plan and Drainage Report propose 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. This re-approval includes the storage of the first flush volume in the City's pond (Coors Pond), which was approved by the Department of Municipal Development. The Work Order approval does not substitute any re-approvals from NMDOT District III that are 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: _____ Building Permit #: _____ City Drainage #: _____

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

Legal Description: _____

City Address: _____

Engineering Firm: _____ Contact: _____

Address: _____

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

Owner: _____ Contact: _____

Address: _____

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

Architect: _____ Contact: _____

Address: _____

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

Other Contact: _____ Contact: _____

Address: _____

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

Check all that Apply:

DEPARTMENT:

_____ HYDROLOGY/ DRAINAGE
_____ TRAFFIC/ TRANSPORTATION
_____ MS4/ EROSION & SEDIMENT CONTROL

TYPE OF SUBMITTAL:

_____ ENGINEER/ ARCHITECT CERTIFICATION

_____ CONCEPTUAL G & D PLAN
_____ 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

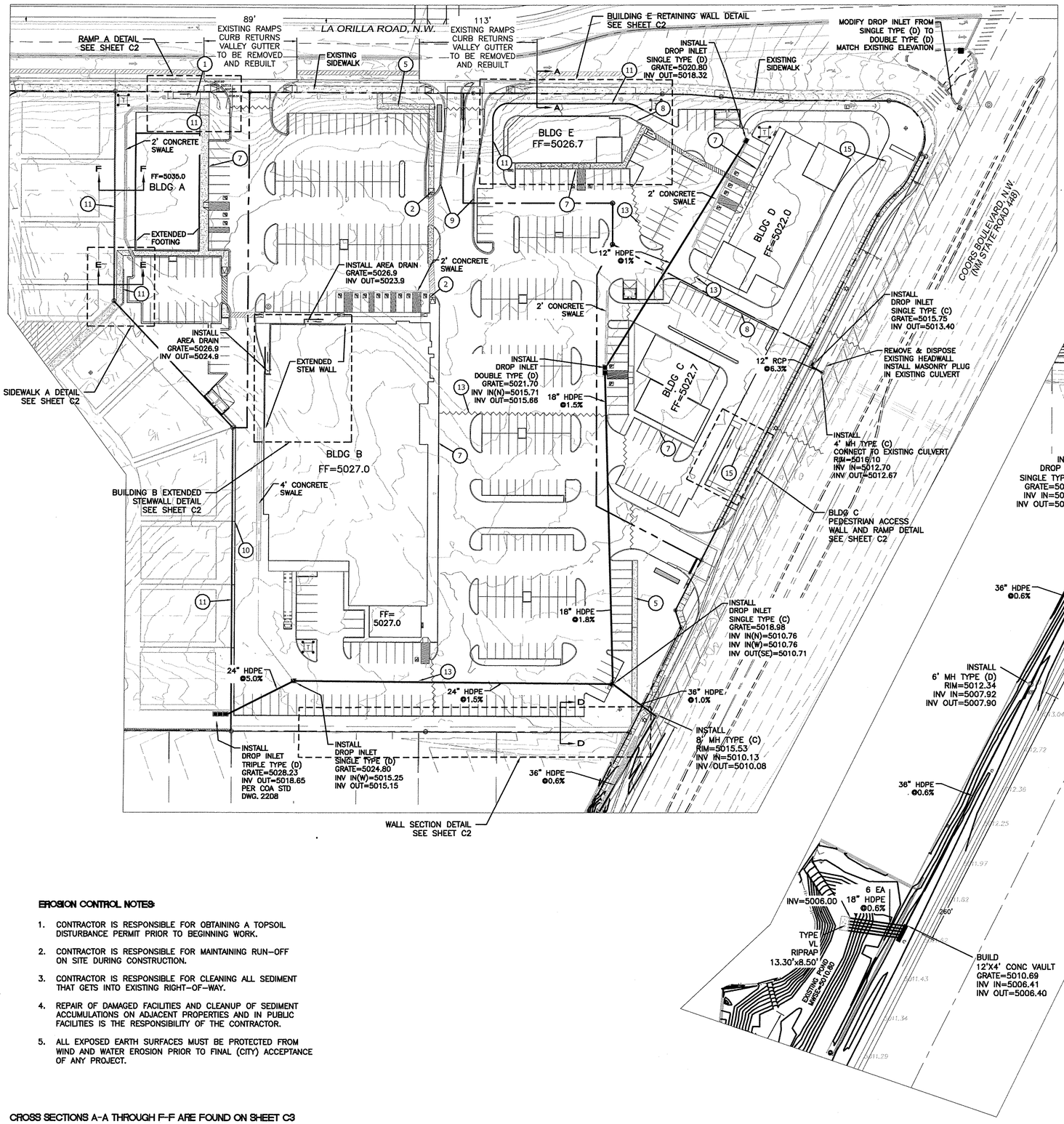
_____ PRELIMINARY PLAT APPROVAL
_____ SITE PLAN FOR SUB'D APPROVAL
_____ SITE PLAN FOR BLDG. PERMIT APPROVAL
_____ FINAL PLAT APPROVAL
_____ SIA/ RELEASE OF FINANCIAL GUARANTEE
_____ FOUNDATION PERMIT APPROVAL
_____ GRADING PERMIT APPROVAL
_____ SO-19 APPROVAL
_____ PAVING PERMIT APPROVAL
_____ GRADING/ PAD CERTIFICATION
_____ WORK ORDER APPROVAL
_____ CLOMR/LOMR

_____ PRE-DESIGN MEETING
_____ OTHER (SPECIFY) _____

IS THIS A RESUBMITTAL?: _____ Yes _____ No

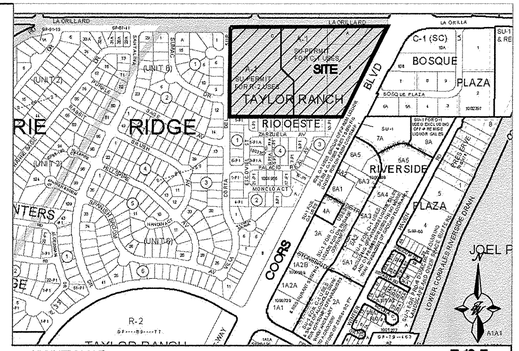
DATE SUBMITTED: _____ By: _____

COA STAFF: ELECTRONIC SUBMITTAL RECEIVED: ___



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' PEDESTRIAN 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)
15. LANDSCAPE WATER HARVESTING SWALE
16. 1' WIDE CONCRETE WALL , 1.70' HIGH

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

GRAPHIC SCALE
50 25 0 25 50
SCALE: 1"=50'

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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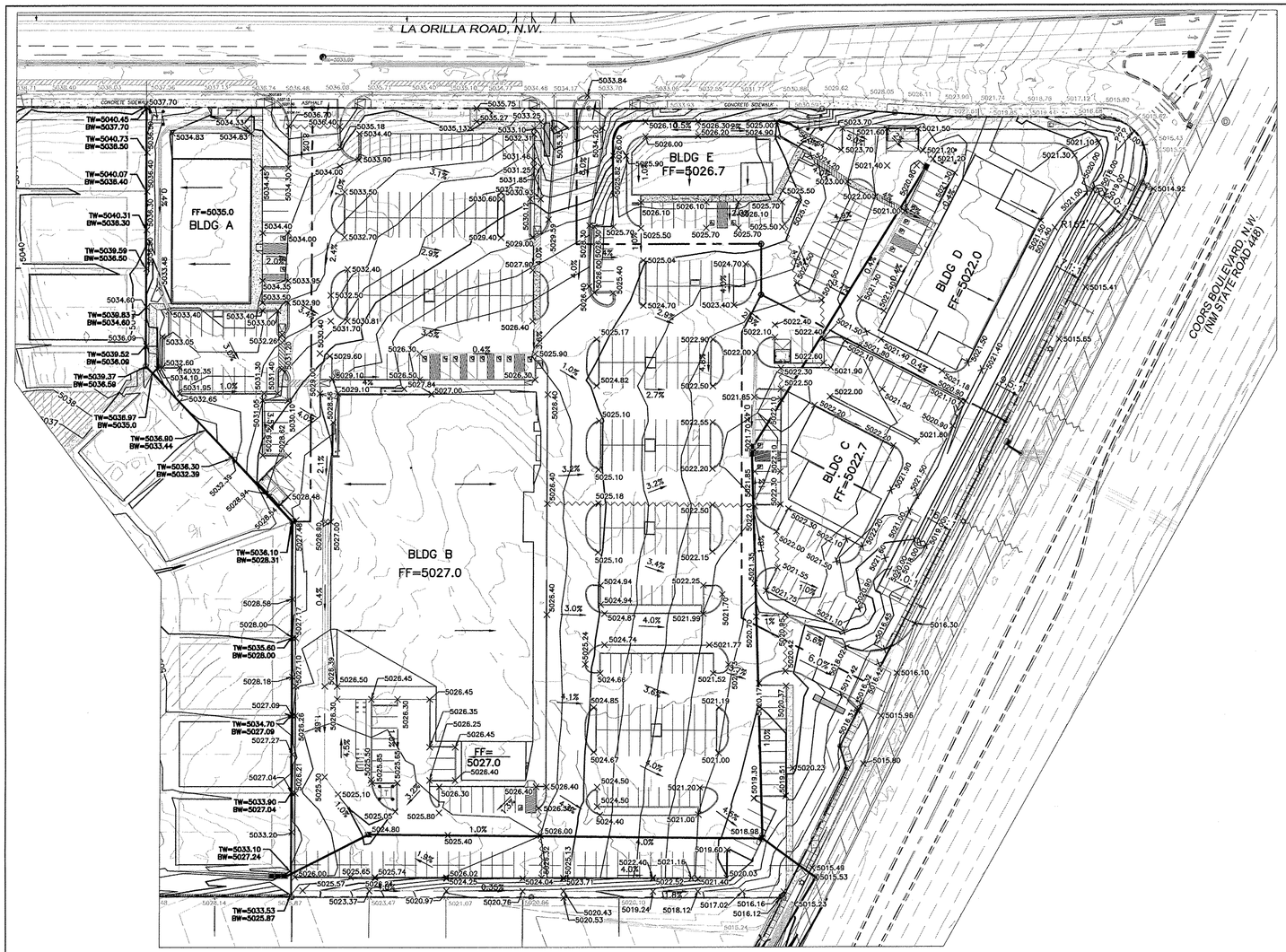
ALBUQUERQUE, NM 87109
(505) 858-3100
www.tierrawestllc.com

DRAWN BY: BJF
DATE: 05/18/16
2012005_GR_COM
SHEET # C1
JOB # 2012005



LEGEND

- CURB & GUTTER
- BOUNDARY LINE
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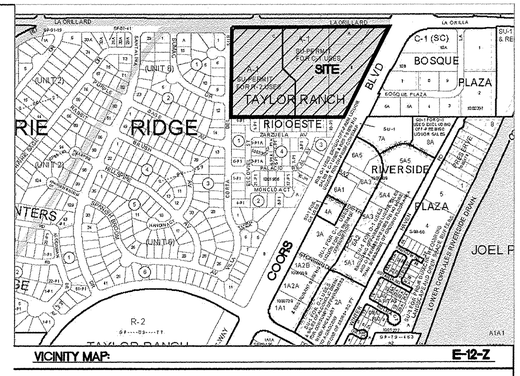
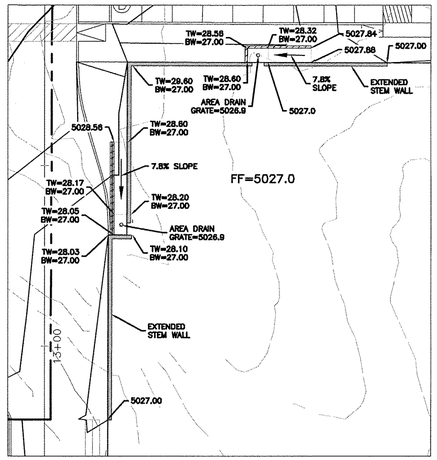
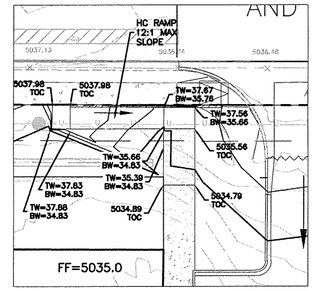
- RETAINING WALL
- WATER BLOCK
- 5010 CONTOUR MAJOR
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE



