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

October 29, 1999

Dave Thompson, P.E.
Thompson Engineering Consultants, Inc.
2060 Main Street, NE, Suite E
Los Lunas, New Mexico 87031

RE: Drainage Report and Grading and Drainage Plan for Tuscany West, Unit 5, (A11/D1D) Submitted for Preliminary Plat and Rough Grading approval, Engineer's Stamp Dated 10/12/99.

Dear Mr. Thompson:

Based on the information provided, the above referenced report, and the Grading and Drainage Plans dated October 12, 1999, are approved for Preliminary Plat action by the DRB.

The above referenced plan is also approved for Rough Grading provided that it is first approved by the DRB.

Prior to Final Plat sign-off, the Subdivision Improvements Agreement (SIA) must be in place. As you are aware, the Grading and Drainage Certification is required prior to release of the SIA.

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

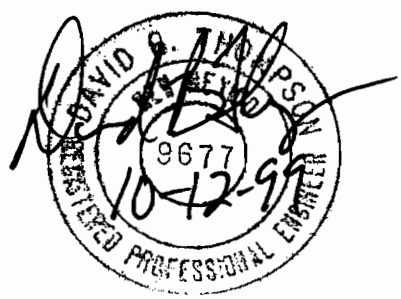
c: DRB-99-26
Stan Strickman, Curb West, Inc.
File

DRAINAGE REPORT
FOR
TUSCANY WEST UNIT 5
SUBDIVISION

Prepared for:
CURB West, Inc.
6301 Indian School Rd. NE
Suite 208
Albuquerque, NM 871

Prepared by:
Thompson Engineering Consultants, Inc.
2060 Main Street N.E., Suite E
Los Lunas, NM 87031

October 1999



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INTRODUCTION AND SITE LOCATION

The proposed Tuscany West Unit 5 Subdivision is located on the west side of Albuquerque near Unser Boulevard and McMahon Boulevard. The 14 acre site lies within the Tuscany West Master Plan area. The tract is currently platted as Paradise Heights Unit 2. The property will be subdivided into 71 residential lots including 69 lots owned by CURB West, Inc. and 2 lots remaining from the existing plat. The drainage plan for this parcel is included in the approved "Drainage Report for Tuscany West Subdivision, Units I & II" by Community Sciences, dated January 23, 1997. This report specifically addresses the grading and drainage plan and analysis for Tuscany West Unit 5.

METHODOLOGY

The hydrologic and hydraulic criteria in Section 22 of the City of Albuquerque Development Process Manual (DPM), entitled "Drainage, Flood Control, and Erosion Control," was followed to perform the analyses given in this report. The design storm used for both the existing undeveloped and developed conditions of the Tuscany West Unit 5 Subdivision is the 100-year, 6-hour storm event for peak flow computations.

A hydrologic computer model using AHYMO 97 was developed for both existing and developed conditions to determine the peak flows expected for the development. Street capacities were modeled using HEC-RAS to determine normal depths and conjugate depths. Finally, a hydraulic analysis of the storm sewer collection system was performed to assist in the sizing of the infrastructure.

EXISTING DRAINAGE CONDITIONS

INTRODUCTION

The site is the last area to be developed in the Tuscany area. The site is located north of Bandelier Drive and east of Tuscany West Units 3 and 4. The site has an average slope of about 7.5%. The site slopes from north to south to Bandelier Drive. The total fall in elevation from north to south is 86 feet. The site is sparsely vegetated.

The FEMA Flood Insurance Rate Map Number 35001C0104D, effective date September 20, 1996, shown in Figure 1, does not indicate the presence of any floodplains on or near the site, except for the Calabacillas Arroyo.

OFF-SITE FLOWS

Minor offsite flows drain to the subdivision from the west. These offsite flows are conveyed in the street section of Hemlock Avenue. The 0.41 acre offsite basin includes two residential lots and about 100 feet of the street. The offsite runoff is 1.45 cfs.

ON-SITE FLOWS

For the existing conditions hydrologic analysis, land treatment types A and B were used to determine peak flows. There is only one on-site drainage basin. The 14.08 acre on-site basin drains to Bandelier Drive. The on-site Basin the land treatments are 82% A and 18%B. The peak flows from the on-site basin is 20.42 cfs.

DEVELOPED DRAINAGE CONDITIONS

DRAINAGE BASIN DELINEATION

Plate 1 shows that the site is divided into four drainage basins, basins 110, 120, 130, and 140. Basin 140 includes the small offsite basin. Following the Tuscany Master Drainage Plan, the flows from the four basins are routed to Bandelier Drive by either a storm sewer or in Napoli Street. The majority of the flows are collected in a storm sewer in Napoli Street and discharged to an existing 36" RCP stub at the Bandelier/Napoli intersection. The remaining flows are conveyed in Napoli Street to Bandelier Drive to be collected downstream in the Bandelier storm sewer. The Bandelier storm sewer eventually drains to the Calabacillas Arroyo.

HYDROLOGIC ANALYSIS

To determine the peak flows of each basin a hydrologic analysis was performed in accordance to section 22.2 of the Development Process Manual (DPM) using AHYMO 97. The analysis included the 100-year 6-hour storm. The 100-year 6-hour storm was the basis for determining peak flows to size the storm sewer collection system (see Appendix A). The design storm values were obtained from the Tuscany Master Drainage Plan Report. The Tuscany West Unit 5 subdivision site is contained within sections A-11of the City of Albuquerque Zone Atlas Map. The Drainage Report of Tuscany West, Units I & II used the following design storms:

100-year 1-hour event -- 1.90 inches,
100-year 6-hour event -- 2.20 inches,
100-year 24-hour event -- 2.65 inches.

