

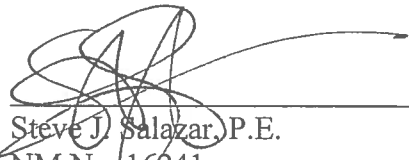
DRAINAGE REPORT

for

TRACT 8 AT THE TRAILS UNIT II Albuquerque, New Mexico

AUGUST 2006

I, Steve J. Salazar, do hereby certify that this report was prepared by me or under my direction and that I am a duly registered Professional Engineer under the laws of the State of New Mexico.



Steve J. Salazar, P.E.
NM No. 16241

Date

8/8/06

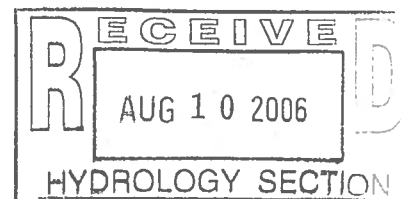


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Exhibit B: FEMA Flood map with site

Exhibit C: Zone Atlas Sheet C-9-Z with site

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(Located in Pockets)

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Appendix C: FLOWMASTER Street Capacity Analysis

Appendix D: HYDRAFLOW Storm Drain Sizing Analysis

Introduction

Wilson & Company prepared this drainage report under contract to Longford Homes. The document provides a basis for the design of storm water conveyance systems within Tract 8 of the Trails Unit II (subject property). The objective of this report is to analyze the hydrologic characteristics associated with the existing and developed conditions.

Tract 8 of the Trails Unit II is a single-family residential subdivision with 64 total lots within The Trails master planned community. The "Master Drainage Study for The Trails Subdivision", dated December 2003, prepared by Bohannon-Huston, Inc (BHI Study) outlines the major drainage requirements for the entire Trails development. This DMP covers a large area surrounding the subject property. The master planned area will drain through a series of detention surge ponds to the southeast corner of the Trails project to reduce flows. As established in the "Amendment to The Trails Subdivision Master Drainage Study", dated May 5, 2004 and prepared by Wilson & Company, a future storm drain system (currently under design, COA#761281) is scheduled to carry developed flows from the southeast corner of the Trails south to the Boca Negra Detention Dam. Wilson & Company has revised the BHI Study as the project progresses to more accurately model the drainage conditions. This revised Drainage Master Plan is included in this report as Plate 2 (also referred to as the Overall Pond Grading & Drainage Plan for Future Developed Conditions). The Drainage Master Plan establishes revised Basin, Pond and Hydrologic summary data. Tract 8 of The Trails Unit II drains to the South-Easement storm drain system of The Trails Unit II COA # 730084, which ultimately drains to the Universe Blvd. storm drain system to the Boca Negra dam scheduled to be built with Trails Unit II COA # 761281 as outlined in the "Amendment to The Trails Subdivision Master Drainage Study", dated May 5, 2004.

Project Description

The proposed development is located within the city limits of Albuquerque, New Mexico. The subject property consists of approximately 9.44 acres of undeveloped land on the west side of Albuquerque, south of Ventana Ranch subdivision. The Trails Subdivision is located on Albuquerque's Northwest Mesa, west of Universe Boulevard and south of Paseo Del Norte. The subject property is bound by Tract 9A of the Trails to the west, Universe Blvd. to the east, Town of Alameda Grant to the south, and Tract 7 at the Trails Unit II to the north. See Exhibit A, Vicinity Map.

There are currently eight other tracts within the Trails Subdivision that are developed or under construction - Santa Fe at the Trails (Tract C of the Trails), Taos at the Trails (Tract D of the Trails), Heritage at the Trails Units I and II (Tract A & B of the Trails respectively), The Reserve at the Trails (Tract F of the Trails), Santa Fe II at the Trails Unit II (Tract 6 of the Trails Unit II), Valle Vista at The Trails Unit II (Tract 11 of Trails Unit II) and Santa Fe III at The Trails (Tract 9A of Trails Unit II). The Trails Unit II (COA #730084) is also currently under construction, which includes the development of

Woodmont Avenue, Oakridge Street, Rainbow Boulevard, Paseo Del Norte and Universe Boulevard within the boundaries of The Trails Unit II. Also included is the construction of all major drainage facilities necessary for the development of The Trails Unit II, including facilities within Tract 8.