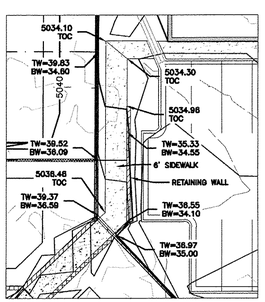
VICINITY MAP: E-12-Z



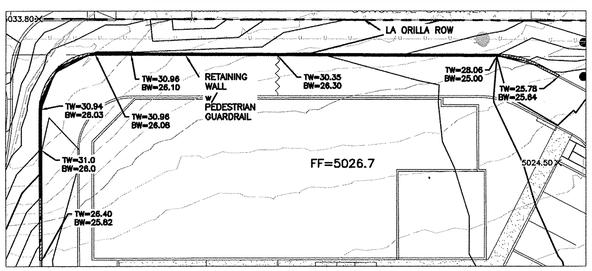
BUILDING B - EXTENDED STEM WALL DETAIL



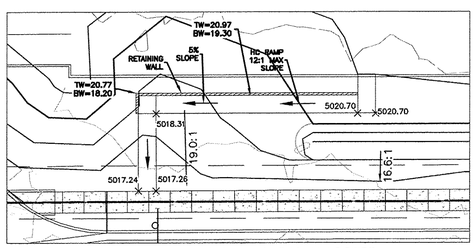
RAMP A DETAIL



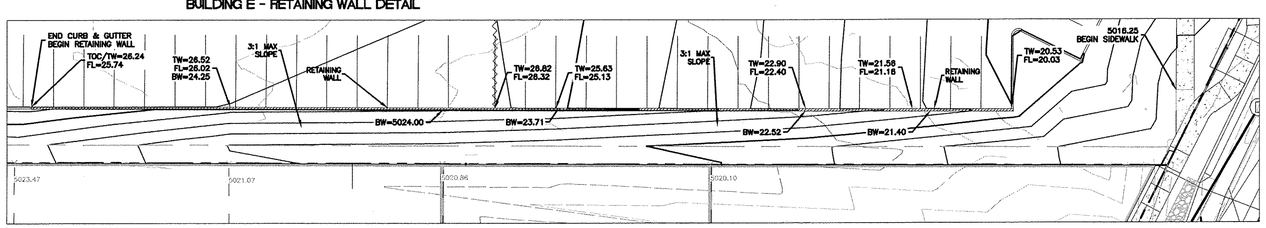
SIDEWALK A DETAIL



BUILDING E - RETAINING WALL DETAIL



BUILDING C - PEDESTRIAN ACCESS



PEDESTRIAN ACCESS, WALL AND RAMP DETAIL

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GRAPHIC SCALE

50 25 0 25 50

SCALE: 1"=50'

N

ALL SPOT ELEVATION ARE AT FLOWLINE UNLESS OTHERWISE SPECIFIED.

ENGINEER'S SEAL

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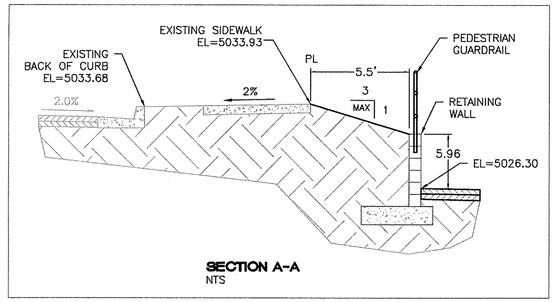
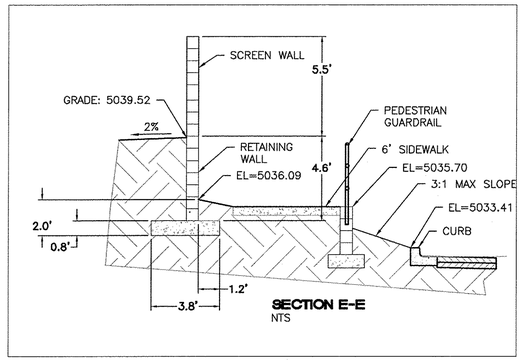
SHEET # C2

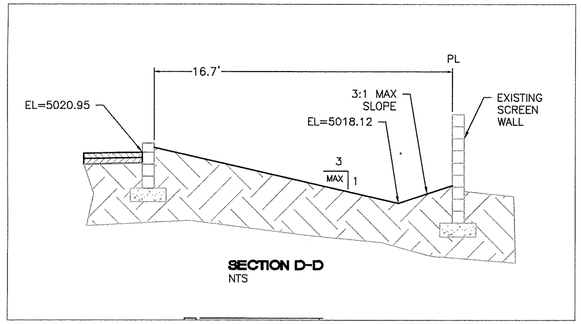
JOB # 2012005



SECTION A-A
NTS



SECTION E-E
NTS



SECTION D-D
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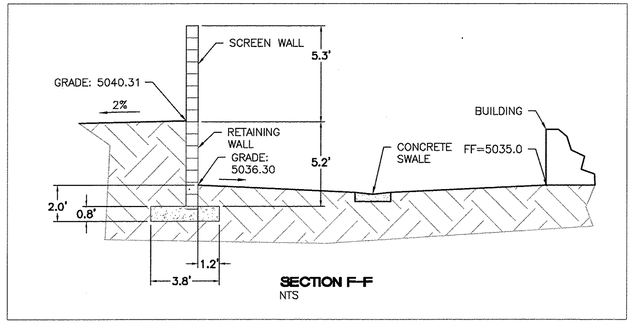

SECTION F-F
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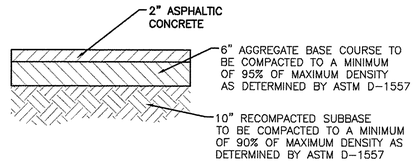
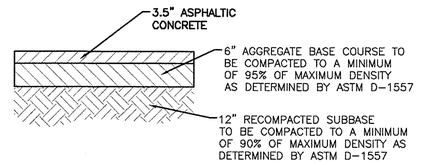
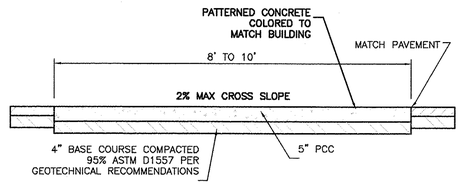


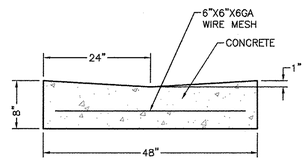
DRIVE AISLE/PARKING PAVING SECTION
OR 3.5" ASPHALT OVER NATIVE



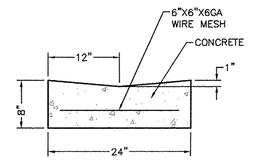
SERVICE AREA PAVING SECTION
OR 5" ASPHALT OVER NATIVE



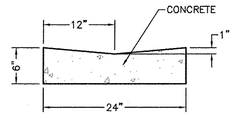
PEDESTRIAN CROSSING
NTS



4' CONCRETE SWALE DETAIL
IN PARKING LOT

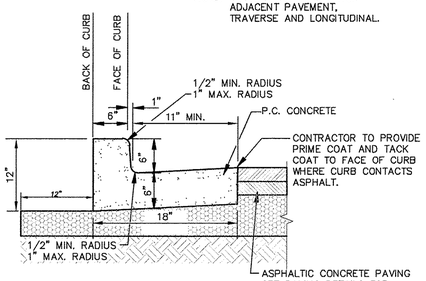


2' CONCRETE SWALE DETAIL
IN PARKING LOT

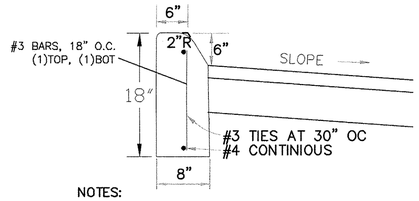


2' CONCRETE SWALE DETAIL
IN LANDSCAPE AREA

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

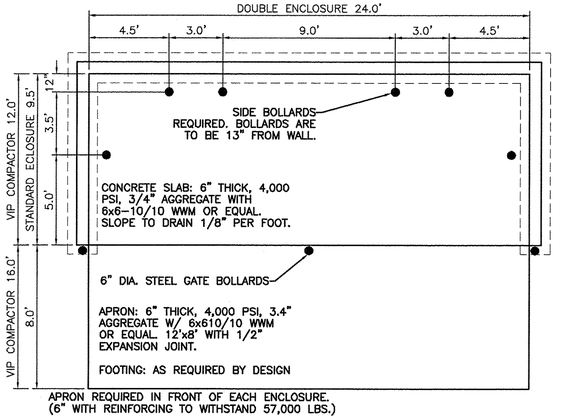


TYPE 'A' CONCRETE
CURB AND GUTTER



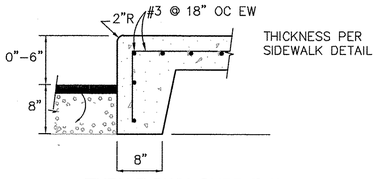
NOTES:
1. 1/2 INCH CAULKABLE EXPANSION JOINTS SHALL BE PROVIDED AT INTERVALS NOT TO EXCEED 50 FEET AT THE ENDS AND MIDPOINT OF RETURNS, AND AT ANY POINT WHERE THE NEW CURB AND GUTTER ABUTS OTHER CONCRETE STRUCTURES.
2. 5 FOOT LONG TRANSITIONS SHALL BE PROVIDED BETWEEN NORMAL GUTTER AND PITCHED GUTTER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

6" HEADER CURB DETAIL
NTS

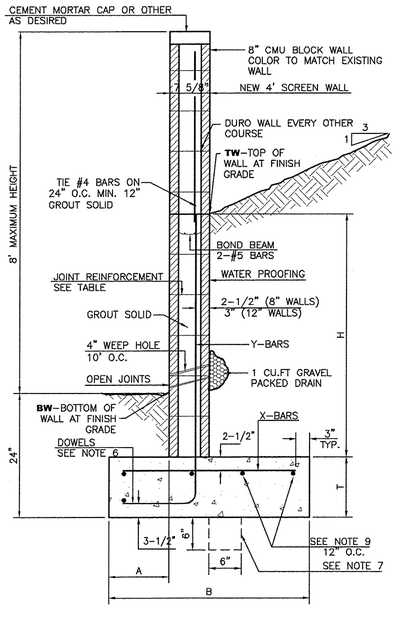


NOTE: THESE ARE THE MINIMUM REQUIREMENTS FOR TRASH ENCLOSURES. DESIGNS MAY VARY TO FIT THE SELECTED ENCLOSURE.

DOUBLE DUMPSTER ENCLOSURE DETAIL
NTS



TURN DOWN CURB DETAIL
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".

ENGINEER'S SEAL

RONALD R. BOHANNAN
NEW MEXICO
7868
PROFESSIONAL ENGINEER

RONALD R. BOHANNAN
P.E. #7868

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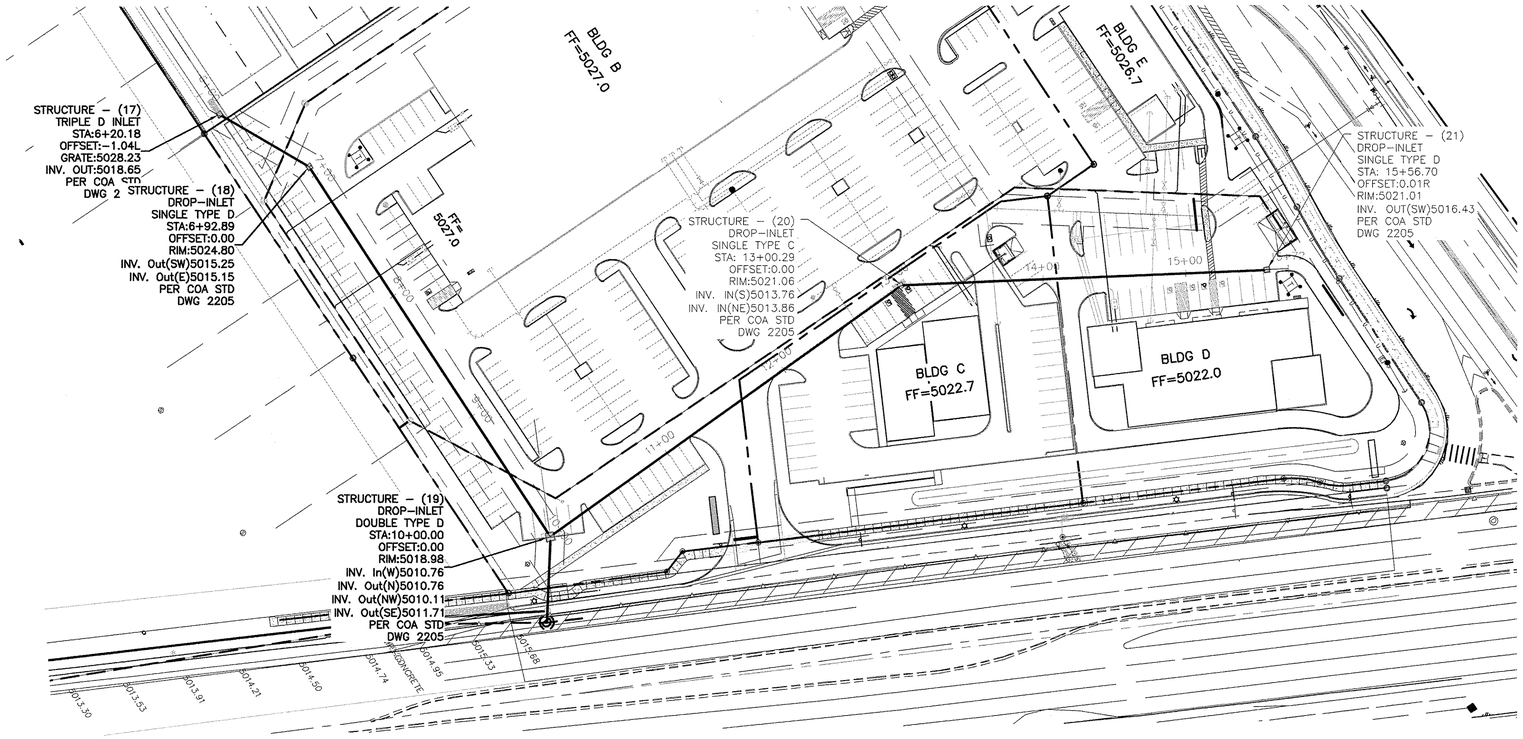


50 25 0 25 50

SCALE: HORIZ. 1"=50'
VERT. 1"=5'

GENERAL NOTES:

1. ALL WATER AND SEWER UTILITY WORK TO BE DONE IN ACCORDANCE WITH C.O.A. STANDARDS AND SPECIFICATIONS LATEST EDITION.

2. 4' MINIMUM BURY REQUIRED FOR ALL UTILITIES UNLESS OTHERWISE NOTED.

