DRAINAGE REPORT

FOR

PARADISE RIDGE SUBDIVISION

A 125 LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION

ALBUQUERQUE, NEW MEXICO
MARCH 2002

Prepared by:

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Genevieve L. Donart 3/29/02

Genevieve L. Donart, PE **Date**

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I. PROJECT INFORMATION

PROPOSED LEGAL DESCRIPTION:
Paradise Ridge Subdivision

EXISTING LEGAL DESCRIPTION:
Tract A-2-A, Paradise Bluff Addition (Filed in Volume C39, Folio 143, on 08/16/89) and Parcel by Warranty Deed #78-81859

ENGINEER: Isaacson & Arfman, P.A.
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Albuquerque, NM 87108
(505) 268-8828
Attn: Genevieve Donart

SURVEYOR: Aldrich Land Surveying
(505) 884-1990
Attn: Tim Aldrich, NMPLS No. 7719

DEVELOPER: Argus Development Co.
6400 Uptown Blvd NE Ste. #200W
Albuquerque, NM 87110
(505) 889-3061
Attn: Ben Spencer

NUMBER OF PROPOSED LOTS: 125

TOTAL AREA: 22.177 Acres

FLOOD PLAIN: Zone X
No portion of this site lies within a 100-year flood plain as based on Firm Map #35001C0104 dated September 20, 1996

II. INTRODUCTION

The Paradise Ridge Subdivision is a 125 lot, single-family residential subdivision within the City of Albuquerque. Justin Dr, a Bernalillo County right-of-way, borders the proposed site to the west and Paradise Blvd runs along the north property line. To the south, preliminary grading for the Paradise Vista Subdivision is completed, and there are several undeveloped tracts to the west.

This report references design information found in the approved "Final Drainage Report for Paradise Boulevard Storm Drain" dated July 23, 1999 by Mark H. Burak, P.E.

III. EXISTING CONDITIONS

Paradise Ridge currently is a 22.18 acre undeveloped tract of land, with native grasses and scrub brush. Basaltic rock is exposed or shallowly buried on much of the property. The site slopes downhill to the north and east at grades varying from approximately 2.5% to 50% along the exposed basalt ridges.

Offsite flows of 4.2 cfs and 0.3 cfs respectively enter the site from Basins OF1 and OF2. These storm waters are from undeveloped properties to the west. Preliminary grading for the Paradise Vista Subdivision to the south directs other offsite stormwater away from the property. (See the Existing Basin Map in Appendix A.)

Recent construction by Bernalillo County on Paradise Blvd east of the site included a 72" storm drain that ends in a series of inlet basins at the intersection of Paradise Blvd and Justin Dr. An existing asphalt swale on the south side of Paradise Blvd channels stormwater from areas west of the intersection to a triple Type 'D' sump inlet at the end of the storm drain system. The 34.6 cfs of flows historically produced by the site combine with the 4.5 cfs of offsite flows that cross the site to freely discharge a total of 39.1 cfs to this swale. (See Appendix A for Runoff Calculations for Existing Conditions.)

IV. PROPOSED CONDITIONS

GRADING

Grading for this site is complicated by the basaltic rock that lies at or near to the existing ground surface. In order to avoid extensive blasting, this plan raises the site using imported fill. A Grading & Drainage Plan for the proposed subdivision is in the pockets at the back of this report.

In most places, the exposed rock is buried. However, Lots 1-6, & 28-33 of Block B share a common access easement along the back property line. Within this area, there is an exposed rock ridge. Disturbance of the existing vegetation in this area is minimized, and the easement serves as a private open space area for those lots.

Throughout this site, there are slopes steeper than 3 to 1. Where the slopes are between 1.5 to 1 and 3 to 1, they require 4" thick, 2½" mean diameter fractured face rock armoring. There are no slopes steeper than 1.5 to 1 on the project.

Lots 18 and 19, Block A, Lots 1-13, Block C, and Lots 1-9, Block D all have sideyard or rearyard slopes that drain directly to Paradise Blvd. Lots 9, 10, 24, and 25, Block D have sideyard slopes that drain to Justin Dr. Each of these lots will have privacy walls at the top of the slope rather than at the property line.

DRAINAGE

Drainage basin boundaries were determined based on the conceptual grades established in this plan. (See the Proposed Onsite Basin Map in Appendix B.) Land treatments for the development are as follows:

Type A	0%	(Calculated per Sect. 22.2, Table A.5 of
Type B	15.87%	the City of Albuquerque DPM. See
Type C	22%	Appendix B.)
Type D	62.13%	

These treatment percentages were used to calculate the 100-year, 6-hour storm runoff quantities for each basin. (See Appendix B for Runoff Calculations for Developed Conditions.)

There are four major outfall points from the site. The north end of Bradford Pl (AP1) outlets 8.7 cfs at a concrete rundown to the asphalt swale on the south side of Paradise Blvd. Geneva Dr discharges 14.7 cfs from either side of the road at the intersection with Paradise Blvd (AP3). Also, a 30" culvert directs water in the existing asphalt swale under Geneva Dr. Brunswick Dr discharges 48.5 cfs to a storm drain (AP6), and the east end of Mansfield Pl (AP7) outlets 8.0 cfs at a concrete rundown onto Justin Dr. (See Appendix E for Concrete Rundown, Curb Cut, and Culvert Calculations.)

Minor runoff from rearyard and sideyard slopes sheet a total of 0.8 cfs onto Paradise Blvd and 0.3 cfs onto Justin Dr. These areas (Basins 410 - 440) use land treatments of 100% Type C because of the steep, compacted slopes. The combined 8.3 cfs this subdivision adds to Justin Dr exceeds the existing inlet capacity. To alleviate this problem, a curb cut will be added to the west curb downstream of the inlets, next to the existing Type 'D' inlet. This inlet has more than sufficient capacity for the excess flows. (See Appendix E for Curb Cut Calculations.)