Basins were assigned land treatment values in accordance with Tables A-4 and A-5 of the DPM's section 22.2. Table 1 shows the land treatments and areas for each drainage basin. The time of concentration for all basins was calculated using the SCS Upland Method Calculated outlined in subsection B.2 of DPM section 22.2 within the AHYMO 97 model.

Table 1 Developed Drainage Conditions

BASINS	Area (acres)	100yr-6hr Peak Flow (cfs)	100yr- 6hr Runoff Volume (acre-ft)	Land Treatment
110	0.75	2.64	0.088	17%B, 34%C, 49%D
120	5.74	20.13	0.678	17%B, 34%C, 49%D
130	3.32	11.65	0.392	17%B, 34%C, 49%D
140	4.68	16.41	0.552	17%B, 34%C, 49%D
TOTAL	14.49	50.83	1.710	

DRAINAGE CONCEPT

Introduction

This drainage report addresses the drainage concept for the developed condition of the Tuscany West Unit 5 subdivision. The drainage concept follows the Tuscany Master Drainage Plan Report. This subdivision is included as Basins 155, 156, and 157 of the Tuscany Master Drainage Plan (see Appendix C). The Tuscany Master Plan allows for a total of 51.2 cfs to be discharged from the subdivision to Bandelier Drive to be collected and conveyed by the Bandelier storm sewer system. Of the 52 cfs allowed, as much as 39 cfs can be discharged to the existing 36" storm sewer stub at the Bandelier/Napoli intersection according to the record drawings for Bandelier Drive in the City Project No. 5208.91. The remaining flows will drain into Bandelier Drive from Napoli Street to be collected in the Bandelier storm drain downstream. The eventual outfall for the Bandelier storm drain is the Calabacillas Arroyo.

Street Hydraulic Analysis

A hydraulic analysis of the street flows was completed to determine normal depth and sequent depth of the flow (see Appendix B). The sequent depth must remain within the street right-of-way. Therefore, the sequent depth must be equal to or less than 0.87 feet. A HEC-RAS model was developed for each street including Napoli Street, Maddux Place, Hemlock Avenue and Bandelier Drive. HEC-RAS automatically calculates the energy grade depth, which is always greater than the sequent depth. Therefore, if the energy grade depth is equal to or less than 0.87 feet for a street section with a standard curb and gutter and 0.53 feet for a street section with mountable curb and gutter, then the sequent depth is also less than 0.87 feet and 0.53 feet respectively. On Hemlock Avenue at the property line between lots 23 and 24, the energy grade depth is 0.51 feet which is less than the maximum of 0.53 for mountable curb and gutter. Therefore, west of the property line between lots 23 and 24 to the subdivision boundary, the curb and gutter section will be mountable. Table 2 shows the results of the analysis including the energy grade depth.

Table 2 Street Hydraulic Analysis

Street	Width (ft)	Slope (%)	Contributing Basins	Flow (cfs)	Normal Depth (ft)	Energy Grade Depth (ft)
Napoli	28	8.25	140	16.4	0.31	0.85
Napoli	28	8.25	130 & 140	16.25	0.31	0.85
Maddux	26	3.33	120	20.13	0.38	0.72
Napoli	28	4.00	110, 120, & 130	14.52	0.32	0.68
Hemlock	28	3.33	Part of 140	7.50	0.27	0.51
Bandelier	40	1.00	Upstream & 14.52 cfs from Unit 5	39.90	0.49	0.71

Drainage Description

Following the Tuscany Drainage Master Plan. peak flows from the drainage basins will be discharged to the Bandelier storm drainage system via both an underground storm sewer and in Napoli Street. Refer to Plate 1. The majority of the flows will be collected in a storm sewer to be drained to an existing 36" RCP stub at the intersection of Bandelier and Napoli. Approximately 11.8 cfs of the 16.4 cfs peak flow from Basin 140 will be collected by two double-grate Type A storm inlets and carried in a 24" RCP storm sewer. Therefore, 4.6 cfs will remain in Napoli street to be collected down stream. In Basin 130, the total street flow is 16.25 cfs including 4.6 cfs from Basin 140. About 11.8 cfs will be collected in two double-grate Type A storm inlets and conveyed to a manhole at the intersection of Napoli and Maddux. The remaining flows (4.45 cfs) will be carried in Napoli Street to Basin 110.

Approximately 12.8 cfs of the 20.13 cfs peak flow from Basin 120 will be collected by two double-grate Type A storm Inlets and drained in a 24" RCP storm sewer to a manhole at the intersection of Napoli and Maddux. The remaining 7.33 cfs will drain in Maddux to Napoli Street. An analysis to determine the energy grade depth if a hydraulic jump occurs at the intersection was completed. The analysis shows that all flows will remain within the street at the intersection and within the right-of-way just downstream of the intersection. A 24" RCP storm sewer in Napoli from Maddux to Bandelier will carry the 36.4 cfs from the upstream basins to the 36" RCP stub at Bandelier. And a total of 14.52 cfs will be conveyed in Napoli Street to drain to Bandelier Drive to be collected downstream.

Storm Sewer Hydraulics Analysis

Once the hydrologic analysis was completed, a hydraulics analysis was performed to size the proposed storm sewer pipes. Since the slopes of the streets within the subdivision are steep, all of the storm sewers were sized by the gravity flow method. The hydraulics analysis is shown in Appendix B.

