



Preliminary Drainage Report

MASTER
for

The Summit at Scottsdale

Northeast Corner of Scottsdale Road and Ashler Hills Drive

Commercial sites must have approved Master plans due to phasing, etc.

Prepared for

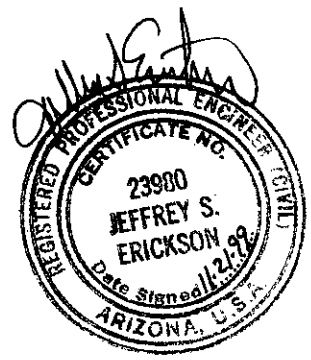
Koll Development Company
2777 East Camelback Road Suite 375
Phoenix, AZ 85015

and

Donahue Schriber
3501 Jamboree Rd. #300 - South Tower
Newport Beach, CA 92660

FILE COPY

APPROVED IN CONCEPT
FOR CASE # 118DR99
SUBMIT A FINAL DRAINAGE
REPORT WITH FINAL PLANS
REVIEWED BY [Signature] DATE 12/29/99



Prepared by

DEI Professional Services, L.L.C.
7600 N. 15th Street Suite 290
Phoenix, AZ 85020

November 18, 1999

118-DR.99

Table of Contents

	<u>Page No.</u>
1.0 INTRODUCTION.....	1
2.0 OFFSITE DRAINAGE.....	1
3.0 PROPOSED DRAINAGE IMPROVEMENTS.....	3
4.0 CONCLUSIONS.....	5

DRAINAGE WORKSHEET (IN BACK POCKET)

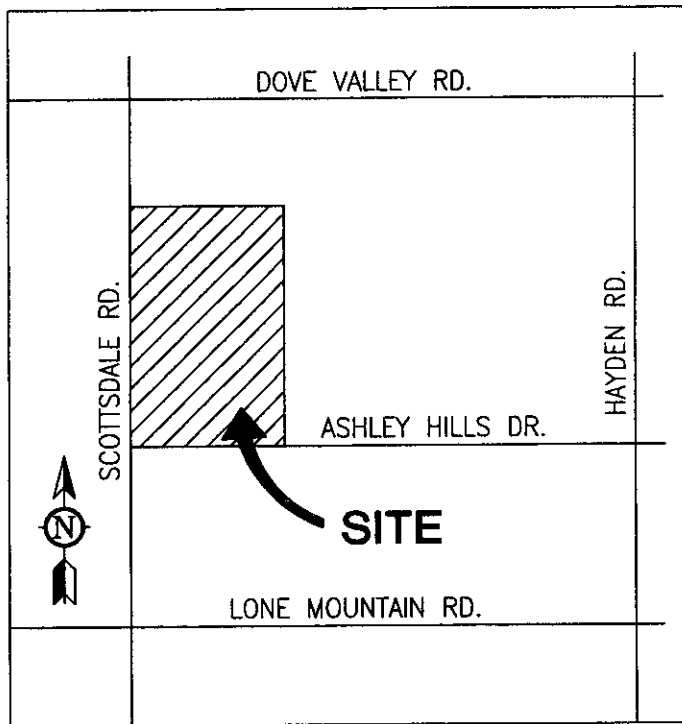
1.0 INTRODUCTION

The proposed Summit at Scottsdale project is located in a portion of the northwest quarter of Section 14, Township 5 North, Range 4 East, of the Gila and Salt River base and Meridian, in the City of Scottsdale, Arizona. The approximate 35-acre developed project site is located on the northeast corner of the intersection of Scottsdale Road and Ashler Hills Drive alignment. The development will consist of a variety of retail, shops and restaurants. Refer to the Vicinity Map on the following page.

The proposed site generally slopes at approximately 2.0% to 3.0% from the east to west. The site is vacant with typical desert grasses, shrubs, cacti, palo verde, mesquite and brush. There is no evidence of fill placement or former structures.

The project site is currently located in a Zone X designation per Flood Insurance Rate Map Panel 820, dated December 3, 1993. This designation is defined as, "Areas of 500-year flood; areas of 100-year flood with average flood depths of less than 1 foot or with drainage areas of less than 1 square mile; and areas protected by levees from the base flood".

The proposed development will be designed to meet City of Scottsdale drainage guidelines and ordinance criteria including the 100-year, 2-hour retention requirement.