3. REFERENCE ARCHITECTURAL PLANS FOR WATER LINE RISER LOCATIONS.

4. CLEAN OUTS ARE TO BE BUILT PER UNIFORM PLUMBING CODE STANDARDS.

5. ALL PLUMBING PIPE MATERIAL TO BE USED PER UPC.

6. FIRE LINE AND DOMESTIC WATERLINE MUST HAVE BACKFLOW PREVENTORS PER UPC. IF BACKFLOW PREVENTOR IS INSTALLED EXTERIOR OF BUILDING A HOT BOX SHALL BE INSTALLED AND USED. BACKFLOW PREVENTOR TO BE INSTALLED INSIDE OF BUILDING.

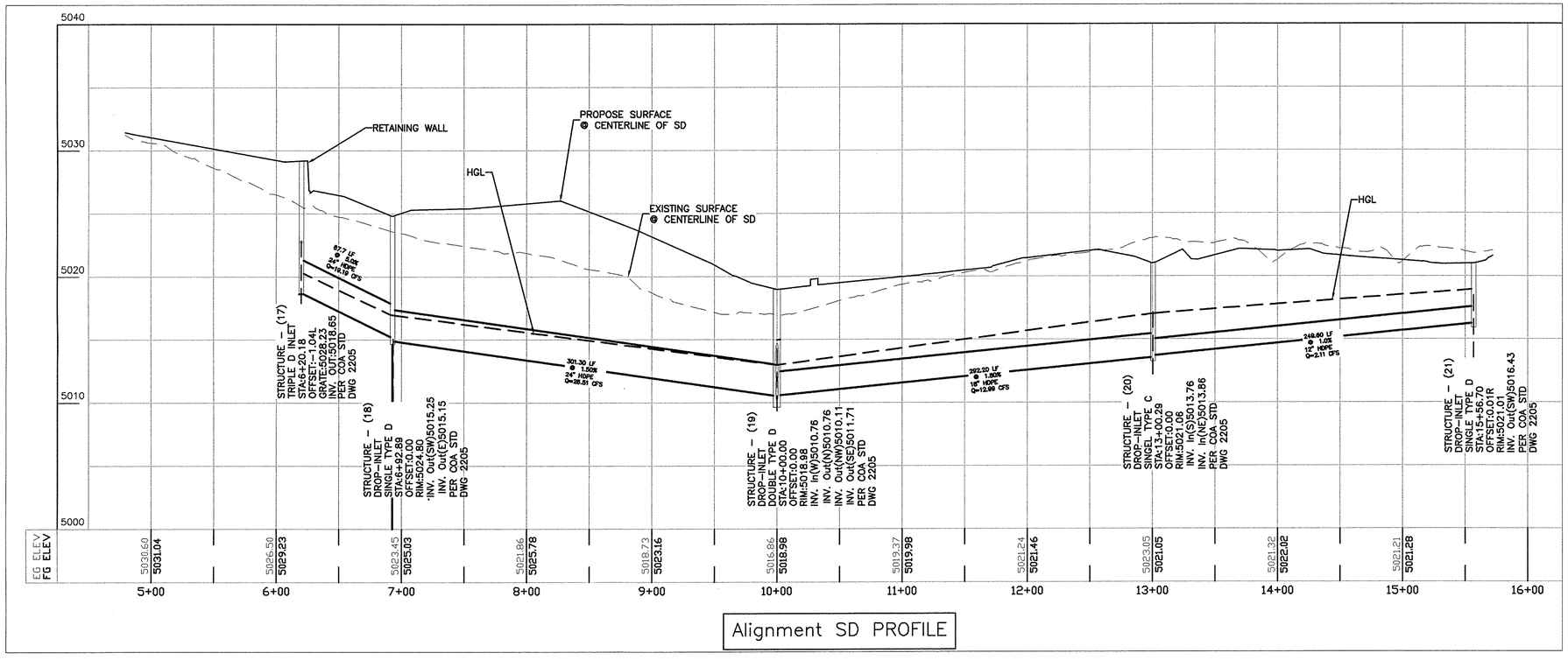
7. ALL EX. SD INLETS AND MH SHALL HAVE CONCRETE COLLARS POURED AND BE ADJUSTED TO FINISHED GRADE.

8. ALL EXCAVATION, TRENCHING AND SHORING ACTIVITIES MUST BE CARRIED–OUT IN ACCORDANCE WITH OSHA 29 CFR 1926.650 SUBPART P.

9. ALL UTILITY DISTANCES SHOWN ARE FOR REFERENCE ONLY.

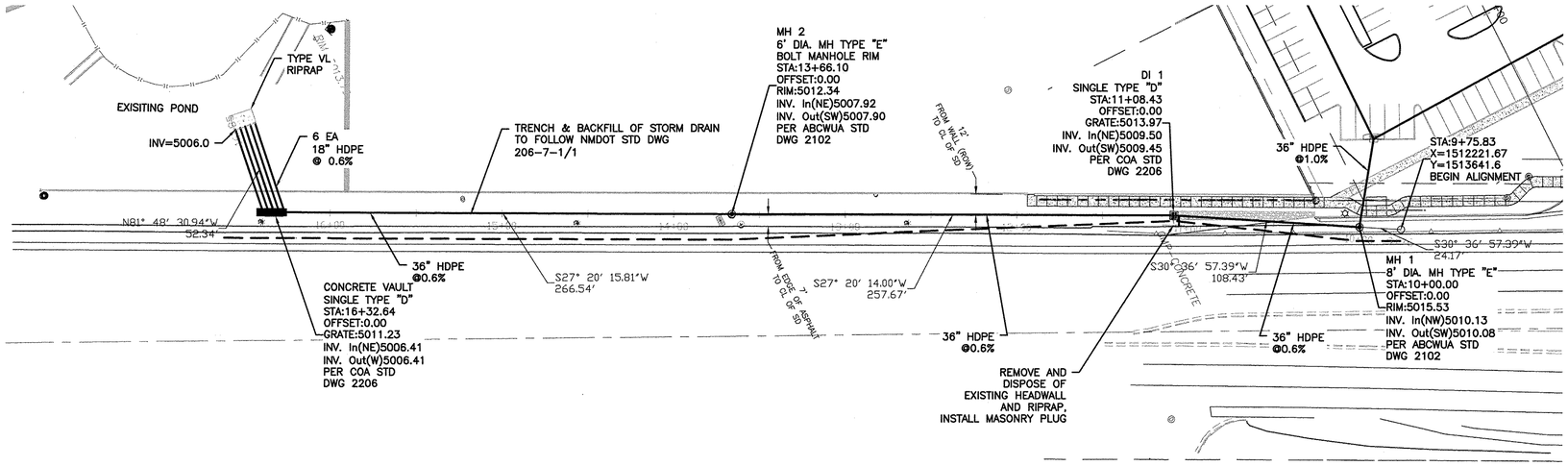
CAUTION:

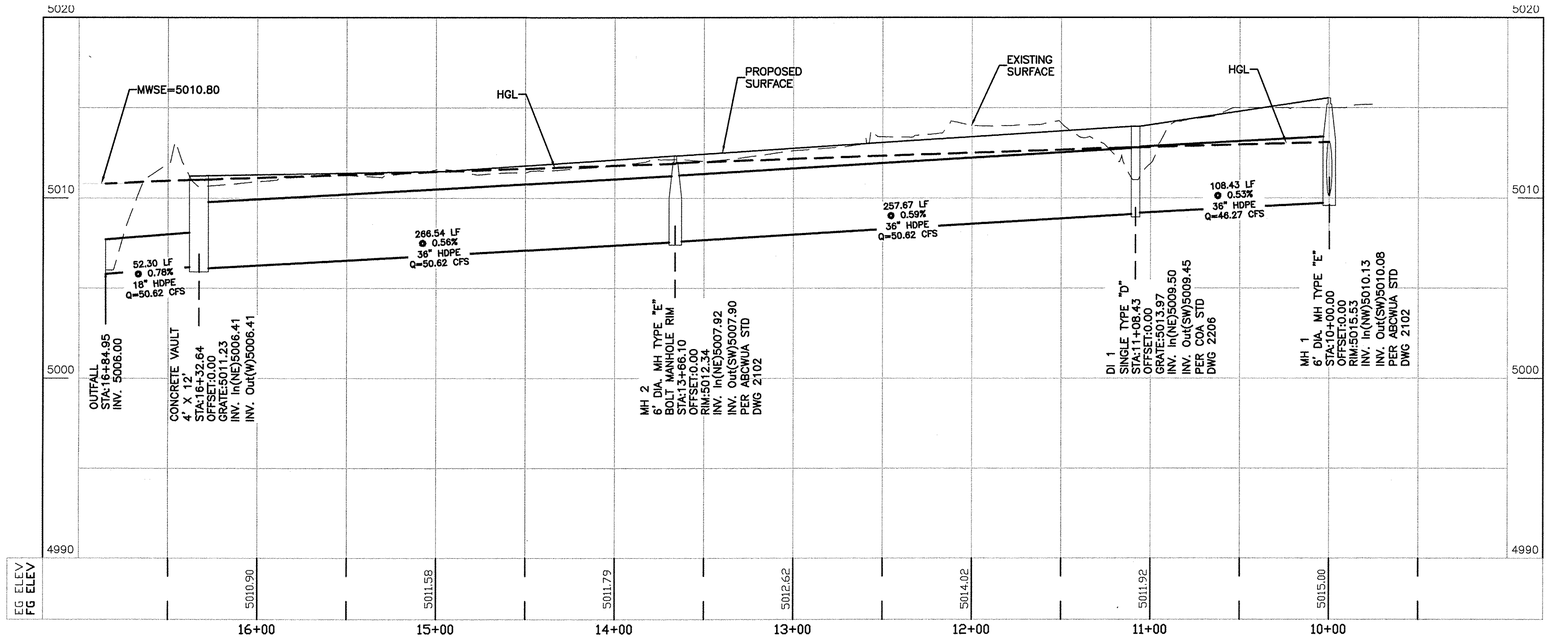
ALL EXISTING UTILITIES SHOWN WERE OBTAINED FROM RESEARCH, AS–BUILTS, SURVEYS OR INFORMATION PROVIDED BY OTHERS. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO CONDUCT ALL NECESSARY FIELD INVESTIGATIONS PRIOR TO AND INCLUDING ANY EXCAVATION, TO DETERMINE THE ACTUAL LOCATION OF UTILITIES AND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



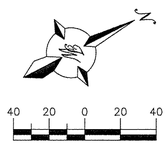
Alignment SD PROFILE

ENGINEER'S SEAL RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER RONALD R. BOHANNAN P.E. #7868	LA ORILLA ESTATES COORS AND LA ORILLA ONSITE STORM DRAIN PROFILE	DRAWN BY BJF DATE 05/18/15 2012005 SD_PP SHEET # C4 JOB # 2012005
	TIERRA WEST, LLC 5571 MIDWAY PARK PLACE NE ALBUQUERQUE, NM 87109 (505) 858–3100 www.tierrawestllc.com	





Coors SD Alignment PROFILE



SCALE: HORIZ. 1"=40'
VERT. 1"=4'

