Drainage Report

for

Sedona Subdivision Tract C at Ventana Ranch

October, 1999

Prepared for:
Sandia Properties Ltd. Co.
#10 Tramway Loop NE
Albuquerque, New Mexico 87122

Prepared by:
Easterling & Associates, Inc.
2600 The American Road SE, Suite 100
Rio Rancho, New Mexico 87124

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

Charles M. Easterling, P.E.
NMPE No. 6411

10-21-99
Date

CHARLES M. EASTERLING
NEW MEXICO
6411
REGISTERED PROFESSIONAL ENGINEER

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Sedona Subdivision Tract C
at Ventana Ranch

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I. PURPOSE

This report presents drainage information and analysis for Tract C of the Sedona Subdivision for the purpose of Preliminary Plat, Final Plat and Grading Plan approval. The remaining Phases, Tracts D and E, will be described in subsequent detailed drainage reports.

II. BACKGROUND

Tract C of the Sedona Subdivision consists of 190 single-family residential lots. This report supplements and/or amends portions of the following approved drainage reports/plans.

- Tract A Conceptual Grading and Drainage Plan, November 1998.
- Revised Drainage Report, Ventana Ranch Subdivision, Sedona Subdivision, January 9, 1998.
- Storm Drain Design Analysis Report, Ventana Ranch Tract Z-2-B, Sedona Subdivision, November 17, 1997.

The primary reason for amending the previous reports is to incorporate changes created by raising the east end of the subdivision to accommodate sanitary sewer outfall constraints.

III. OFF-SITE FLOWS

A. Tract A

A detention pond is proposed to serve the Tract A development, as shown on the Drainage Plan (overall and modeling map). The pond will need to be about 4.0 ac-ft in volume, capable of attenuating an inflow peak of 97.87 cfs to a release of 6.65 cfs. The pond is to be constructed concurrent with Tract A development. In the interim, the Ventana Road embankment will contain the existing undeveloped condition runoff.

B. Tracts D and E, Sedona Subdivision

Tracts D and E are future phases of the Sedona Subdivision. They include Basins D-1, D-2, D-3, D-4, and D-5. All basins except D-5 drain to the Oak Creek Storm Drain/Las Ventanas Drainage Facility #2 (LVDF #2/Little Window Dam) system and are included in the analysis performed as part of this report. Basin D-5 drains to the Las Ventanas Drainage Facility #1 (LVDF #1/Ventana Dam) in accordance with Bohannan-Huston's revised Drainage Report, Ventana Ranch Subdivision, Sedona Subdivision, dated January 9, 1998. In the interim, a portion of the existing undeveloped condition runoff will pond in natural depression within the existing terrain, the remainder will discharge into LVDF #1/Ventana Dam located to the south and east. The Sedona subdivision is elevated 5 to 6 ft above existing ground (to be above basalt rock), and consequently will not be impacted by these offsite flows.

C. Tract B, Sedona Subdivision

Tract B represents the first phase of the Sedona Subdivision, which has already been constructed. Tract B is located just to the north of Tract C. Basin B-1 and the open space Basins O-1 and O-2 are the only basins from the first phase which drain to the LVDF #2/Little Window Dam outfall, and are included in the analysis contained in this report. Basin B-2 drains directly to the LVDF main outfall pipe, in accordance with Bohannan-Huston's revised Drainage Report for the Ventana Subdivision, Sedona Subdivision, dated January 9, 1998.

IV. HYDROLOGIC AND HYDRAULIC ANALYSES

A. Hydrologic Analysis

The City of Albuquerque Development Process Manual (DPM) Chapter 22, Section 22.2, in conjunction with AMAFCA's PC Version of the AHYMO program (updated January 1994) was used to perform the hydrologic analysis.

Basins B-2 and D-5 were assumed to drain to the Las Ventanas Drainage Outfall Pipe, and the Las Ventanas Drainage Facility No. 1 (LVDF #1/Ventana Dam) respectively, in accordance with the approved revision to the Sedona Subdivision Drainage Plan prepared by Bohannan–Huston, January 9, 1998. The remaining drainage basins which drain to the LVDF #2/Little Window Dam were revised to reflect the new grading. Copies of the new Grading Plans and new Drainage Plan are contained in Appendix B. Other hydrologic data such as the AHYMO input and output files, Hydrologic Basin Summary Table, and Storm Drain Analysis Points Table are contained in Appendix A.

Las Ventanas Dam and Little Window Dam are approved, operated and maintained by AMAFCA.

B. Hydraulic Analysis

<u>Streets and Inlets</u>

The hydraulic analysis of typical street sections was performed using FlowMaster V5.13 computer program by Haestad Methods. This analysis was used to determine where storm drain inlets were needed. Actual inlet locations are based on street flow criteria and typical construction practice. Inlet Capacities were analyzed using the HEC-12 computer program. All streets and inlets are in compliance with City of Albuquerque criteria. Data relating to this analysis is contained in Appendix A.

