CITY OF
Albuquerque

Martin J. Chávez, Mayor

May 14, 1996

Kevin Patton
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, New Mexico 87109

RE: ENGINEER'S CERTIFICATION FOR DESERT SKY AT HIGH DESERT (E23/D3E)
ENGINEER'S STAMP DATED 4/16/96.

Dear Mr. Patton:

Based on the information provided in the submittal of April 23, 1996, the above referenced plan is adequate to satisfy the requirement for Subdivision Certification for release of financial guarantees per the Infrastructure List dated June 6, 1995.

If you should have any questions, or if I may be of further assistance to you, please call me.

Sincerely,

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Terri Martin
File

REVISED DRAINAGE REPORT
FOR
HIGH DESERT TRACT 3A SUBDIVISION

JUNE 1995

Prepared by:

BOHANNAN-HUSTON INC.
COURTYARD I, 7500 JEFFERSON STREET N.E.
ALBUQUERQUE, NM 87109

Prepared for:

SCOTT PATRICK HOMES, INC.
5353 WYOMING BLVD. NE
ALBUQUERQUE, NM 87109

PREPARED BY:

Kevin Patton 6/16/95

Kevin Patton, E.I. **Date**

UNDER THE SUPERVISION OF:

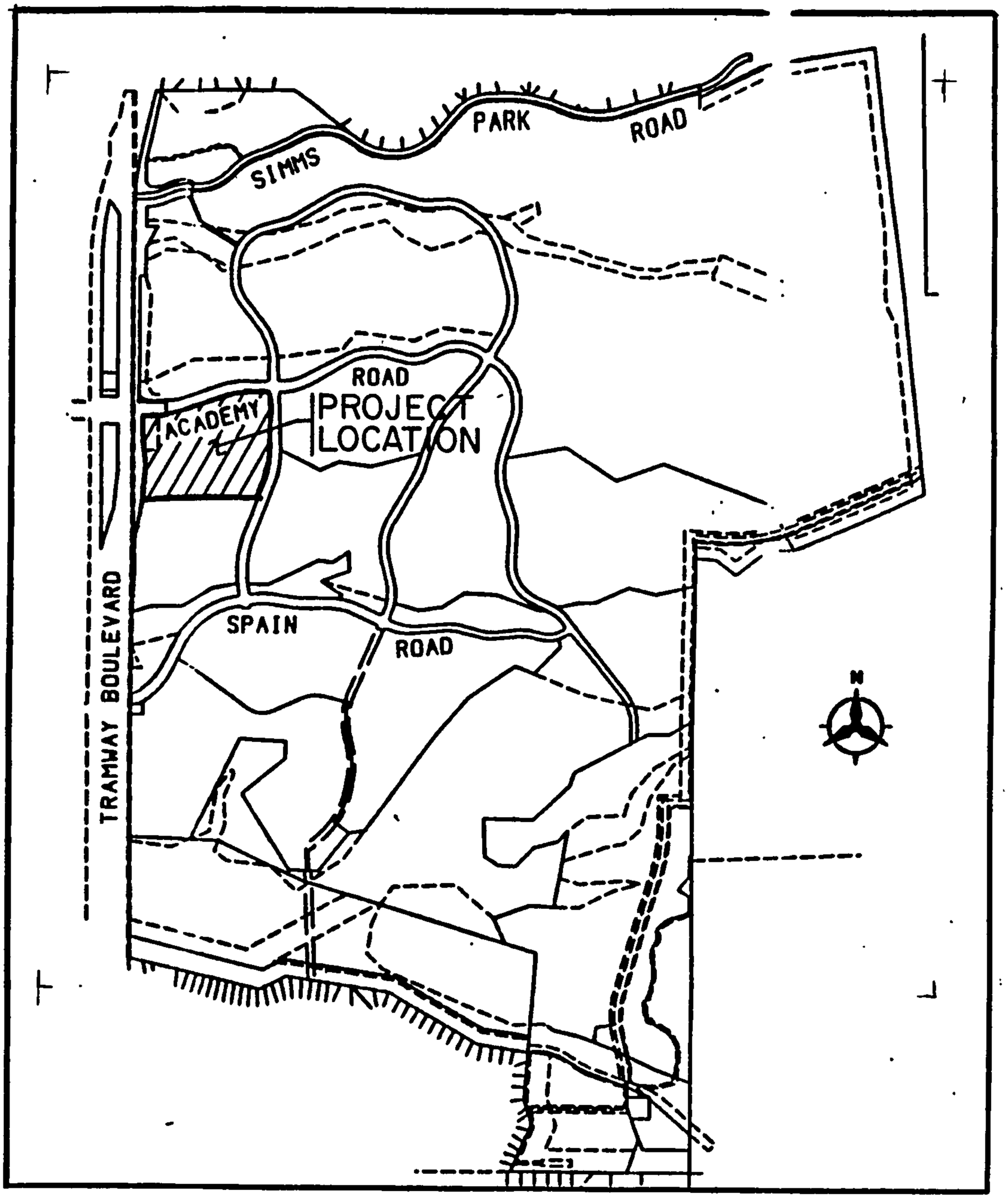
James R Topmiller 6/16/95

James Topmiller, P.E. **Date**

F:\CDP\9517043\REV_DRNG.RPT-6/7/95

JUN 19 1995

BOHANNAN-HUSTON INC.
ENGINEERS ARCHITECTS PHOTOGRAMMETRISTS SURVEYORS



LOCATION MAP

ZONE ATLAS MAP NO.E-23
NOT TO SCALE

LEGAL DESCRIPTION
TRACT 3A HIGH DESERT

I. PURPOSE

The purpose of this report is to present historic and proposed drainage conditions for the proposed subdivision of High Desert Tract 3A, and to obtain approval of the drainage report to support preliminary and final plat approval for this project.

II. METHODOLOGIES

Site conditions are analyzed for a 10-year and 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM) Volume 2, Design Criteria, Section 22.2, Hydrology, for the City of Albuquerque, January 1993.

Part A of the DPM, Section 22.2, Hydrology, January 1993, provides a simplified procedure for projects with sub-basins smaller than 40 acres. The Subdivision within Tract 3A at High Desert, referred to within the report as the "Site," is approximately 15.5 acres in size and utilizes the simplified method mentioned above. No upland drainage basins enter the site with one exception of a small portion of Cortaderia Street.