ENGINEER'S SEAL

RONALD R. BOHANNAN NEW MEXICO 7868 PROFESSIONAL ENGINEER

RONALD R. BOHANNAN
P.E. #7868

LA ORILLA ESTATES
COORS AND LA ORILLA
COORS STORM DRAIN PROFILE

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
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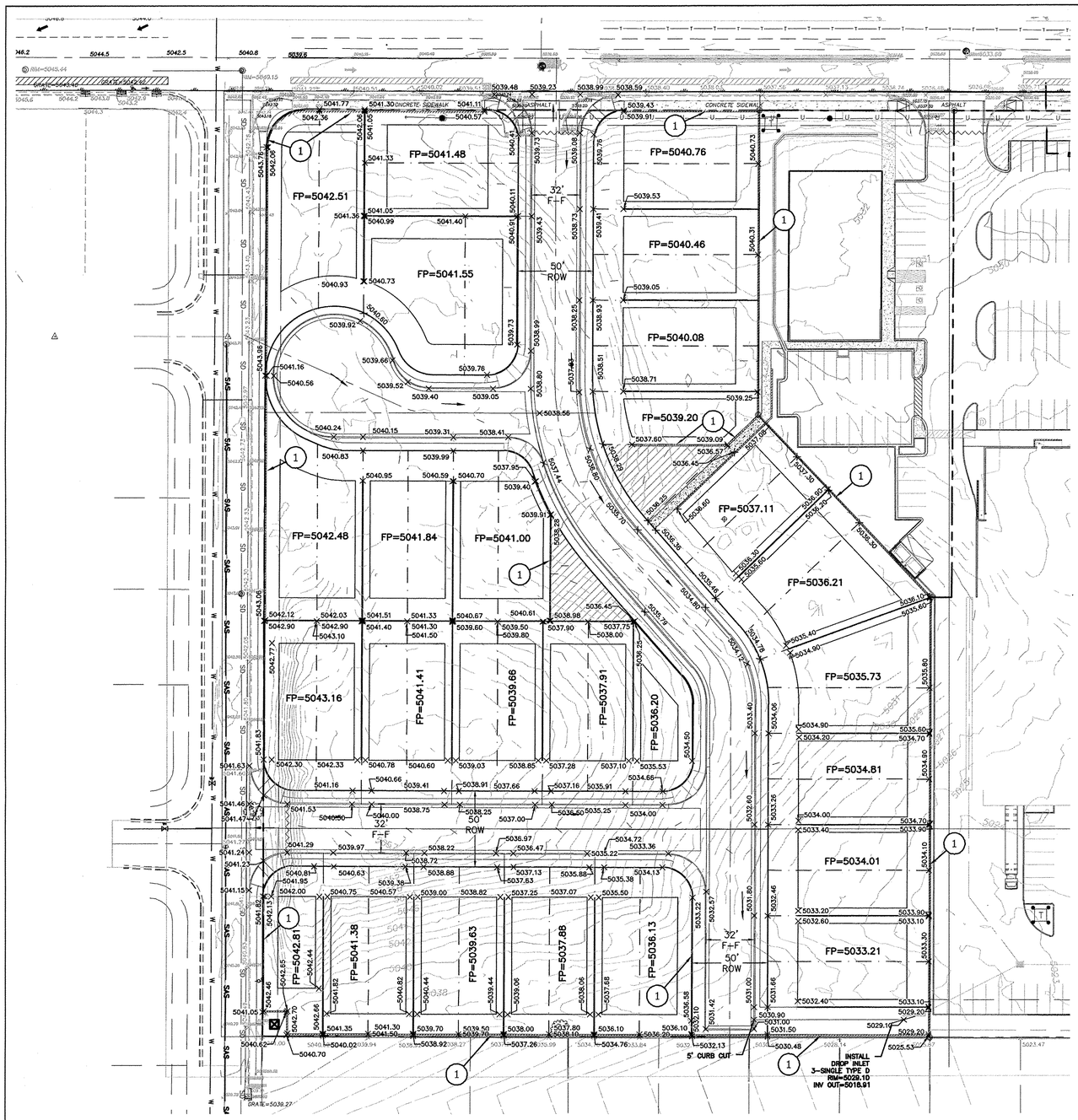
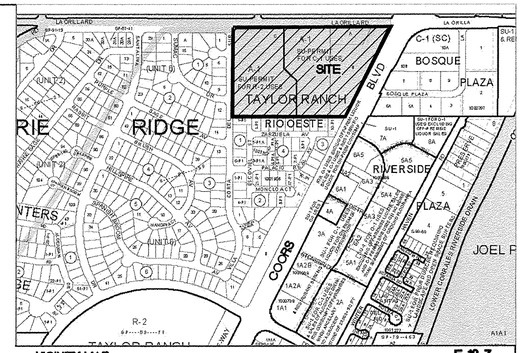
DRAWN BY: BJF
DATE: 05/18/16
2012005 SD_PP2
SHEET # C5
JOB # 2012005



LEGEND

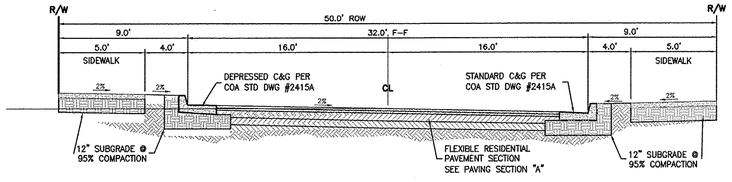
- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- SCREEN WALL
- RETAINING WALL
- WATER BLOCK
- 5010 CONTOUR MAJOR
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- (1) RETAINING WALL



VICINITY MAP: E-12-Z

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 7868 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: 05/18/16
2012005_GR_RES
SHEET # R1
JOB # 2012005

REVISED DRAINAGE REPORT

For

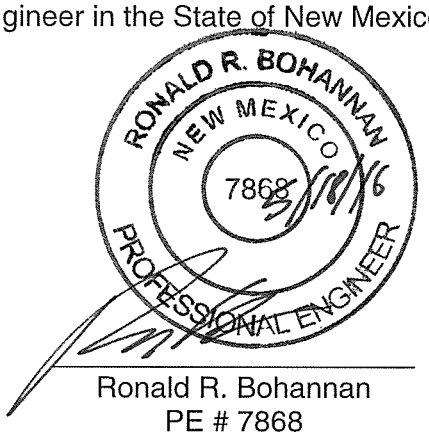
La Orilla Estates

Prepared by:

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

May 18, 2016

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

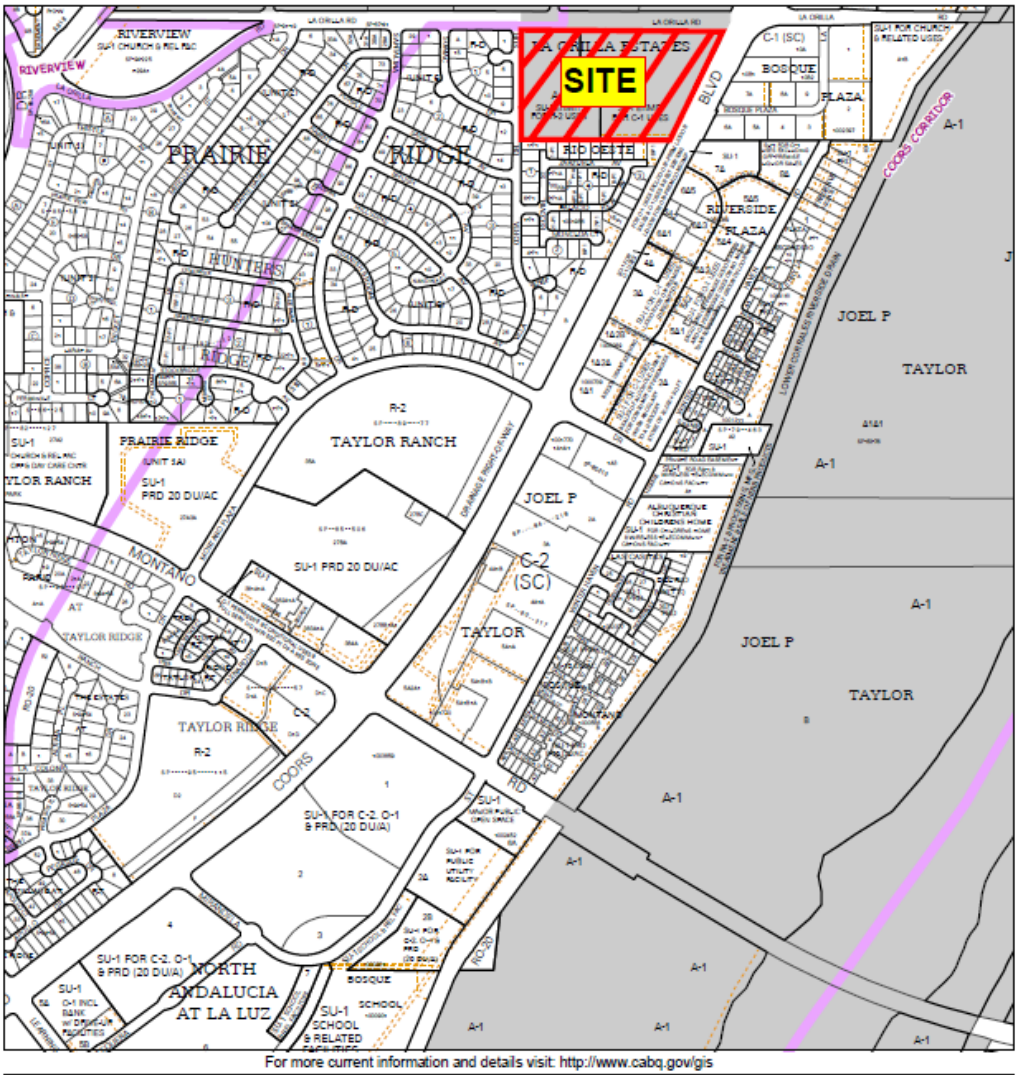
Purpose

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.