Sump Conditions

The initially proposed grading plan for Tract C provided positive surface drainage in all street corridors. Grades in the downstream (east) portion of Tract C were subsequently raised for two reasons: 1) to allow a sanitary sewer line to be raised to resolve a vertical conflict with the Ventana Dam outfall storm drain, and 2) to provide more soil cover over existing basalt rock. The revised grading plan results in three low points/sumps, which are identified on the Drainage Plan at analysis points AP-5, AP-10, and AP-11. The sumps were analyzed using Sump Criteria provided by the City of Albuquerque, a copy of which is contained in Appendix A. The proposed system is based on Option 4.1 of the City criteria with the following assumptions. The only basins that contribute to the sump inlets are those which are not intercepted by upstream inlets. In other words, the inlets upstream of the sump are assumed to be functioning as designed. Since the three sumps are interconnected to each other in series, an additional overflow inlet is proposed to accept the flow in the very unlikely event all three sump locations are clogged at the same time. Low Point #1 (AP-5) is located at the highest elevation in the system. If the inlets in Low Point #1 become clogged, the 21.59 cfs from Basins C-8 and C-10 will spill down Bisbee Place, turning right at Scottsdale Drive, and ending up at Cattle Guard Inlet, Low Point #2 (AP-10). The spill from Basins C-8 and C-10 will be combined with the routed runoff from Basins C-7, C-9, O-1, O-2, B-1 and C-3, for a total of 68.03 cfs. Capturing all the runoff reaching Low Point # 2 with conventional inlets was impractical, due to inlet/driveway spacing conflicts. Consequently, a cattle guard inlet is proposed for this location. In the unlikely event that the entire cattle guard inlet should become clogged, the 68.03 cfs will spill down Court 4 to Low Point #3 (AP-11). The total flow at this location, including flow from basin C-2, is 78.06 cfs. If the two street inlets at Low Point #3 are clogged, the runoff will spill into the rundown between Lot Nos. 21 and 22, where it will be captured by a double c inlet. Analysis associated with the sump overflow system is contained in Appendix A. In all three sump condition areas, the Q100 overflow water surface is contained within the street right-of-way (no structures will be subject to flooding).

Storm Drains

The major storm drain is located in Oak Creek Road and runs from its outlet at the LVDF #2/Little Window Dam to Ventana Road and the proposed Tract A Detention Pond. A secondary storm drain runs form LVDF #2 through a portion of Court 4 and terminating at the cattle guard inlet located at the intersection of Scottsdale Drive and Bisbee Place. Routing the combined discharge from both storm drains (204.38 cfs) through LVDF #2/Little Window Dam using the stage discharge relationship from the Bohannan-Huston AHYMO model produces a routed peak discharge of 29.80 cfs into the Las Ventanas Drainage Outfall Pipe, with a maximum storage of 5.8 ac-ft and a maximum water surface elevation of 5390.29. Based on the Bohannan-Huston Storm Drain Analysis Report the approved allowable discharge from LVDF #2/Little Window

Dam is 32.0 CFS. A storm drain HGL summary table and corresponding plan and profile sheets for both storm drains are contained in Appendices A and B, respectively.

A revised design is proposed for the west side of the LVDF #2/Little Window Dam to minimize the height of the retaining wall between Tract C and the dam. The revised design will provide additional fill on the west side of the dam without detrimental affect on the drainage and/or sediment detention volume. The revised design is shown on Sheet 4 of 8 in Exhibit B. Design details will be included in the Tract C improvement plans.

V. CONCLUSION

The modifications proposed in this Drainage Plan meet the original design parameters set out in previous reports. The outlined improvements are capable of conveying the runoff from the proposed development in an acceptable manner, and provide the required detail for grading plan, preliminary plat, and final plat review and approval.

HYDROLOGIC SUMMARY

Basin I.D.	Description	Hyd No.	Area (Acres)	% Land Treatment				Volume (ac-ft)		Discharge (cfs)	
				A	B	C	D	10 YR.	100 YR.	10 YR.	100 YR.
A-1	Tract A *	101	24.91	0	5	10	85	2.827	4.554	62.96	97.87
B-1	Scottsdale Ave. - Sedonia Phase I	152	5.95	0	23	23	54	0.485	0.836	12.13	20.49
C-1	LVDF # 2	166	1.78	35	55	10	0	0.027	0.089	1.04	3.21
C-2	Court # 4	162	2.88	0	22	22	56	0.240	0.412	5.98	10.03
C-3	Scottsdale Ave. - North of Oak Creek	157	2.21	0	22	22	56	0.184	0.316	4.58	7.69
C-4	Scottsdale Ave. - South of Oak Creek	139	5.65	0	22	22	56	0.472	0.809	10.54	17.80
C-5	Oak Creek - Sta. 22+50 to Sta. 26+60	136	1.83	0	22	22	56	0.153	0.262	3.80	6.38
C-6	Court # 3	133	3.55	0	22	22	56	0.297	0.509	7.37	12.36
C-7	Bisbee Place - Sedonia Phase I	156	2.73	0	23	23	54	0.228	0.390	5.66	9.49
C-8	Oak Creek - Sta. 18+00 to Sta. 22+50	129	3.41	0	22	22	56	0.285	0.488	7.08	11.87
C-9	Fredonia Place	154	2.10	0	22	22	56	0.175	0.301	4.36	7.31
C-10	Court # 2	127	3.10	0	22	22	56	0.259	0.443	5.76	9.72
C-11	Oak Creek - Sta. 10+50 to Sta. 18+00	119	1.02	0	0	20	80	0.112	0.182	2.34	3.65
C-12	Court # 1	115	3.88	0	22	22	56	0.324	0.555	7.06	11.86
C-13	Ventana Road - Sta. 10+60 to Sta. 19+00	103	1.70	14	30	0	56	0.133	0.229	3.12	5.42
C-14	Ventana Road - Sta. 0+00 to Sta. 10+60	104	2.43	14	30	0	56	0.190	0.327	4.45	7.72
D-1	Street 10 -Sta. 10+50 to Sta. 19+65	124	4.50	0	22	22	56	0.462	0.644	11.48	15.66
D-2	East Part of Loop 1	112	3.28	0	22	22	56	0.274	0.470	6.81	11.43
D-3	West Part of Loop 1	117	1.47	0	22	22	56	0.123	0.211	3.06	5.13
D-4	Street 7, Street 16, and Street 16 - Sta. 10+00 to Sta. 17+05	109	10.90	0	22	22	56	0.909	1.558	19.67	33.03
O-1	Open Space	150	0.82	35	55	10	0	0.012	0.041	0.48	1.48
O-2	Open Space	148	0.90	35	55	10	0	0.014	0.045	0.52	1.62
	Runoff Volume Total							8.171	13.626		