This report will reference the following City of Albuquerque approved studies prepared for the High Desert Development: 1) the *High Desert Drainage Management Master Plan*, dated December 1993, and 2) the *Final High Desert Subdivision Academy Storm Drain Design Report*, dated November 1994.

The *High Desert Drainage Management Master Plan*, dated December 1993, was prepared to support future drainage plans submitted for the development of individual land parcels within High Desert, and to provide design guidance to the installation of major drainage infrastructure to be constructed by

High Desert in advance of, or simultaneously with individual parcel development. In addition, it provides fully developed flow rates for basins that influence Tracts within the High Desert Development infrastructure.

The *Final High Desert Subdivision Academy Storm Drain Design Report*, dated November 1994, was prepared to provide the necessary hydrologic and hydraulic information for the design of the Academy Boulevard Storm Drain System within the High Desert Subdivision. That report is based upon the above mentioned *High Desert Drainage Management Master Plan*. With the acceptance of the *Final High Desert Subdivision Academy Storm Drain Design Report*, the completion of the Academy Storm Drain marks the completion of all of the offsite drainage infrastructure required for Tracts 3A, 8A, 8B, 8C, 11, 15A, 15B, 15C, and the south half of Tracts 4, 9, and 15D. The Academy Storm Drain provided stub-outs to serve future developed flows for Tract 3A.

III. SITE LOCATION AND CHARACTERISTICS

Please refer to the existing drainage conditions map enclosed with this report.

Tracts 3A - 3D are located between Tramway Boulevard and Cortaderia Street (east/west boundaries) and Academy and Spain Road (north/south boundaries). This report will reflect the development of Tract 3A. As of April 25th of this year, Tracts 3B and 3C have received preliminary plat approval and Tract 3D is designated as High Desert Open Space and will remain in its natural state.