VICINITY MAP

NTS

2.0 OFFSITE DRAINAGE

Hydrology

The offsite drainage impacting the site is generated from watersheds to the east and northeast side of the project. Two medium sized washes run from east to west across the site and a number of smaller tributary washes also run from east to west and join into the two washes at various locations. A Drainage Work Map is located at the back of this report that shows locations of both the offsite and onsite subwatersheds in the existing condition. An additional 8 1/2" x 11" exhibit is located on the following page showing this same information on a smaller scale. The rational method was utilized to calculate 100-year peak discharges for each subwatershed. The hydrologic soil group for this area was assumed to be an average of "C" as there are areas of B, C, and D hydrologic soil groups throughout the study area. This relates to a runoff coefficient of 0.48, which is then utilized in the Rational Method. Improved areas on the proposed site utilize a runoff coefficient of 0.90 and areas where there are both improved and unimproved areas utilized an average coefficient based on average weighted values. The formula is as follows:

$$Q = ciA \text{ where}$$

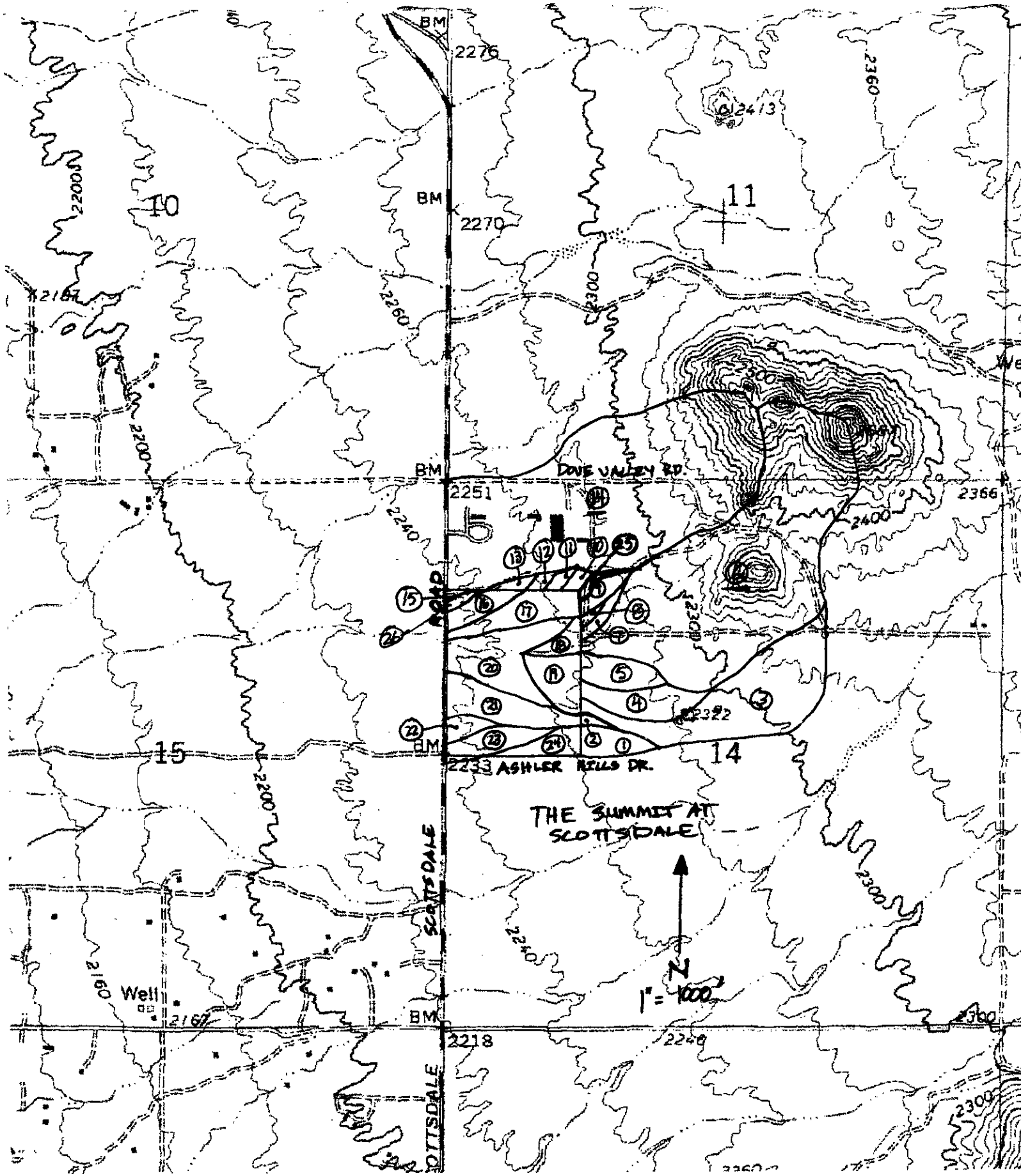
Q = peak discharge, cfs

c = runoff coefficient

i = intensity, inches per hour

A = area, acres

The tables on the following pages shows the peak discharge calculated for each subbasin and hydrologic base data as well.