* Developed flow rate before routing through proposed detention pond

Storm Drain Flow
Analysis Points

Analysis Point	Description	Hyd No.	Storm Drain Volume 100 yr. 24 hr. V (ac-ft)	Storm Drain Discharge 100 yr. Q (cfs)	Street Discharge 100 yr. Q (cfs)	Total Discharge 100 yr. Q (cfs)
AP-1	Manhole No. 14 - Tract A Pond Outflow	501	4.535	6.65	0.00	6.65
AP-2	Manhole No. 13 - Sta. 10+50 Oak Creek Drive	107	5.091	16.86	0.00	16.86
AP-3	Manhole No. 12 - Sta. 11+95 Oak Creek Drive	110	6.649	49.83	11.86 [1]	61.69
AP-3A	Manhole No. 10 - Sta. 16+13 Oak Creek Drive	113	7.118	59.76	14.76 [2]	74.52
AP-4	Manhole No. 9 - Sta. 18+10 Oak Creek Drive	122	8.065	77.20	0.00	77.20
AP-4A	Manhole No. 8 - Sta. 18+70 Oak Creek Drive	125	8.709	91.09	10.12 [3]	101.21
AP-5	Manhole No. 7 - Sta. 20+45 Oak Creek Drive (Sump)	131	9.640	111.08	0.00	111.08
AP-6	Manhole No. 3 - Sta. 23+97 Oak Creek Drive	134	10.072	118.17	6.06 [4]	124.23
AP-7	Manhole No. 1 - Sta. 26+40 Oak Creek Drive	137	10.411	128.84	0.20 [5]	129.04
AP-8	Inlet - Sta. 27+20 Oak Creek Drive	140	11.220	146.64	0.00	146.64
AP-9	Oak Creek SD Outlet into LVDF #2	141	11.220	147.04	0.00	147.04
AP-10	Cattle Guard Inlet - Sta. 10+05 Scottsdale Drive	160	1.929	46.44	0.00	46.44
AP-11	Manhole No. 18 - Sta. 12+11 Court 4	163	2.341	56.22	0.00	56.22
AP-12	Court 4 SD Outlet into LVDF #2	164	2.341	55.86	0.00	55.86
AP-13	Combinded Flow into LVDF#2 (Including the Basin Itself)	167	13.651	204.12	0.00	204.12
AP-14	LVDF #2 Discharge into LVDF #1 Outfall Pipe	502	13.632	29.79	0.00	29.79

1. Basin C-1
2. Routed Flow from Basins C-12 and D-3 HYD Nos. 116 and 118 respectively
3. Basin C-10 Plus 0.4 cfs Flow By from Street 10 Inlets.
4. Flow By from AP-6 Inlets / Basin C-6 Runoff
5. Flow By from AP-7 Inlets

Street # 7 - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.006000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 33.03 cfs → BASIN D-4

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.64	ft
Flow Area	10.48	ft²
Wetted Perimeter	32.98	ft
Top Width	32.01	ft
Height	0.49	ft
Critical Depth	5,099.63	ft
Critical Slope	0.006396	ft/ft
Velocity	3.15	ft/s
Velocity Head	0.15	ft
Specific Energy	5,099.79	ft
Froude Number	0.97	
Flow is subcritical.		

1.

Street # 7 - 10yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data	
Channel Slope	0.006000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 19.67 cfs ⟶ BASIN C-4

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.55	ft
Flow Area	7.66	ft²
Wetted Perimeter	32.81	ft
Top Width	32.01	ft
Height	0.40	ft
Critical Depth	5,099.54	ft
Critical Slope	0.007123	ft/ft
Velocity	2.57	ft/s
Velocity Head	0.10	ft
Specific Energy	5,099.65	ft
Froude Number	0.93	
Flow is subcritical.		

DEPTH X VELOCITY CRITERIA

V = 2.57 FT/S
D = 0.40 FT

V X D = 2.57 X 0.40 = 1.03

V X D = 1.03 < 6.5 ∴ OK

2.

Ash Fork Loop (East End) - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	28 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005800 ft/ft

Elevation range: 99.15 ft to 100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	100.00	0.00	48.00	0.017
9.50	99.82			
9.51	99.15			
23.51	99.43			
37.51	99.15			
37.52	99.82			
48.00	100.00			

Discharge 11.43 cfs ⟶ BASIN D-2

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	99.48	ft
Flow Area	5.29	ft²
Wetted Perimeter	28.66	ft
Top Width	28.01	ft
Height	0.33	ft
Critical Depth	99.46	ft
Critical Slope	0.007784	ft/ft
Velocity	2.16	ft/s
Velocity Head	0.07	ft
Specific Energy	99.55	ft
Froude Number	0.88	
Flow is subcritical.		