The Site, Tract 3A at High Desert, is located at the southeast corner of the intersection of Tramway Boulevard and Academy Road. It is proposed that the 15.5 acre site be developed into 79 lots; 26 townhomes and 53 single family detached dwelling units. The entrance to the site is oriented east/west and will

access from Cortaderia Street which lies along the eastern boundary of Tract 3A. Median cuts to this entrance were built with the Phase 1A Construction that was completed and accepted in February of this year.

Vegetation consists primarily of prairie grasses and a few juniper trees. Slopes in the project site range from 2% to 8%, with the majority of the project sloping at 5% to the west. The Soil Conservation Service has classified the soils in this site area as Embudo-Tijeras complex, Embudo gravelly fine sandy loam and Tijeras gravelly fine sandy loam, all of which correspond to a common hydrological soil group classification of B.

IV. EXISTING HYDROLOGIC AND SITE DRAINAGE CONDITIONS

Please refer to the existing drainage conditions map enclosed with this report.

Approximately 14.22 acres of the 15.5 acre site drain to an existing desiltation pond at the northwest corner of the site. This pond was recently redesigned in accordance with the approved *Final High Desert Subdivision Academy Storm Drain Design Report*, dated November 1994 and the Phase 1-B-1 Construction Plans. There is an existing beehive grate on top of an eight foot diameter manhole located within the pond that directs flows through an existing 84" diameter RCP that is located beneath Academy Road to the northeast corner of Academy and Tramway. Phase 1-B-1 is currently being built and has provided a 36" diameter storm drain stub-out, from the eight foot diameter manhole located in the pond, to serve the future fully developed flows from Tract 3A. The future bulked flow rate estimated for the Tract 3A basin (known as basin id SPT-4) within that report is 66.0 cfs in the 100-year, 6 hour storm event.

FEMA Floodplain

According to the latest FEMA floodplain maps, there are no existing floodplains within the site. The closest FEMA floodplain lies adjacent to the northern right-of-way of Academy Road.

V. PROPOSED (DEVELOPED) HYDROLOGIC AND HYDRAULIC CONDITIONS

Please refer to the Grading/Drainage Plan enclosed with this report.

The proposed subdivision is broken into six drainage basins.

Basin 1 is an offsite drainage basin located within a isolated portion of Cortaderia Street and approximately 0.21 acres in size. In order to assist in balancing our earthwork, we are accepting a minor amount of storm water runoff from Cortaderia Street (approximately 1.10 cfs in 100-yr storm event) within the proposed public right-of-way of this project.

Basin 2 is a drainage basin that consists of an isolated number of rear yards that lie along the southern right-of-way of Academy Road. This basin is 0.53 of an acre in size. It is the intent, to allow the rear yards of these lots to drain the storm water runoff onto Academy Road through inverted blocks in the privacy wall along the right-of-way. The flow from each lot will then be conveyed down Academy Road into the existing inlets located 200 feet down the road. Nuisance flows will be prevented from crossing Academy road by the curb and gutter along Academy. The maximum combined amount of flow that the rear yards will generate during a 100-yr storm event is 1.90 cfs. This same approach is evident throughout the City of Albuquerque along Academy Road between Wyoming and Tramway Boulevard, Unser Boulevard between Ladera and Atrisco, etc.

Basin 3 encompasses the northern portion of the subdivision. It is approximately 6.08 acres in size and yields a 100-year storm water runoff of 27.86 cfs to the proposed street "C". The street will transport the 27.86 cfs from Basin 3 as well as 1.1 cfs from upstream Basin 1, to a type "A" single grate inlet located on the south side of the street. It will collect 7.0 cfs of the total 28.96 cfs produced, the residual amount of runoff (~22.0 cfs) will flow to Basin 5.

Basin 4 encompasses the southern portion of the subdivision. This basin will transport the runoff from individual lots to the adjacent street, street "E", which will transport the flows down to Basin 5. Basin 4 is approximately 6.35 acres in size and yields a 100-year storm water runoff of 29.09 cfs.