Grading Plan

Plate 2 shows the Mass Grading Plan for the subdivision. This is the last subdivision to be developed in the area, therefore the subdivision is surrounded by developed lots. The majority of the north-south street slopes are steep in order to meet boundary conditions. Sideyard retaining walls similar to Tuscany Ridge subdivision to the south will be required. The back lots of the row of lots between Maddux Place and Bandelier Drive all drain to Bandelier Drive. The lots on the east side of Napoli Street from Maddux Place to the cul-de-sac bulb will have backyard ponding. Seven of these lots will require retaining walls along the back wall. Also, the four large lots south of Hemlock Avenue adjacent to Tuscany West Unit 4 will require backyard ponding and retaining walls along the back wall. The grade difference between these lots and the back of the Maddux Place cul-de-sac lots is as much as 24 feet. Therefore, it is proposed that as many as three rows of staggered retaining walls be used to take up the grade difference. Plate 3 shows the grading and location of retaining walls for the lots on the south side of Hemlock Avenue. A cross-section of these staggered retaining walls is shown on Plate 4.

Drainage Details

Drainage details for the project are shown on Plate 4. Details include street sections, typical retaining wall detail, a section of the staggered or tiered retaining walls, typical lot grading detail, erosion control detail, typical cross-section for lots draining into Bandelier Drive, and sideyard grading detail.

Tuscany West Unit 5
Proposed Conditions

Basin	Area Ac	Area Sq Mi	Flow Line Length	Flow Line Δelev	Avg Slope	LAND TREATMENTS %A	%B	%C	%D	
120	5.74	0.00897	840 LF	45.5	.0542		17	34	49	1)
140	4.68	0.00731	870 LF	32.0	.0368		17	34	49	1)
110	0.75	0.00117	320 LF	8.5	.0266		17	34	49	1)
130	3.32	0.00519	675 LF	42	.0622		17	39	49	1)

$P_{60} = 1.9$

$P_{360} = 2.3$ in

$P_{1440} = 2.7$ in

1) Based on 5.0 Du/Ac Density 49 5 Dus/Ac

HEC-RAS Output

Bandelier Drive at Hillside/Napoli Intersection S=1.0%

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 40' F-F

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
40' F-F	5	39.90	100.00	100.52	100.53	100.69	0.007213	3.35	11.91	40.06	1.08
40' F-F	4	39.90	99.00	99.48	99.53	99.72	0.012372	3.94	10.13	40.04	1.38
40' F-F	3	39.90	98.00	98.50	98.53	98.70	0.009022	3.58	11.14	40.05	1.20
40' F-F	2	39.90	97.00	97.49	97.53	97.71	0.010852	3.79	10.54	40.04	1.30
40' F-F	1	39.90	96.00	96.49	96.53	96.71	0.010643	3.77	10.60	40.05	1.29

Depth = 0.49 ft
Energy Grade = 0.71 ft

Flows include 25.4 CFS
from upstream basins on Bandelier
and 14.5 CFS from Tuscany West Unit 5

Bandelier Drive at Hillside/Napoli Intersection S=1.0%

Plan: Plan 01 River: Typical Street Reach:40' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	96.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.017	
E.G. Elev (ft)	96.71	Reach Len. (ft)			
Crit W.S. (ft)	96.53	Flow Area (sq ft)		10.60	
E.G. Slope (ft/ft)	0.010643	Area (sq ft)		10.60	
Q Total (cfs)	39.90	Flow (cfs)		39.90	
Top Width (ft)	40.05	Top Width (ft)		40.05	
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)		3.77	
Max Chl Dpth (ft)	0.49	Hydr. Depth (ft)		0.26	
Conv. Total (cfs)	386.8	Conv. (cfs)		386.8	
Length Wtd. (ft)		Wetted Per. (ft)		40.90	
Min Ch El (ft)	96.00	Shear (lb/sq ft)		0.17	
Alpha	1.00	Stream Power (lb/ft s)		0.65	
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

Hillside/Napoli upstream of Bandelier Street-discharge from Tuscany West Unit 5 Slope = 4.0%

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 40' F-F

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
40' F-F	5	14.52	100.00	100.33	100.41	100.64	0.036780	4.43	3.27	25.00	2.16
40' F-F	4	14.52	96.00	96.32	96.41	96.66	0.041470	4.64	3.13	24.40	2.29
40' F-F	3	14.52	92.00	92.33	92.41	92.65	0.038920	4.53	3.20	24.71	2.22
40' F-F	2	14.52	88.00	88.32	88.41	88.66	0.040835	4.62	3.14	24.47	2.27
40' F-F	1	14.52	84.00	84.32	84.41	84.68	0.045661	4.82	3.01	23.92	2.39 ⇐

Depth = 0.32 ft

Energy grade = 0.68 ft

Hillside/Napoli upstream of Bandelier Street - discharge from Tuscany West Unit 5

Plan: Plan 01 River: Typical Street Reach:40' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	84.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.36	Wt. n-Val.		0.016	
E.G. Elev (ft)	84.68	Reach Len. (ft)			
Crit W.S. (ft)	84.41	Flow Area (sq ft)		3.01	
E.G. Slope (ft/ft)	0.045661	Area (sq ft)		3.01	
Q Total (cfs)	14.52	Flow (cfs)		14.52	
Top Width (ft)	23.92	Top Width (ft)		23.92	
Vel Total (ft/s)	4.82	Avg. Vel. (ft/s)		4.82	
Max Chl Dpth (ft)	0.32	Hydr. Depth (ft)		0.13	
Conv. Total (cfs)	68.0	Conv. (cfs)		68.0	
Length Wtd. (ft)		Wetted Per. (ft)		24.49	
Min Ch El (ft)	84.00	Shear (lb/sq ft)		0.35	
Alpha	1.00	Stream Power (lb/ft s)		1.69	
Frctn Loss (ft)	4.01	Cum Volume (acre-ft)			
C & E Loss (ft)	0.00	Cum SA (acres)			