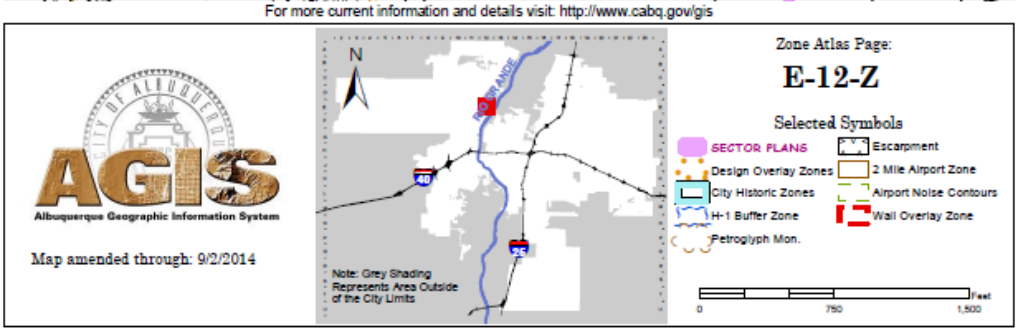
Location

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

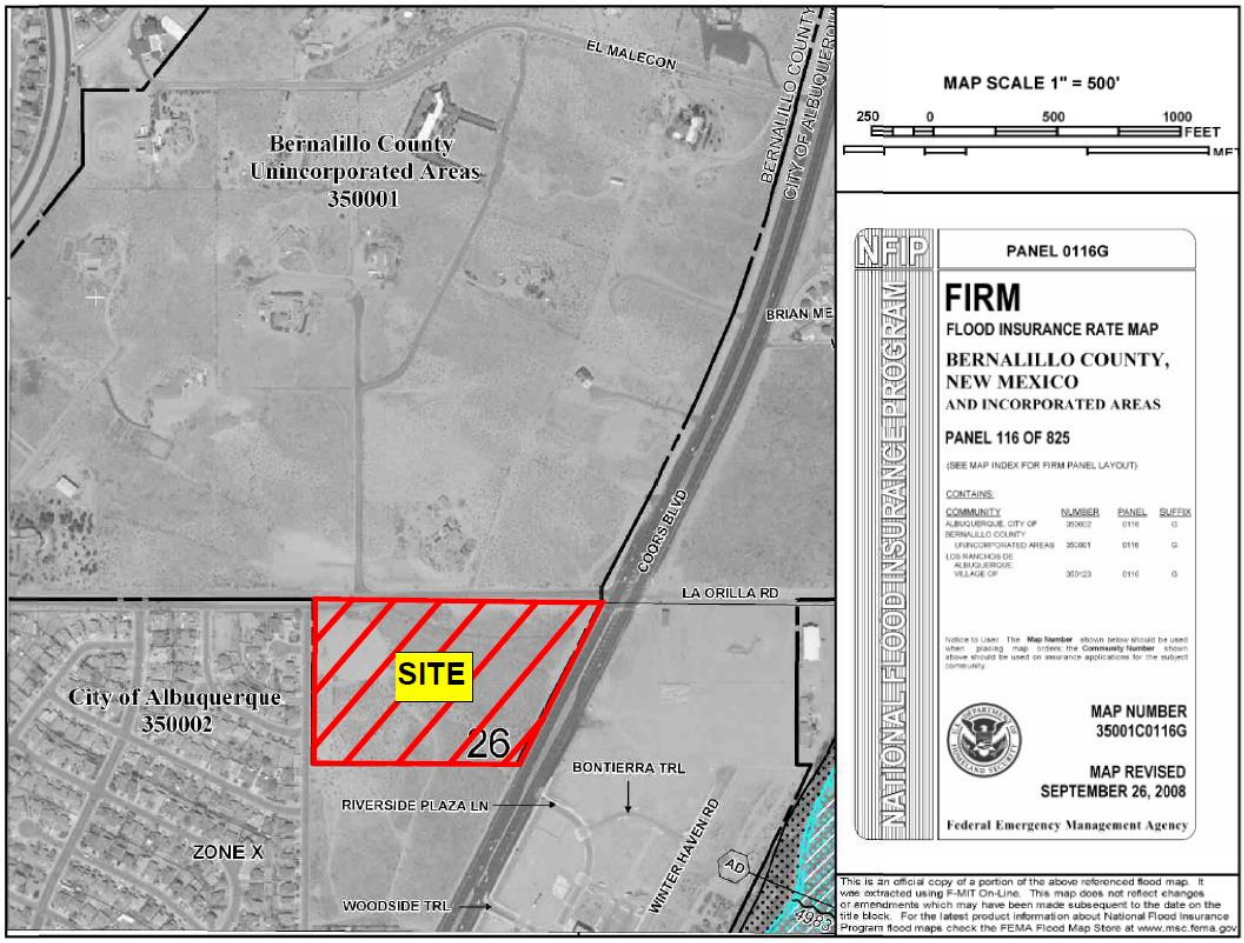
The site is undeveloped and drains naturally from west to east. No dirt work has taken place on the site. The site currently drains to existing culverts in Coors Boulevard, which drain across and under Coors. With the development of this project, the site will no longer drain to the existing culverts 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 9 on-site basins and 3 off-site basins to analyze the future drainage conditions.

The commercial site was separated into 8 basins (C1-C8) 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 10-12-2015, stating that the City of Albuquerque does not need to approve 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 50.62 cfs, which was used as the maximum allowable discharge to the pond for the current drainage analysis.

The runoff from Basins R1, C1-C3, C5, and C7-8 (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 C4 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 ROW and to the pond via 5-18” RCP pipes in order to maintain clearance from the existing sanitary sewer line.

Basins C6 and O2 (3.15 cfs total) will be conveyed via new drop inlet 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.

Water Quality Volume Retention

In order to comply with the Clean Water Act, any improvements to the site will need to retain the water quality volume of the impervious flows. Don Briggs with Bernalillo County Public Works has indicated to us that the site needs to capture 0.42” of runoff from the impervious areas to meet this water quality requirement.

Appendix B shows the water quality volume required for the impervious areas of the site, landscaped islands in the parking lot will be depressed to capture as much of this volume as possible and the remaining volume will be retained in the outfall pond within the Coors ROW with the addition of a wall to act as a weir overflow. An email from Bryan Wolfe, the City’s acting Director of the Department of Municipal Development,

can be found in Appendix I which gives permission from the city to incorporate a wall feature in their pond for the water quality solution to the site.

The wall has been sized to accommodate retaining the water quality volume of both the La Orilla Estates site as well as the Rio Oeste Subdivision directly south of the site. The capacity of the pond currently was calculated from as-built information from the "Coors/Montano Drainage Detention Facility" plans dated from 1986, and from the as-built information from the "Rio Oeste Subdivision" Plans dated from 2003. The 1986 plan set shows the fully developed pond capacity to be 7.32 acre-feet. The Rio Oeste plans called to extend this pond further north to accommodate the runoff volume from the Rio Oeste Subdivision as well as the La Orilla Estates site; this increased the pond capacity to 9.01 acre-feet of fully developed runoff.

The proposed wall height will be at an elevation of 5006.50 (1.7 ft high) which will retain the water quality volume of La Orilla Estates/Rio Oeste. The water quality volume, or 90^{th} percentile volume, for the remaining pond basins will have a maximum water surface elevation of 5006.35 which is lower than the top of wall to prevent any backflow of contaminants from the downstream drainage into the water quality retention area. Stage-storage calculations, tables, and pond/wall exhibits for this wall feature can be found in Appendix I.

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. Water quality volume retention per Bernalillo County requirements can be found in Appendix B with the weighted E hydrology table along with the Weir Wall stage-storage tables found in Appendix I.

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.

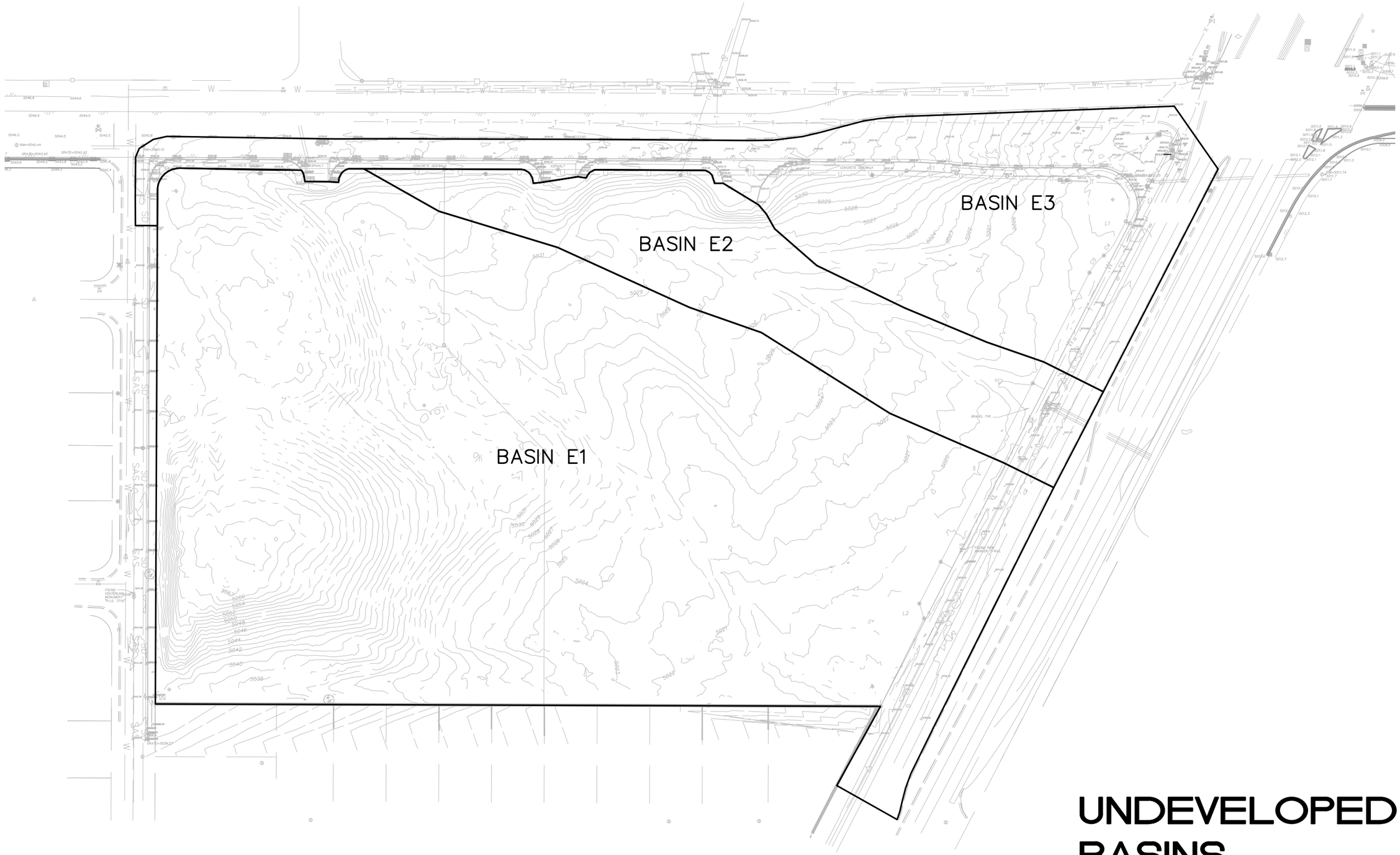
The proposed development consists of both commercial and residential development with the residential development containing 1 basin, the commercial containing 8 basins, and 3 off-site basins.

The residential basin, 7 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.

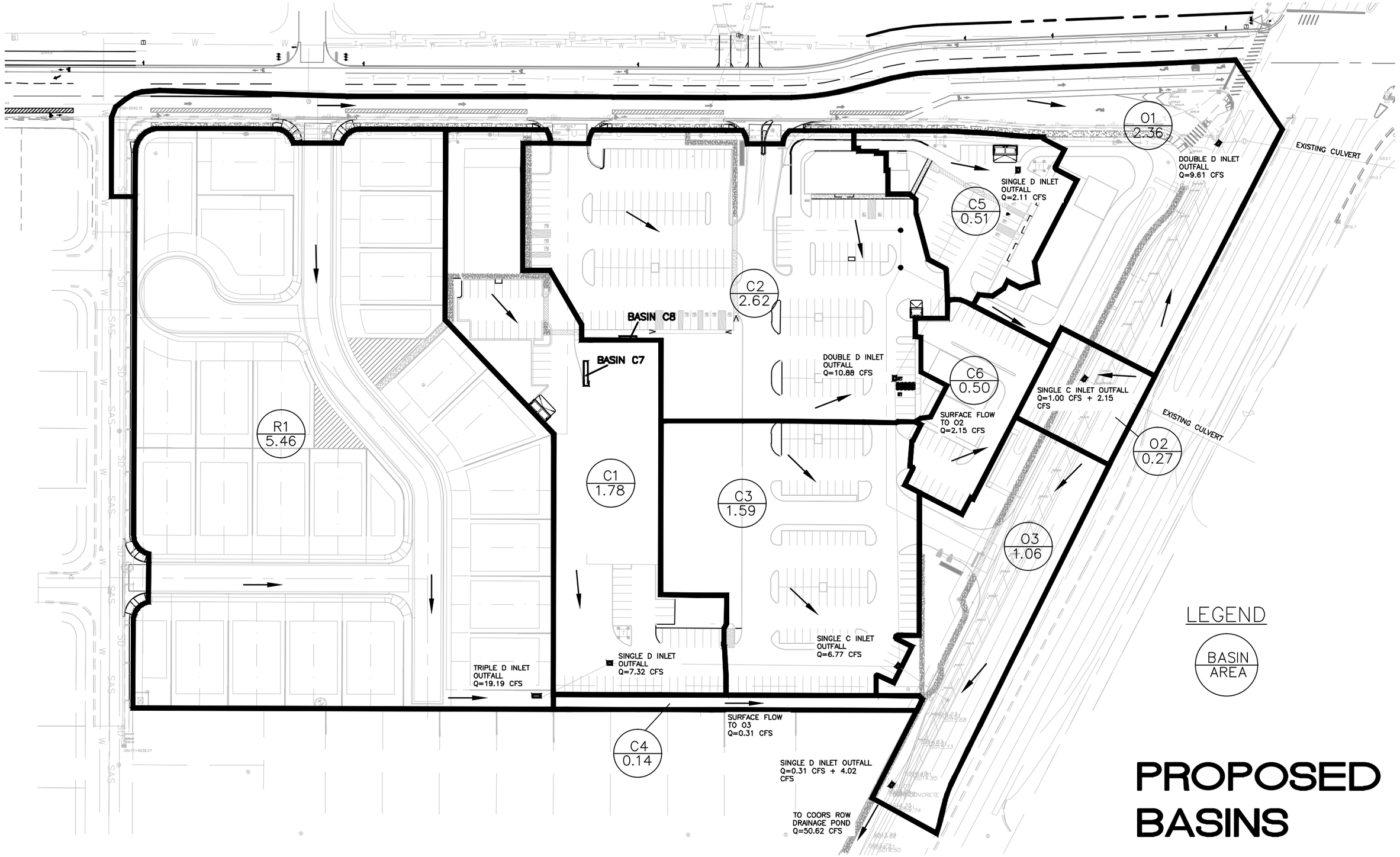
The remaining 1 commercial basin and 2 off-site basins will be directed towards the existing drainage structures that currently convey flow underneath Coors Blvd. The development of this site limits the discharge allowed underneath Coors to 21.07 cfs which we will be under with 12.76 cfs.