The Final Drainage Report for Paradise Blvd Storm Drain by Burak allows this site a total developed runoff rate of 103.4 cfs. The recently constructed storm drain collects the entire amount in 2-type 'A' inlets in Paradise Blvd just west of Justin Dr and a triple type 'D' inlet in the existing asphalt swale on the southwest side of the same intersection. The combined discharge from Paradise Ridge totals 81.0 cfs, which is well below the 103.4 cfs allowable.

Offsite flows from the west are mostly redirected south to Paradise Blvd via a swale on Tract 1 of the Mesa Encantada Subdivision. Permission was obtained from the owner of this lot to grade along the east boundary. This allows a swale outside the west boundary from Lot 9, Block A north to Paradise Blvd. The swale will redirect the 4.2 cfs from Basin OF1, so that those waters do not cross this site.

The 0.3 cfs generated by Basin OF2 proceeds south to join offsite flows entering Paradise Vista Subdivision. As these very minor flows are routed from farther away than any other point in Paradise Vista, they should not significantly impact that subdivision. Future development on properties to the west shall prevent storm waters from entering Paradise Ridge Subdivision.

STREET FLOW CAPACITIES

The Street flow capacity calculations for each road are found in Appendix C. Table 1 following shows that the right-of-way contains the velocity head for 100-year, 6-hour storms in all areas except Brunswick Dr. Just after the intersection with Timberfalls Rd, steep grades in Brunswick Dr increase the velocity head to a height above the right-of-way line, therefore storm drain inlets will collect the 21.8 cfs at this location.

STORM DRAIN

Because street flow capacity in the Brunswick Dr right-of-way is insufficient to contain the 100 year-6 hour storm, this project extends the storm drain in Paradise Blvd to just north of the intersection with Timberfalls Rd in Brunswick Dr. Two inlets collect 21.8 cfs at this location. An additional two inlets collect 26.7 cfs just north of the intersection on Mansfield Pl and Brunswick Dr. (See Appendix D for Hydraflow Storm Sewer Worksheets and Storm Drain Inlet Capacity Calculations.)

The existing asphalt swale in Paradise Blvd between Brunswick Dr and the existing Type 'D' inlet is demolished with the construction of the storm drain extension. It will be replaced by a triple Type 'D' inlet west of Brunswick Dr, which collects the entire 49.2 cfs of future developed flows from upstream. The inlet requires a 2' deep asphalt sump, similar to the existing sump at the southwest corner of Paradise Blvd and Justin Dr. This storm drain diverts all existing flows from that inlet, except for the previously mentioned 8.3 cfs from the curb cut in Justin Dr.

V. SUMMARY & CONCLUSIONS

Based on information in previous sections, it is recommended that the following items be constructed:

1. 4" thick, 2½" mean diameter fractured face rock armoring on all slopes steeper than 3 to 1.
2. A 5' wide, 8" deep concrete rundown between Lots 18 and 19, Block A at the north end of Bradford Pl, leading to the existing swale along Paradise Blvd. An 8' wide x 6' long x12" thick type 'L' riprap splash pad is needed at the bottom of the rundown, before it enters the existing swale.
3. A 30" RCP culvert under Geneva Dr to pass water in the asphalt swale along Paradise Blvd under the road. This will require removal and partial restoration of portions of the asphalt swale as shown in the detail on Sheet 5 of the Grading & Drainage Plan.
4. A 5' wide, 8" deep concrete rundown between Lots 9 and 10, Block D at the east end of Mansfield Pl, leading to Justin Dr. Two 2' wide sidewalk culverts are needed at the bottom of the rundown, where it crosses the proposed sidewalk on Justin Dr.
5. A 2' wide curb cut on the west side of Justin Dr, north of the existing inlets, to direct storm water to the existing sump inlet.
6. An offsite swale west of Lots 9 – 18, Block A, to redirect offsite flows to Paradise Blvd.
7. A 36" storm drain in Paradise Blvd from the existing double Type 'D' sump inlet to just west of Brunswick Dr. The existing asphalt swale shall be removed in this area, except at the existing sump inlet.
8. A triple Type 'D' inlet just west of Brunswick Dr. A 2' deep asphalt sump shall be constructed around the inlet, at the end of the existing asphalt swale as shown in the detail on Sheet 5 of the Grading & Drainage Plan.
9. A 36" and 24" storm drain in Brunswick Dr from Paradise Blvd to just north of Timberfalls Rd.
10. Two single-grate Type 'A' inlets in Brunswick Dr just north of Timberfalls Rd, with an 18" connector pipe.
11. Two single-grate Type 'A' inlets in Brunswick Dr just north of Mansfield Pl, with an 18" connector pipe.

NOTE:

If future construction on Paradise Blvd includes curb on the returns of Geneva Dr, then 2' wide curb cuts on either side of Geneva Dr are required prior to Paradise Blvd, or Paradise Blvd must accept the 14.7 cfs of flows into the road.

TABLE 1

STREET FLOW DEPTH SUMMARY

STREET	LOCATION	STREET WIDTH	CURB TYPE	SLOPE (ft/ft)	Q_{100} (cfs)	DEPTH (ft)	EGL DEPTH (ft)
Bradford Pl	Half-street flows diverted to Dominion Rd	28' F-F	mtbl	0.0051	5.56	0.28	0.32
Bradford Pl	@AP1	28' F-F	mtbl	0.0269	8.70	0.25	0.41
Dominion Rd	@AP2	28' F-F	std	0.0400	5.10	0.21	0.44
Geneva Dr	south of AP2	32' F-F	mtbl	0.0162	9.60	0.28	0.39
Geneva Dr	north of AP2	32' F-F	std	0.0400	14.70	0.30	0.65
Geneva Dr	@AP3	32' F-F	std	0.0600	14.70	0.28	0.76
Mansfield Pl	(flows 2/3 of Basin 230)	28' F-F	mtbl	0.0235	14.35	0.30	0.49
Mansfield Pl		28' F-F	std	0.0575	20.70	0.31	0.86
Mansfield Pl	@AP5	28' F-F	std	0.0267	20.70	0.35	0.65
Mansfield Pl	@AP7	28' F-F	mtbl	0.0137	8.00	0.27	0.36
Timberfalls Dr		28' F-F	mtbl	0.0177	15.90	0.32	0.50
Timberfalls Dr		28' F-F	std	0.0448	15.90	0.30	0.70
Timberfalls Dr		28' F-F	std	0.0628	15.90	0.28	0.80
Timberfalls Dr	@AP4	28' F-F	std	0.0320	15.90	0.31	0.62
Mansfield Ct		28' F-F	mtbl	0.0253	10.40	0.26	0.43
Brunswick Rd	(flows 1/2 of Basin 220)	28' F-F	mtbl	0.0050	5.90	0.29	0.33
Brunswick Rd	north of AP4	28' F-F	std	0.0446	21.80	0.33	0.79
Brunswick Rd	north of AP4	28' F-F	std	0.0669	21.80	0.31	0.94
Brunswick Rd	@AP6	28' F-F	std	0.0350	48.50	0.45	1.12

