City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

February 13, 2001

Kevin Patton, P.E.
Bohannan Huston, Inc.
7500 Jefferson NE
Albuquerque, NM 87109

Re: Engineers Certification – Pinon Point at High Desert (E23/D3P)
Submitted for Release of Financial Guaranty
Engineers Stamp dated November 11, 2000
Engineers Certification Dated 2/9/2001

Dear Mr. Patton:

Based upon the information provided in your submittal dated 2/12/2001, the Engineering Certification for the above referenced project is approved for Release of Financial Guaranty.

If I can be of further assistance, please contact me at 924-3980.

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Senior Civil Engineer, Hydrology
Public Works Dept./C.O.A.

C: Arlene Portillo, PWD – #630681
file

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

November 16, 1999

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

RE: Drainage Report and Grading and Drainage Plan for Pinon Point at High Desert, Tract 2A-1C-2A-1, (E23/D3P) Submitted for Preliminary Plat Approval, Engineer's Stamp Dated 10/22/99 on Report, and Plans Dated 11/11/99.

Dear Mr. Patton:

Based on the information provided in the submittals of October 22, 1999 and November 12, 1999, the above referenced Report and Grading Plan for Pinon Point Subdivision are approved for Preliminary Plat action.

The above referenced plan is also approved for Rough Grading provided that it is approved at the DRB. A topsoil disturbance permit must be obtained before any grading may occur on this site.

As you are aware, the Subdivision Improvements Agreement (SIA) must be in place prior to Final Plat sign-off. The grading and drainage certification is required prior to release of the SIA or financial guarantees for this subdivision. Please include existing and/or proposed street grades for Spain on the certification.

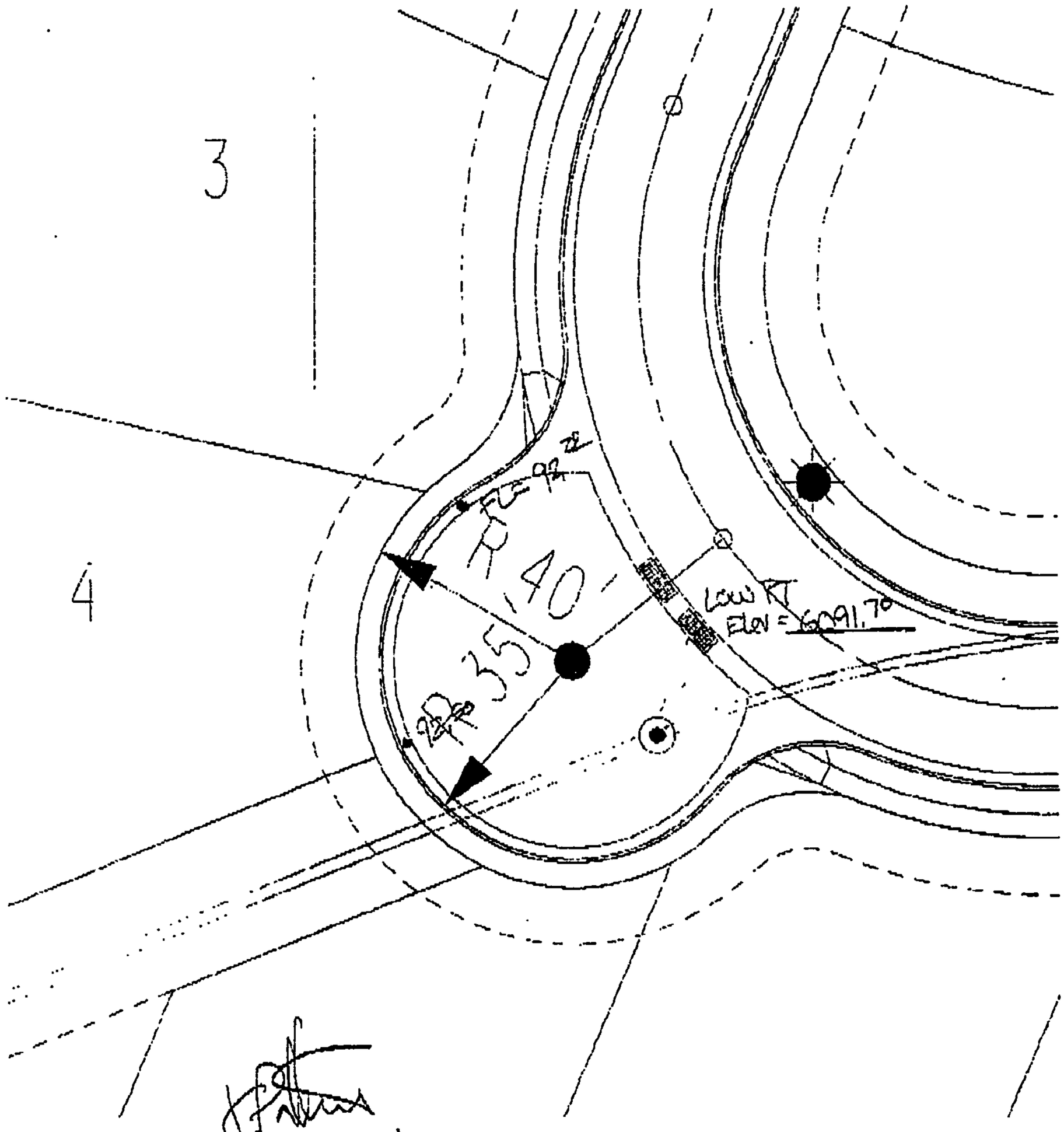
If you have any questions, or if I may be of further assistance to you, please call me at 924-3982.

Sincerely,

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

c: Fred Aguirre, DRB-99-262
Whitney Reierson, City Hydrology
File

Post-it® Fax Note 7671	Date 1-15-01	# of pages ▶ 1
To Kim Kumpis	From Ki PATTON	
Co./Dept. Kumpis-Vaughn	Co. BHI	
Phone # 338-2352	Phone # 823-1000	
Fax # 338-2353	Fax #	



Q 2×100yr = 46 cfs

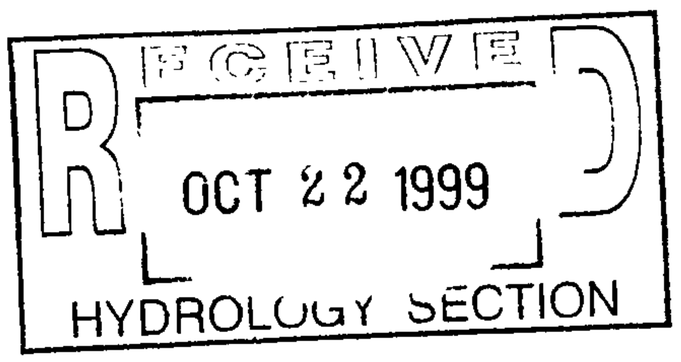
Low Pt Grate Elev = 6091.70

Water surface elev = 6092.20
for 2×100 yr
6 hr

See Approved (CLOMR)
BHI Drainage Report
for Pinon Point @
High Desert dated
Oct. 22, 1999

DRAINAGE REPORT
FOR
PINON POINT SUBDIVISION
(TRACT 2A-1C-2A-1)
AT HIGH DESERT

OCTOBER 22, 1999



PREPARED BY:

BOHANNAN HUSTON, INC.
COURTYARD I
7500 JEFFERSON STREET NE
ALBUQUERQUE, NM 87109

PREPARED FOR:

MESA VERDE DEVELOPMENT
6060 SAN MATEO BLVD NE
ALBUQUERQUE, NM 87109

PREPARED BY:

Colleen Garcia 10-22-99

Colleen Garcia, E.I. **Date**

UNDER THE SUPERVISION OF:

Kevin Patton 10/22/99

Kevin Patton, P.E. **Date**

I. INTRODUCTION

Tract 2A-1C-2A-1 (Pinon Point Subdivision) is 21 acres located southeast of the Spain Road/Imperata Street intersection in the High Desert Development. Imperata Street and the Soltera Subdivision is due east, The Canyons Subdivision is directly south and Spain Road borders the northern boundary.

The High Desert Development is bound by a Sector Development Plan within the City of Albuquerque and Bernalillo County. Tract 2A-1C-2A-1 is zoned SU-2 HD/R-LT.

The Pinon Point Subdivision will be mass graded. The subdivion currently slopes from east to west. Two major factors require the subdivision to drain to two different storm drain systems; the existing Golden Aster storm drain system built with the Imperata Street extension work order and the Spain Road storm drain system built with the Phase I-B work order.