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 26' F-F Maddux Place Basin 120 S = 3.33%

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
26' F-F	5	20.13	100.00	100.40	100.48	100.67	0.019974	4.13	4.87	26.02	1.68
26' F-F	4	20.13	96.67	97.02	97.15	97.53	0.055224	5.72	3.52	24.89	2.68
26' F-F	3	20.13	93.34	93.73	93.82	94.03	0.025194	4.43	4.54	26.02	1.87
26' F-F	2	20.13	90.00	90.36	90.48	90.79	0.044282	5.25	3.83	26.01	2.41
26' F-F	1	20.13	86.67	87.05	87.15	87.39	0.029901	4.67	4.31	26.01	2.02

Depth = 0.38 ft

Energy Grade = 0.72 ft

Maddux Place Basin 120 S = 3.33%

Plan: Plan 01 River: Typical Street Reach:26' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	87.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.		0.016	
E.G. Elev (ft)	87.39	Reach Len. (ft)			
Crit W.S. (ft)	87.15	Flow Area (sq ft)		4.31	
E.G. Slope (ft/ft)	0.029901	Area (sq ft)		4.31	
Q Total (cfs)	20.13	Flow (cfs)		20.13	
Top Width (ft)	26.01	Top Width (ft)		26.01	
Vel Total (ft/s)	4.67	Avg. Vel. (ft/s)		4.67	
Max Chl Dpth (ft)	0.38	Hydr. Depth (ft)		0.17	
Conv. Total (cfs)	116.4	Conv. (cfs)		116.4	
Length Wtd. (ft)		Wetted Per. (ft)		26.68	
Min Ch El (ft)	86.67	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		1.41	
Frctn Loss (ft)	3.39	Cum Volume (acre-ft)			
C & E Loss (ft)	0.03	Cum SA (acres)			

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 28' F-F Hillside / Napoli Basin 140 Q=16.4cfs S=8.25%

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
28' F-F	5	16.40	100.00	100.30	100.43	100.93	0.087909	6.38	2.57	21.99	3.29
28' F-F	4	16.40	91.75	92.06	92.18	92.63	0.077751	6.09	2.69	22.55	3.10
28' F-F	3	16.40	83.50	83.80	83.93	84.43	0.087775	6.38	2.57	22.00	3.29
28' F-F	2	16.40	75.25	75.55	75.68	76.23	0.097419	6.64	2.47	21.53	3.46
28' F-F	1	16.40	67.00	67.31	67.43	67.85	0.072100	5.91	2.77	22.90	2.99

Depth = 0.31 ft
Energy Grade = 0.85 ft

Hillside/Napoli Basin 140 Q=16.4 S=8.25%

Plan: Plan 01 River: Typical Street Reach:28' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	67.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.54	Wt. n-Val.		0.016	
E.G. Elev (ft)	67.85	Reach Len. (ft)			
Crit W.S. (ft)	67.43	Flow Area (sq ft)		2.77	
E.G. Slope (ft/ft)	0.072100	Area (sq ft)		2.77	
Q Total (cfs)	16.40	Flow (cfs)		16.40	
Top Width (ft)	22.90	Top Width (ft)		22.90	
Vel Total (ft/s)	5.91	Avg. Vel. (ft/s)		5.91	
Max Chl Dpth (ft)	0.31	Hydr. Depth (ft)		0.12	
Conv. Total (cfs)	61.1	Conv. (cfs)		61.1	
Length Wtd. (ft)		Wetted Per. (ft)		23.45	
Min Ch El (ft)	67.00	Shear (lb/sq ft)		0.53	
Alpha	1.00	Stream Power (lb/ft s)		3.15	
Frctn Loss (ft)	8.34	Cum Volume (acre-ft)			
C & E Loss (ft)	0.04	Cum SA (acres)			

28'

Plan: Plan 01 River: Typical Street Reach: ~~40~~ F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	84.27	Crit W.S.			
Vel Total (ft/s)	0.24	Min Ch El		0.016	
Q Total (cfs)	84.51	Alpha (Left To)			
Q Left (cfs)	84.34	Frctn Loss (ft)		1.89	
Q Channel (cfs)	0.040271	Area (sq ft)		1.89	
Q Right (cfs)	7.50	Flow (cfs)		7.50	
Top Width (ft)	18.65	Top Width (ft)		18.65	
Vel Head (ft)	3.96	Avg Vel (ft/s)		3.96	
Hydraulic Depth (ft)	0.27	Hydr. Depth (ft)		0.10	
Conv. Total (cfs)	37.4	Conv. (cfs)		37.4	
Length wtd. (ft)		Wetted Per. (ft)		19.13	
Min Ch El (ft)	84.00	Shear (lb/sq ft)		0.25	
Alpha	1.00	Stream Power (lb/ft s)		0.99	
Frctn Loss (ft)	4.03	Cum Volume (acre-ft)			
C & E Loss (ft)	0.02	Cum SA (acres)			

Hemlock Avenue at Sta 15+20

$Q = 7.5$ cfs

$d = 0.27$ feet

$E = 0.51$ feet

HEC-RAS Plan: Plan 01 River: Typical Street Reach: ~~40'~~ 28' F-F HEMLOCK AVENUE at Sta 15+20