RUNOFF CALCULATIONS FOR EXISTING CONDITIONS (Q_{100})

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **PARADISE RIDGE SUBDIVISION**

JOB NUMBER: 899

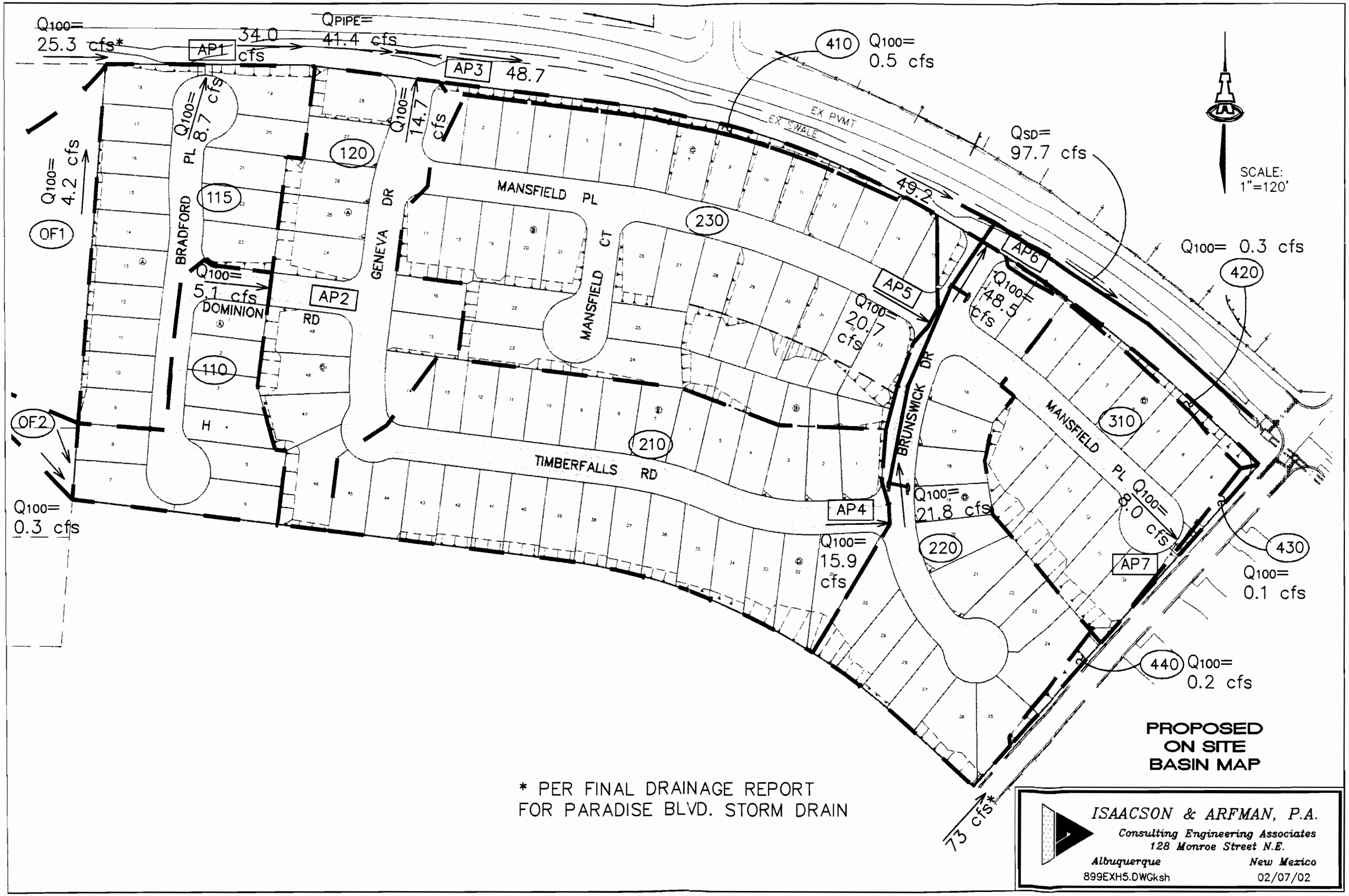
PRECIP ZONE	Q_{100} RUNOFF RATES (cfs/Ac)			
	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.70
3	1.87	2.60	3.45	5.02
4	2.20	2.92	3.73	5.25

	% LAND TREATMENTS			
	TREAT TYPE 1	TREAT TYPE 2	TREAT TYPE 3	TREAT TYPE 4
A	75	95		
B	15	5		
C	10	0		
D	0			
Σ% =	100	100	0	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
100	22.17	16.63	3.33	2.22	0	**34.6**	Entire site drains to Paradise Blvd

TREATMENT TYPE 2							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
OF1	3.136	2.98	0.16	0	0	**4.2**	Offsite basin on N side of W boundary
OF2	0.197	0.19	0.01	0	0	**0.3**	Offsite basin on S side of W boundary