The first factor requiring the split is the amount of run-off that can enter the Golden Aster storm drain system (41.25 cfs). The Golden Aster storm drain system was originally designed to contain all of the developed flows from Pinon Point Subdivision. Desert Song Subdivision was then constructed and its flow diverted into the Golden Aster storm drain system. With additional Desert Song flows the capacity of Golden Aster's storm drain system will allow 41.25 cfs of Pinon Point Subdivision's developed flows. The remainder must be diverted into the Spain Road storm drain system.

The second factor requiring the split is the grade difference between the Spain Road storm drain system and the low point of the subdivision. The proposed sump in Pinon Point Subdivision is significantly lower than the Spain Road system. The sump inlet at the southwest corner of the Pinon Point Subdivision is too low (elevation) to drain to the existing Spain storm drain stub-out (elevation). The roadways within Pinon Point Subdivision will provide curb and gutter which will channel the storm water runoff to downstream inlets. These inlets will then direct the southern flows into the existing Golden Aster storm drain system. The northern flows will flow into the Spain Road storm drain system.

II. PURPOSE OF REPORT

The purpose of this report is to provide site-specific drainage analysis for existing, interim and ultimate conditions for the residential development, referred to as Pinon Point at High Desert (Tract 2A-1C-2A-1). This plan is prepared and submitted to support grading, infrastructure design, preliminary and final plat approvals.

The application submitted to the Development Review Board is requesting a sidewalk waiver along the East Side of Imperata Street and along one side of the private roadways internal to the subdivision. This waiver request is consistent with the approved Sector Development Plan for the High Desert Development.

III. METHODOLOGIES AND REFERENCES

Site conditions are analyzed for a 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.

The site, as described in the "Site Location and Characteristics" section below, is approximately 21 acres. Therefore, Part A of the DPM, Section 22.2, which provides a simplified procedure for projects with sub-basins smaller than 40 acres, was used.

This drainage report is consistent with a number of approved drainage reports that exist in and around this development. The following City of Albuquerque and Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the High Desert Development may be referenced throughout this report:

High Desert Drainage Management Master Plan, December 1993, prepared by BHI.

Drainage Report for High Desert - Imperata Street Extension, January 1996, prepared by BHI.

Drainage Report for Desert Song Subdivision, Oct. 1998, prepared by Mark Goodwin & Assoc.

Drainage Report for the Canyons at High Desert, May 22, 1998 prepared by BHI.

The above referenced reports are associated with the development of Pinon Point Subdivision in some manner. Additional information on the above mentioned reports can be found summarized in the paragraphs below.

The *High Desert Drainage Management Master Plan*, dated December 1993, was prepared to support drainage plans for the development of individual land parcels within High Desert and to provide design guidance for the design of primary drainage infrastructure, to be constructed by High Desert. In addition, it provides anticipated fully developed flow rates for basins that influence the Pinon Point Subdivision at High Desert.

The *Drainage Report for High Desert - Imperata Street Extension*, dated January 1996, provides street hydraulics and storm drain system capacities for the outflow of Pinon Point Subdivision. Imperata Street borders Pinon Point Subdivision to the East. The Imperata Street Extension plans show the design details of the existing temporary drainage swale and pond currently in Pinon Point Subdivision. The report also provides inlet locations and flow capacity for residual flows from Pinon Point Subdivision into Imperata Street. The storm drain system in Imperata Street flows into the Golden Aster storm drain system.

The *Drainage Report for Desert Song Subdivision*, dated October 1998, prepared by Mark Goodwin & Associates, provides quantities of flows from Desert Song Subdivision into the Golden Aster storm drain system as well as capacity calculations for the storm drain system. The Golden Aster storm drain system was not originally designed to accept the flows from the Desert Song Subdivision. This drainage report helps determine the allowable flows from Pinon Point Subdivision into the Golden Aster storm system taking into consideration the additional flows from Desert Song Subdvision. The remaining flows that surpass the Golden Aster systems capacity will then be diverted into the Spain Road storm drain system.

The *Drainage Report for the Canyons at High Desert*, dated May 22, 1998, provides information about the storm drain inlets and system adjacent to Pinon Point Subdivision. The existing drainage basins for Pinon Point Subdivision were drawn and calculated in the Canyons drainage report. In coordination with the Imperata Street Extension plans, Canyons drainage report shows the design details of the existing temporary drainage swale and pond currently in Pinon Point Subdivision. Flows from the Canyons do not enter the Golden Aster storm drain system.

IV. SUMMARY OF THE RELATED PLATTING AND EASEMENTS

Please refer to the proposed Preliminary Plat enclosed in the Exhibit section of this report. The proposed Preliminary Plat will subdivide Pinon Point into 70 lots.

The High Desert Residential Owners Association will maintain the private drainage easements containing the proposed ribbon channel running along the southern border of Lots 5 through 14.

V. SITE LOCATION AND CHARACTERISTICS

For location of the site, please refer to the Vicinity Map on the Grading and Drainage Plan enclosed with this report.

Vegetation currently consists primarily of prairie grasses and a few juniper trees. Slopes in the project site range from 2% to 15%, with the majority of the project sloping at 2% to 8%. The Soil Conservation Service has classified the soils on this site as Embudo-Tijeras complex, Embudo gravely fine sandy loam and Tijeras gravely fine sandy loam, all of which correspond to a common hydrological soil group classification B.

VI. EXISTING HYDROLOGIC AND SITE DRAINAGE CONDITIONS

The existing drainage basins and patterns are shown graphically on the Existing Drainage Conditions Map located in the Plates section of this report. A summary table is provided from the Canyons drainage report that breaks down the basins and their characteristics in Appendix A of this report. For additional information and comparison, please refer to *The Canyons at High Desert Drainage Report*, dated May 22, 1998.

The existing site consists of three drainage basins, labeled Basins 14P, 47P and 46P, consistent with the Canyons drainage plan. Basin 14P covers the northern portion of Pinon Point (Q_{100}=31.00cfs). These flows are captured in the existing swale and temporary pond currently on the western border of Pinon Point Subdivision along Imperata Street. Flows collected into this temporary pond are directed into the Golden Aster storm drain system. Basin 47P covers the southern part of Pinon Point (Q_{100}=13.93cfs). These flows travel in a southwest direction. They are currently routed by temporary berms and directed toward the temporary pond along the western border of Pinon Point Subdivision. Basin 46P is in the southeast corner of Pinon Point (Q_{100}=1.88cfs) these flows historically travel south into the Bear Canyon Arroyo and Hight Desert Open Space. There is a flood plain within the Bear Canyon Arroyo that runs along the subdivision's southwestern boundary. There are no flood plains within the subdivision.

VII. DEVELOPED HYDROLOGICAL AND HYDRAULIC CONDITIONS

The proposed drainage basins and patterns for Pinon Point Subdivision are shown graphically on the Proposed Conditions Map located in the Plates section of this report. For additional information and comparison, please refer to the *High Desert Drainage Management Master Plan*, dated December 1993. A summary table has been provided in Appendix A of this report that provides the calculated treatment types and the peak discharge for the 100-year, 6-hour storm event.

Pinon Point's fully developed conditions are made up of 10 basins (see Exhibit 4 for Proposed Conditions Basin Map). These basins flow in an easterly direction across the subdivision. Initially the Golden Aster Storm drain was designed to accommodate all of the proposed flows from the Pinon Point Subdivision. The addition of Desert Song Subdivisions flows to the Golden Aster Storm drain system limits the capacity of the system to allow a maximum of 41.25 cfs from the proposed Pinon Point Subdivision. These flows will be collected in a sump in the southeast corner of the subdivision and fed directly into the Golden Aster system. Additional flows developed within Pinon Point Subdivision will be collected in batteries of inlets and fed into the Spain Storm drain system in the north east corner of the subdivision. The Spain Storm drain system will be designed in a drainage report (by others) in congruence with this report.

Golden Aster storm drain system will contain flows from Basins P-1, P-3, P-4, P-7, P-8 & P-9. Basins P-1 (Q_{100}=7.1cfs) contains the southern half of Twilight Trail cul-de-sac and the lots adjacent to it. The flows from P-1 will travel along the southern side of the turn about and into Twilight Trail where they will join the flows from basins P-3 and P-4. P-3 (Q_{100}=20.3cfs) contains both lots and pavement along Twilight Trail and Evening Star Lane. Basin P-4 (Q_{100}=3.3cfs) is a proposed open-space/park with 85% of the slopes <10%. Drainage from the park flows onto Twilight Trail and combines with Basin P-3. Flows from Basins P-1, 3, & 4 are collected in a sump at the knuckle in the southeastern corner of the subdivision. They are then transported via storm drain to the existing Golden Aster storm drain system. Basin P-7 (Q_{100}=1.8cfs) releases backyard drainage from Lots 18 through 27 into the existing FEMA Floodplain (Tact OS2) via turned blocks in the low corner of each lot (similar to historic flows). Basin P-8 (Q_{100}=3.2cfs) captures flows from the backyards of Lots 5 through 14 and carries them via a concrete ribbon channel to a storm drain inlet where they enter the Golden Aster storm drain system. Basin P-9 (Q_{100}=2.4cfs) contains flows from the backyards of Lots 1-5 and Lots 45-47 and small flows from Moondance Lane that are west of the proposed inlets. These flows will be captured in the existing inlets along Imperata Street and directed into the Golden Aster Storm Drain System.