The current legal description of the proposed development is "Tract 8 of the Trails Unit II (Filed in Book 2004C, Page 332, on 10/18/2004). The site is located on Zone Atlas Sheet C-9-Z. See Exhibit C for site location on this Zone Atlas Sheet. Tract 8 of Trails Unit II is currently zoned R-D. No portion of Tract 8 lies within the 100-year flood zone based on FIRM Map #35001C0111D dated September 20, 1996. See Exhibit B for site location on the Flood Insurance Rate Map.

Existing Conditions

Tract 8 of Trails Unit II consists of approximately 9.44 acres of undeveloped land on the west side of Albuquerque, south of Ventana Ranch subdivision. Currently, the site is located in a local depression with slopes ranging from 2% to 5% and is covered with native grasses, scrub brush, and exposed basaltic ridges. The soils are classified as Alameda Sandy Loam (AmB) for slopes based on sheet 10 of Soil survey of Bernalillo County. See Exhibit D for site location on the Soils map. A shallow basaltic layer runs subsurface of the natural grade, and varies in depth from 0 ft to 9 ft.

Developed Conditions

(Refer to Plates 1 & 2 – Interim and Developed Conditions)

The developed site will consist of 64 lots of single-family housing. Tract 8 of Trails Unit II is contained within Basins L of the Drainage Master Plan. Proposed flows for individual sub-basins are determined based on an area percentage of the overall Basin L flow. The overall Basin L has an area of 27.03 acres and a fully developed 100-year flow of 78.21 cfs. This plan develops 34.92% (9.44 acres) of the total 27.03 acres. The total generated runoff for Tract 8 under fully developed conditions is 27.31 cfs.

This report divides the proposed development into sub-basins. (See the proposed Basin Map in Plate 4). Drainage & basin boundaries were determined based on the grades established in the grading & drainage plan, and by street flow capacity and storm drain requirements. (See the Grading & Drainage Plans in Plate 3 and Street Flow Capacity Calculations in Appendix C).

Proposed flows from Sub-Basins E1 and E2 are collected through a series of inlets on Road B. See the proposed Sub-Basin Map in Plate 4. (See the HydraFlow Storm Drain Calculations and Inlet Capacity Calculations in Appendix D).

See Plate 1, Overall Pond Grading & Drainage Plan - Interim Conditions for summary tables. See Appendix A for AHYMO input and output.

In the future developed conditions, all ponds will be detention surge ponds. According to the "Amendment to the Trails Subdivision Master Drainage Study", a maximum of flowrate of 200 cfs is allowed from the Trails Subdivision. According to the revised Drainage Master Plan, a maximum flowrate of 198 cfs will enter the Universe Blvd. storm drain system to the Boca Negra Dam. See Plate 2 for the Overall Pond Grading & Drainage Plan for Developed Conditions.

Once the storm drain from The Trails to the Boca Negra Detention Dam is completed, all of the plugs in the ponds within The Trails Unit II can be removed, creating detention facilities and eliminating the need to retain runoff from the Trails.

The hydrologic analysis for the interim and developed condition was completed using the Arid Lands Hydrologic Model (AHYMO) Version 1997.02. The 100-year 24-hour return frequency storm was used as the basis of analysis. (See Appendices A & B for input and output data). Methodology outlined in Section 22.2 of the City of Albuquerque Development Process Manual was also incorporated into this analysis. Street flows have been evaluated using Flow Master by Haested Methods. Street flows were analyzed for the use of roll type curb where capacities permitted. Inlets are located to prevent exceeding the street flow capacities per the DPM. See Appendix C for street capacity analysis. Storm Drain design and analysis was performed using *Hydraflow*. See Appendix D for *Hydraflow* output.

Grading Plan

The Tract 8 of Trails Unit II Grading Plan is attached as Plate 3. It illustrates the overall grading concept for the Tract 8 of Trails Unit 2 as well as the proposed storm drain.