Basin 5 encompasses the western portion of the subdivision and receives storm water street flows from Basins 3 and 4. It is approximately 1.84 acres in size and produces 8.42 cfs of storm water runoff to the proposed street, Street "D". Street "D" will transport the runoff (~33.05 cfs) from Basins 4 and 5 to a type "A" double grate inlet located on the west side of the street. The residual from both the single "A" (~22.0 cfs) in Basin 3 and the double "A" (29.09) in Basin 5 will flow to a low point in the valley gutter north of the double "A" inlet. Two double grate type "D" inlets will be constructed at this sump location. The double "A" and double "D" inlets, as well as the storm drain pipe carrying the flows to the manhole, are analyzed based upon 2 x the 100-year storm event in order to obviate the construction of an emergency overflow spillway through the public storm drain easement located between lots 30 and 31. The original approved *Final High Desert Subdivision Academy Storm Drain Design Report* provided a stub-out to serve this Tract with an estimated future flow of 66.0 cfs in a 100-year, 6 hour storm event. The actual flows calculated for the proposed development are 66.47 cfs in a 100-year, 6 hour storm event.

Basin 6 is a drainage basin that consists of the rear yards of the lots located along the western property line of the subdivision and is 0.71 of an acre in size. Basin 6 can be broken down into three separate sub-basins that will allow the rear yards in each sub-basin to transport flows to a common water harvest pool within the property and outside of privacy walls, again through invert blocks. The maximum amount of flow that any one sub-basin will generate during a 100-yr storm event is less than 1.0 cfs. The maximum volume of each sub-basin pond during a 100 year storm event is approximately 1270 cf. This same practice has been approved on the Tract 3B drainage plan adjacent to our southern boundary.

The existing pond located in the northwest corner of the site, as well as the storm drain going from the southeast to northeast corners of Tramway and Academy, where originally sized based on the assumption that a large portion of the entire High Desert Subdivision would flow to this point. Since this is no longer the case, and Tract 3A is substantially the only source of flow using these facilities, they are now oversized. This was partially corrected with the construction of the Academy Storm Drain Project, which greatly reduced the size of the pond. The Academy Storm Drain Project also constructed a beehive grate which will remain to accept minor flows from surrounding area (<1.0 cfs).

This report proposes to reduce the size of the pond even further. This is possible because the majority of the flows from Tract 3A will now flow into the inlets in the proposed streets, and through the 36" RCP (Q=66.47cfs). (Please see the Storm Drain Plan enclosed with this report). At manhole #3, the 66.47cfs meets 8.7cfs (6.8cfs from the Final High Desert Subdivision Academy Storm Drain Design Report, plus 1.9cfs coming form Basin 2 equals 8.7cfs) coming from the inlets on the south side of Academy. These flows combine for 75.17cfs in the 36" line between MH#3 and existing MH#4. From MH#4, the flow procededs to the north in the existing 66" line. Appendix D contains calculations which show that all of the above lines have sufficient capacity.

VI. CONCLUSION

This report has presented a comprehensive drainage management plan for the proposed Tract 3A Subdivision. The plan provides safe and adequate drainage protection for the proposed development. It is recommended that this report be approved as presented.

TRACT 3A @ HIGH DESERT
EXISTING CONDITIONS

BASIN	AREA (ACRES)	% LAND TREATMENT*				PEAK DISCHARGE - (CFS/ACRE)**				Q(100-YR) EXISTING (CFS)
		A	B	C	D	A	B	C	D	
A	14.23	60.00	30.00	10.00	0.00	2.20	2.92	3.73	5.25	36.56
B	1.21	60.00	30.00	10.00	0.00	2.20	2.92	3.73	5.25	3.10

NOTES:

Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993

* Table A-4

** Table A-9

TRACT 3A @ HIGH DESERT
PROPOSED CONDITIONS

BASIN	AREA (ACRES)	% LAND TREATMENT*				PEAK DISCHARGE - (CFS/ACRE)**				Q(100-YR) PROPOSED (CFS)	Q(2x100-YR) PROPOSED (CFS)
		A	B	C	D	A	B	C	D		
1	0.21	0.00	2.00	0.00	98.00	2.20	2.92	3.73	5.25	1.10	2.20
2	0.53	0.00	20.00	78.00	2.00	2.20	2.92	3.73	5.25	1.90	---
3	6.08	0.00	11.00	27.00	62.00	2.20	2.92	3.73	5.25	27.86	55.71
4	6.35	0.00	11.00	27.00	62.00	2.20	2.92	3.73	5.25	29.09	58.19
5	1.84	0.00	11.00	27.00	62.00	2.20	2.92	3.73	5.25	8.42	16.85
6	0.71	0.00	20.00	78.00	2.00	2.20	2.92	3.73	5.25	2.55	---
										66.47	132.95