The Spain Road storm drain system contains flows from Basins P-2, P-5, & P-6. Basin P-2 (Q_{100}=-5.8cfs) contains the southern half of Twilight Trail cul-de-sac and the lots adjacent to it. Flows form P-2 will travel along the northern side of the turn about and into Emery Point. The flows from Basin P-6 (Q_{100}=12.5cfs) contain both lots and pavement along ~~Twilight Trail~~ Emery Point. The majority of the flows from basins P-2 and P-6 will be collected in a battery of inlets in the northeast corner of the subdivision, along Twilight Trail, and directed, through a storm drain easement, into the Spain Road storm drain system. Residual flows will be collected in the adjacent Basin P-5 and directed back to the Spain Road system. Basin P-5 (Q_{100}=19.8cfs) contains both pavement and lots along Mooondance Lane. These flows will be collected in a battery of inlets at intersection of Moondance Lane and Evening Star Lane. The majority of these flows will then be combined with those from basins P-2 & 6 and directed into the Spain Road system. 2.8 cfs of residual flows will travel to the sump in the southeastern corner of the subdivision and into the Golden Aster system.

Basin P-10 (Q_{100}= 8.2 cfs) contains flows from the backyards of Lots 35, 37 and 43 as well as Spain Road right-of-way adjacent to Pinon Point Subdivision. Spain Road is currently a dirt road that was constructed with small check dams that redirect run-off towards the existing northern arroyo. This arroyo then carries the flows to an existing pond in the northeast corner of Imperata and Spain Road. Spain Road will be developed by others. A separate grading and drainage report will determine the exact number of inlets and size of storm drain necessary. As for this submittal the roadway will remain the same dirt road that currently provides access to the Michael Emery Rear Canyon Trail Head parking.

VIII. CONCLUSION

This report has presented a comprehensive drainage management plan for the proposed residential subdivision. The plan provides safe and adequate drainage protection for the proposed development and is consistent with the previous approved *High Desert Drainage Management Master Plan,* the *Drainage Report for High Desert-Imperata Street Extension,* and the *Drainage Report for The Canyons at High Desert.* **Therefore it is recommended that this plan be approved for rough grading, preliminary and final platting actions.**

EXISTING CONDITIONS
PINON POINT

ULTIMATE PROPOSED CONDITIONS FOR
THE CANYONS AT HIGH DESERT
May-98

BASIN ID	DISCHARGES TO	AREA (ACRES)	% LAND TREATMENT* A	B	C	D	PEAK DISCHARGE - (CFS/ACRE)** A	B	C	D	Q(100-YR) DEVELOPED (CFS)
46P	Bear Canyon Arroyo	0.85	98.00	2.00	0.00	0.00	2.20	2.92	3.73	5.25	1.88
47P	Existing Detention Pond	6.29	98.00	2.00	0.00	0.00	2.20	2.92	3.73	5.25	13.93
14P	Existing Detention Pond	14.00	98.00	2.00	0.00	0.00	2.20	2.92	3.73	5.25	31.00

PINON POINT EXISTING CONDITIONS

NOTES:
1. 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
2. Comparison of Table A-5 Percent Treatment D (Impervious) to actual Percent Treatment D used for On-Site Basins:
   N = 65 units/26.33 acres
   N = 2.5
   Table A-5 %D = 7[(2.5*2.5)+(5*2.5)]^.5
   Table A-5 %D = 30.31% < 40%

Source: Approved Canyons at High Desert Drainage Report May 22, 1998.
PREPAIRED BY BOHANNAN HUSTON

A-1

HYDROLOGIC DATA -
PINON POINT
11/16/99

PROPOSED CONDITIONS

PEAK DISCHARGE, CFS/ACRE**				
EVENT	A	B	C	D
100-YR-6hr	2.2	2.92	3.73	5.25

FULLY DEVELOPED CONDITIONS
100 YR, 6 HR. STORM

SUMMARY OF HYDROLOGIC DATA

BASIN ID	DISCHARGES TO	AREA AC	AREA SQ.MI.	% LAND TREATMENT*				TIME TO PEAK	100-YR DISCHARGE CFS/AC	Q(100YR) CFS
				A	B	C	D			
P1	Golden Aster SD System	1.87	0.0029	0.0	63.1	0.0	36.9	0.1333	3.78	7.1
P2	Spain SD System	1.54	0.0024	0.0	63.1	0.0	36.9	0.1333	3.78	5.8
P3	Golden Aster SD System	5.39	0.0084	0.0	63.1	0.0	36.9	0.1333	3.78	20.4
P4	Golden Aster SD System	1.33	0.0021	0.0	85.0	15.0	0.0	0.1333	3.04	4.0
P5	Spain SD System	5.00	0.0078	0.0	63.1	0.0	36.9	0.1333	3.78	18.9
P6	Spain SD System	3.31	0.0052	0.0	63.1	0.0	36.9	0.1333	3.78	12.5
P7	Golden Aster SD System	0.58	0.0009	0.0	91.8	0.0	8.2	0.1333	3.11	1.8
P8	Golden Aster SD System	1.03	0.0016	0.0	90.0	0.0	10.0	0.1333	3.15	3.2
P9	Spain SD System	0.75	0.0012	0.0	82.9	0.0	17.1	0.1333	3.32	2.5
P10	Spain SD System	2.19	0.0034	0.0	0.0	100.0	0.0	0.1333	3.73	8.2

84.4 CFS

NOTES:

1. Obtained from Section 22.2, Hydrology, of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, July 1997
   * Table A-4
   ** Table A-9

2. Table A-5 Percent Treatment D (Impervious) used for Basin Calculations (w/ streets and lots)
   N = 70 units / 21.01 acres
   N = 3.33
   Table A-5, %D = 7*((N*N)+(n*5))^(1/2)
   Table A-5, %D = 36.9%

HYDROLOGIC DATA -
PINON POINT
10/20/99

PROPOSED CONDITIONS

PEAK DISCHARGE, CFS/ACRE**				
EVENT	A	B	C	D
100-YR-6hr	2.2	2.92	3.73	5.25

FULLY DEVELOPED CONDITIONS
100 YR, 6 HR. STORM

SUMMARY OF HYDROLOGIC DATA

BASIN ID	DISCHARGES TO	AREA AC	AREA SQ.MI.	% LAND TREATMENT*				TIME TO PEAK	100-YR DISCHARGE CFS/AC	Q(100YR) CFS
				A	B	C	D			
P1	Golden Aster SD System	1.87	0.0029	0.0	63.1	0.0	36.9	0.1333	3.78	7.1
P2	Spain SD System	1.54	0.0024	0.0	63.1	0.0	36.9	0.1333	3.78	5.8
P3	Golden Aster SD System	5.39	0.0084	0.0	63.1	0.0	36.9	0.1333	3.78	20.4
P4	Golden Aster SD System	1.33	0.0021	0.0	85.0	15.0	0.0	0.1333	3.04	4.0
P5	Spain SD System	5.00	0.0078	0.0	63.1	0.0	36.9	0.1333	3.78	18.9
P6	Spain SD System	3.31	0.0052	0.0	63.1	0.0	36.9	0.1333	3.78	12.5
P7	Golden Aster SD System	0.58	0.0009	0.0	91.8	0.0	8.2	0.1333	3.11	1.8
P8	Golden Aster SD System	1.03	0.0016	0.0	90.0	0.0	10.0	0.1333	3.15	3.2
P9	Spain SD System	0.75	0.0012	0.0	91.8	0.0	8.2	0.1333	3.11	2.3
P10	Spain SD System	2.19	0.0034	0.0	0.0	100.0	0.0	0.1333	3.73	8.2

84.3 CFS

Street not paved will drain north when paved?