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
40' F-F	5	7.50	100.00	100.26	100.34	100.54	0.047848	4.24	1.77	17.98	2.38
40' F-F	4	7.50	96.00	96.27	96.34	96.51	0.039063	3.91	1.92	18.78	2.16
40' F-F	3	7.50	92.00	92.27	92.34	92.51	0.040778	3.98	1.88	18.61	2.20
40' F-F	2	7.50	88.00	88.26	88.34	88.54	0.046960	4.21	1.78	18.05	2.36
40' F-F	1	7.50	84.00	84.27	84.34	84.51	0.040271	3.96	1.89	18.65	2.19

Hillside / Napoli Inlet Capacity

~~Basin 140~~

Depth = 0.31 ft Slope = 8.25%

Q per grate = 5.9 CFS Double A grate

total Q = 5.9 x 2 = 11.8 CFS

Remaining Q = 16.40 - 11.8 CFS = 4.6 CFS will flow into Basin 130

Q in street = 11.65 + 4.6 = 16.25 CFS

Depth = 0.31 ft Slope = 8.25%

Double A grate

Q per Grate = 5.9 CFS

total Q intercepted = 11.80 CFS

remaining Q = 16.25 - 11.80 = 4.45 CFS

Flow into basin 110

Sub total flow in street in Basin 110

Q = 2.64 + 4.45 = 7.19 CFS

Maddux Place Inlet Capacity

Q = 20.13 CFS

D = 0.38 ft S = 3.33%

Double A grate

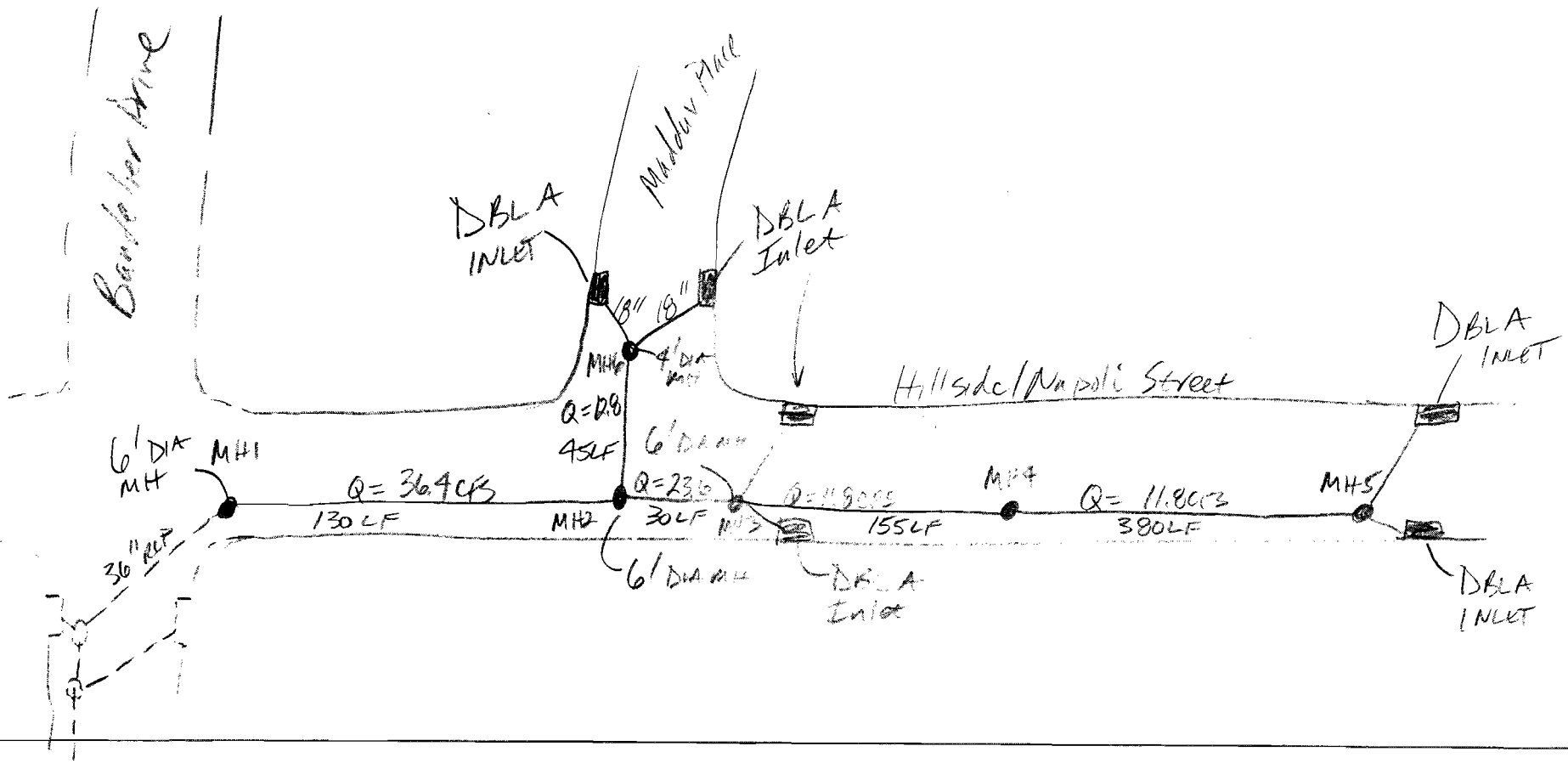
Q = 6.4 CFS per inlet

total Q = 6.4 x 2 = 12.8 CFS

remaining = 20.13 - 12.8 = 7.33 Drain to Hillside

total Q in Hillside draining to Bandelier

Q = 7.19 + 7.33 = 14.52 CFS



STORM SEWER HYDRAULICS
GRAVITY METHOD

Napoli Street

MH 3 to MH 5

DIA = 24" Q = 11.8 CFS S = 8.25%

D = 0.58 ft V = 15.7 fps Fr = 4.31

MH 1 to MH 2

DIA = 24" Q = 36.9 CFS S = 4.00%

D = 1.35 ft V = 16.1 fps Fr = 2.59

MH 2 to MH 3

DIA = 24" Q = 23.6 CFS S = 8.25%

D = 0.83 ft V = 19.06 fps Fr = 4.24

Maddux Place

MH 2 to MH 6

DIA 24" Q = 12.8 CFS S = 3.33%

D = 0.76 ft V = 11.6 fps Fr = 2.71

SUMMARY OF HYDRAULIC CALCULATIONS

CLOSED CONDUIT

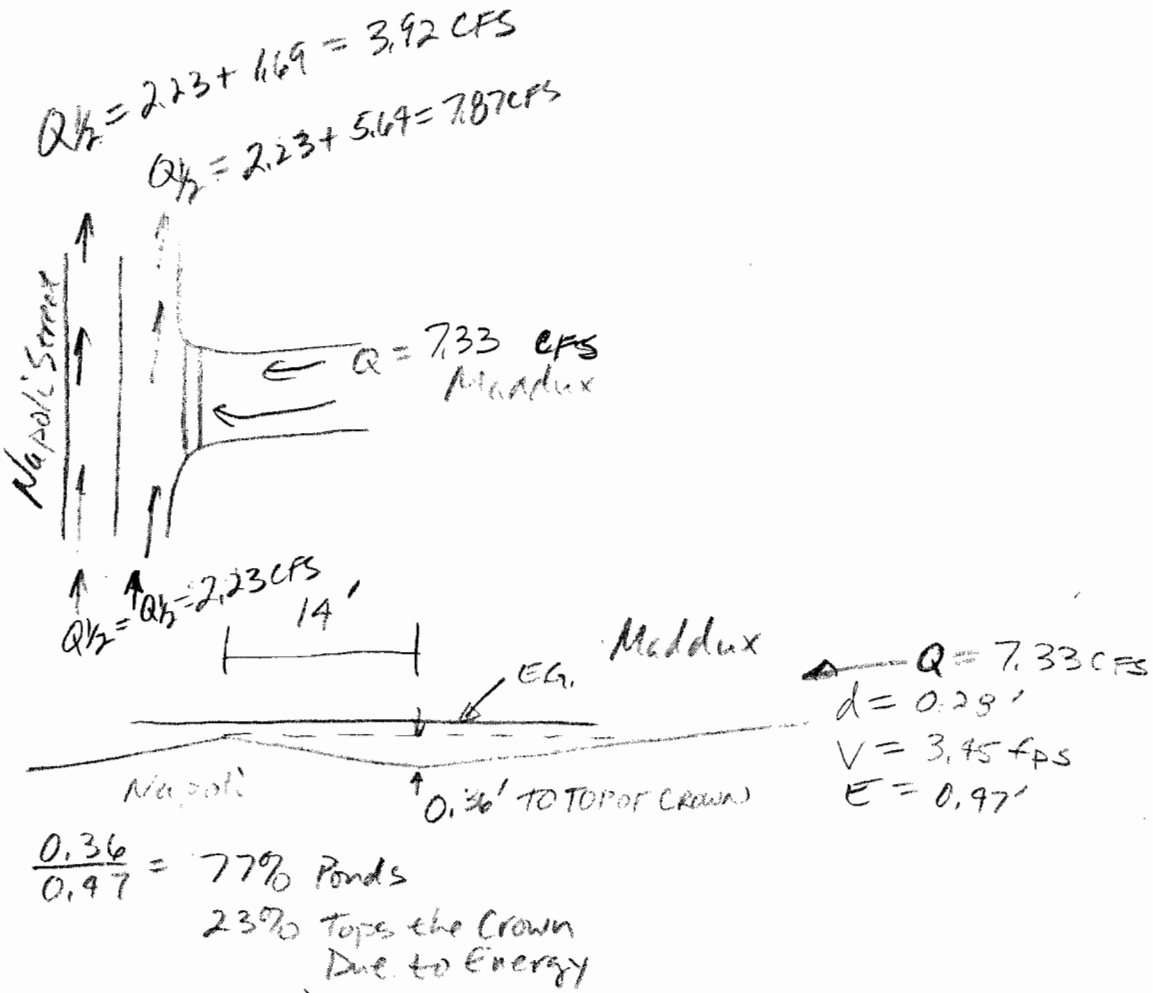
BY: DBT
DATE: 8/5/99
SHEET: 1 of 1

PROJECT: TUSCANY WEST U5 LINE: HILLSIDE/NAPOLI
100 year

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
										JUNCTION		LOSSES										
STATION	STRUCT	D	Q	A	V	K	Sf	L	DELTA	D	ANGLE	hf	hb	hj	hmh	ht	hmisc	SUM	E.G.	hv	H.G.	GROUND ELEV.