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** 5/2/2016

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	91%	1.833	0%	0.000	0%	0.000	9%	0.181	0.578	0.097	3.16	0.184	0.031	0.96
E3	139,918.35	3.21	0.00502	44%	1.413	0%	0.000	0%	0.000	56%	1.799	1.297	0.347	9.68	0.730	0.195	5.54
Total	**478,497.68**	**16.21**	**0.02533**										**0.903**	**28.36**		**0.342**	**10.30**

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	77,539.85	1.78	0.00278	0%	0.000	9%	0.160	3%	0.053	88%	1.566	1.824	0.271	7.32	1.124	0.167	4.73
C2	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
C3	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
C4	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
C5	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
C6	21,864.96	0.50	0.00078	0%	0.000	4%	0.020	0%	0.000	96%	0.482	1.918	0.080	2.15	1.199	0.050	1.41
C7	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
C8	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
Oeste	434,071.40	9.96	0.01557	0%	0.000	20%	1.993	0%	0.000	80%	7.972	1.710	1.420	38.88	1.036	0.860	24.55
Total	**1,143,350.88**	**26.25**	**0.04101**										**2.309**	**63.38**		**1.398**	**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

Water Quality Volume (Onsite)

Total Impervious Area = 9.75 acres = 424710 SF

Retainage depth = 0.42" = 0.035'

Retention Volume = 0.035 * 424710 = **14864.85 CF = 0.34 ac-ft**

Water Quality Volume (Rio Oeste)

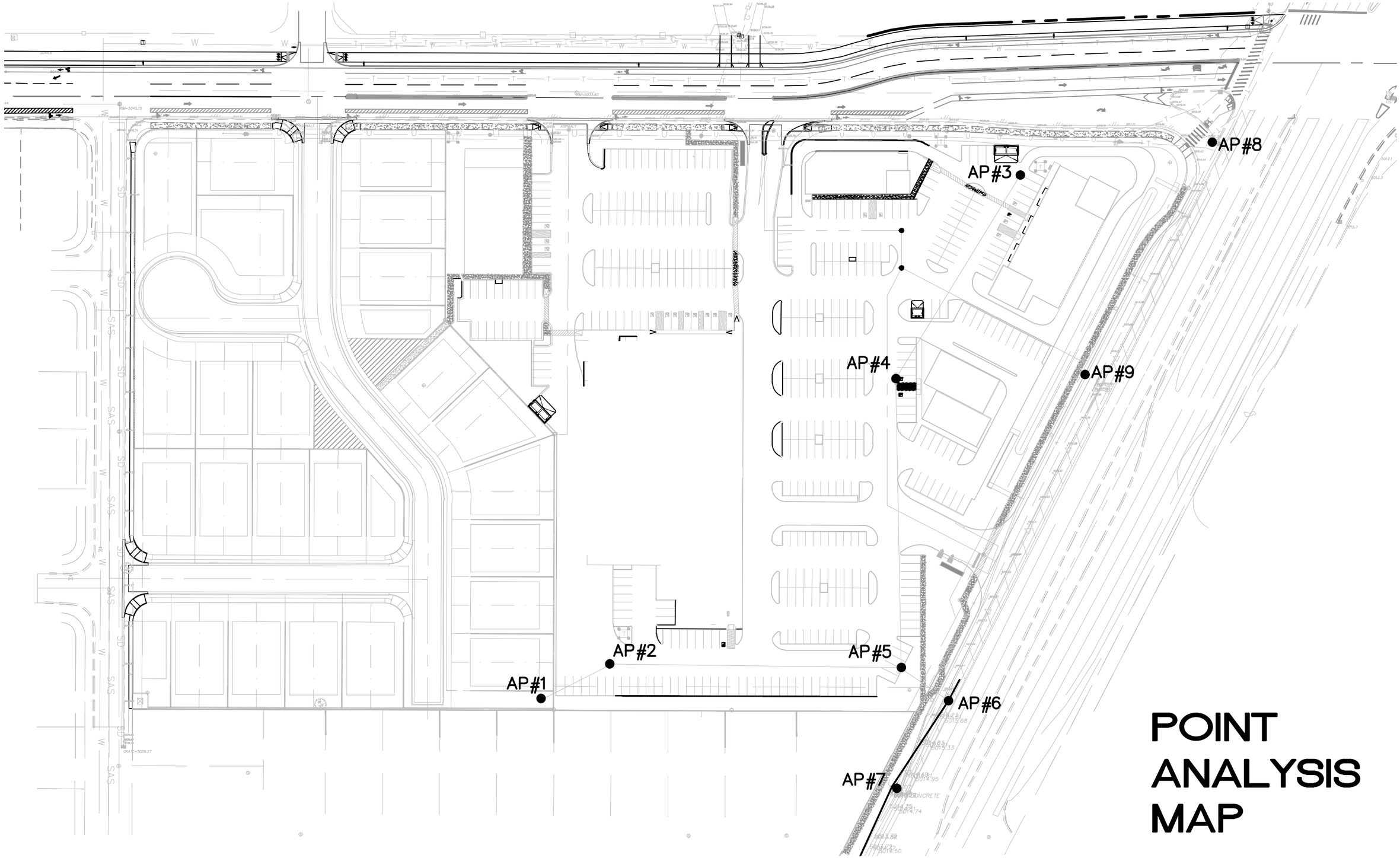
Total Impervious Area = 7.47 acres = 325553.28 SF

Retainage depth = 0.42" = 0.035'

Retention Volume = 0.035 * 325553.28 = **CF = 0.27 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	Triple D	23.61	19.19
AP#2	Single D	8.24	7.32
AP#3	Single D	8.24	2.11
AP#4	Double D	15.93	10.88
AP#5	Single C	11.61	6.77
AP#6	N/A	N/A	N/A
AP#7	Single D	8.24	4.33
AP#8	Double D	15.93	9.61
AP#9	Single C	11.61	3.15

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	70.74	19.19	18.16
AP#2 to AP#5	24	1.5	38.74	26.51	12.54
AP#3 to AP#4	12	1.0	4.98	2.11	5.76
AP#4 to AP#5	18	1.5	17.99	12.99	10.45
AP#5 to AP#6	36	1.0	93.27	46.27	12.47
AP#6 to AP#7	36	0.6	72.24	46.27	10.25
AP#7 to Vault	36	0.6	72.24	50.62	10.25

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 #2
Flow required = 7.32 cfs < 8.24 cfs
Single D inlet has capacity

AP #3
Flow required = 2.11 cfs < 8.24 cfs
Single D inlet has capacity

AP #7
Flow required = 4.33 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 #4
Flow required = 10.88 cfs < 15.93 cfs
Double D inlet has capacity

AP #8
Flow required = 9.61 cfs < 15.93 cfs
Double D inlet has capacity

Capacity of a Triple ‘D’ Storm Drop Inlet

Capacity of the grate:

L = 120” - 2(2"$_{ends}$) - 21(½” $_{middle\ bars}$) – 2(6” $_{center\ piece}$)
= 93.5”
= 7.79’

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

Area = 7.79' x 1.54'
= 11.99 ft^2

Effective Area = 11.99- 11.99 (0.5 $_{clogging\ factor}$)
= 5.99 ft^2 at the grate

Orifice Equation

Q = CA sqrt(2gH)
Q = 0.6*5.99*sqrt(2*32.2*0.67)
Q = 23.61 cfs

AP #1
Flow required = 19.19 cfs < 23.61 cfs
Triple D inlet has capacity

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 = 6.77 cfs < 11.61cfs
Single C inlet has capacity

AP #9
Flow required = 3.15 cfs < 11.61 cfs
Single C inlet has capacity

Worksheet for 12" HDPE @ 1.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01000	ft/ft
Diameter	1.00	ft
Discharge	2.11	ft³/s

Results

Normal Depth	0.47	ft
Flow Area	0.37	ft²
Wetted Perimeter	1.52	ft
Hydraulic Radius	0.24	ft
Top Width	1.00	ft
Critical Depth	0.62	ft
Percent Full	47.4	%
Critical Slope	0.00415	ft/ft
Velocity	5.76	ft/s
Velocity Head	0.52	ft
Specific Energy	0.99	ft
Froude Number	1.68	
Maximum Discharge	4.98	ft³/s
Discharge Full	4.63	ft³/s
Slope Full	0.00208	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	47.36	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24" HDPE @ 1.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01500	ft/ft
Diameter	2.00	ft
Discharge	26.51	ft³/s

Results

Normal Depth	1.28	ft
Flow Area	2.11	ft²
Wetted Perimeter	3.70	ft
Hydraulic Radius	0.57	ft
Top Width	1.92	ft
Critical Depth	1.80	ft
Percent Full	63.8	%
Critical Slope	0.00716	ft/ft
Velocity	12.54	ft/s
Velocity Head	2.44	ft
Specific Energy	3.72	ft
Froude Number	2.11	
Maximum Discharge	38.74	ft³/s
Discharge Full	36.02	ft³/s
Slope Full	0.00813	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	63.77	%
Downstream Velocity	Infinity	ft/s

Worksheet for 18" HDPE @ 1.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01500	ft/ft
Diameter	1.50	ft
Discharge	12.99	ft³/s

Results

Normal Depth	0.99	ft
Flow Area	1.24	ft²
Wetted Perimeter	2.85	ft
Hydraulic Radius	0.44	ft
Top Width	1.42	ft
Critical Depth	1.35	ft
Percent Full	66.2	%
Critical Slope	0.00796	ft/ft
Velocity	10.45	ft/s
Velocity Head	1.70	ft
Specific Energy	2.69	ft
Froude Number	1.97	
Maximum Discharge	17.99	ft³/s
Discharge Full	16.72	ft³/s
Slope Full	0.00905	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	66.24	%
Downstream Velocity	Infinity	ft/s

Worksheet for 24" HDPE @ 5.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.05000	ft/ft
Diameter	2.00	ft
Discharge	19.19	ft³/s

Results

Normal Depth	0.74	ft
Flow Area	1.06	ft²
Wetted Perimeter	2.62	ft
Hydraulic Radius	0.40	ft
Top Width	1.93	ft
Critical Depth	1.58	ft
Percent Full	37.0	%
Critical Slope	0.00460	ft/ft
Velocity	18.16	ft/s
Velocity Head	5.12	ft
Specific Energy	5.86	ft
Froude Number	4.33	
Maximum Discharge	70.74	ft³/s
Discharge Full	65.76	ft³/s
Slope Full	0.00426	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	37.01	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36" HDPE @ 0.6%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.00600	ft/ft
Diameter	3.00	ft
Discharge	46.27	ft³/s

Results

Normal Depth	1.83	ft
Flow Area	4.52	ft²
Wetted Perimeter	5.38	ft
Hydraulic Radius	0.84	ft
Top Width	2.93	ft
Critical Depth	2.22	ft
Percent Full	61.0	%
Critical Slope	0.00355	ft/ft
Velocity	10.25	ft/s
Velocity Head	1.63	ft
Specific Energy	3.46	ft
Froude Number	1.45	
Maximum Discharge	72.24	ft³/s
Discharge Full	67.16	ft³/s
Slope Full	0.00285	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	61.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for 36" HDPE @ 1.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01000	ft/ft
Diameter	3.00	ft
Discharge	46.27	ft³/s

Results

Normal Depth	1.56	ft
Flow Area	3.71	ft²
Wetted Perimeter	4.83	ft
Hydraulic Radius	0.77	ft
Top Width	3.00	ft
Critical Depth	2.22	ft
Percent Full	52.0	%
Critical Slope	0.00355	ft/ft
Velocity	12.47	ft/s
Velocity Head	2.42	ft
Specific Energy	3.97	ft
Froude Number	1.98	
Maximum Discharge	93.27	ft³/s
Discharge Full	86.70	ft³/s
Slope Full	0.00285	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	51.97	%
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

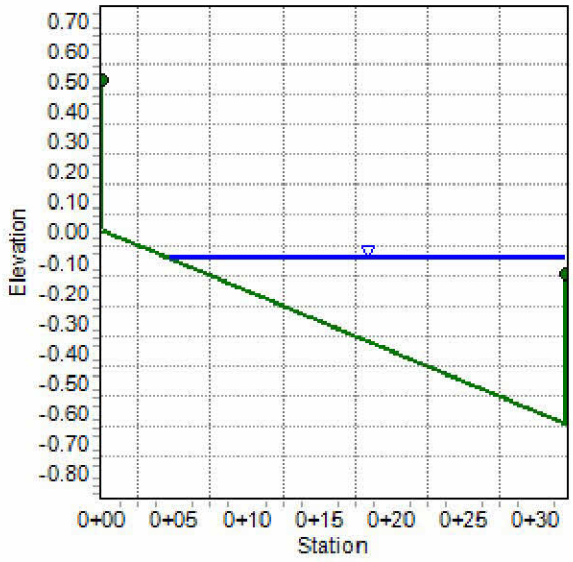
Project Description

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

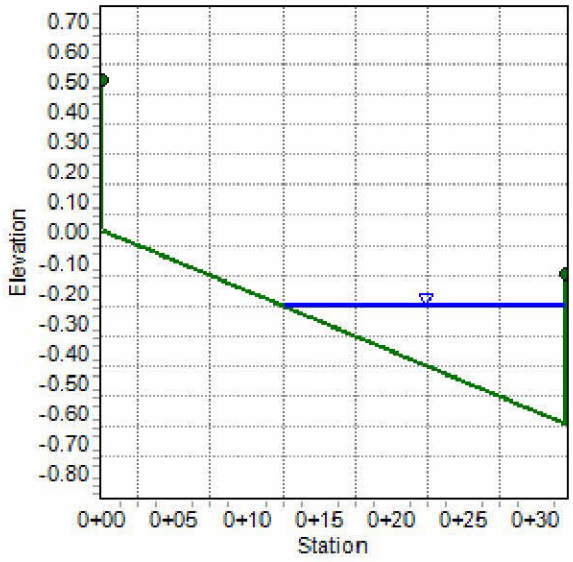
Project Description

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
For Outfall to Montano Pond

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".