Basin = street — % D too Low

NOTES:

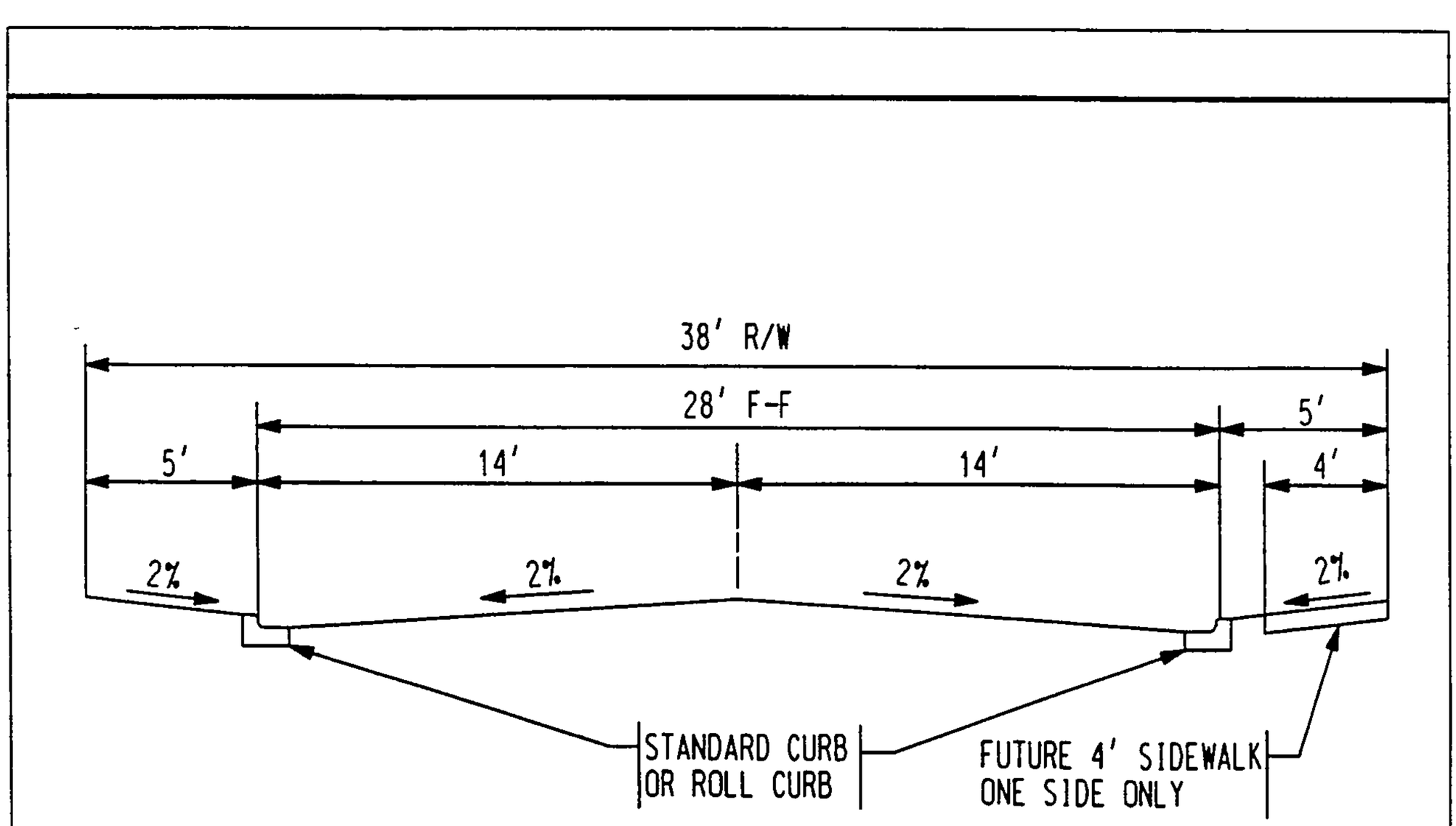
1. Obtained from Section 22.2, Hydrology, of the Development Process Manual, Volume 2, Design Criteria for the City of Albuquerque, July 1997
   * Table A-4
   ** Table A-9

2. Table A-5 Percent Treatment D (Impervious) used for Basin Calculations (w/ streets and lots)
   N = 70 units / 21.01 acres
   N = 3.33
   Table A-5, %D = 7*((N*N)+(n*5))^(1/2)
   Table A-5, %D = 36.9%

A-2

PINON POINT

TYPICAL STREET CROSS-SECTION



TYPICAL STREET SECTION A-A

NOT TO SCALE

SUMMARY OF THE ROADWAY CAPACITY ANALYSIS FOR THE PINON POINT AT HIGH DESERT

Street	Roadway Grade %	Q (100YR) in roadway (CFS)	Curb Type	Depth of water in roadway (ft)	Velocity of storm water in roadway (ft/s)	V^2/(2G)	EGL	ROW Elevation (ft)	Comments
TWILIGHT TRAIL									
Downstream of cul-de-sac	3.99	7.1	std.	0.16	4.86	0.37	0.53	0.77	OK
Upstream from first set of inlets	6.00	22.5	std.	0.25	7.63	0.9	1.15	0.77	OK*
Downstream of first set of inlets	6.00	9.9	std.	0.17	6.17	0.59	0.76	0.77	OK
MOONDANCE LANE									
Upstream from first set of inlets	4.00	13.7	std.	0.17	5.04	0.39	0.57	0.77	OK
At intersection w/ Evening Star	4.00	8.1	std.	0.22	5.78	0.52	0.74	0.77	OK
EMERY POINT									
Downstream of cul-de-sac	3.99	5.8	std.	0.24	4.42	0.3	0.54	0.77	OK
Downstream of basin boundary	3.00	18.3	std.	0.27	5.6	0.48	0.75	0.77	OK

* NOTE1: Water depth upstream of inlets is 3". At this point we have double grates on both sides of the road to absorb at total of 12.6 cfs. This will result in a EGL that is below the Right of Way. (see next row: Downstream of first inlets)

$Q = P_{2} + P_{6} = 5 \text{ E} \cdot 12.5 \text{ CFS}$

$= 18.3 \text{ CFS}$

EMERY POINT @ BASIN BOUNDARY

MANNING'S N= .013 SLOPE= .03

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.77	5	19.00	0.37	9	38.00	0.77
2	4.83	0.67	6	31.00	0.01	10	0.00	0.00
3	5.00	0.00	7	33.00	0.00	11	0.00	0.00
4	7.00	0.01	8	33.17	0.67	12	0.00	0.00

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.03	0.03	0.11	0.2	5.40	1.51	5.35	0.04	0.07
0.06	0.06	0.30	0.7	7.46	2.35	7.36	0.09	0.15
0.09	0.09	0.56	1.7	9.52	2.98	9.38	0.14	0.23
0.12	0.12	0.87	3.0	11.58	3.52	11.39	0.19	0.31
0.15	0.15	1.24	5.0	13.65	4.00	13.41	0.25	0.40
0.18	0.18	1.67	7.4	15.71	4.45	15.42	0.31	0.49
0.21	0.21	2.16	10.5	17.77	4.86	17.44	0.37	0.58
0.24	0.24	2.72	14.3	19.84	5.26	19.46	0.43	0.67
0.27	0.27	3.33	18.8	21.90	5.64	21.47	0.49	0.76
0.30	0.30	4.01	24.1	23.96	6.01	23.49	0.56	0.86
0.33	0.33	4.74	30.2	26.02	6.36	25.50	0.63	0.96
0.36	0.36	5.54	37.1	28.09	6.71	27.52	0.70	1.06
0.39	0.39	6.38	46.2	28.82	7.24	28.20	0.82	1.21
0.42	0.42	7.22	56.8	28.88	7.86	28.21	0.96	1.38
0.45	0.45	8.07	68.2	28.94	8.45	28.23	1.11	1.56
0.48	0.48	8.92	80.4	29.00	9.02	28.24	1.26	1.74
0.51	0.51	9.77	93.5	29.06	9.57	28.26	1.42	1.93
0.54	0.54	10.61	107.2	29.13	10.10	28.27	1.58	2.12
0.57	0.57	11.46	121.7	29.19	10.62	28.29	1.75	2.32
0.60	0.60	12.31	136.9	29.25	11.12	28.30	1.92	2.52
0.63	0.63	13.16	152.8	29.31	11.61	28.32	2.09	2.72
0.66	0.66	14.01	169.3	29.37	12.09	28.33	2.27	2.93
0.69	0.69	14.88	179.4	31.33	12.05	30.27	2.26	2.95
0.72	0.72	15.83	187.5	34.22	11.84	33.17	2.18	2.90
0.75	0.75	16.87	197.4	37.12	11.70	36.07	2.13	2.88
0.77	0.77	17.61	205.0	39.06	11.64	38.00	2.10	2.87