Q100= 25.3 cfs*
AP1
34.0 cfs
QPIPE= 41.4 cfs
AP3
48.7
410
Q100= 0.5 cfs
EX PVMT
EX SWALE
QSD= 97.7 cfs
SCALE: 1"=120'
Q100= 4.2 cfs
OF1
Q100= 8.7 cfs
BRADFORD PL
120
115
Q100= 14.7 cfs
GENEVA DR
MANSFIELD PL
230
49.2
AP6
Q100= 0.3 cfs
420
Q100= 5.1 cfs
AP2
DOMINION RD
MANSFIELD CT
AP5
Q100= 20.7 cfs
Q100= 48.5 cfs
110
OF2
H
210
TIMBERFALLS RD
BRUNSWICK DR
MANSFIELD PL
310
Q100= 0.3 cfs
AP4
Q100= 15.9 cfs
Q100= 21.8 cfs
220
Q100= 8.0 cfs
AP7
430
Q100= 0.1 cfs
440
Q100= 0.2 cfs
73 cfs*
PROPOSED ON SITE BASIN MAP
* PER FINAL DRAINAGE REPORT FOR PARADISE BLVD. STORM DRAIN
ISAACSON & ARFMAN, P.A.
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128 Monroe Street N.E.
Albuquerque New Mexico
899EXH5.DWGksh 02/07/02

LAND TREATMENT CALCULTIONS

(Per the City of Albuquerque DPM Section 22.2, Table A-5)

PROJECT NAME: **Paradise Ridge**

JOB NUMBER: 899

Total Area	18.6	Acres
# of Lots	125	lots

N = 6.72 D.U./Ac.

Percentage of Impervious Land (Type D)

$\%D = 7(N^2+5N)^{1/2}$

%D= 62.13 %

A+D= 62.13 %

B+C= 37.87 %

LAND TREATMENTS	
Type A=	**0 %**
Type B=	**15.87 %**
Type C=	**22.00 %**
Type D=	**62.13 %**
Σ=	100 %

RUNOFF CALCULATIONS FOR DEVELOPED CONDITIONS (Q_{100})

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **PARADISE RIDGE SUBDIVISION**

JOB NUMBER: 899

PRECIP ZONE	Q_{100} RUNOFF RATES (cfs/Ac)			
	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.70
3	1.87	2.60	3.45	5.02
4	2.20	2.92	3.73	5.25

% LAND TREATMENTS				
	TREAT TYPE 1	TREAT TYPE 2	TREAT TYPE 3	TREAT TYPE 4
A	0	0	0	0
B	15.87	15.87	15.87	0
C	22	22	22	100
D	62.13	62.13	62.13	0
Σ% =	100	100	100	100

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
110	1.4013	0	0.22	0.31	0.87	**5.1**	AP2
120	2.6104	0	0.41	0.57	1.62	**9.6**	
115	2.3671	0	0.38	0.52	1.47	**8.7**	AP1
						14.7	AP3 (combined basins 110 & 120)

TREATMENT TYPE 2							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
210	4.3333	0	0.69	0.95	2.69	**15.9**	AP4
220	3.238	0	0.51	0.71	2.01	**11.9**	
230	5.6361	0	0.89	1.24	3.50	**20.7**	AP5
						48.5	AP6 (combined basins 210, 220, & 230)

TREATMENT TYPE 3							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
310	2.1703	0	0.34	0.48	1.35	**8.0**	AP7
						8.0	

TREATMENT TYPE 4							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
410	0.1869	0	0	0.19	0	**0.5**	slope to Paradise Blvd
420	0.1205	0	0	0.12	0	**0.3**	slope to Paradise Blvd
430	0.0509	0	0	0.05	0	**0.1**	slope to Justin Dr
440	0.0638	0	0	0.06	0	**0.2**	slope to Justin Dr
						1.2	

TOTAL FLOW FROM SITE =	**81.0**

STREET FLOW CAPACITY CALCULATIONS

STREET NAME: **Bradford Pl** 1
LOCATION: **Half-street flows diverted to Dominion Rd**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0051	Road Width/2	14
Q_{100}	5.56	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	14.281
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.804
Manning's N	0.017	Discharge (1/2 Q)	2.816

Depth: 0.281

RESULTS

HGL

Q_{100} FLOW CAPACITY = **5.63 cfs** **OK**
at an HGL Depth= **0.28 ft** < Curb height = 0.33
OK

EGL

Velocity 1.56 fps
$V^2/2g$ 0.04 ft
EGL Depth = **0.32 ft** < Right-of-way height = 0.50
OK

STREET NAME: **Bradford Pl** 2
LOCATION: **@AP1**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0269	Road Width/2	14
Q_{100}	8.70	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	12.495
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.350
Manning's N	0.017	Discharge (1/2 Q)	4.360

Depth: 0.245

RESULTS

HGL

Q_{100} FLOW CAPACITY = **8.72 cfs** **OK**
at an HGL Depth= **0.25 ft** < Curb height = 0.33
OK

EGL

Velocity 3.23 fps
$V^2/2g$ 0.16 ft
EGL Depth = **0.41 ft** < Right-of-way height = 0.50
OK

STREET NAME: **Dominion Rd** 3
LOCATION: **@AP2**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.04	Road Width/2	14
Q_{100}	5.10	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	6.562
Road Width	28	1/2 Area(STD)	0.673
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	2.559

Depth: 0.212

RESULTS

HGL

Q_{100} FLOW CAPACITY = **5.12 cfs** **OK**
at an HGL Depth= **0.21 ft** < Curb height = 0.67
OK

EGL

Velocity 3.80 fps
$V^2/2g$ 0.22 ft
EGL Depth = **0.44 ft** < Right-of-way height = 0.84
OK

STREET FLOW CAPACITY CALCULATIONS

STREET NAME:	**Geneva Dr**	4
LOCATION:	**south of AP2**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.01623	Road Width/2	16
Q_{100}	9.60	Curb Height	0.33
Right-of-way Width	50	1/2 Wetted Perimeter (P)	14.127
Road Width	32	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.750
Manning's N	0.017	Discharge (1/2 Q)	4.809

Depth: 0.277

RESULTS

HGL

Q_{100} FLOW CAPACITY = **9.62 cfs** **OK**

at an HGL Depth= **0.28 ft** < Curb height = 0.33

OK

EGL

Velocity 2.75 fps

$V^2/2g$ 0.12 ft

EGL Depth = **0.39 ft** < Right-of-way height = 0.50

OK

STREET NAME:	**Geneva Dr**	5
LOCATION:	**north of AP2**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.04	Road Width/2	16
Q_{100}	14.70	Curb Height	0.67
Right-of-way Width	50	1/2 Wetted Perimeter (P)	10.795
Road Width	32	1/2 Area(STD)	1.549
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	7.372