NOTES:
Obtained from Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, January, 1993
* Table A-4
** Table A-9

SECTION A-A

TRACT 3A DRAINAGE ANALYSIS OF ROLLED CURB STREET SECTION

MANNING'S N = .0170 SLOPE = .0450

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.33	4	14.63	0.30	7	29.25	0.33
2	2.00	0.00	5	26.63	0.06			
3	2.63	0.06	6	27.25	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.02	0.02	0.0	0.0	0.6	0.9	0.64
0.04	0.04	0.0	0.0	1.3	1.4	1.28
0.06	0.06	0.1	0.1	1.9	1.8	1.92
0.08	0.08	0.1	0.2	4.0	1.7	3.96
0.10	0.10	0.2	0.4	6.2	2.0	6.20
0.12	0.12	0.4	0.8	8.5	2.3	8.44
0.14	0.14	0.6	1.4	10.7	2.6	10.68
0.16	0.16	0.8	2.3	13.0	2.9	12.92
0.18	0.18	1.1	3.4	15.2	3.2	15.16
0.20	0.20	1.4	4.8	17.4	3.4	17.40
0.22	0.22	1.8	6.6	19.7	3.7	19.64
0.24	0.24	2.2	8.7	21.9	4.0	21.88
0.26	0.26	2.6	11.2	24.2	4.2	24.12
0.28	0.28	3.1	14.1	26.4	4.5	26.36
0.30	0.30	3.7	17.5	28.7	4.7	28.60
0.32	0.32	4.3	22.0	29.2	5.2	29.09
0.33	0.33	4.7	25.3	29.3	5.4	29.25

$Q_{100} = 19.1$ cfs

EGL IS BELOW ROW (.65')

SECTION B-B

TRACT 3A DRAINAGE CAPACITY OF STREET "E" W/ STANDARD C&G

MANNING'S N = .0170 SLOPE = .0430

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.37	7	28.00	0.67
2	0.17	0.00	5	26.00	0.13			
3	2.00	0.13	6	27.83	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.05	0.05	0.0	0.1	1.6	1.5	1.49
0.10	0.10	0.1	0.4	3.1	2.4	2.98
0.15	0.15	0.4	0.9	6.5	2.6	6.24
0.20	0.20	0.8	2.4	11.6	3.0	11.26
0.25	0.25	1.5	5.4	16.7	3.6	16.29
0.30	0.30	2.4	10.2	21.8	4.2	21.31
0.35	0.35	3.6	17.2	26.9	4.8	26.34
0.40	0.40	5.0	28.4	28.5	5.7	27.86
0.45	0.45	6.4	42.6	28.6	6.7	27.89
0.50	0.50	7.8	59.1	28.7	7.6	27.91
0.55	0.55	9.2	77.6	28.8	8.5	27.94
0.60	0.60	10.6	98.1	28.9	9.3	27.96
0.65	0.65	12.0	120.4	29.0	10.0	27.99
0.67	0.67	12.5	129.8	29.1	10.4	28.00

0.41 — $Q_{100} = 29.09$

EGL IS BELOW ROW (0.504 FEET)