INLET 1 & 2

① $Q = 18.3 \text{ CFS}$

$d = 0.27'$

$V = 5.60$

$V_H = 0.48$

$E_H = 0.75 < 0.77' \checkmark OK$

INLET 3 $Q = 10.9$ CFS

$D = 0.24'$

INLET 4 $Q = 7.2$ CFS

$D = 0.21$

MOONDANCE LANE

- BEFORE INLETS $(P-S)(16/22) = 13.74$ CFS
- AFTER 3 INLETS $(P-S) - 3(3.6\text{CFS}) = 8.1$ CFS

MANNING'S N= .013 SLOPE= .04

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.77	5	19.00	0.37	9	38.00	0.77
2	4.83	0.67	6	31.00	0.01	10	0.00	0.00
3	5.00	0.00	7	33.00	0.00	11	0.00	0.00
4	7.00	0.01	8	33.17	0.67	12	0.00	0.00

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.03	0.03	0.11	0.2	5.40	1.74	5.35	0.05	0.08
0.06	0.06	0.30	0.8	7.46	2.71	7.36	0.11	0.17
0.09	0.09	0.56	1.9	9.52	3.44	9.38	0.18	0.27
0.12	0.12	0.87	3.5	11.58	4.06	11.39	0.26	0.38
0.15	0.15	1.24	5.7	13.65	4.62	13.41	0.33	0.48
0.18	0.18	1.67	8.6	15.71	5.13	15.42	0.41	0.59
0.21	0.21	2.16	12.2	17.77	5.62	17.44	0.49	0.70
0.24	0.24	2.72	16.5	19.84	6.08	19.46	0.57	0.81
0.27	0.27	3.33	21.7	21.90	6.52	21.47	0.66	0.93
0.30	0.30	4.01	27.8	23.96	6.94	23.49	0.75	1.05
0.33	0.33	4.74	34.8	26.02	7.35	25.50	0.84	1.17
0.36	0.36	5.54	42.9	28.09	7.74	27.52	0.93	1.29
0.39	0.39	6.38	53.4	28.82	8.37	28.20	1.09	1.48
0.42	0.42	7.22	65.6	28.88	9.08	28.21	1.28	1.70
0.45	0.45	8.07	78.8	28.94	9.76	28.23	1.48	1.93
0.48	0.48	8.92	92.9	29.00	10.42	28.24	1.68	2.16
0.51	0.51	9.77	107.9	29.06	11.05	28.26	1.90	2.41
0.54	0.54	10.61	123.8	29.13	11.66	28.27	2.11	2.65
0.57	0.57	11.46	140.5	29.19	12.26	28.29	2.33	2.90
0.60	0.60	12.31	158.1	29.25	12.84	28.30	2.56	3.16
0.63	0.63	13.16	176.4	29.31	13.41	28.32	2.79	3.42
0.66	0.66	14.01	195.5	29.37	13.96	28.33	3.02	3.68
0.69	0.69	14.88	207.1	31.33	13.92	30.27	3.01	3.70
0.72	0.72	15.83	216.5	34.22	13.67	33.17	2.90	3.62
0.75	0.75	16.87	228.0	37.12	13.51	36.07	2.84	3.59
0.77	0.77	17.61	236.7	39.06	13.44	38.00	2.81	3.58

8.1

13.74

$Q_{100} = 8.1$ CFS
$D = 0.17'$
$V = 5.04$ ft/sec
$V_H = 0.39'$
$E_H = 0.57' < 0.77'$ ✓ OK

$Q_{100} = 13.74$ CFS
$D = 0.22'$
$V = 5.78$ ft/s
$V_H = 0.52$ ft.
$E_H = 0.74 < 0.77$ ✓ OK

TWILIGHT TRAIL : ① • BEFORE 1ST SET OF INLETS (EAST OF LOT 8)
② • DOWNSTREAM OF INLETS

① 70%(P-4) + (13/21)(P3) + P1 = 22.5 CFS ② 22.5 - 2(6.3) = 9.93 CFS

TWILIGHT TRAIL AT FIRST SET OF INLETS

MANNING'S N= .013 SLOPE= .06

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.77	5	19.00	0.37	9	38.00	0.77
2	4.83	0.67	6	31.00	0.01	10	0.00	0.00
3	5.00	0.00	7	33.00	0.00	11	0.00	0.00
4	7.00	0.01	8	33.17	0.67	12	0.00	0.00

	WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
	0.03	0.03	0.11	0.2	5.30	2.10	5.25	0.07	0.10
	0.06	0.06	0.30	1.0	7.37	3.29	7.28	0.17	0.23
	0.09	0.09	0.55	2.3	9.44	4.18	9.30	0.27	0.36
	0.12	0.12	0.85	4.2	11.51	4.95	11.32	0.38	0.50
②	0.15	0.15	1.22	6.9	13.59	5.63	13.35	0.49	0.64
②	0.18	0.18	1.66	10.4	15.66	6.26	15.37	0.61	0.79
	0.21	0.21	2.15	14.7	17.73	6.85	17.40	0.73	0.94
①	0.24	0.24	2.70	20.0	19.80	7.42	19.42	0.85	1.09
①	0.27	0.27	3.31	26.4	21.87	7.96	21.44	0.98	1.25
	0.30	0.30	3.99	33.8	23.94	8.47	23.47	1.11	1.41
	0.33	0.33	4.72	42.4	26.01	8.97	25.49	1.25	1.58
	0.36	0.36	5.52	52.2	28.08	9.46	27.51	1.39	1.75
	0.39	0.39	6.36	65.0	28.82	10.22	28.20	1.62	2.01
	0.42	0.42	7.20	79.9	28.88	11.10	28.21	1.91	2.33
	0.45	0.45	8.05	96.1	28.94	11.93	28.23	2.21	2.66
	0.48	0.48	8.90	113.3	29.00	12.74	28.24	2.52	3.00
	0.51	0.51	9.74	131.7	29.06	13.51	28.26	2.84	3.35
	0.54	0.54	10.59	151.1	29.12	14.27	28.27	3.16	3.70
	0.57	0.57	11.44	171.6	29.19	15.00	28.29	3.49	4.06
	0.60	0.60	12.29	193.1	29.25	15.71	28.30	3.83	4.43
	0.63	0.63	13.14	215.5	29.31	16.40	28.32	4.18	4.81
	0.66	0.66	13.99	238.9	29.37	17.08	28.33	4.53	5.19
	0.69	0.69	14.86	253.0	31.33	17.03	30.27	4.50	5.19
	0.72	0.72	15.81	264.6	34.22	16.73	33.17	4.35	5.07
	0.75	0.75	16.85	278.6	37.12	16.54	36.07	4.25	5.00
	0.77	0.77	17.59	289.4	39.06	16.45	38.00	4.20	4.97

2) Q = 9.93 CFS
D = 0.17
V = 6.17 FPS
V_H = 0.59'
E_H = 0.7' ≤ 0.77' ✓ OK

1.) Q = 22.5
D = 0.25'
V = 7.63 FPS
V_H = 0.90'
E_H = 1.15'

DEPTH IN STREET IS ONLY 3". INLETS ARE DIRECTLY DOWNSTREAM.