4.

Ash Fork Loop (East End) - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	28 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005800 ft/ft

Elevation range: 99.15 ft to 100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	100.00	0.00	48.00	0.017
9.50	99.82			
9.51	99.15			
23.51	99.43			
37.51	99.15			
37.52	99.82			
48.00	100.00			

Discharge 6.81 cfs → BASIN D-2

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	99.43	ft
Flow Area	3.86	ft²
Wetted Perimeter	28.35	ft
Top Width	27.80	ft
Height	0.28	ft
Critical Depth	99.41	ft
Critical Slope	0.008552	ft/ft
Velocity	1.76	ft/s
Velocity Head	0.05	ft
Specific Energy	99.48	ft
Froude Number	0.83	
Flow is subcritical.		
Flow is divided.		

VELOCITY X DEPTH CRITERIA

V = 1.76 FT/S

D = 0.28

V X D = 1.76 X 0.28 = 0.49

$V \times D = 0.49 < 6.5$ ∴ OK

5.

Oak Creek Sta. 17+60 - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 22.44 cfs →

BASIN D-3	5.13	
C-12	11.86	
C-11	3.65	
ASH FORK FLOW BY	1.8	
	22.44	CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.58	ft
Flow Area	8.76	ft²
Wetted Perimeter	32.87	ft
Top Width	32.01	ft
Height	0.43	ft
Critical Depth	5,099.56	ft
Critical Slope	0.006929	ft/ft
Velocity	2.56	ft/s
Velocity Head	0.10	ft
Specific Energy	5,099.69	ft
Froude Number	0.86	
Flow is subcritical.		

Oak Creek Sta. 17+60 - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 12.46 cfs → BASIN D-3 3.06

C-12 7.06

C-11 2.34

ASH FORK FLOWBY 0.00

12.46 CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.50	ft
Flow Area	6.15	ft²
Wetted Perimeter	32.71	ft
Top Width	32.01	ft
Height	0.35	ft
Critical Depth	5,099.48	ft
Critical Slope	0.007847	ft/ft
Velocity	2.03	ft/s
Velocity Head	0.06	ft
Specific Energy	5,099.57	ft
Froude Number	0.82	
Flow is subcritical.		

DEPTH X VELOCITY CRITERIA

V = 2.03 FT/S

D = 0.35

V x D = 2.03 x 0.35 = 0.71

V x D = 0.71 < 6.5 ∴ OK

8.

Street # 10 - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.014100 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 15.66 cfs ——> BASIN D-1

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.47	ft
Flow Area	5.16	ft²
Wetted Perimeter	32.65	ft
Top Width	32.01	ft
Height	0.32	ft
Critical Depth	5,099.51	ft
Critical Slope	0.007473	ft/ft
Velocity	3.03	ft/s
Velocity Head	0.14	ft
Specific Energy	5,099.61	ft
Froude Number	1.33	
Flow is supercritical.		

10.

Street # 10 - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.014100 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 11.48 cfs → BASIN D-1

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.44	ft
Flow Area	4.10	ft²
Wetted Perimeter	29.20	ft
Top Width	28.63	ft
Height	0.29	ft
Critical Depth	5,099.47	ft
Critical Slope	0.007976	ft/ft
Velocity	2.80	ft/s
Velocity Head	0.12	ft
Specific Energy	5,099.56	ft
Froude Number	1.31	
Flow is supercritical.		
Flow is divided.		

DEPTH X VELOCITY CRITERIA

V = 2.80 FT/S

D = 0.29 FT

V x D = 2.80 x 0.29 = 0.81

V x D = 0.81 < 6.5 ∴ OK

Oak Creek Sta. (Sump) - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 21.99 cfs → BASIN C-8 11.87
C-10 9.72
FLOW BY FROM STREET #10 0.4
21.99 CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.58	ft
Flow Area	8.66	ft²
Wetted Perimeter	32.87	ft
Top Width	32.01	ft
Height	0.43	ft
Critical Depth	5,099.55	ft
Critical Slope	0.006958	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	5,099.68	ft
Froude Number	0.86	
Flow is subcritical.		

13.

Oak Creek (Sump) - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data	
Channel Slope	0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 12.84 cfs → BASIN C-8 7.08; C-10 5.76; FLOW BY FROM STREET #10 0; 12.84 CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.51	ft
Flow Area	6.26	ft²
Wetted Perimeter	32.72	ft
Top Width	32.01	ft
Height	0.36	ft
Critical Depth	5,099.48	ft
Critical Slope	0.007797	ft/ft
Velocity	2.05	ft/s
Velocity Head	0.07	ft
Specific Energy	5,099.57	ft
Froude Number	0.82	
Flow is subcritical.		

VELOCITY X DEPTH CRITERIA

V = 2.05 FT/S
D = 0.36
V x D = 2.05 x 0.36 = 0.74
V x D = 0.74 < 6.5 ∴ OK

14.

Oak Creek (AP - 6 Inlet) - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.007500 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 12.36 cfs → BASIN C-6

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.48	ft
Flow Area	5.41	ft²
Wetted Perimeter	32.66	ft
Top Width	32.01	ft
Height	0.33	ft
Critical Depth	5,099.48	ft
Critical Slope	0.007859	ft/ft
Velocity	2.28	ft/s
Velocity Head	0.08	ft
Specific Energy	5,099.56	ft
Froude Number	0.98	
Flow is subcritical.		