SECTION B-B

TRACT 3A DRAINAGE CAPACITY OF STREET "C" W/ STANDARD C&G

MANNING'S N = .0170 SLOPE = .0450

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.37	7	28.00	0.67
2	0.17	0.00	5	26.00	0.13			
3	2.00	0.13	6	27.83	0.00			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.05	0.05	0.0	0.1	1.6	1.5	1.49
0.10	0.10	0.1	0.4	3.1	2.4	2.98
0.15	0.15	0.4	1.0	6.5	2.7	6.24
0.20	0.20	0.8	2.5	11.6	3.1	11.26
0.25	0.25	1.5	5.5	16.7	3.7	16.29
0.30	0.30	2.4	10.4	21.8	4.3	21.31
0.35	0.35	3.6	17.6	26.9	4.9	26.34
0.40	0.40	5.0	29.0	28.5	5.8	27.86
0.45	0.45	6.4	43.6	28.6	6.8	27.89
0.50	0.50	7.8	60.5	28.7	7.8	27.91
0.55	0.55	9.2	79.4	28.8	8.7	27.94
0.60	0.60	10.6	100.3	28.9	9.5	27.96
0.65	0.65	12.0	123.1	29.0	10.3	27.99
0.67	0.67	12.5	132.7	29.1	10.6	28.00

$Q_{100} = 28.96$ CFS

EGL IS BELOW ROW (0.373 FEET)

SECTION C-C

TRACT 3A DRAINAGE CAPACITY OF STREET "C/D" W/ STANDARD C&G

MANNING'S N = .0170 SLOPE = .0200

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.67	4	14.00	0.49	7	28.00	0.91
2	0.17	0.00	5	26.00	0.37			
3	2.00	0.13	6	27.83	0.24			

WSEL (FT)	DEPTH INC	FLOW AREA (SQ FT)	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOP WID
0.05	0.05	0.0	0.0	0.8	1.0	0.74
0.10	0.10	0.1	0.1	1.6	1.6	1.49
0.15	0.15	0.2	0.3	2.8	1.9	2.70
0.20	0.20	0.4	0.8	4.5	2.2	4.38
0.25	0.25	0.6	1.6	6.4	2.6	6.21
0.30	0.30	1.0	2.8	8.9	2.8	8.63
0.35	0.35	1.5	4.7	11.4	3.2	11.06
0.40	0.40	2.1	6.7	16.9	3.1	16.47
0.45	0.45	3.1	10.0	23.7	3.2	23.16
0.50	0.50	4.4	15.9	28.5	3.6	27.85
0.55	0.55	5.8	25.0	28.6	4.3	27.88
0.60	0.60	7.2	35.7	28.7	4.9	27.90
0.65	0.65	8.6	47.8	28.8	5.5	27.93
0.67	0.67	9.2	53.0	28.8	5.8	27.94

$Q_{100} = 28.09$ CFS

EGL IS BELOW RW (0.91')

SUMP CONDITION

ANALYSIS OF A INLET IN A SUMP CONDITION

INLET TYPE: DOUBLE GRATE TYPE "D"

WEIR:
Q=C*L*H**1.5

C=3.3
L(double grate)=[4(2.67')+2(1.8')]=14.28'
Q=3.3(14.28')H**1.5= 47.124H**1.5

ORFICE:
Q=C*A*(2GH)**0.5

C=0.6
A(double grate)=8.19 sf
Q=4.194*(64.4*H)**0.5

	WS ELEVATION	HEIGHT ABOVE "D"	Q (CFS) WEIR DOUBLE "A"	Q (CFS) WEIR DOUBLE "D"	Q (CFS) ORFICE DOUBLE "D"	TOTAL Q (CFS)		COMMENTS:
FL @ INLET #3	13.06	0.00	0.00	0.00	0.00	0.00		BEGIN WEIR CONTROL ON TYPE "D" INLETS
FL @ INLET #2	13.16	0.10	0.00	1.49	12.47	2.98		
	13.26	0.20	0.00	4.21	17.64	8.43		
	13.36	0.30	0.00	7.74	21.60	15.49		
	13.46	0.40	0.00	11.92	24.94	23.84		
FL @ INLET #4	13.56	0.50	0.00	16.66	27.88	33.32		
	13.66	0.60	0.93	21.90	30.55	44.74		FLOW BACKS UP TO DOUBLE "A" INLET
	13.76	0.70	2.64	27.60	32.99	57.84		
	13.86	0.80	4.85	33.72	35.27	72.29		ABLE TO HANDLE 100 YR STORM
	13.96	0.90	7.46	40.24	37.41	82.29		BEGIN ORFICE CONTROL @ "D" INLETS
	14.06	1.00	10.43	47.12	39.43	89.30		
	14.16	1.10	13.71	54.37	41.36	96.43		
	14.26	1.20	17.28	61.95	43.20	103.68		
	14.36	1.30	21.11	69.85	44.96	111.03		
	14.46	1.40	25.19	78.06	46.66	118.51		
ROW LIMIT	14.56	1.50	29.50	86.57	48.30	126.10		ABLE TO HANDLE 2x100 YR STORM