Depth: 0.295

RESULTS

HGL

Q_{100} FLOW CAPACITY = **14.74 cfs** **OK**

at an HGL Depth= **0.30 ft** < Curb height = 0.67

OK

EGL

Velocity 4.76 fps

$V^2/2g$ 0.35 ft

EGL Depth = **0.65 ft** < Right-of-way height = 0.84

OK

STREET NAME:	**Geneva Dr**	6
LOCATION:	**@AP3**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.06	Road Width/2	16
Q_{100}	14.70	Curb Height	0.67
Right-of-way Width	50	1/2 Wetted Perimeter (P)	9.877
Road Width	32	1/2 Area(STD)	1.330
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	7.428

Depth: 0.277

RESULTS

HGL

Q_{100} FLOW CAPACITY = **14.86 cfs** **OK**

at an HGL Depth= **0.28 ft** < Curb height = 0.67

OK

EGL

Velocity 5.59 fps

$V^2/2g$ 0.48 ft

EGL Depth = **0.76 ft** < Right-of-way height = 0.84

OK

STREET FLOW CAPACITY CALCULATIONS

STREET NAME: **Mansfield Pl** 7
LOCATION: **(flows 2/3 of Basin 230)**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0235	Road Width/2	14
Q_{100}	14.35	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	14.295
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	2.000
Manning's N	0.017	Discharge (1/2 Q)	7.175
Depth	0.295		

RESULTS

HGL

Q_{100} FLOW CAPACITY = 14.35 cfs **OK**
at an HGL Depth= 0.30 ft < Curb height = 0.33
OK

EGL

Velocity 3.59 fps
$V^2/2g$ 0.20 ft
EGL Depth = 0.49 ft < Right-of-way height = 0.50
OK

STREET NAME: **Mansfield Pl** 8
LOCATION:

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0575	Road Width/2	14
Q_{100}	20.70	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	11.407
Road Width	28	1/2 Area(STD)	1.743
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	10.377
Depth	0.307		

RESULTS

HGL

Q_{100} FLOW CAPACITY = 20.75 cfs **OK**
at an HGL Depth= 0.31 ft < Curb height = 0.67
OK

EGL

Velocity 5.95 fps
$V^2/2g$ 0.55 ft
EGL Depth = 0.86 ft > Right-of-way height = 0.84
not contained in right-of-way

STREET NAME: **Mansfield Pl** 9
LOCATION: **@AP5**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0267	Road Width/2	14
Q_{100}	20.70	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	13.651
Road Width	28	1/2 Area(STD)	2.359
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	10.393
Depth	0.351		

RESULTS

HGL

Q_{100} FLOW CAPACITY = 20.79 cfs **OK**
at an HGL Depth= 0.35 ft < Curb height = 0.67
OK

EGL

Velocity 4.41 fps
$V^2/2g$ 0.30 ft
EGL Depth = 0.65 ft < Right-of-way height = 0.84
OK

STREET FLOW CAPACITY CALCULATIONS

STREET NAME: **Mansfield Pl** 10
LOCATION: **@AP7**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0137	Road Width/2	14
Q_{100}	8.00	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	13.668
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.632
Manning's N	0.017	Discharge (1/2 Q)	4.022

Depth: 0.268

RESULTS

HGL

Q_{100} FLOW CAPACITY = 8.04 cfs OK
at an HGL Depth= 0.27 ft < Curb height = 0.33
OK

EGL

Velocity 2.46 fps
$V^2/2g$ 0.09 ft
EGL Depth = 0.36 ft < Right-of-way height = 0.50
OK

STREET NAME: **Timberfalls Dr** 11
LOCATION:

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0177	Road Width/2	14
Q_{100}	15.90	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	14.318
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	2.322
Manning's N	0.017	Discharge (1/2 Q)	7.982

Depth: 0.318

RESULTS

HGL

Q_{100} FLOW CAPACITY = 15.96 cfs OK
at an HGL Depth= 0.32 ft < Curb height = 0.33
OK

EGL

Velocity 3.44 fps
$V^2/2g$ 0.18 ft
EGL Depth = 0.50 ft > Right-of-way height = 0.50
not contained in right-of-way

STREET NAME: **Timberfalls Dr** 12
LOCATION:

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0448	Road Width/2	14
Q_{100}	15.90	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	10.795
Road Width	28	1/2 Area(STD)	1.575
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	8.024

Depth: 0.295

RESULTS

HGL

Q_{100} FLOW CAPACITY = 16.05 cfs OK
at an HGL Depth= 0.30 ft < Curb height = 0.67
OK

EGL

Velocity 5.09 fps
$V^2/2g$ 0.40 ft
EGL Depth = 0.70 ft < Right-of-way height = 0.84
OK

STREET FLOW CAPACITY CALCULATIONS

STREET NAME: **Timberfalls Dr** 13
LOCATION:

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0628	Road Width/2	14
Q_{100}	15.90	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	10.081
Road Width	28	1/2 Area(STD)	1.379
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	7.967
Depth	0.281		

RESULTS

HGL

Q_{100} FLOW CAPACITY = **15.93 cfs** **OK**
at an HGL Depth= **0.28 ft** < Curb height = 0.67
OK

EGL

Velocity 5.78 fps
$V^2/2g$ 0.52 ft
EGL Depth = **0.80 ft** < Right-of-way height = 0.84
OK

STREET NAME: **Timberfalls Dr** 14
LOCATION: **@AP4**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.032	Road Width/2	14
Q_{100}	15.90	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	11.560
Road Width	28	1/2 Area(STD)	1.785
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	7.984
Depth	0.310		

RESULTS

HGL

Q_{100} FLOW CAPACITY = **15.97 cfs** **OK**
at an HGL Depth= **0.31 ft** < Curb height = 0.67
OK