																					5219.23	
20+01.39	Bandelier												0.00				0.00	0.00	5219.64	0.41	5219.23	5221.97
		36	36.4	7.07	5.15	667.3	0.0030	55				0.16						0.16	5219.81	0.41	5219.39	
	MH 1								45				0.29	0.00	0.10	0.33		0.73	5220.54	2.08	5218.45	5222.50
		24	36.4	3.14	11.59	226.3	0.0259	130				3.36						3.36	5223.90	2.08	5221.82	
	MH 2									24	90		0.00	2.42	0.00	0.00		2.42	5226.32	0.88	5225.44	5228.50
		24	23.8	3.14	7.51	226.3	0.0109	30				0.33						0.33	5226.65	0.88	5225.77	
	MH 3												0.00	0.00	0.01	0.00		0.01	5226.66	0.22	5226.44	5230.00
		24	11.8	3.14	3.76	226.3	0.0027	155				0.42						0.42	5227.08	0.22	5226.86	
	MH 4												0.00	0.00	0.01	0.00		0.01	5227.09	0.22	5226.87	5243.00
		24	11.8	3.14	3.76	226.3	0.0027	380				1.03						1.03	5228.12	0.22	5227.90	
	MH 5												0.00	0.00	0.01	0.00		0.01	5228.13	0.22	5227.91	5275.00
		24	11.8	3.14	3.76	226.3	0.0027	0				0.00						0.00	5228.13	0.22	5227.91	
																					5225.44	
	MH 2												0.00				0.00	0.00	5225.70	0.26	5225.44	5228.50
		24	12.8	3.14	4.07	226.3	0.0032	45				0.14						0.14	5225.84	0.26	5225.59	
	MH 6								45				0.04	0.00	0.01	0.00		0.05	5225.89	0.26	5225.64	5230.20
		24	12.8	3.14	4.07	226.3	0.0032	0				0.00						0.00	5225.89	0.26	5225.64	

REMARKS: Manning's n: 0.013

Check for Hydraulic Jump at Maddux/Napoli Tee Intersection



$\frac{0.36}{0.47}$ = 77% Ponds

23% Tops the Crown Due to Energy

- Energy Grade (0.54') from Maddux flows is less than top of curb, therefore if a hydraulic jump occurs, the flows will remain in the street.
- Just upstream of Maddux in Napoli Street
  Q = 4.95 CFS d = 0.22 ft E = 0.48 ft
  Flows remain in Street
- Napoli Street just downstream of Maddux
  $Q_{1/2}$ = 7.87 CFS d = 0.32 ft E = 0.72 ft
  Flows will remain in Street

Maddux Place just upstream of Napoli Street

Plan: Plan 01 River: Typical Street Reach:26' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	89.72	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.016	