NOTE:
INLET #1 - SINGLE GRATE TYPE "A" INLET
INLET #2 - DOUBLE GRATE TYPE "D" INLET
INLET #3 - DOUBLE GRATE TYPE "D" INLET
INLET #4 - DOUBLE GRATE TYPE "A" INLET

THE 100 YR STORM EVENT = 66.47 CFS
THE 2 x 100 YR STORM EVENT = 132.94 CFS
THE SINGLE GRATE TYPE "A" INLET, UPSTREAM OF THE DOUBLE "D", EXCEPTS 7.0 CFS IN THE 100 YR STORM EVENT.
126.10 + 7.0 = 133.10 CFS > 132.94 CFS OK

6016.0
30
29
P=6016.0
P=66.47CFS
S=2.0%
$Q_{(25\text{ YEAR})}$ = 48.30 CFS
30" SD
36" SD
$Q_{(25\text{ YEAR})}$ = 48.30 CFS
INLET #3
Q_{100} = 28.96 CFS
Q_S =
INLET #2
Q_{100} = 21.96 CFS Residual
INLET #1
18" SD
Q_{100} = 7.0 CFS
P=6015.5
28
27
P=6015.5
$Q_{(25\text{ YEAR})}$ = 29.50 CFS
24" SD
INLET #4
64
P=6016.5
63
P=6021
EXHIBIT "A"
P=6015.5
26
65
P=6017.0
25
P=6016.5
66
STREET D
Q_{100} = 29.09 CFS
2%
P=6016.8
24
67
P=6017.5
69
P=6024

TRACT 3A NON PRESSURE FLOW ANALYSIS FOR SD

CULVERT RATING TABLE

18. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.02000

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.10733	0.38684	3.60421
4.00000	0.29241	1.60879	5.50192
6.00000	0.51564	3.56129	6.90658
8.00000	0.75883	6.05308	7.97686
10.00000	1.00831	8.84332	8.77040
12.00000	1.25151	11.64484	9.30465
14.00000	1.47474	14.10725	9.56593
16.00000	1.65981	15.74393	9.48535
18.00000	1.76715	14.85537	8.40642

$Q_{100} = 7.0$ CFS

SEE EXHIBIT "A" FOR LOCATION OF STORM DRAIN

pipe capacity

CULVERT RATING TABLE

24. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.01790

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.12504	0.43033	3.44146
4.00000	0.34416	1.82755	5.31012
6.00000	0.61418	4.14597	6.75038
8.00000	0.91669	7.25586	7.91530
10.00000	1.23901	10.98577	8.86656
12.00000	1.57080	15.13333	9.63419
14.00000	1.90258	19.46760	10.23222
16.00000	2.22490	23.72548	10.66361
18.00000	2.52741	27.59951	10.92009
20.00000	2.79743	30.70402	10.97581
22.00000	3.01655	32.45655	10.75950
24.00000	3.14159	30.26669	9.63419

$Q_{2\times100} = 29.5$ CFS

pipe capacity

CULVERT RATING TABLE

30. INCH DIAMETER PIPE

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.00980

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.14054	0.35983	2.56037
4.00000	0.38908	1.54652	3.97480
6.00000	0.69890	3.55581	5.08774
8.00000	1.05085	6.31829	6.01257
10.00000	1.43233	9.73425	6.79611
12.00000	1.83356	13.68333	7.46271
14.00000	2.24619	18.02844	8.02624
16.00000	2.66255	22.61695	8.49448
18.00000	3.07518	27.27997	8.87103
20.00000	3.47641	31.82939	9.15582
22.00000	3.85789	36.05107	9.34477
24.00000	4.20984	39.68991	9.42790
26.00000	4.51965	42.41179	9.38386
28.00000	4.76820	43.67146	9.15890
30.00000	4.90874	40.60487	8.27196