16.

Oak Creek (AP - 6 Inlet) - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.007500 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 7.37 cfs → BASIN C-6

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.42	ft
Flow Area	3.72	ft²
Wetted Perimeter	27.83	ft
Top Width	27.29	ft
Height	0.27	ft
Critical Depth	5,099.42	ft
Critical Slope	0.008462	ft/ft
Velocity	1.98	ft/s
Velocity Head	0.06	ft
Specific Energy	5,099.48	ft
Froude Number	0.94	
Flow is subcritical.		
Flow is divided.		

VELOCITY X DEPTH CRITERA

V = 1.98 FT/S

D = 0.27 FT

V x D = 1.98 x 0.27 = 0.53

V x D = 0.53 < 6.5 ∴ OK

17.

Oak Creek Sta. 26+38 - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.007500 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 12.44 cfs → BASIN C-5 6.38

BASIN C-6 MINUS 6.3 CFS PULLED OFF BY AP-6 INLET 12.36 - 6.3 = 6.06

12.44 CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.48	ft
Flow Area	5.43	ft²
Wetted Perimeter	32.67	ft
Top Width	32.01	ft
Height	0.33	ft
Critical Depth	5,099.48	ft
Critical Slope	0.007848	ft/ft
Velocity	2.29	ft/s
Velocity Head	0.08	ft
Specific Energy	5,099.56	ft
Froude Number	0.98	
Flow is subcritical.		

19.

Oak Creek Sta. 26+38 - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.007500 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 7.57 cfs → BASIN C-5 3.80

BASIN C-6 MINUS 3.6 CFS PULLED OFF BY AP-6 INLET — 7.37 - 3.6 = 3.77

7.57 CFS

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.43	ft
Flow Area	3.80	ft²
Wetted Perimeter	28.11	ft
Top Width	27.57	ft
Height	0.28	ft
Critical Depth	5,099.42	ft
Critical Slope	0.008432	ft/ft
Velocity	1.99	ft/s
Velocity Head	0.06	ft
Specific Energy	5,099.49	ft
Froude Number	0.95	
Flow is subcritical.		
Flow is divided.		

VELOCITY X DEPTH CRITERIA

V = 1.99 FT/S

D = 0.28 FT

V X D = 1.99 X 0.28 = 0.56

V X D = 0.56 < 6.5 ∴ OK

Scottsdale South of Oak Creek - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.011000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 17.80 cfs → BASIN C-4

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.50	ft
Flow Area	6.01	ft²
Wetted Perimeter	32.70	ft
Top Width	32.01	ft
Height	0.35	ft
Critical Depth	5,099.52	ft
Critical Slope	0.007275	ft/ft
Velocity	2.96	ft/s
Velocity Head	0.14	ft
Specific Energy	5,099.63	ft
Froude Number	1.21	
Flow is supercritical.		

Scottsdale South of Oak Creek - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.011000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 10.54 cfs ——→ BASIN C-4

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.44	ft
Flow Area	4.22	ft²
Wetted Perimeter	29.62	ft
Top Width	29.05	ft
Height	0.29	ft
Critical Depth	5,099.46	ft
Critical Slope	0.008069	ft/ft
Velocity	2.50	ft/s
Velocity Head	0.10	ft
Specific Energy	5,099.54	ft
Froude Number	1.16	
Flow is supercritical.		
Flow is divided.		

VELOCITY X DEPTH CRITERIA

V = 2.50 FT/S

D = 0.29

V×D = 2.50 × 0.29 = 0.73

V×D = 0.73 < 6.5 ∴ OK

23.

Court # 4 - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	28 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.008400 ft/ft

Elevation range: 99.15 ft to 100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	100.00	0.00	48.00	0.017
9.50	99.82			
9.51	99.15			
23.51	99.43			
37.51	99.15			
37.52	99.82			
48.00	100.00			

Discharge 10.03 cfs → BASIN C-2

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	99.45	ft
Flow Area	4.38	ft²
Wetted Perimeter	28.60	ft
Top Width	28.01	ft
Height	0.30	ft
Critical Depth	99.45	ft
Critical Slope	0.008002	ft/ft
Velocity	2.29	ft/s
Velocity Head	0.08	ft
Specific Energy	99.53	ft
Froude Number	1.02	
Flow is supercritical.		

26.

Court # 4 - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	28 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.008400 ft/ft

Elevation range: 99.15 ft to 100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	100.00	0.00	48.00	0.017
9.50	99.82			
9.51	99.15			
23.51	99.43			
37.51	99.15			
37.52	99.82			
48.00	100.00			

Discharge 5.98 cfs → BASIN C-2

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	99.40	ft
Flow Area	3.05	ft²
Wetted Perimeter	25.19	ft
Top Width	24.70	ft
Height	0.25	ft
Critical Depth	99.40	ft
Critical Slope	0.008700	ft/ft
Velocity	1.96	ft/s
Velocity Head	0.06	ft
Specific Energy	99.46	ft
Froude Number	0.98	
Flow is subcritical.		
Flow is divided.		

VELOCITY x DEPTH CRITERIA

V = 1.96 FT/S

D = 0.25 FT

V x D = 1.96 x 0.25 = 0.49

V x D = 0.49 < 6.5 ∴ OK

27.