E.G. Elev (ft)	89.91	Reach Len. (ft)			
Crit W.S. (ft)	89.78	Flow Area (sq ft)		2.12	
E.G. Slope (ft/ft)	0.027029	Area (sq ft)		2.12	
Q Total (cfs)	7.33	Flow (cfs)		7.33	
Top Width (ft)	19.05	Top Width (ft)		19.05	
Vel Total (ft/s)	3.45	Avg. Vel. (ft/s)		3.45	
Max Chl Dpth (ft)	0.28	Hydr. Depth (ft)		0.11	
Conv. Total (cfs)	44.6	Conv. (cfs)		44.6	
Length Wtd. (ft)		Wetted Per. (ft)		19.55	
Min Ch El (ft)	89.44	Shear (lb/sq ft)		0.18	
Alpha	1.00	Stream Power (lb/ft s)		0.63	
Frctn Loss (ft)	2.63	Cum Volume (acre-ft)			
C & E Loss (ft)	0.00	Cum SA (acres)			

$Q = 7.33$ CFS

$d = 0.28$ feet

$E = 0.47$ feet

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 26' F-F

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
26' F-F	5	7.33	100.00	100.28	100.34	100.48	0.029896	3.59	2.04	18.65	1.91
26' F-F	4	7.33	97.36	97.65	97.70	97.82	0.024868	3.34	2.19	19.38	1.75
26' F-F	3	7.33	94.72	95.00	95.06	95.19	0.027560	3.48	2.11	18.97	1.84
26' F-F	2	7.33	92.08	92.37	92.42	92.54	0.025539	3.37	2.17	19.28	1.77
26' F-F	1	7.33	89.44	89.72	89.78	89.91	0.027029	3.45	2.12	19.05	1.82

Napoli Street just downstream of Maddux
1/2 Street flows 7.87 CFS

Plan: Plan 01 River: Typical Street Reach: ~~40~~ F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	79.12	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.		0.016	
E.G. Elev (ft)	79.52	Reach Len. (ft)			
Crit W.S. (ft)	79.23	Flow Area (sq ft)		3.14	
E.G. Slope (ft/ft)	0.048273	Area (sq ft)		3.14	
Q Total (cfs)	15.74	Flow (cfs)		15.74	
Top Width (ft)	24.45	Top Width (ft)		24.45	
Vel Total (ft/s)	5.02	Avg. Vel. (ft/s)		5.02	
Max Chl Dpth (ft)	0.32	Hydr. Depth (ft)		0.13	
Conv. Total (cfs)	71.6	Conv. (cfs)		71.6	
Length Wtd. (ft)		Wetted Per. (ft)		25.02	
Min Ch El (ft)	78.80	Shear (lb/sq ft)		0.38	
Alpha	1.00	Stream Power (lb/ft s)		1.90	
Frctn Loss (ft)	5.23	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