$Q_{100} = 31.15$ cfs

pipe capacity

CULVERT RATING TABLE

36. INCH DIAMETER PIPE — FROM DOUBLE D INLET TO MH #1

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.01250

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.15449	0.44833	2.90208
4.00000	0.42932	1.94186	4.52310
6.00000	0.77437	4.50271	5.81469
8.00000	1.16962	8.07580	6.90464
10.00000	1.60224	12.57135	7.84613
12.00000	2.06255	17.87699	8.66742
14.00000	2.54258	23.86308	9.38537
16.00000	3.03532	30.38526	10.01057
18.00000	3.53429	37.28548	10.54964
20.00000	4.03326	44.39171	11.00642
22.00000	4.52600	51.51670	11.38240
24.00000	5.00603	58.45480	11.67688
26.00000	5.46634	64.97620	11.88660
28.00000	5.89896	70.81562	12.00477
30.00000	6.29421	75.64853	12.01875
32.00000	6.63926	79.03140	11.90365
34.00000	6.91409	80.19234	11.59839
36.00000	7.06858	74.57102	10.54965

$Q_{100} = 38.9$ cfs

pipe capacity

CULVERT RATING TABLE

36. INCH DIAMETER PIPE - From MH #1 to MH #3

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.01000

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.15449	0.40100	2.59570
4.00000	0.42932	1.73685	4.04559
6.00000	0.77437	4.02735	5.20082
8.00000	1.16962	7.22322	6.17570
10.00000	1.60224	11.24416	7.01779
12.00000	2.06255	15.98966	7.75238
14.00000	2.54258	21.34379	8.39453
16.00000	3.03532	27.17741	8.95372
18.00000	3.53429	33.34915	9.43589
20.00000	4.03326	39.70516	9.84444
22.00000	4.52600	46.07794	10.18073
24.00000	5.00603	52.28357	10.44412
26.00000	5.46634	58.11648	10.63170
28.00000	5.89896	63.33942	10.73739
30.00000	6.29421	67.66210	10.74990
32.00000	6.63926	70.68784	10.64695
34.00000	6.91409	71.72621	10.37392
36.00000	7.06858	66.69835	9.43589

$Q_{100} = 66.47 cfs$

pipe capacity

CULVERT RATING TABLE

18. INCH DIAMETER PIPE - MH #2 to MH #3

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.05030

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.10733	0.61348	5.71582
4.00000	0.29241	2.55134	8.72536
6.00000	0.51564	5.64776	10.95298
8.00000	0.75883	9.59943	12.65031
10.00000	1.00831	14.02440	13.90876
12.00000	1.25151	18.46726	14.75602
14.00000	1.47474	22.37234	15.17037
16.00000	1.65981	24.96790	15.04258
18.00000	1.76715	23.55876	13.33154

$Q_{100} = 8.7$ cfs

pipe capacity

CULVERT RATING TABLE

36. INCH DIAMETER PIPE – MH #3 to MH #4

N = 0.01300 INCREMENT = 2.00 SLOPE = 0.24100

FLOW DEPTH (IN)	FLOW AREA (SQ FT)	DISCHARGE (CFS)	VELOCITY (FPS)
2.00000	0.15449	1.96858	12.74276
4.00000	0.42932	8.52650	19.86049
6.00000	0.77437	19.77094	25.53173
8.00000	1.16962	35.46005	30.31758
10.00000	1.60224	55.19953	34.45156
12.00000	2.06255	78.49604	38.05778
14.00000	2.54258	104.78038	41.21024
16.00000	3.03532	133.41866	43.95539
18.00000	3.53429	163.71680	46.32242
20.00000	4.03326	194.91954	48.32807
22.00000	4.52600	226.20467	49.97898
24.00000	5.00603	256.66916	51.27201
26.00000	5.46634	285.30396	52.19285
28.00000	5.89896	310.94431	52.71173
30.00000	6.29421	332.16513	52.77312
32.00000	6.63926	347.01898	52.26773
34.00000	6.91409	352.11655	50.92737
36.00000	7.06858	327.43387	46.32243

$Q_{100} = 75.17$ cfs