Riprap Pad for Outfall to Montano Pond to be 13.30' x 8.50' x 0.50'

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.

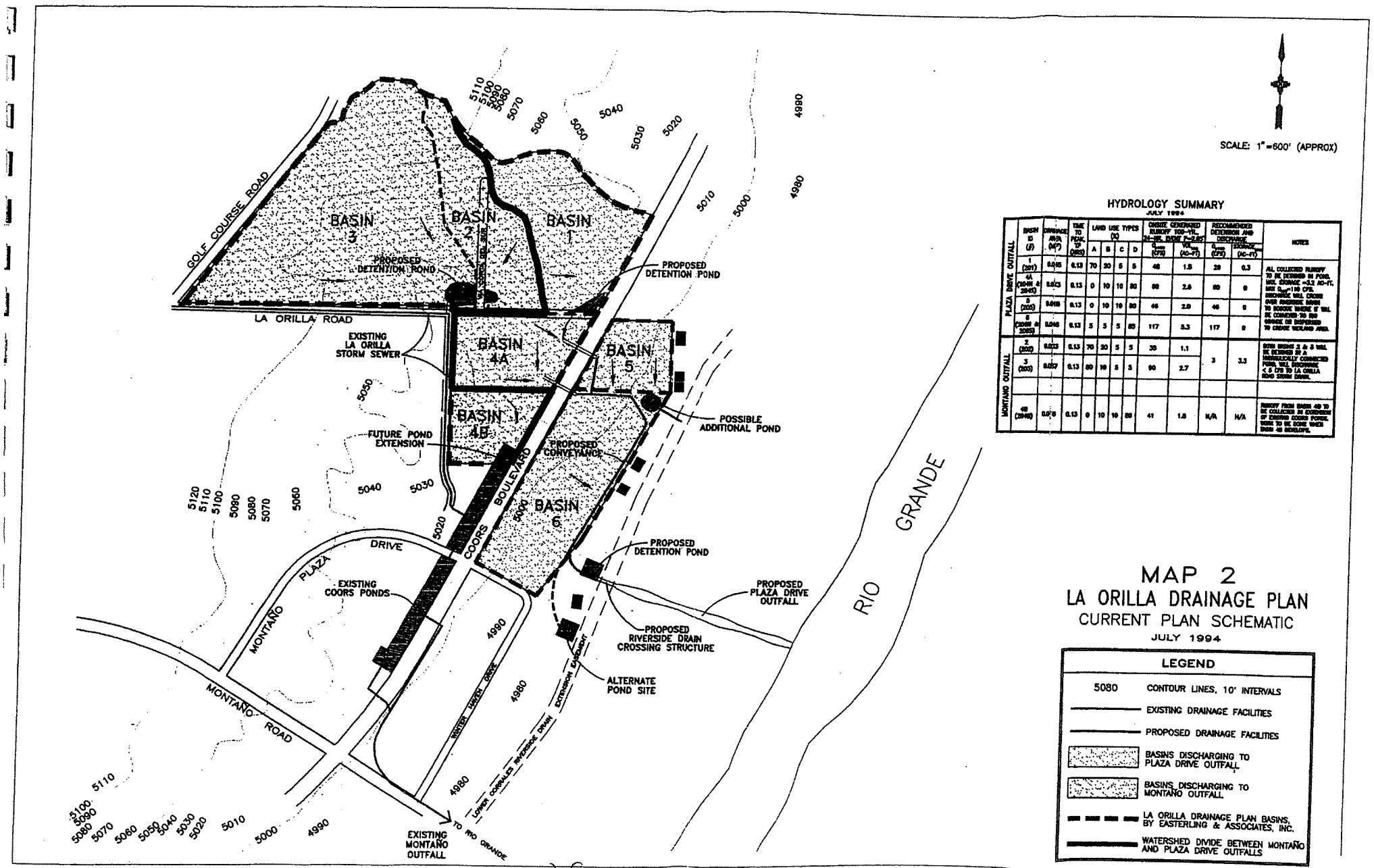
*** Type VL and L riprap shall be buried after placement to reduce vandalism.
SM9 slope mattress with toe protection may be substituted for Type VL or L riprap.
G12 gabion with toe protection may be substituted for Type M and Type H riprap.

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

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

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

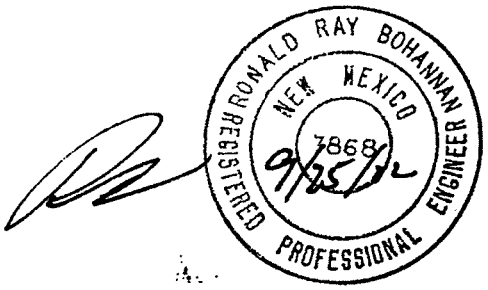
for

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.

APPENDIX I

Water Quality Weir Wall

In Regional Pond

MONTANO POND - EXISTING

Montano Pond – Existing Hydrology

Pond Bottom = 5004.80
Pond Top = 5010.80 (MWSE)

1986 Coors/Montano Drainage Detention As-Builts: Pond Capacity = 5.96 ac-ft

2003 Rio Oeste Subdivision As-Builts: Pond Extension Capacity = 1.36 ac-ft

La Orilla Estates Site Drainage Volume = 1.69 ac-ft

Fully Developed Pond Volume Capacity = 5.96 + 1.36 + 1.69 = **9.01 ac-ft**

Northern Montano Pond - Existing
Volume Calculations

A_b - Bottom Of The Pond Surface Area
A_t - Top Of The Pond Surface Area
D - Water Depth
D_t - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $A_b * D + 0.5 * C * D^2$

$C = (A_t - A_b) / D_t$

A_b =	27,043.00	ft^2
A_t =	97,448.63	ft^2
D_t =	6.00	ft
C =	11734.27	

ACTUAL ELEVATION	DEPTH (ft)	VOLUME (ac-ft)	Note
5004.80	0.00	0	BOP
5005.80	1.00	0.9572	
5006.80	2.00	2.3374	
5007.80	3.00	3.8804	
5008.80	4.00	5.5766	
5009.80	5.00	7.4266	
5010.80	6.00	9.0135	MWSE

Montano Pond – WQ Development

La Orilla Site Impervious Area = 424710 SF
Retainage Depth = 0.42" = 0.035'
Retention Volume Required = 0.035 * 424710 SF = 14864.85 CF = **0.34 ac-ft**

Rio Oeste Site = 9.96 acres
Rio Oeste Impervious Area (Assume 80% impervious) = 325553.28 SF
Retention Volume Required = 0.035 * 325553.28 = 11394.36 CF = **0.27 ac-ft**
Total WQ Retention Volume Required = 0.34 + 0.27 = 0.61 ac-ft

Northern Montano Pond - WQ Pond
Volume Calculations

A_b - Bottom Of The Pond Surface Area
A_t - Top Of The Pond Surface Area
D - Water Depth
D_t - Total Pond Depth
C - Change In Surface Area / Water Depth

Volume = $A_b * D + 0.5 * C * D^2$
$C = (A_t - A_b) / D_t$

A_b =	12,176.02	ft^2
A_t =	31,954.41	ft^2
D_t =	6.00	ft
C =	3296.40	

ACTUAL ELEVATION	DEPTH (ft)	VOLUME (ac-ft)	Note
5004.80	0.00	0.0000	BOP
5005.80	1.00	0.3286	
5006.50	1.70	0.6210	WQ MWSE
5006.80	2.00	0.7351	
5007.80	3.00	1.1988	
5008.80	4.00	1.7208	
5009.80	5.00	2.3027	
5010.80	6.00	2.9482	100-Yr MWSE

Montano Pond – Downstream Development

Water Quality Volume for remaining pond volume = 1.15 ac-ft

Northern Montano Pond - Downstream Pond
Volume Calculations

A_b - Bottom Of The Pond Surface Area

A_t - Top Of The Pond Surface Area

D - Water Depth

D_t - Total Pond Depth

C - Change In Surface Area / Water Depth

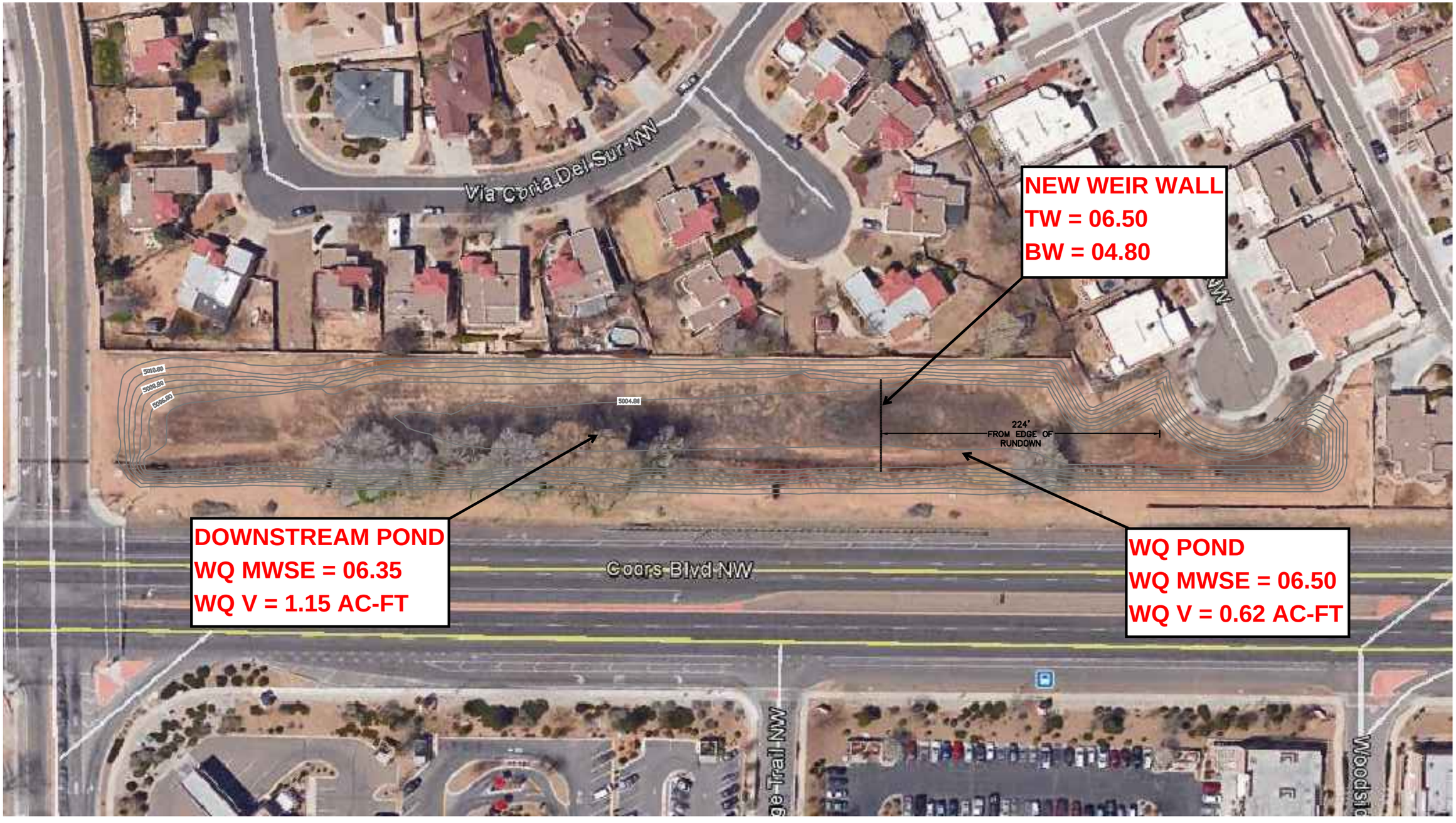
Volume = $A_b * D + 0.5 * C * D^2$

$C = (A_t - A_b) / D_t$

A_b =	14,821.60	ft^2
A_t =	65,385.43	ft^2
D_t =	6.00	ft
C =	8427.31	

ACTUAL ELEVATION	DEPTH (ft)	VOLUME (ac-ft)	Note
5004.80	0.00	0.0000	BOP
5005.80	1.00	0.6272	
5006.35	1.55	1.1521	WQ MWSE
5006.80	2.00	1.5992	
5007.80	3.00	2.6766	
5008.80	4.00	3.8488	
5009.80	5.00	5.1148	
5010.80	6.00	6.4774	100-Yr MWSE