Ventana Rd. (Basin C-14) - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	36 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	55.02	0.017
9.50	5,099.82			
9.51	5,099.15			
27.51	5,099.51			
45.51	5,099.15			
45.52	5,099.82			
55.02	5,100.00			

Discharge 7.72 cfs → BASIN C-14

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.45	ft
Flow Area	4.49	ft²
Wetted Perimeter	30.56	ft
Top Width	29.96	ft
Height	0.30	ft
Critical Depth	5,099.42	ft
Critical Slope	0.008410	ft/ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Specific Energy	5,099.50	ft
Froude Number	0.78	
Flow is subcritical.		
Flow is divided.		

Ventana Rd. (Basin C-14) - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	36 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.005000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	55.02	0.017
9.50	5,099.82			
9.51	5,099.15			
27.51	5,099.51			
45.51	5,099.15			
45.52	5,099.82			
55.02	5,100.00			

Discharge 4.45 cfs → BASIN C 14

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.39	ft
Flow Area	2.97	ft²
Wetted Perimeter	24.86	ft
Top Width	24.37	ft
Height	0.24	ft
Critical Depth	5,099.37	ft
Critical Slope	0.009050	ft/ft
Velocity	1.50	ft/s
Velocity Head	0.03	ft
Specific Energy	5,099.43	ft
Froude Number	0.76	
Flow is subcritical.		
Flow is divided.		

VELOCITY X DEPTH CRITERIA

V = 1.5 FT/S

D = 0.24

V x D = 1.5 (0.24) = 0.36

V x D = 0.36 < 6.5 ∴ OK

30.

Scottsdale @ Cattleguard - 100 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.011000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 46.44 cfs → AP-10 (ROUTED FLOW)

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.64	ft
Flow Area	10.72	ft²
Wetted Perimeter	33.00	ft
Top Width	32.01	ft
Height	0.49	ft
Critical Depth	5,099.71	ft
Critical Slope	0.005968	ft/ft
Velocity	4.33	ft/s
Velocity Head	0.29	ft
Specific Energy	5,099.94	ft
Froude Number	1.32	
Flow is supercritical.		

32.

Scottsdale @ Cattleguard - 10 yr.
Worksheet for Irregular Channel

Project Description	
Project File	t:\projects\5051\eng\st_flow.fm2
Worksheet	32 street
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data

Channel Slope 0.011000 ft/ft

Elevation range: 5,099.15 ft to 5,100.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5,100.00	0.00	50.52	0.017
9.50	5,099.82			
9.51	5,099.15			
25.51	5,099.47			
41.51	5,099.15			
41.52	5,099.82			
50.52	5,100.00			

Discharge 26.56 cfs → AP-10 (ROUTED FLOW)

Results		
Wtd. Mannings Coefficient	0.017	
Water Surface Elevation	5,099.55	ft
Flow Area	7.65	ft²
Wetted Perimeter	32.80	ft
Top Width	32.01	ft
Height	0.40	ft
Critical Depth	5,099.59	ft
Critical Slope	0.006690	ft/ft
Velocity	3.47	ft/s
Velocity Head	0.19	ft
Specific Energy	5,099.74	ft
Froude Number	1.25	
Flow is supercritical.		

VELOCITY X DEPTH CRITERIA

V = 3.47 FT/S

D = 0.40

V x D = 3.47 x 0.40 = 1.39

V x D = 1.39 < 6.5 ∴ OK

33.

the City Engineer. All catch basins which must be located outside street property lines in order to intercept storm waters under existing conditions are considered "must" catch basins. Right-of-way or an easement for such catch basins must be acquired. Catch basins to be located outside dedicated streets to accommodate future street widenings and which will not intercept storm water under existing conditions are detectable items. Please refer to the City Engineer regarding detectable catch basins.

Catch basins to be constructed off the paved portion of the roadway but within the street property lines must be made operable by grading the roadway to permit storm water to flow to the basin. Street remodeling of this nature will be performed during construction.

(3) If a project is to have one or more cutoff points in phased construction, each cutoff point should have a battery of catch basins at the upstream terminus sufficient to collect the flow carrying capacity of the storm drain at that point.
Each battery of catch basins should be designed with sufficient data regarding types and sizes of catch basins, connector pipe sizes and D-loads, "V" depths, local depressions, and whatever other information may be necessary to construct the system.

(4) Sump designs for catch basins should normally be limited to local streets and only those situations where terrain or grading considerations warrant their use. When specifying a sump catch basin(s) the designer shall ensure that surrounding properties are protected from the occurrence of system clogging by demonstrating that one of the following emergency backup conditions exist:

1) The design storm peak flow rate will release to either a public R.O.W. or public easement without rising above any adjacent structure pad elevations;

or

2) Sufficient storage is available within a combination of public R.O.W., public easement, and nonstructurally occupied private properties to hold 100% of the design event volume, without inflicting damage to structures, until such time as the underground system can be unclogged.

When relying on public easements across private property to achieve either objective, the easement language creating the encumbrance shall specify that said easement is a surface flowage easement and no structural improvements which would interfere with conveyance or storage of water shall be allowed. Any surface modification within the flowage easement will require an encroachment agreement from the City.

b. Catch Basins

The selection of type, number, and spacing of catch basins should be based on Plates 22.3 D-1 through 22.3 ~~D-9~~ D-9 and the following instructions.

City standard catch basins "Type A, B and C" are combination basins with both curb opening and grading. Catch basin "Type D" is a grating only basin. Basin gratings tend to accumulate debris and clog. The curb opening both limits debris accumulation and offsets lost capacity due to clogging of the grating. Except for certain valley applications, combination basins should be used. Due to main line clogging, grating only basins should be used in valley applications where main line pipe diameters are 24" or less or where quarter full pipe velocities are less than 2.5 f.p.s.