Conclusion

The analysis performed for this report demonstrates that the proposed system of streets and storm drainage improvements will safely convey and adequately detain the 100-year storm runoff from the offsite and the onsite basins contributing to the site development. Wilson & Company recommends that the proposed storm drain system undergo regular maintenance activities. This should include removing debris from grate inlets, as well as removing sediment buildup within the pipe system. The Future area contributing flow to the Tract 8 storm drainage system should be analyzed in greater detail at the time of development to ensure that the runoff is within the constraints of this design.

Per The Trails Unit II Construction Plans, plugs at Pond E, Pond G and Pond K are scheduled to be installed. As a result of the interim conditions analysis, Wilson & Company recommends also installing temporary plugs at Pond D and Pond F to retain runoff from the 100-year, 10-day event, until the Universe storm drain to the Boca Negra Detention Dam is constructed.

AHYMO PROGRAM SUMMARY TABLE (AHYMO_97) -
 (MON/DAY/YR) =07/31/2006
 INPUT FILE = trails.wpd
 AHYMO-C-9803C01UNMLIB-AH

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PER	COMMAND	IDENTIFICATION	NO.	NO.	(CFS)	(AC-FT)	(INCHES)	(HOURS)
ACRE	NOTATION							

*S THE TRAILS OVERALL DRAINAGE - INTERIM CONDITIONS
 *SUMMARY 1 MID. B. PIEDRAS- DEV CONDS WITH BULK - MODIFIED 7/95

```

TIME=          .00
RAINFALL TYPE= 2
RAIN24= 2.660
SEDIMENT BULK
PK BF = 1.00

```

[illegible]

Page 1

	AHYMO . SUM				
1.722 PER IMP= 11.00					
*S BASIN H IS CURRENTLY 16% DEVELOPED					
COMPUTE NM HYD BASIN.H - 20	.03110	28.24	1.015	.61193	1.550
1.419 PER IMP= 8.00					
*S BASIN L IS CURRENTLY 4% DEVELOPED					
COMPUTE NM HYD BASIN.L - 20	.02770	19.34	.703	.47583	1.550
1.091 PER IMP= 2.00					
*S BASIN J IS CURRENTLY 15% DEVELOPED					
COMPUTE NM HYD BASIN.J - 80	.05140	34.57	1.647	.60067	1.600
1.051 PER IMP= 7.50					
ROUTE RESERVOIR POND.J 80 90	.05140	9.86	1.647	.60066	2.050
.300 AC-FT= .863					
*S BASIN K IS CURRENTLY 14% DEVELOPED					
COMPUTE NM HYD BASIN.K - 85	.07050	55.37	2.215	.58923	1.550
1.227 PER IMP= 7.00					
*S*****RUNOFF FROM THE TRAILS IS CONVEYED TO THE BOCA NEGRA DETENTION FACILITY					
*S*****VIA UNIVERSE SD PER "AMENDMENT TO THE TRAILS SUBDIVISION MASTER DRAINAGE S					
*S*****DATED MAY 5, 2004 BY WILSON & CO.					
*S*****END OF THE TRAILS DRAINAGE ANALYSIS					
FINISH					

AHYMO. SUM

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 AHYMO-C-9803C01UNMLIB-AH

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- VERSION: 1997.02c
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PER		HYDROGRAPH	ID	DISCHARGE	VOLUME	PEAK
ACRE	COMMAND	IDENTIFICATION	NO.	AREA	(AC-FT)	(HOURS)
	NOTATION			(SQ MI)		

*S THE TRAILS OVERALL DRAINAGE - FULLY DEVELOPED CONDITIONS
*SUMMARY 1 MID. B. PTEDRAS- DEV CONDS WITH BULK - MODIFIED 7/95

*SUMMARY

START

TIME=.00

RAINFALL TYPE= 2

RAIN24= 2.61

SEDIMENT BULK

PK I
* *

\$***** COMPUTE ONSTTF BASTNS FROM THE TRAILS SUBDIVISION*****

COMPUTE NM HYD	OFFSITE1	-	50	19980	38.48	4.588	.43051	2.050
----------------	----------	---	----	-------	-------	-------	--------	-------

PER IMP= .00

ROUTE	RESERVOIR	OFF.POND.	1	50	53	.19980	9.40	4.588	.43051	3.250
-------	-----------	-----------	---	----	----	--------	------	-------	--------	-------