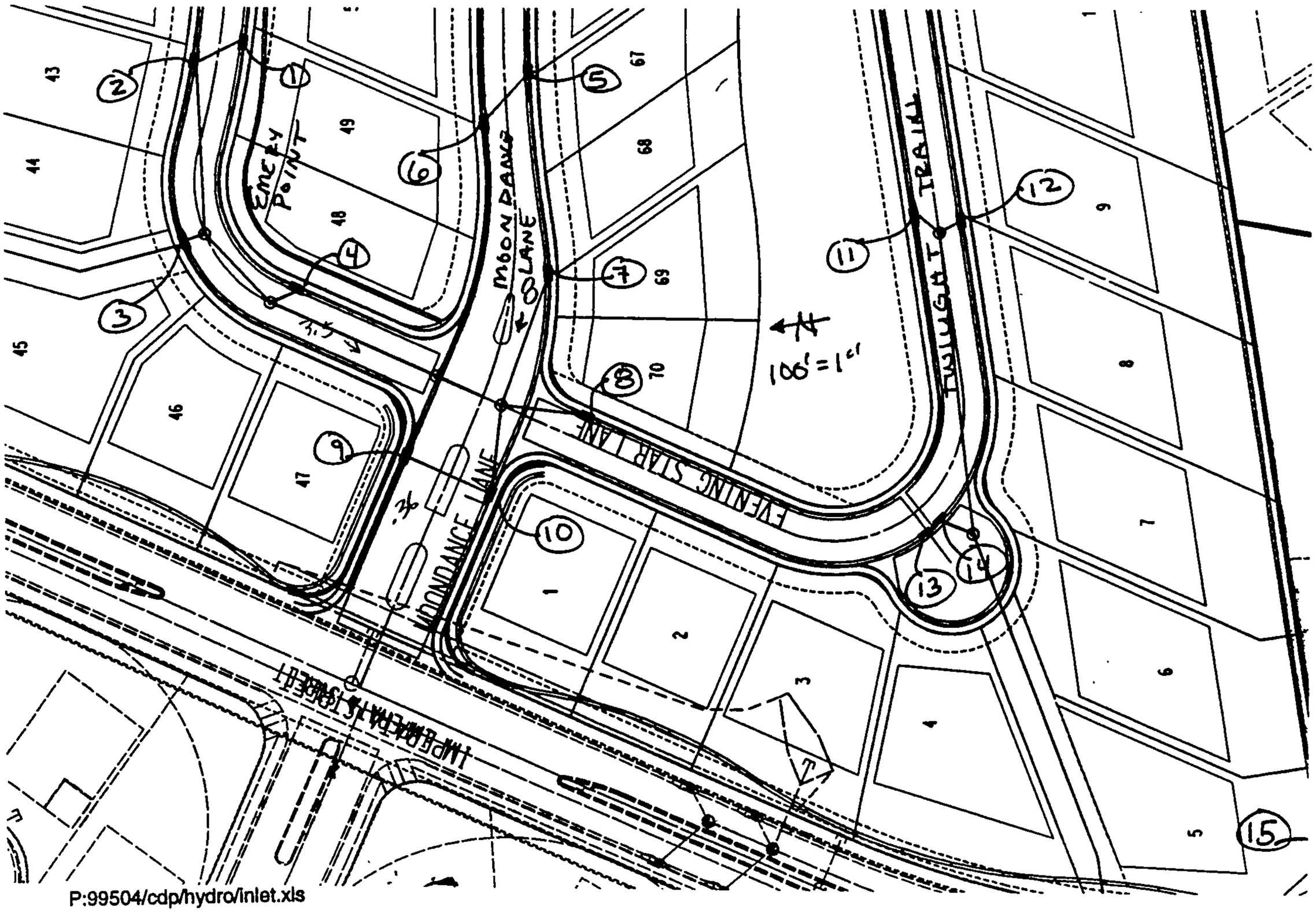
DEVELOPED CONDITIONS FOR INLETS IN PINON PIONT AT HIGH DESERT

INLET	CONDITION	TYPE	CONTRIBUTING BASIN	FLOW TO INLET* 100-YR (CFS)	STREET DEPTH (FT)	GRATE CAP. (CFS)	RESIDUAL FLOW (CFS)
1	3% grade	Double type "A"	P-2, P-6	9.15	0.27	3.70	5.45
2	3% grade	Double type "A"	P-2, P-6	9.15	0.27	3.70	5.45
3	3% grade	Double type "A"	P-2, P-6	10.90	0.24	3.70	7.20
4	3% grade	Double type "A"	P-2, P-6	7.20	0.21	3.70	3.50
5	4% grade	Double type "A"	P-5	6.85	0.22	3.60	3.25
6	4% grade	Double type "A"	P-5	6.85	0.25	3.60	3.25
7	4% grade	Double type "A"	P-5	11.70	0.20	3.60	8.10
8	4% grade	Double type "A"	P-5	4.05	0.21	2.50	1.55
9	4% grade	Double type "A"	P-6	3.78	0.23	3.60	0.18
10	4% grade	Double type "A"	P-5	3.78	0.23	3.60	0.18
11	5.7% grade	Double type "A"	P-1, P-3, P-4	11.25	0.25	6.30	4.95
12	5.7% grade	Double type "A"	P-1, P-3, P-4	11.25	0.25	6.30	4.95
13	sump	Double type "A"	P-1, P-3, P-4	10.23	0.90*	22.90**	0.00
14	sump	Triple type "D"	P-1, P-3, P-4	10.23	0.90*	22.9**	0.00
15	end of swale	single type "D"	P-8	3.20	--	3.60	0.00

* A vally gutter will transport flows across the street into the inlets. All flows will be retained below the curb top of curb (in the knuckle).

** Grates at sump sized for 2 x 100 year storm

NOTE:
See next pages for further information on the inlets in the sump condition.



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EMERY POINT INLET LAYOUT

36" = 1'

SPAIN ROAD STORM DRAIN SYSTEM

SPAIN RD

45

44

43

25' PUBLIC STORM DRAIN EASEMENTS

30" RCP

TYPE 'A' DOUBLE GRATE QCAP = 3.7 CFS

TYPE 'A' DOUBLE GRATE QCAP = 3.3CFS

EMERY POINT INLET LAYOUT REQ.

EMERY POINT

Q_{100} = 10.9 CFS

Q_{100} = 18.3 CFS

S = 3.0%

Q_{100} = 7.2CFS

Q_{100} = 3.5CFS

30" RCP

18" RCP

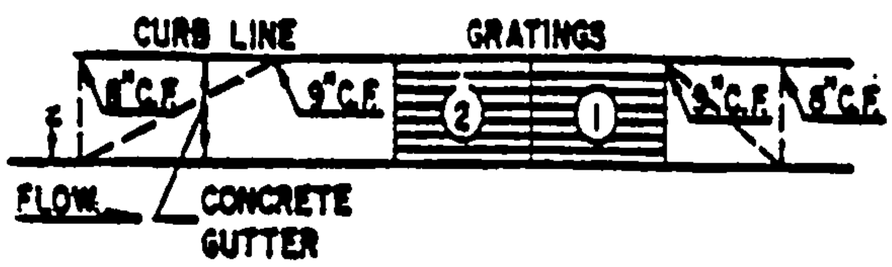
TYPE 'A' DOUBLE GRATE QCAP = 3.3 CFS

TYPE 'A' DOUBLE GRATE QCAP = 3.7 CFS

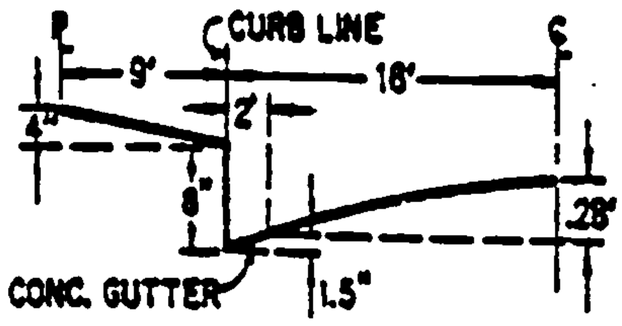
C-2

EMERY POINT :: @ SD EASEMENT

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

Q = 18.3CFS
D = 0.29
S = 3.00%

USE 4 DOUBLE INLETS

Q = 4(3.7CFS) = 14.8CFS

RESIDUAL = 3.5CFS

PLATE 22.3 D-6

C-3

MOON DANCE LANE
INLET LAYOUT
& INFO.

30' = 1"