$d = 0.32'$

$E = 0.72'$

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 40' F-F

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
40' F-F	5	15.74	100.00	100.32	100.43	100.74	0.052888	5.20	3.03	24.00	2.58
40' F-F	4	15.74	94.70	95.02	95.13	95.45	0.054021	5.24	3.00	23.89	2.60
40' F-F	3	15.74	89.40	89.72	89.83	90.14	0.052322	5.17	3.04	24.05	2.56
40' F-F	2	15.74	84.10	84.42	84.53	84.81	0.047801	5.00	3.15	24.49	2.46
40' F-F	1	15.74	78.80	79.12	79.23	79.52	0.048273	5.02	3.14	24.45	2.47

Napoli Street just upstream of Maddux

Plan: Plan 01 River: Typical Street Reach: ~~48~~ 28' F-F Riv Sta: 1 Profile: PF#1

W.S. Elev (ft)	79.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.26	Wt. n-Val.		0.016	
E.G. Elev (ft)	79.28	Reach Len. (ft)			
Crit W.S. (ft)	79.09	Flow Area (sq ft)		1.08	
E.G. Slope (ft/ft)	0.058630	Area (sq ft)		1.08	
Q Total (cfs)	4.45	Flow (cfs)		4.45	
Top Width (ft)	13.58	Top Width (ft)		13.58	
Vel Total (ft/s)	4.13	Avg. Vel. (ft/s)		4.13	
Max Chl Dpth (ft)	0.22	Hydr. Depth (ft)		0.08	
Conv. Total (cfs)	18.4	Conv. (cfs)		18.4	
Length Wtd. (ft)		Wetted Per. (ft)		13.96	
Min Ch El (ft)	78.80	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		1.17	
Frctn Loss (ft)	5.33	Cum Volume (acre-ft)			
C & E Loss (ft)	0.01	Cum SA (acres)			

$d = 0.22'$

$E = 0.48'$

HEC-RAS Plan: Plan 01 River: Typical Street Reach: 40' F-F

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
40' F-F	5	4.45	100.00	100.22	100.29	100.46	0.052058	3.93	1.13	13.97	2.44
40' F-F	4	4.45	94.70	94.92	94.99	95.16	0.053256	3.97	1.12	13.89	2.46
40' F-F	3	4.45	89.40	89.62	89.69	89.88	0.059170	4.14	1.07	13.55	2.59
40' F-F	2	4.45	84.10	84.32	84.39	84.59	0.060134	4.17	1.07	13.50	2.61
40' F-F	1	4.45	78.80	79.02	79.09	79.28	0.058630	4.13	1.08	13.58	2.58

TABLE 1
TUSCANY WEST #1 & #2
EXISTING DEVELOPMENT CONDITIONS

					LAND TREATMENT				INCREMENTAL		FUTURE TOTAL	
Basin I.D.	**Area (Sq.Mi.)**	**Contr. Basin**	**Sum Area (Sq.Mi.)**	**Tc (Min.)**	**A**	**B**	**C**	**D**	**Q_{100} (cfs)**	**Q_{10} (cfs)**	**Q_{100} (cfs**	**Q_{10} (cfs)**
455	0.0071	450	0.0575	12	---	30	30	40	14.8		128.3	
460	0.0083	455& 515	0.0863	12	---	30	30	40	8.4		174.7	
Q100 Total in Proposed S.D. to Outfall @ Arroyo 174.7 CFS												
S @ Point 'C'												
291	0.0017	--------	0.0017	12	---	30	30	40	2.5		2.5	
Q on Slope supporting Unser Blvd.,: Q = 2.5 CFS												
461	0.0012	-------	0.0012	12	---	50	50	---	1.9		1.9	
Q to Ponds (Rear yard) at East Boundry : Q = 1.9 CFS (Rear yard Q to be divided by 10 lots)												
Drainage Areas truibutary to Bandelier Drive/Tuscany Dr. And McMahon Storm Drain Systems: (Portions constructed with Tuscany #1, #2, and #3 and Paloma Del Sol projects)												
Future Developments -- Off-site to Tuscany #1, #2, and #3												
101	0.0046	---	0.0046	12	---	5	5	90	12.5		12.5	
100	0.0035	101	0.0081	12	---	5	5	90	9.5		22.0	
Q on S/S McMahon Blvd. At Point #1												
100.1	0.0035	100	00.0116	12	---	5	5	90	9.5		31.6	
105	0.0183	100.1	0.0299	12	---	30	30	40	38.2		69.8	
Total Q at Point #1; Q_{100} = 69.8CFS: Divide Q 40 CFS to McMahon and 29.8 CFS to Tuscany Drive												
116	0.0007	105D	-----	12	---	5	5	90	1.9		31.7	
111	0.0044	116	0.0199	12	---	20	20	60	10.3		42.0	
110	0.0007	111	0.0206	12	---	5	5	90	1.9		43.9	
115	0.0146	110	0.0352	12	---	21	22	57	33.7		77.6	
Total Q at Point #2 - Q100 = 83.7 CFS												
125	0.0090	115	0.0442	12	---	29	29	42	19.0		94.5	
Tuscany Dr. Q A TN/S Bandelier Drive Point #3 Q_{100} = 94.5 CFS												
Future Off-Site Developments - N/S Bandelier Dr. (P.H. #2):												
155	0.0131		0.0131	12		30	30	40	27.4		27.4	
506	0.0003		0.0003	12		5	5	90	0.8		28.2	
156	0.0082	506	0.0085	12		30	30	40	17.1		45.3	
157	0.0032	506 & 155	0.0248	12		30	30	40	6.7		52.0	
Total Q at Bandelier Drive in Hillside Drive - Q_{100} = 52.0 CFS												