AC-FT= 2.420

COMPUTE NM HYD	-	20	.10480	222.42	9.013	1.61257	1.500
BASIN.A	-	20					

[illegible]

ADD HYD 1.500
I.A 53&20 5Z .83/21
274.45 13.601
.30460

POLITE RESERVOTR	POND A	52	50	30460	16 94	13 601	83721	2 400
------------------	--------	----	----	-------	-------	--------	-------	-------

ROUTE RESERVOIR	FUND.A	JZ	30	.30400	10.37	13.001	.03721	Z.400
AC-ET=	6.375							

COMPUTE NM	HYD	BASIN.D	-	25	.09110	151.97	7.835	1.61257	1.550
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6 PER IMP= 50.00

ADD	HYD	1.A.D	50&25	30	.39570	164.89	21.436	1.01571	1.550
-----	-----	-------	-------	----	--------	--------	--------	---------	-------

DIVIDE	HYD	30	31	.27474	16.00	14.883	1.01571	1.300
	BYPASS.D	30	31					

Source	Year	Value	Unit
Source	2000	10000	10000
Source	2001	10000	10000
Source	2002	10000	10000
Source	2003	10000	10000
Source	2004	10000	10000
Source	2005	10000	10000
Source	2006	10000	10000
Source	2007	10000	10000
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Source	2081	10000	10000
Source	2082	10000	10000
Source	2083	10000	10000
Source	2084	10000	10000
Source	2085	10000	10000
Source	2086	10000	10000
Source	2087	10000	10000

SURGE.D and	3Z	.12096	148.89	6.553	1.01571	1.550
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POLITE RESERVATR	POND D	30	50	39570	23 56	21 436	1 01571	2 700
------------------	--------	----	----	-------	-------	--------	---------	-------

ROUTE RESERVOIR	FUND.D	30	.9970	Z3.30	Z1.430	T.VIJ/I	Z.700
AC-ET=	5	387					

COMPUTE NM HYD	BASIN.C -	20	.02110	44.81	1.815	1.61257	1.500
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9 PER IMP= 50.00

ADD HYD	1.A.D.C 50&20	25	.41680	63.88	23.250	1.04593	1.500
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3.315	COMPUTE NM HYD	BASIN.F	-	20	AHYMO.SUM	274.98	11.146	1.61257	1.500
	PER IMP= 50.00				.12960				
.969	ADD HYD	1.A.D.C.F	20&25	30	.54640	338.86	34.396	1.18033	1.500
.172	DIVIDE HYD	BYPASS.F	30	31	.41899	46.00	26.376	1.18033	1.300
3.591		SURGE.F	and	32	.12741	292.86	8.021	1.18033	1.500
.097	ROUTE RESERVOIR	POND.F	30	50	.54640	33.92	34.396	1.18033	2.450
	AC-FT= 9.405								
3.318	COMPUTE NM HYD	BASIN.G	-	20	.04990	105.96	4.292	1.61257	1.500
	PER IMP= 50.00								
.364	ADD HYD	1.A.D.C.F.G	20&50	30	.59630	138.81	38.688	1.21650	1.500
.088	ROUTE RESERVOIR	POND.G	30	27	.59630	33.51	38.692	1.21664	3.400
	AC-FT= 3.656								
.280	COMPUTE NM HYD	OFFSITE2	-	55	.08050	14.42	1.848	.43051	2.050
	PER IMP= .00								
.087	ROUTE RESERVOIR	OFFPOND2	55	50	.08050	4.49	1.848	.43051	3.200
	AC-FT= .857								
3.318	COMPUTE NM HYD	BASIN.B	-	30	.04010	85.15	3.449	1.61257	1.500
	PER IMP= 50.00								
1.110	ADD HYD	2.B	50&30	35	.12060	85.67	5.297	.82355	1.500
.044	ROUTE RESERVOIR	POND.B	35	50	.12060	3.38	5.297	.82350	6.450
	AC-FT= 3.150								
1.108	COMPUTE NM HYD	BASIN.E	-	30	.06494	46.06	1.491	.43051	1.550
	PER IMP= .00								
1.981	COMPUTE NM HYD	BASIN.E1	-	32	.02480	31.45	.967	.73104	1.500
	PER IMP= 7.00								
.410	ADD HYD	2.B.E	50&30	40	.18554	48.64	6.788	.68595	1.550
.580									
	ADD HYD	2.B.E.E1	40&32	41	.21034	78.13	7.755	.69126	1.550
3.321	COMPUTE NM HYD	BASIN.E8	-	**	.00748	15.91	.644	1.61257	1.500
	PER IMP= 50.00								
.669	ADD HYD	2.B.E.E1.E8	41&**	42	.21783	93.29	8.399	.72292	1.500
.066	ROUTE RESERVOIR	POND.E	42	43	.21783	9.23	8.398	.72291	2.250
	AC-FT= 2.293								
2.772	COMPUTE NM HYD	BASIN.H1	-	33	.01830	32.46	1.101	1.12838	1.500
	PER IMP= 20.20								
4.096	COMPUTE NM HYD	BASIN.H2	-	34	.00900	23.59	1.094	2.28007	1.500
	PER IMP= 90.00								
3.208	ADD HYD	H1.H2	33&34	35	.02730	56.06	2.196	1.50804	1.500
.402									
	ADD HYD	2.B.E.E1.H1.	43&35	40	.24513	63.00	10.594	.81035	1.500