WQ MWSE = 5006.35 < 5006.50 (Top of Weir Wall) Therefore OK



MONTANO POND - WQ IMPROVEMENTS

TIERRA WEST, LLC

Project _____ Date _____

Project No. _____

Meeting Purpose _____ Sheet No ___ of ___

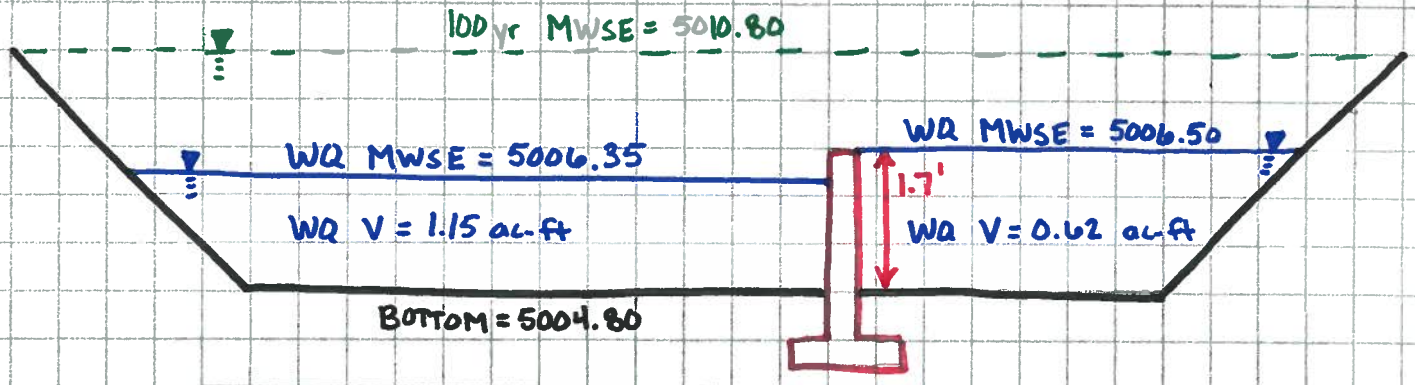
Attendees _____ _____

_____ _____

_____ _____

_____ _____

_____ _____



LA ORILLA WQ POND SCHEMATIC

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

Vinny Perea

From: Wolfe, Bryan K. <BWolfe@cabq.gov>
Sent: Monday, March 21, 2016 1:21 PM
To: Vinny Perea; Jude Baca (jbaca10@aol.com) (jbaca10@aol.com)
Cc: Biazar, Shahab; Daggett, Kevin; Lozoya, Melissa; Cherne, Curtis; Abiel X. Carrillo
Subject: RE: Village @ La Orilla First Flush Pond Variance Request

Mr. Perea and Mr. Baca,
The Department of Municipal Development (DMD) will allow you to build the first-flush water quality feature in our existing pond. We will require, however, that you still incorporate other LID's where it is still reasonable do so as part of your development. For those defined areas, please work with Shahab Biazar, City Engineer, and his team.
Thank you,

Bryan Wolfe, P.E.
Acting Deputy Director

Department of Municipal Development
City Of Albuquerque
P.O. Box 1293
Albuquerque, New Mexico 87102
(505) 768-3858

From: Vinny Perea [mailto:vperea@tierrawestllc.com]
Sent: Monday, March 14, 2016 9:02 AM
To: Wolfe, Bryan K.; Jude Baca (jbaca10@aol.com) (jbaca10@aol.com)
Cc: Abiel X. Carrillo; Biazar, Shahab; Daggett, Kevin
Subject: RE: Village @ La Orilla First Flush Pond Variance Request

Hi Bryan,

I've attached an email from earlier last year from the County Drainage Engineer, Don Briggs, stating that he would be okay with water quality retention in the city regional pond. Would this suffice for your request?

Thanks,

Vinny Perea
Engineer Intern, EIT

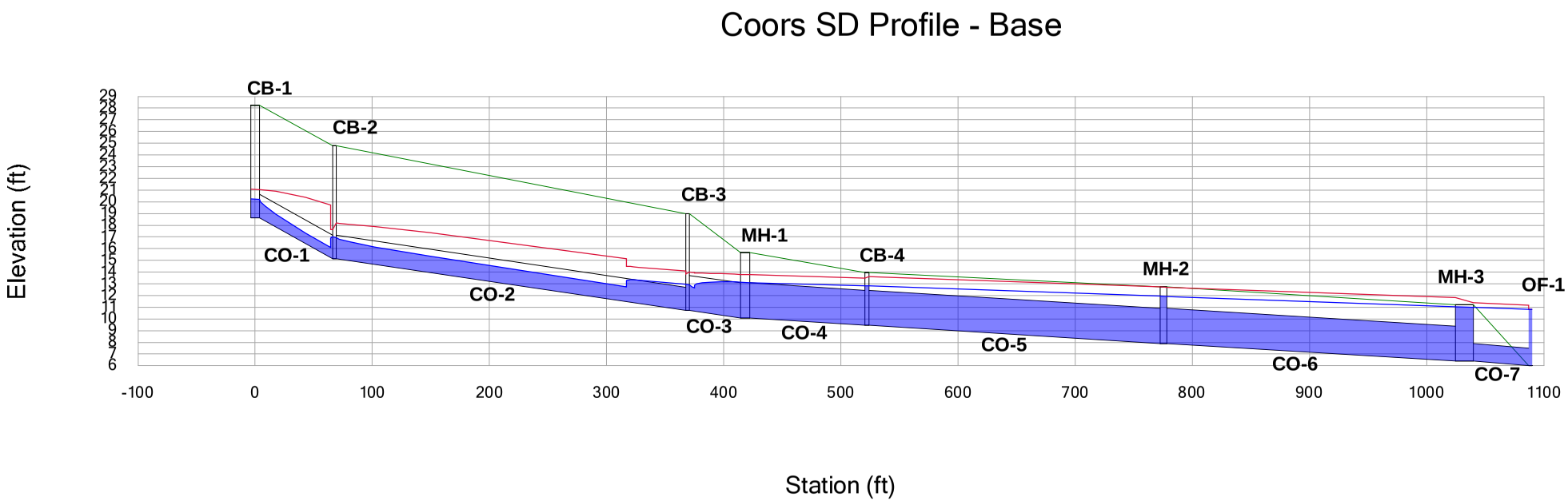
Tierra West, LLC
5571 Midway Park Pl. NE
Albuquerque, NM 87109
Office: (505) 858-3100
Fax: (505) 858-1118
1-800-245-3102
www.tierrawestllc.com

APPENDIX J

Hydraulic Grade Line Analysis

STORM DRAIN ROUTING ANALYSIS

Profile Report
Profile: Coors SD Profile



MH-3
MH-3

Calculation Detailed Summary

Element Details			
ID	13	Notes	
Label	Base Calculation Options		

Hydraulic Summary			
Flow Profile Method	Backwater Analysis	Average Velocity Method	Actual Uniform Flow Velocity
Number of Flow Profile Steps	5	Minimum Structure Headloss	0.00 ft
Hydraulic Grade Convergence Test	0.001 ft	Minimum Time of Concentration	5.000 min

Inlets			
Neglect Side Flow?	False	Active Components for Combination Inlets In Sag	Grate and Curb
Neglect Gutter Cross Slope For Side Flow?	False	Active Components for Combination Inlets on Grade	Grate and Curb

HEC-22			
Elevations Considered Equal Within	0.50 ft	Depressed Unsubmerged	1.000
Consider Non-Piped Plunging Flow	False	Half Bench Submerged	0.950
Flat Submerged	1.000	Half Bench Unsubmerged	0.150
Flat Unsubmerged	1.000	Full Bench Submerged	0.750
Depressed Submerged	1.000	Full Bench Unsubmerged	0.070

AASHTO			
Expansion, Ke	0.350	Shaping Adjustment, Cs	0.500
Contraction, Kc	0.250	Non-Piped Flow Adjustment, Cn	1.300

Bend Angle vs. Bend Loss Curve

Bend Angle (degrees)	Bend Loss Coefficient, Kb
0.00	0.000
15.00	0.190
30.00	0.350
45.00	0.470
60.00	0.560
75.00	0.640
90.00	0.700

Generic Structure Loss			
Governing Upstream Pipe Selection Method	Pipe with Maximum QV		

Calculation Detailed Summary

Catchment Summary

Label	Area (acres)	Time of Concentration (min)	Rational C	Catchment CA (acres)	Catchment Intensity (in/h)	Catchment Rational Flow (ft³/s)

Conduit Summary

Label	Conduit Description	Conduit Shape	Branch ID	Subnetwork Outfall	Flow (Link) (ft³/s)	Velocity (Average) (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Depth (In Link) (ft)	Depth (Out Link) (ft)
CO-1	Circular Pipe - 24.0 in	Circular Pipe	2	OF-1	19.19	18.38	20.23	17.01	1.58	1.86
CO-2	Circular Pipe - 24.0 in	Circular Pipe	2	OF-1	26.51	12.45	16.95	12.98	1.80	2.27
CO-3	Circular Pipe - 36.0 in	Circular Pipe	1	OF-1	46.27	13.68	12.93	13.14	2.22	3.06
CO-4	Circular Pipe - 36.0 in	Circular Pipe	1	OF-1	46.27	6.55	13.10	12.81	3.02	3.36
CO-5	Circular Pipe - 36.0 in	Circular Pipe	1	OF-1	50.60	7.16	12.81	11.95	3.36	4.05
CO-6	Circular Pipe - 36.0 in	Circular Pipe	1	OF-1	50.60	7.16	11.91	11.03	4.01	4.63
CO-7	Circular Pipe - 18.0 in	Circular Pipe	1	OF-1	50.60	4.77	11.01	10.80	4.61	4.80
CO-8	Circular Pipe - 12.0 in	Circular Pipe	1	OF-1	2.11	5.90	18.94	17.06	0.62	1.40
CO-9	Circular Pipe - 18.0 in	Circular Pipe	1	OF-1	12.99	10.98	17.01	12.98	1.35	2.27

Node Summary

Label	Element Type	Subnetwork Outfall	Flow (Total Surface) (ft³/s)	Flow (Total Out) (ft³/s)
CB-1	Catch Basin	OF-1	19.19	19.19
CB-2	Catch Basin	OF-1	7.32	26.51
CB-3	Catch Basin	OF-1	6.77	46.27
CB-4	Catch Basin	OF-1	4.33	50.60
CB-5	Catch Basin	OF-1	2.11	2.11
CB-6	Catch Basin	OF-1	10.88	12.99

Calculation Detailed Summary

Node Summary

Label	Element Type	Subnetwork Outfall	Flow (Total Surface) (ft³/s)	Flow (Total Out) (ft³/s)
MH-1	Manhole	OF-1	0.00	46.27
MH-2	Manhole	OF-1	0.00	50.60
MH-3	Manhole	OF-1	0.00	50.60

Elevation (Ground) (ft)	Elevation (Invert) (ft)	Energy Grade Line (In Node) (ft)	Energy Grade Line (Out Node) (ft)
28.23	18.65	21.08	21.04
24.80	15.15	17.63	18.18
18.98	10.71	13.82	13.99
13.97	9.45	13.47	13.61
20.80	18.32	19.22	19.20
21.00	15.66	17.17	17.94
15.65	10.08	13.80	13.77
12.73	7.90	12.74	12.70
11.23	6.40	11.83	11.37

Inlet Summary

Label	Inlet Type	Catalog Inlet Type	Catalog Inlet	Flow (Total Intercepted) (ft³/s)
CB-1	(N/A)	(N/A)	(N/A)	0.00
CB-2	(N/A)	(N/A)	(N/A)	0.00
CB-3	(N/A)	(N/A)	(N/A)	0.00
CB-4	(N/A)	(N/A)	(N/A)	0.00
CB-5	(N/A)	(N/A)	(N/A)	0.00
CB-6	(N/A)	(N/A)	(N/A)	0.00

Flow (Total Bypassed) (ft³/s)	Bypass Target	Capture Efficiency (Calculated) (%)	Gutter Depth (in)	Gutter Spread (ft)
0.00	(N/A)	100.0	0.0	0.0
0.00	(N/A)	100.0	0.0	0.0
0.00	(N/A)	100.0	0.0	0.0
0.00	(N/A)	100.0	0.0	0.0
0.00	(N/A)	100.0	0.0	0.0
0.00	(N/A)	100.0	0.0	0.0