"Type A" basins should be used for single basin applications and as the first basin in a

REVISED 2/17/98

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Sedona Subdivision Tract C

Sump #1 Overflow

Weir at Oak Creek and Bisbee

October 1, 1999

<u>Sump Overflow Weir at Oak Creek and Bisbee</u>

Sump Inlet Data

TC = Top of curb FL = Curb flow line

TC = 3.33 FL = 2.66

Head required to capture 100 year flow at sump = 0.67'

Spill Weir Data

Weir elevation set by adding 0.67 to sump flow line elevation

FL = 2.66 + 0.67 = 3.33

FL = 3.33

Width = 32' face to face

Basin C-8 =	11.87 cfs
Basin C-10 =	9.72 cfs
Q_{spill} =	21.59 cfs

$Q = C\,L\,H^{3/2}$ C = 2.67 L = 32 ft Q_{spill} = 21.59 cfs

$(21.59) = 2.67\,(32)\,(H)^{3/2}$

$H^{3/2}\ 0.253$

H = 0.40

Maximum Water Surface (MWSE)

3.33 + 0.40 = 3.73

MWSE = 3.37

Minimum pad elevation in low point = 4.60

∴ Overflow can pass 100-year Q without rising above any adjacent structure pad elevations.

Sedona Subdivision Tract C

Sump #2 Overflow

Weir at Scottsdale and Court #4

October 1, 1999

Sump Overflow Weir at Scottsdale and Court #4

Cattle Guard Inlet Data

TL = 98.50 FL = 97.83

Essentially no head required for cattle guard to capture 100-year flow.

Spill Weir Data

$FL_1 = 98.39$
$FL_2 = 98.58$
Width 28' F/F

AP-10 =	46.44 cfs
Spill Basin C-8 =	11.87 cfs
Spill Basin C-10 =	9.72 cfs
Q_{spill} =	68.03 cfs

$Q = C\,L\,H^{3/2}$ C = 2.57 L = 32 ft $Q_{spill} = 68.03$

$68.03 = 2.67\,(28)\,(H)^{3/2}$

$H^{3/2} = 0.9099$

H = 0.94 ft

Maximum Water Surface (MWSE)

$$\frac{F_1 + F_2}{2} + 0.94 \text{ ft} = \frac{98.39 + 98.58}{2} + 0.94 \text{ ft}$$

MWSE = 99.42

Minimum Pad Elevation in Low Point 99.8
∴ overflow can pass 100-year Q without rising above any adjacent structures.

Sedona Subdivision Tract C

Sump #3 Overflow

Rundown and Double C Inlet

September 17, 1999

Curb Opening

Q at curb assuming an inlet at all three sumps are clogged

AP-10		46.44 cfs
Basin C-10		9.72 cfs
Basin C-8		11.87 cfs
Basin C-2		10.03 cfs
	Q Spill =	78.06 cfs

AP-10 represents routed runoff from Basins C-7, C-9, O-1, O-2, B-1, and C-3. Inlet to rundown will function as Weir.

$Q = C\,L\,H^{3/2}$

C = 2.67
L = 36'
H = curb height plus 0.2' = 0.87
Q Spill = 78.06

$Q = 2.7\,(36)\,(0.87)^{3/2}$

Maximum water surface elevation contained within R/W

$Q = 78.87$ cfs 〈 78.06 cfs ∴ OK

Double C Inlet at End of Rundown

Top of Wall = 99.17 — h = 99.17 – 97.17 = 2.0

Top of Grate = 97.17 — h = 2.0

Assume inlet functioning under orifice control

$Q = CA\sqrt{2gh}$

A => open area of double grate
A = 10.30 sq. ft.

$Q = 0.67\,(10.30)\,\sqrt{2(32.2)(2)}$

$Q = 78.32$ cfs > 78.06 cfs ∴ OK

STORM DRAIN HYDRUALIC GRADE LINE ANALYSIS

PROJECT: Tract C Ventana Ranch
JOB NO.: 5050
SUBJECT: Oak Creek Storm Drain
DATE: 10/01/99
BY: DSH