COMPUTE NM HYD	BASIN.H	-	20	AHYMO.SUM	26.30	1.109	1.79108	1.500
3.539 PER IMP= 60.00				.01161				
ADD HYD	2.B.E.H1.H2.	40&20	21	.25674	89.30	11.703	.85470	1.500
.543	POND.H	21	30	.25674	27.69	11.703	.85470	1.950
.169 AC-FT= 1.377	BYPASS.H	21	35	.23804	37.00	10.851	.85470	1.400
DIVIDE HYD								
.243	SURGE.H	and	36	.01870	52.30	.852	.85470	1.500
4.370								
CFS	PAGE = 2	HYDROGRAPH	FROM TO	AREA	DISCHARGE	RUNOFF	RUNOFF	TIME TO
PER			ID ID	(SQ MI)	(CFS)	(AC-FT)	(INCHES)	PEAK
ACRE	COMMAND	IDENTIFICATION	NO. NO.					(HOURS)
	NOTATION							
COMPUTE NM HYD	BASIN.L	-	20	.04224	78.21	3.633	1.61257	1.550
2.893 PER IMP= 50.00								
ADD HYD	2BEHL	20&30	25	.29898	100.70	15.336	.96177	1.550
.526	BASIN.J	-	80	.05140	82.74	4.421	1.61257	1.600
2.515 PER IMP= 50.00								
ROUTE RESERVOIR	POND.J	80	90	.05140	21.36	4.421	1.61256	2.100
.649 AC-FT= 2.140								
COMPUTE NM HYD	BASIN.K	-	85	.07050	128.14	6.063	1.61257	1.550
2.840 PER IMP= 50.00								
ADD HYD	J.K	90&85	91	.12190	136.13	10.484	1.61255	1.550
1.745								
ADD HYD	1ADCFG.JK	27&91	95	.71820	164.27	49.176	1.28384	1.550
.357								
ROUTE RESERVOIR	POND.K	95	70	.71820	101.37	49.176	1.28384	1.850
.221 AC-FT= 2.150								
DIVIDE HYD	BYPASS.K	95	97	.68793	80.00	47.103	1.28384	1.450
.182								
4.350	SURGE.K	and	98	.03027	84.27	2.073	1.28384	1.550
ADD HYD								
.272	TRAILS.ALL	25&70	**	1.01718	177.05	64.512	1.18917	1.600

 *****RUNOFF FROM THE TRAILS IS CONVEYED TO THE BOCA NEGRA DETENTION FACILITY
 *****VIA UNIVERSE SD PER "AMENDMENT TO THE TRAILS SUBDIVISION MASTER DRAINAGE S
 *****DATED MAY 5, 2004 BY WILSON & CO.

 *****END OF THE TRAILS DRAINAGE ANALYSIS
 FINISH

Storm Sewer Summary Report

Page 1

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		14.08	24 c	43.8	5410.47	5411.35	2.008	5411.80	5412.68	n/a	5412.68	End
2		7.04	24 c	23.4	5411.45	5411.92	2.009	5413.45	5413.43	0.12	5413.55	1
Project File: SD-INLETS3&4.stm							Number of lines: 2			Run Date: 07-31-2006		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; j - Line contains hyd. jump.												