EGL

Velocity 4.47 fps
$V^2/2g$ 0.31 ft
EGL Depth = **0.62 ft** < Right-of-way height = 0.84
OK

STREET NAME: **Mansfield Ct** 15
LOCATION:

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0253	Road Width/2	14
Q_{100}	10.40	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	13.464
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.581
Manning's N	0.017	Discharge (1/2 Q)	5.236
Depth	0.264		

RESULTS

HGL

Q_{100} FLOW CAPACITY = **10.47 cfs** **OK**
at an HGL Depth= **0.26 ft** < Curb height = 0.33
OK

EGL

Velocity 3.31 fps
$V^2/2g$ 0.17 ft
EGL Depth = **0.43 ft** < Right-of-way height = 0.50
OK

STREET FLOW CAPACITY CALCULATIONS

STREET NAME:	**Brunswick Rd**	16
LOCATION:	**(flows 1/2 of Basin 220)**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.005	Road Width/2	14
Q_{100}	5.90	Curb Height	0.33
Right-of-way Width	46	1/2 Wetted Perimeter (P)	14.286
Road Width	28	1/2 Area(STD)	----
Curb Type	mtbl	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	1.874
Manning's N	0.017	Discharge (1/2 Q)	2.970

Depth: 0.286

RESULTS

HGL

Q_{100} FLOW CAPACITY = **5.94 cfs** **OK**

at an HGL Depth= **0.29 ft** < Curb height = 0.33

OK

EGL

Velocity 1.58 fps

$V^2/2g$ 0.04 ft

EGL Depth = **0.33 ft** < Right-of-way height = 0.50

OK

STREET NAME:	**Brunswick Rd**	17
LOCATION:	**north of AP4**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0446	Road Width/2	14
Q_{100}	21.80	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	12.376
Road Width	28	1/2 Area(STD)	2.009
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	10.969

Depth: 0.326

RESULTS

HGL

Q_{100} FLOW CAPACITY = **21.94 cfs** **OK**

at an HGL Depth= **0.33 ft** < Curb height = 0.67

OK

EGL

Velocity 5.46 fps

$V^2/2g$ 0.46 ft

EGL Depth = **0.79 ft** < Right-of-way height = 0.84

OK

STREET NAME:	**Brunswick Rd**	18
LOCATION:	**north of AP4**	

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.0669	Road Width/2	14
Q_{100}	21.80	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	11.305
Road Width	28	1/2 Area(STD)	1.715
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	10.960

Depth: 0.305

RESULTS

HGL

Q_{100} FLOW CAPACITY = **21.92 cfs** **OK**

at an HGL Depth= **0.31 ft** < Curb height = 0.67

OK

EGL

Velocity 6.39 fps

$V^2/2g$ 0.63 ft

EGL Depth = **0.94 ft** > Right-of-way height = 0.84

not contained in right-of-way

STREET FLOW CAPACITY CALCULATIONS

STREET NAME: **Brunswick Rd** 19
LOCATION: **@AP6**

STREET INFORMATION		HALF STREET CALCULATIONS	
Slope	0.035	Road Width/2	14
Q_{100}	48.50	Curb Height	0.67
Right-of-way Width	46	1/2 Wetted Perimeter (P)	14.447
Road Width	28	1/2 Area(STD)	3.703
Curb Type	std	1/2 Area(MDN)	----
Road Cross Slope	0.02	1/2 Area(MTBL)	----
Manning's N	0.017	Discharge (1/2 Q)	24.324
Depth	0.447		

RESULTS

HGL

Q_{100} FLOW CAPACITY = 48.65 cfs **OK**
at an HGL Depth= 0.45 ft < Curb height = 0.67
OK

EGL

Velocity 6.57 fps
$V^2/2g$ 0.67 ft
EGL Depth = 1.12 ft > Right-of-way height = 0.84
not contained in right-of-way

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	194.0	0.00	0.00	0.00	0.00	0.00	0.0	1.3	0.0	97.80	168.3	13.92	36	6.37	5263.00	5250.65	5265.89	5254.65	5270.50	5264.05	connect to double
2	1	260.0	0.00	0.00	0.00	0.00	0.00	0.0	1.0	0.0	97.80	126.8	13.92	36	3.62	5272.50	5263.10	5275.39	5266.35	5280.00	5270.50	Paradise Blvd
3	2	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	49.20	111.6	6.96	36	2.80	5274.00	5272.60	5278.71	5278.44	5280.50	5280.00	Type D Inlet
4	2	113.0	0.00	0.00	0.00	0.00	0.00	0.0	0.7	0.0	48.60	139.6	7.77	36	4.38	5277.60	5272.65	5279.82	5278.44	5283.59	5280.00	Street G - Inlet 1
5	4	24.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.40	10.72	7.58	18	1.04	5278.00	5277.75	5281.96	5281.57	5283.59	5283.59	Inlet 2
6	4	145.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	21.80	50.57	7.39	24	5.00	5285.50	5278.25	5287.15	5281.57	5291.00	5283.59	Street G
7	6	135.0	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	21.80	52.95	7.76	24	5.48	5293.00	5285.60	5294.65	5287.30	5298.86	5291.00	Street G - Inlet 3
8	7	23.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	10.90	8.48	6.17	18	0.65	5293.30	5293.15	5296.34	5296.09	5298.86	5298.86	Inlet 4

Project File: Paradise.stm | IDF File: sampleFHA.IDF | Total number of lines: 8 | Run Date: 02-01-2002

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs. ; Initial tailwater elevation = 5254.65 (ft)

Hydraflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	Double Type D	49.20*	0.00	49.20	0.00	DrGrt	0.0	0.00	7.05	3.33	2.08	Sag	4.00	0.050	0.050	0.000	1.69	71.47	1.69	71.47	0.0	2
4	Type A	13.40*	0.00	13.40	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.040	2.00	0.177	0.020	0.013	0.54	11.30	0.57	10.79	4.25	3
5	Type A	13.40*	0.00	13.40	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.040	2.00	0.177	0.020	0.013	0.54	11.30	0.57	10.79	4.25	4
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	4
7	Type A	10.90*	0.00	10.90	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.067	2.00	0.177	0.020	0.013	0.49	8.80	0.51	7.79	4.25	4
8	Type A	10.90*	0.00	10.90	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.067	2.00	0.177	0.020	0.013	0.49	8.80	0.51	7.79	4.25	5