STARTING CC
OUTFALL STA
PIPE INVERT E
TAILWATER EL
STARTING HG
STARTING GR

PIPE DATA								STRUCTURE(	EGL & HGL @ UPSTREAM END OF PIPE SEGMENT							HGL BELOW GROUND?	
PIPE SEGMENT FROM DOWN STREAM	TO UP STREAM	STA. OFFSET	MAIN FLOW (cfs)	PIPE DIA. (inches)	MANNING COEFF. ("n")	LAY LENGTH (feet)	PIPE SLOPE (fpf)	MANHOLE LOSS (1=yes)	STORM DRAIN STA.	EGL ELEV. BACK	EGL ELEV. AHEAD	HGL ELEV. BACK	HGL ELEV. AHEAD	DEFAULT HGL ELEV AHEAD	PIPE FULL?	FINISHED GROUND ELEV	CHECK
OUTFALL	Inlet Junctio	O27+20.10RT	146.89	54	0.013	167.73	0.0108	1	167.73	5391.76	5391.90	5390.44	5390.58	5391.31	(PARTIAL)	5400.50	OK
Inlet Junctio	MH1	O26+38.81,10RT	128.88	48	0.013	81.90	0.0140	1	249.63	5393.60	5394.13	5391.97	5392.49	5392.49	(PARTIAL)	5400.88	OK
MH1	MH2	O25+79.84,10.08R	122.86	48	0.013	55.81	0.0140	1	305.44	5394.39	5394.58	5392.90	5393.10	5393.24	(PARTIAL)	5401.32	OK
MH2	MH3	O24+63.41, 10RT	122.86	48	0.013	116.03	0.0140	1	421.47	5395.57	5396.30	5394.09	5394.82	5394.86	(PARTIAL)	5402.19	OK
MH3	MH4	O23+97.46,10.33R	111.08	48	0.013	68.19	0.0050	1	489.66	5396.48	5396.64	5395.27	5395.43	5395.43	FULL	5402.69	OK
MH4	MH5	O23+23.36,10RT	111.08	48	0.013	76.56	0.0050	1	566.22	5397.10	5397.26	5395.89	5396.05	5396.05	FULL	5403.24	OK
MH5	MH6	O22+58.91, 10RT	111.08	48	0.013	66.64	0.0050	1	632.86	5397.66	5397.78	5396.44	5396.57	5396.57	FULL	5403.51	OK
MH6	MH7	O20+44.73, 10RT	111.08	48	0.013	214.18	0.0050	1	847.04	5399.07	5400.14	5397.85	5398.93	5398.93	FULL	5402.78	OK
MH7	MH8	O18+70.80, 10RT	91.09	48	0.013	173.93	0.0050	1	1020.97	5400.44	5401.29	5399.63	5400.48	5400.48	FULL	5403.39	OK
MH8	MH9	O18+10.13,10RT	77.20	42	0.013	60.67	0.0190	1	907.71	5400.28	5401.14	5399.28	5400.14	5400.14	FULL	5403.69	OK
MH9	MH10	O16+17.81,10RT	59.76	42	0.013	192.32	0.0190	1	1100.03	5401.41	5401.81	5400.81	5401.21	5401.80	(PARTIAL)	5404.65	OK
MH10	MH11	O14+87.04,9.99RT	49.83	42	0.013	130.77	0.0030	1	1230.80	5402.54	5402.56	5402.12	5402.14	5402.19	(PARTIAL)	5405.30	OK
MH11	MH12	O11+84.36,10RT	49.83	42	0.013	311.57	0.0030	1	1542.37	5403.37	5404.58	5402.96	5404.16	5404.16	(PARTIAL)	5406.82	OK
MH12	MH13	O10+38.52,10RT	16.86	36	0.013	146.15	0.0030	1	1688.52	5404.35	5404.59	5404.26	5404.51	5404.51	FULL	5407.55	OK
MH13	MH14		6.65	24	0.013	100.04	0.0030	1	1642.41	5404.32	5404.32	5404.25	5404.25	5404.25	FULL	5409.00	OK
MH14	INLET		6.65	24	0.013	24.00	0.0030	1	1712.52	5404.60	5404.60	5404.53	5404.53	5404.53	FULL	5409.00	OK
MH14	DUMMY		0.00	24	0.013	10.00	0.0030		431.47	5394.86	5394.86	5394.86	5394.86	5394.89	(PARTIAL)	5409.00	OK

STORM DRAIN HYDRUALIC GRADE LINE ANALYSIS

PROJECT: Tract C Ventana Ranch
JOB NO.: 5051
SUBJECT: Scottsdale Storm drain
DATE: 10/01/99
BY: DSH

STARTING CC
OUTFALL STA
PIPE INVERT E
TAILWATER E
STARTING HG
STARTING GF

PIPE DATA								STRUCTURE(	EGL & HGL @ UPSTREAM END OF PIPE SEGMENT							HGL BELOW GROUND?	
PIPE SEGMENT FROM DOWN STREAM	TO UP STREAM	STA. OFFSET	MAIN FLOW (cfs)	PIPE DIA. (inches)	MANNING COEFF. ("n")	LAY LENGTH (feet)	PIPE SLOPE (fpf)	MANHOLE LOSS (1=yes)	STORM DRAIN STA.	EGL ELEV. BACK	EGL ELEV. AHEAD	HGL ELEV. BACK	HGL ELEV. AHEAD	DEFAULT HGL ELEV AHEAD	PIPE FULL?	FINISHED GROUND ELEV	CHECK
Outlet	MH-19		56.22	36	0.013	83.79	0.0080	1	83.79	5389.58	5389.75	5388.60	5388.76	5388.76	(PARTIAL)	5398.41	OK
MH-19	INLET		56.22	36	0.013	120.24	0.0080	1	204.03	5390.60	5390.89	5389.62	5389.90	5389.90	(PARTIAL)	5397.75	OK
INLET	MH-18		46.44	30	0.013	44.84	0.0100	1	248.87	5391.87	5391.94	5390.48	5390.55	5390.55	FULL	5398.17	OK
MH-18	MH-17		46.44	30	0.013	113.48	0.0100	1	362.35	5393.39	5393.74	5392.00	5392.35	5392.35	FULL	5398.71	OK
MH-17	Cattleguard		46.44	30	0.013	111.88	0.0100		474.23	5395.17	5395.17	5393.78	5393.78	5393.78	FULL	5397.83	OK
Cattleguard	DUMMY		0.00	18	0.013	10.00	0.0200		372.35	5392.35	5392.35	5392.35	5392.35	5392.35	FULL	0.00	HGL > GRND