Storm Sewer Summary Report

Page 1

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1		13.23	24 c	23.4	5411.73	5412.20	2.011	5413.02	5413.49	n/a	5413.49	End
2		6.60	24 c	21.0	5412.30	5412.72	2.002	5414.30	5414.29	0.10	5414.39	1
Project File: SD-INLETS1&2.stm								Number of lines: 2		Run Date: 07-31-2006		
NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs.												



August 24, 2006

Steve J. Salazar, P.E.
Wilson & Company, Inc.
2600 The American Road SE, Suite 100
Rio Rancho, NM 87124

Re: Taos at the Trails, Unit 2 – Engineer's Stamp dated 8-8-06 (C9/D1E)
Request for Preliminary Plat, Site Development Plan for Subdivision, Grading Permit

Dear Mr. Salazar,

Upon review of the information provided in your received on August 10, 2006, there are several items that must be addressed prior to approval of the subject requests. Those issues are detailed below.

1. The storm drain easement must be shown.
2. The total basin areas in the interim condition do not match the areas in the developed condition. Eleven (11) basins are shown on plate 1 but only nine (9) are tabularized on plate 2.
3. What does the "% Dev (acres)" column mean and how does it affect the calculations?
4. With the density you propose, ~ 6.8 dwelling units per acre, the impervious percentage would be on the order of 62% as per the DPM, Table A.5. Please provide justification of the 27.3 cfs runoff cited for the 9.44-acre development.

You provided flow rates ranging from 1.09 to 13.06 cfs per acre. At 100 % treatment A in Zone 1, we would expect no less than 1.29 cfs per acre. Based on the DPM evaluation procedure with the land treatments you propose, I am obtaining significantly different numbers than what is shown in your flow tables. Please revisit the flow calculations and correct as necessary.
6. V it is permissible for the velocity head to extend above the top of the curb elevation, the actual flow area must be contained between the curb faces. Your analysis indicates that the 4-inch roll curb will be overtopped and therefore does not meet this criterion. As such, the roll curb will need to be replaced with standard curb for the areas where design street flows exceed the 5.7 cfs capacity described in the report. Furthermore, as the southern inlets will be in a sump condition, all of the curb along that right-of-way must be standard curb.
7. The backyard flow arrows show water progressing from side yards, uphill to the backyards, and then out to the street. Please revise the plan so as to route the flows directly out to the public right-of-way.
8. The flow arrows for lots 42 and 43 do not fit with the proposed high point. The high point adjacent to lots 44 and 46 does not fit with the proposed basin boundaries. No graphical representation was given for the high point between lots 22 and 58.
9. The legend symbols for the retaining walls and storm drain inlets are not consistent with the plan drawings and no symbol is provided for the proposed curb and gutter – mountable or standard.

P.O. Box 1293

Albuquerque

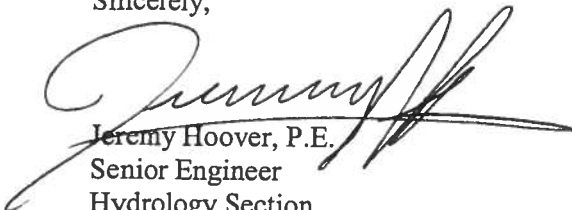
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10. The Grading and Drainage Plan line types suggest that your project, not 7300.84, will be constructing the 54-inch storm drain. Furthermore, the construction drawings for that project call out the south-easternmost manhole as "future." Please revise the line types to better define the extent of the storm drain improvements specifically associated with your project.
11. The drawing in Appendix C page 7 needs revision to increase clarity.
12. The figure in Appendix D is illegible due to the overlapping text.
13. Please show the design grades of Universe. Depending on the grades at the intersection with Woodmont, it appears that an additional inlet may be necessary.

I would be willing to meet with you to discuss these issues. If you have any questions, you can contact me at 924-3990.

Sincerely,



Jeremy Hoover, P.E.
Senior Engineer
Hydrology Section
Development and Building Services

cc: file C9/D1E