Project File: Paradise.stm | I-D-F File: sampleFHA.IDF | Total number of lines: 8 | Run Date: 03-29-2002

NOTES: Inlet N-Values = 0.016 ; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.8; Return period = 100 Yrs. ; * Indicates Known Q added

ANALYZE SUMP INLETS

GRATE OPEN AREA:
(per COA std dwg #2220, single grate)

GROSS AREA FOR ONE GRATE =	(2.08 ft)(3.33 ft) =	6.94 SF
LESS BEARING BARS =	(0.5 in/12)(3.33 ft)(13) =	1.80 SF
LESS CROSS BARS =	(0.5 in/12)(7)[(2.08 ft)-(13)(0.5 in/12)] =	0.45 SF
	NET GRATE OPEN AREA =	**4.69 SF**
	GRATE OPEN AREA (assuming 50% clogging factor) =	***2.35 SF***

ORIFICE EQUATION:

$$Q = CA(2gh)^{1/2}$$

Where:

C = 0.67
A = 2.35 ft^2
g = 32.2 ft/sec^2
h = height of the water surface above the grate

CAPACITY CALCULATIONS:

INLET #
LOCATION: Sump at Intersection of Paradise Blvd and Brunswick

h = 1.7 ft
$Q_{(capacity)}$ = 16.44 cfs
REQUIRED Q = 49.2 cfs

NUMBER OF GRATES REQUIRED = **3**

Paradise Ridge
Worksheet for Rectangular Channel

Project Description	
Project File	c:\haestad\fmw\paradise.fm2
Worksheet	5' Rundown at the end of Bradford Pl
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.412000	ft/ft
Bottom Width	5.00	ft
Discharge	8.70	cfs

Results		
Depth	0.11	ft
Flow Area	0.54	ft^2
Wetted Perimeter	5.22	ft
Top Width	5.00	ft
Critical Depth	0.45	ft
Critical Slope	0.004002	ft/ft
Velocity	16.15	ft/s
Velocity Head	4.05	ft
Specific Energy	4.16	ft
Froude Number	8.67	
Flow is supercritical.		

Paradise Ridge
Worksheet for Rectangular Channel

Project Description	
Project File	c:\haestad\fmw\paradise.fm2
Worksheet	5' Rundown at the end of Mansfield Pl
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.295330	ft/ft
Bottom Width	5.00	ft
Discharge	8.00	cfs

Results		
Depth	0.11	ft
Flow Area	0.57	ft^2
Wetted Perimeter	5.23	ft
Top Width	5.00	ft
Critical Depth	0.43	ft
Critical Slope	0.004032	ft/ft
Velocity	14.12	ft/s
Velocity Head	3.10	ft
Specific Energy	3.21	ft
Froude Number	7.40	
Flow is supercritical.		

Paradise Ridge
Worksheet for Rectangular Channel

Project Description	
Project File	c:\haestad\fmw\paradise.fm2
Worksheet	Curb cut on Geneva Dr
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Bottom Width

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.020000	ft/ft
Depth	0.67	ft
Discharge	7.35	cfs

Results		
Bottom Width	1.39	ft
Flow Area	0.93	ft^2
Wetted Perimeter	2.73	ft
Top Width	1.39	ft
Critical Depth	0.95	ft
Critical Slope	0.007917	ft/ft
Velocity	7.89	ft/s
Velocity Head	0.97	ft
Specific Energy	1.64	ft
Froude Number	1.70	
Flow is supercritical.		

Paradise Ridge
Worksheet for Rectangular Channel

Project Description	
Project File	c:\haestad\fmw\paradise.fm2
Worksheet	Curb cut on Justin Dr
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Bottom Width

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.020000	ft/ft
Depth	0.67	ft
Discharge	8.30	cfs

Results		
Bottom Width	1.52	ft
Flow Area	1.02	ft^2
Wetted Perimeter	2.86	ft
Top Width	1.52	ft
Critical Depth	0.97	ft
Critical Slope	0.007444	ft/ft
Velocity	8.13	ft/s
Velocity Head	1.03	ft
Specific Energy	1.70	ft
Froude Number	1.75	
Flow is supercritical.		

PARADISE RIDGE
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\paradise.fm2
Worksheet	1-RCP under Geneva Dr
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010100	ft/ft
Diameter	30.00	in
Discharge	41.40	cfs

Results		
Depth	24.7	in
Flow Area	4.33	ft^2
Wetted Perimeter	5.69	ft
Top Width	1.91	ft
Critical Depth	2.16	ft
Percent Full	82.37	
Critical Slope	0.009385	ft/ft
Velocity	9.57	ft/s
Velocity Head	1.42	ft
Specific Energy	3.48	ft
Froude Number	1.12	
Maximum Discharge	44.34	cfs
Full Flow Capacity	41.22	cfs
Full Flow Slope	0.010189	ft/ft
Flow is supercritical.		