MOON DANCE LANE

EVENING STAR LANE

TYPE 'A'
DOUBLE
GRATE
QCAP = 3.6 CFS

$Q_{RESIDUAL}$ = 0.36 CFS

Q_{100} = 3.5 CFS

30" RCP

S = 4.0%

18" RCP

24" RCP

Q_{100} = 4.05 CFS

18" RCP

S = 4.0%

Q_{100} = 8.1 CFS

18" RCP

18" RCP

Q_{100} = 4.05 CFS

TYPE 'A'
DOUBLE
GRATE
QCAP = 3.6 CFS

$Q_{RESIDUAL}$ = 1.55 CFS

TYPE 'A'
SINGLE
GRATE
QCAP = 2.50 CFS

18" RCP

S = 3.0%

Q_{100} = 11.7 CFS

TYPE 'A'
DOUBLE
GRATE
QCAP = 3.6 CFS

Q_{100} = 13.7 CFS

18" RCP

TYPE 'A'
DOUBLE
GRATE
QCAP = 3.6 CFS

70

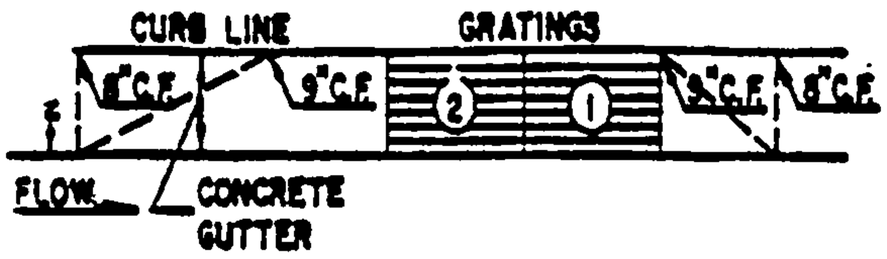
69

68

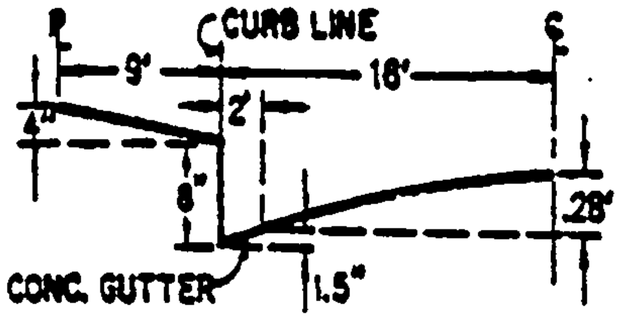
67

MOON DANCE LANE PROPOSED INLETS

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

$Q_{100} = 19.80$ CFS
$S = 30\%$
$D = 0.24'$

USE 5 DOUBLE INLETS

$Q = 5(3.6\text{CFS})$
$= 18.0\text{CFS}$

RESIDUAL = 1.8CFS

PLATE 22.3 D-6

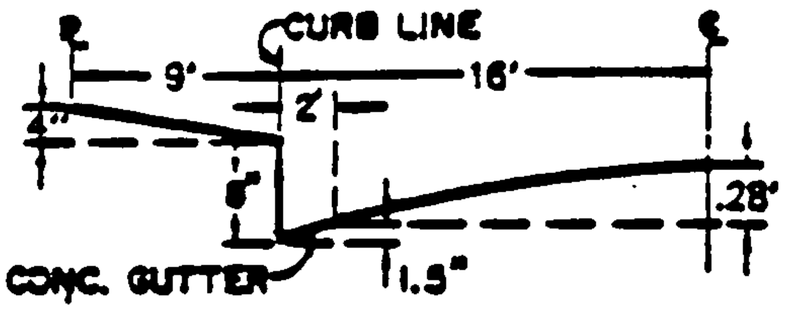
C-5

EVENING STAR PROPOSED INLET

22.3

GRATING CAPACITIES FOR TYPE "A", "C" and "D"

GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

9%
5%
2%
.2%

Q = 2 RESIDUAL

= 5.3CFS

S = 4.0%

D = 0.24

Q = 2.5CFS

RESIDUAL = 2.8CFS ✓ OK.

TWILIGHT TRAIL

INLET LAYOUT
& INFO

30' = 1"

EVENING STAR LANE

Q = 1.55 CFS

Q100 = 21.86 CFS

TWILIGHT TRAIL

TYPE 'A'
DOUBLE INLET
Q = 6.3 CFS
CAP.

Q = 22.5 CFS

S = 5.7 %

Q100 = 9.9 CFS

18" RCP

18" RCP

24" RCP

24" RCP

2 - DOUBLE TYPE 'D' INLETS
CAPACITY = 22.9 CFS
EACH

36" RCP

TYPE A
DOUBLE INLET
Q = 6.3 CFS
CAP.

IMPERATA STREET

GOLDEN ASTER
STORM DRAIN SYSTEM

7

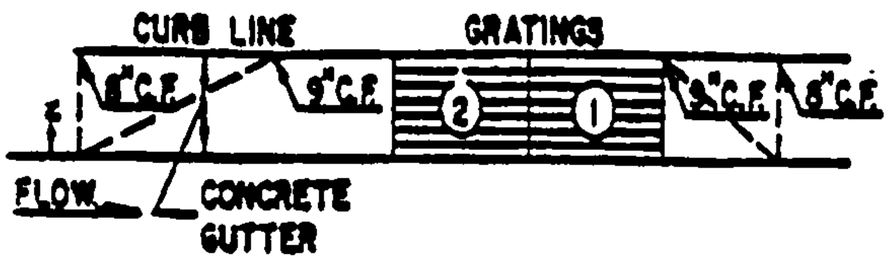
8

9

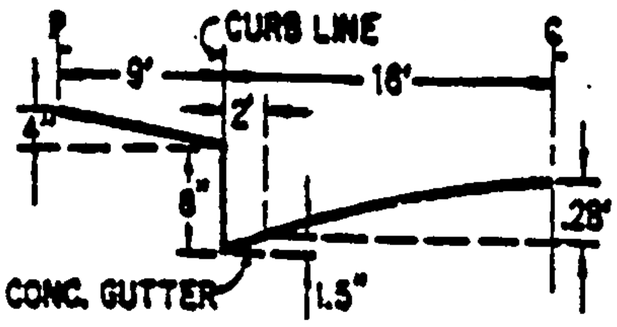
L-2

TWILIGHT TRAIL INLETS

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

S: 5.7 %
Q: 21.98 (@ pt)
D = 0.34

Q/ DOUBLE GRATE

2 GRATES = 12.6 CFS

RESIDUAL = 21.98 - 12.6
= 9.38 CFS

PLATE 22.3 D-6

C-8

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Twilight Trail and Evening Star Lane**

INLET TYPE: Double Grate Type "D" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5

Wing opening

C= 3.0

L= 4.0 ft

Q=3.0(4.0')H**1.5= 12.0H**1.5

Q=C*A*(2*G*H)**0.5

Wing opening

C=0.6

A=2.0 sf

Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	COMMENTS:	
~FL @ INLET	0.00	0.00	0.00	0.00	Flow at "D" inlet orifice control on grate analysis	
	0.10	0.10	0.85	12.47		
	0.20	0.20	2.40	17.64		
	0.30	0.30	4.41	21.60		
	0.40	0.40	6.78	24.94		
	0.50	0.50	9.48	27.88		
	0.60	0.60	12.46	30.55		
TOP OF CURB	0.70	0.70	15.71	32.99		
	0.80	0.80	19.19	35.27		
	0.90	0.90	22.90	37.41		
	1.00	1.00	26.82	39.43		
	1.10	1.10	30.94	41.36		
	1.20	1.20	35.26	43.20	Q(100 yr) = 21.86 cfs is provided at this depth	
	1.30	1.30	39.75	44.96	Q(2x100 yr) = 43.72 cfs is provided at this depth	
ROW LIMIT=1.45	**1.40**	**1.40**	**44.43**	**46.66**	Use 2-double grates, depth of water is within the R/W	
	1.50	1.50	49.27	48.30	A valley gutter crosses the street to the inlets.	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:

Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].

THE 100 YR STORM EVENT = 21.86 CFS at the sump condition

THE 2 x 100 YR STORM EVENT = 43.72 at the sump condition

GOLDEN ASTER STORM DRAIN CONNECTIONS

6

CONCRETE RIBBON CHANNEL
$Q_{100} = 3.2$ CFS

36" RCP

5

$Q_{100} = 35.5$ CFS

DOUBLE TYPE 'D' INLET
$Q_{100} = 3.2$

EXISTING SD STUB

EXISTING STORM DRAIN INLET

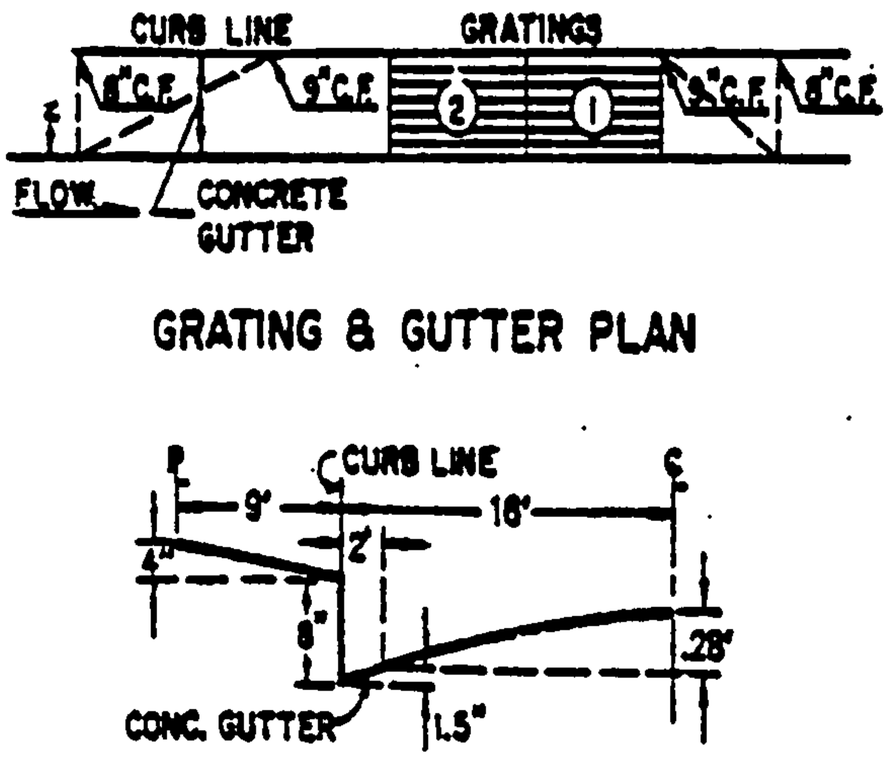
EXISTING IMPARATA ST

EXISTING GOLDEN ASTER STORM DRAIN SYSTEM

30' = 1"