RUNOFF CALCULATIONS FOR DEVELOPED CONDITIONS (Q_{100})

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **PARADISE RIDGE SUBDIVISION**

JOB NUMBER: 899

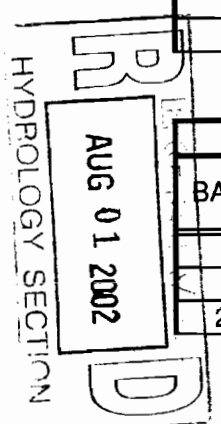
PRECIP ZONE	Q_{100} RUNOFF RATES (cfs/Ac)			
	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.70
3	1.87	2.60	3.45	5.02
4	2.20	2.92	3.73	5.25

% LAND TREATMENTS				
	TREAT TYPE 1	TREAT TYPE 2	TREAT TYPE 3	TREAT TYPE 4
A	0	0	0	0
B	15.87	15.87	15.87	0
C	22	22	22	100
D	62.13	62.13	62.13	0
∑% =	100	100	100	100

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
110	1.4013	0	0.22	0.31	0.87	**5.1**	AP2
120	2.6104	0	0.41	0.57	1.62	**9.6**	
115	2.3671	0	0.38	0.52	1.47	**8.7**	AP1
						14.7	AP3 (combined basins 110 & 120)

TREATMENT TYPE 2							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
210	4.3333	0	0.69	0.95	2.69	**15.9**	AP4
220	3.238	0	0.51	0.71	2.01	**11.9**	
230a	4.918	0	0.78	1.08	3.06	**18.0**	AP5
						45.8	AP6 (combined basins 210, 220, & 230)



TREATMENT TYPE 3							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
310	2.1703	0	0.34	0.48	1.35	**8.0**	AP7
						8.0	

TREATMENT TYPE 4							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
410	0.1869	0	0	0.19	0	**0.5**	slope to Paradise Blvd
420	0.1205	0	0	0.12	0	**0.3**	slope to Paradise Blvd
430	0.0509	0	0	0.05	0	**0.1**	slope to Justin Dr
440	0.0638	0	0	0.06	0	**0.2**	slope to Justin Dr
230b	0.7181	0	0	0.72	0	**2.1**	Private access area on ridge
						3.3	

TOTAL FLOW FROM SITE =	**80.5**

PARADISE RIDGE
Worksheet for Circular Channel

Project Description	
Project File	m:\active\genny\haestad\fmw\paradise.fm2
Worksheet	12" PVC PRIVATE DRAIN
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	12.00	in
Discharge	2.10	cfs

Results		
Depth	0.55	ft
Flow Area	0.44	ft^2
Wetted Perimeter	1.68	ft
Top Width	0.99	ft
Critical Depth	0.62	ft
Percent Full	55.22	
Critical Slope	0.007003	ft/ft
Velocity	4.72	ft/s
Velocity Head	0.35	ft
Specific Energy	0.90	ft
Froude Number	1.24	
Maximum Discharge	3.83	cfs
Full Flow Capacity	3.56	cfs
Full Flow Slope	0.003475	ft/ft
Flow is supercritical.		

PARADISE RIDGE
Worksheet for Triangular Channel

Project Description	
Project File	m:\active\genny\haestad\fmw\paradise.fm2
Worksheet	Riprap swale along back of lots
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.010000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Discharge	2.10	cfs

Results		
Depth	0.72	ft
Flow Area	1.05	ft^2
Wetted Perimeter	3.24	ft
Top Width	2.90	ft
Critical Depth	0.59	ft
Critical Slope	0.031202	ft/ft
Velocity	2.00	ft/s
Velocity Head	0.06	ft
Specific Energy	0.79	ft
Froude Number	0.59	
Flow is subcritical.		

ANALYZE SUMP INLETS

GRATE OPEN AREA:
(per COA std dwg #2220, single grate)

GROSS AREA FOR ONE GRATE =	(2.08 ft)(3.33 ft) =	6.94 SF
LESS BEARING BARS =	(0.5 in/12)(3.33 ft)(13) =	1.80 SF
LESS CROSS BARS =	(0.5 in/12)(7)[(2.08 ft)-(13)(0.5 in/12)] =	0.45 SF
	NET GRATE OPEN AREA =	**4.69 SF**
	GRATE OPEN AREA (assuming 50% clogging factor) =	***2.35 SF***

ORIFICE EQUATION:

$$Q = CA(2gh)^{1/2}$$

Where:
- C = 0.67
- A = 2.35 ft^2
- g = 32.2 ft/sec^2
- h = height of the water surface above the grate

CAPACITY CALCULATIONS:

INLET #
LOCATION: Sump at Intersection of Paradise Blvd and Brunswick

h =	1.7 ft		
$Q_{(capacity)}$ =	16.44 cfs	REQUIRED Q =	49.2 cfs

NUMBER OF GRATES REQUIRED = **3**

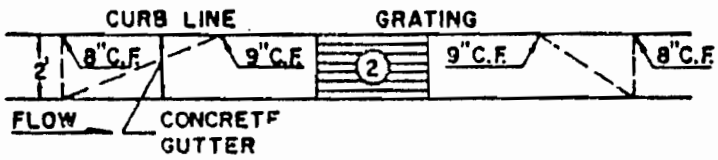
Hydraflow Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp line No
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	depth (ft)	spread (ft)	depth (ft)	spread (ft)	Dep (in)	
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	Double Type D	49.20*	0.00	49.20	0.00	DrGrt	0.0	0.00	7.05	3.33	2.08	Sag	4.00	0.050	0.050	0.000	1.69	71.47	1.69	71.47	0.0	2
4	Type A	13.40*	0.00	13.40	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.040	2.00	0.177	0.020	0.013	0.54	11.30	0.57	10.79	4.25	3
5	Type A	13.40*	0.00	13.40	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.040	2.00	0.177	0.020	0.013	0.54	11.30	0.57	10.79	4.25	4
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	0.000	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	4
7	Type A	10.90*	0.00	10.90	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.067	2.00	0.177	0.020	0.013	0.49	8.80	0.51	7.79	4.25	4
8	Type A	10.90*	0.00	10.90	0.00	Comb	7.0	6.45	0.00	3.33	0.70	0.067	2.00	0.177	0.020	0.013	0.49	8.80	0.51	7.79	4.25	5

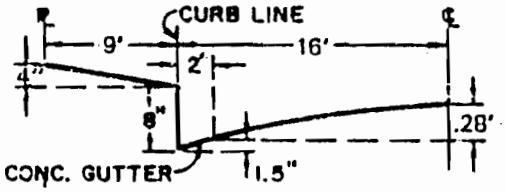
Project File: Paradise.stm | I-D-F File: sampleFHA.IDF | Total number of lines: 8 | Run Date: 04-01-2002

NOTES: Inlet N-Values = 0.016 ; Intensity = 127.16 / (Inlet time + 17.80) ^ 0.8; Return period = 100 Yrs. ; * Indicates Known Q added

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



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)