GRATE @ END OF CONCRETE RIBBON CHANNEL

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN

TYPICAL HALF STREET SECTION
(ABOVE BASIN)

Slope = 6.0%
depth = 0.23'
Capacity = 3.25 CFS
Q_{100} = 3.2 CFS
✓

USE DOUBLE GRATE, TYPE 'D'

PLATE 22.3 D-6

C-11

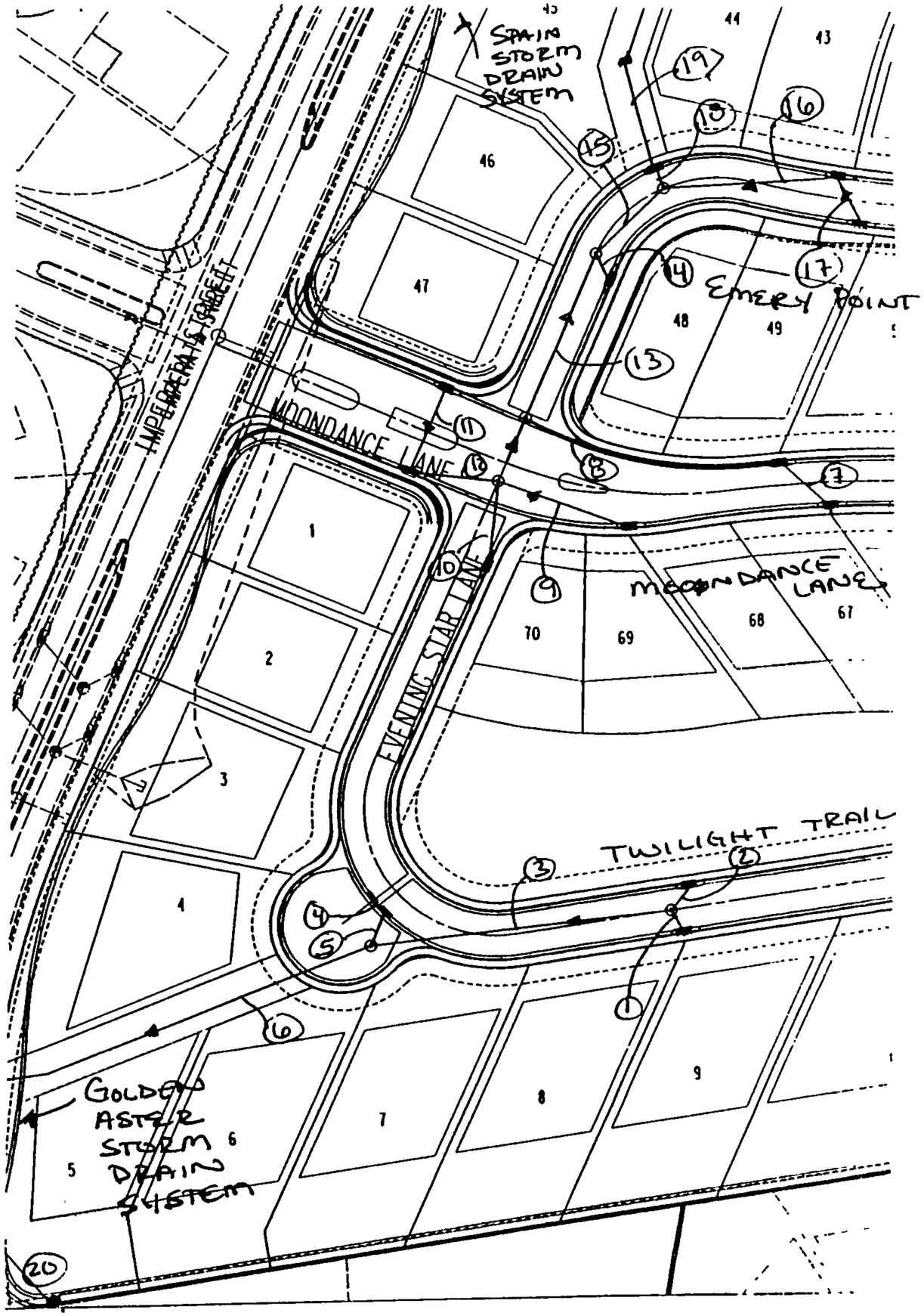
Summary

CULVERT ANALYSIS FOR PINON POINT AT HIGH DESERT

SEE EXHIBIT FOR CORRESPONDING PIPE #'S.

PIPE NO.	SIZE/TYPE	LENGTH (FT)	SLOPE (%)	PROPOSED Q (100-YR, CFS)	PIPE CAPACITY (100YR, CFS)
1	18" RCP	16.1	2.0	6.30	14.89
2	18" RCP	16.1	2.0	6.30	14.89
3	18" RCP	120.6	3.0	12.60	18.24
4	18" RCP	8.0	0.5	11.45	18.24
5	24" RCP	22.5	2.0	22.90	32.08
6	30" RCP	220.2	2.0	35.50	58.16
7	18" RCP	38.7	1.0	3.60	10.53
8	18" RCP	91.8	3.0	~~7.2~~ ~~2.65~~	18.24
9	18" RCP	67.3	3.0	3.60	18.24
10	18" RCP	59.8	0.5	2.50	7.45
11	18" RCP	52.2	0.5	3.60	7.45
12	18" RCP	58.0	0.5	7.20	7.45
13	30" RCP	131.8	0.5	20.50	31.20
14	18" RCP	15.1	1.0	3.70	10.53
15	30" RCP	54.1	0.1	24.20	31.20
16	18" RCP	93.5	3.0	7.40	18.24
17	18" RCP	26.7	1.0	3.70	10.53
18	30" RCP	10.5	1.0	35.30	41.13
19	30" RCP	162.7	1.0	35.30	41.13
20	18" RCP	65.9	1.0	3.20	10.53

p:\99504\CDP\HYDRO\CULVERT.XLS



1-a

EMERY POINT
CULVERT EXHIBIT

30' = 1"

SPAIN ROAD STORM DRAIN SYSTEM

SPAIN R

45

44

43

30" RCP

Q_{100} = 35.3CFS

30" RCP
Q_{100} = 35.30 CFS

30" RCP
Q=24.20 CFS

18" RCP
Q_{100} = 3.70 CFS

30" RCP
Q_{100} = 35.3CFS

18" RCP
Q_{100} = 7.40CFS

18" RCP
Q_{100} = 3.7 CFS

S=3.0%

EME

D-2

CULVERT LAYOUT
MOONDANCE LANE
1" = 30'

89

69

70

29

MOONDANCE LANE

EVENING STAR LANE

18" RCP Q100=3.6 CFS

18" RCP Q100=7.2 CFS

S=3.0%

18" RCP Q100=7.2 CFS

18" RCP Q100=3.6 CFS

18" RCP Q100=2.5CFS

18" RCP Q100=7.2CFS

30" RCP

30" RCP Q100=20.5CFS

18" RCP Q100=3.6CFS

S=4.0%

CULVERT EXHIBIT
TWILIGHT TRAIL

N 30' = 1"

18" RCP
Q_{100} = 6.3CFS

18" RCP
Q_{100} = 6.3 CFS

S=5.7%

18" RCP
Q_{100} = 12.6 CFS

18" RCP
Q_{100} = 11.4 CFS

24" RCP
Q_{100} = 22.9 CFS

30" RCP
Q_{100} = 35.5 CFS

GOLDEN ASTER
STORM DRAIN
SYSTEM

D-4

Concrete Ribbon Channel

$Q_{100} = 3.2$ CFS

P-8 Swale (3' wide by 6" deep)

MANNING'S N= .013 SLOPE= .06

POINT	DIST	ELEV	POINT	DIST	ELEV	POINT	DIST	ELEV
1	0.00	0.50	3	3.50	0.00			
2	0.50	0.00	4	4.00	0.00			

WSEL (FT)	DEPTH INC (FT)	FLOW AREA SQ.FT.	FLOW RATE (CFS)	WETTED PER (FT)	FLOW VEL (FPS)	TOPWID (FT)	VEL HEAD (FT)	ENERGY HEAD (FT)
0.10	0.10	0.36	2.1	3.64	5.93	3.60	0.55	0.65
0.20	0.20	0.72	6.7	3.78	9.26	3.70	1.33	1.53
0.30	0.30	1.10	13.1	3.92	11.96	3.80	2.22	2.52
0.40	0.40	1.48	21.1	4.07	14.27	3.90	3.16	3.56
0.50	0.50	1.88	30.6	4.21	16.34	4.00	4.14	4.64