Summit at Scottsdale

DEI Professional Services
 Date: 11/18/99
 Project No.: 99102
 Made By: JSE

Peak Discharge $Q = ciA$
 c = Runoff Coefficient from Fig 2.2-17
 i = Rainfall intensity, inches/hour from Fig 2.2-13
 A = Area, acres
 All Figs. from "Design Standards and Policies Manual,
 City of Scottsdale"

100 Year Peak Discharges - Offsite and Onsite
 (Existing Conditions Offsite and Proposed Conditions Onsite)

ubbasin I.D.	Area, Ac.	Land Type	Avg. Runoff Coefficient	Intensity In/hr.	Peak Q cfs	Time of Concentration Min.	
1	2.50	Desert	0.48	9.10	<u>10.9</u>	5.00	
2	1.30	Desert	0.48	9.10	<u>5.7</u>	5.00	
3	30.60	Desert	0.48	6.00	<u>88.1</u>	14.01	
4	9.50	Desert	0.48	8.45	<u>38.5</u>	6.67	
5	2.60	Desert	0.48	9.10	<u>11.4</u>	5.00	
6	67.50	Desert	0.48	6.60	<u>213.8</u>	12.59	
7	1.40	Desert	0.48	9.10	<u>6.1</u>	5.00	
8	0.40	Desert	0.48	9.10	<u>1.7</u>	5.00	
9	5.00	Desert	0.48	9.10	<u>21.8</u>	5.00	
10	0.36	Desert	0.48	9.10	<u>1.6</u>	5.00	
11	0.50	Desert	0.48	9.10	<u>2.2</u>	5.00	
12	0.40	Desert	0.48	9.10	<u>1.7</u>	5.00	
13	0.50	Desert	0.48	9.10	<u>2.2</u>	5.00	
14	85.40	Desert	0.48	6.50	<u>266.4</u>	13.29	
15	0.40	Des/Comm	0.61	9.10	<u>2.2</u>	5.00	
16	3.10	Des/Comm	0.75	9.10	<u>21.2</u>	5.00	
17	9.70	Des/Comm	0.85	7.90	<u>65.1</u>	8.06	
18	1.70	Comm.	0.90	9.10	<u>13.9</u>	5.00	
19	4.60	Comm.	0.90	9.00	<u>37.3</u>	5.32	
20	9.80	Des/Comm	0.85	8.00	<u>66.6</u>	7.65	
21	6.50	Des/Comm	0.80	7.60	<u>39.5</u>	8.63	
22	4.40	Des/Comm	0.69	9.10	<u>27.6</u>	5.00	
23	4.20	Desert	0.48	8.10	<u>16.3</u>	7.36	
24	2.80	Desert	0.48	9.10	<u>12.2</u>	5.00	
25	1.00	Desert	0.48	9.10	<u>4.4</u>	5.00	
26	0.94	Des/Comm	0.69	9.10	<u>5.9</u>	5.00	
2+3+4+5	(A)	44.00	Desert	0.48	5.90	<u>124.6</u>	16.01
7+8+9+25	(B)	7.80	Desert	0.48	8.15	<u>30.5</u>	7.29
<u>6+B</u>		75.30	Desert	0.48	6.60	<u>238.6</u>	7.29
<u>6+A+B</u>		119.30	Desert	0.48	5.90	<u>337.9</u>	16.01

213.8 ok

266.4 ok

mostly offsite

Washes with 250 cfs should be analyzed to see if capacity is 50 cfs. Ordinance says these washes shall be protected.

ok

Summit at Scottsdale

DEI Professional Services, L.L.C.

Velocity Taken From Fig 2.2-14

Date: 11/18/99

Minimum 5 Minute Time of Concentration

Project No. 99102

All Figs. from "Design Standards and Policies Manual,
City of Scottsdale"

Made By: JSE

Hydrologic Base Data

Subbasin I.D.	Area, Ac.	Length Ft.	Elev. Diff. Ft.	Avg. Slope Ft./Ft.	Vel. Ft./Sec.	of Concentr Min.	Min. Tc Min.
1	2.50	610	16	0.0262	3.10	3.28	5.00
2	1.30	520	13	0.0250	3.05	2.84	5.00
3	30.60	2900	88	0.0303	3.45	14.01	
4	9.50	1380	42	0.0304	3.45	6.67	
5	2.60	510	23	0.0451	4.10	2.07	5.00
6	67.50	3400	182	0.0535	4.50	12.59	
7	1.40	550	22	0.0400	3.90	2.35	5.00
8	0.40	275	10	0.0364	3.60	1.27	5.00
9	5.00	1200	56	0.0467	4.20	4.76	5.00
10	0.36	250	9	0.0360	3.60	1.16	5.00
11	0.50	370	13	0.0351	3.60	1.71	5.00
12	0.40	210	8	0.0381	3.70	0.95	5.00
13	0.50	320	6	0.0188	2.70	1.98	5.00
14	85.40	3430	165	0.0481	4.30	13.29	
15	0.40	360	13	0.0361	3.60	1.67	5.00
16	3.10	775	19	0.0245	3.00	4.31	5.00
17	9.70	1450	35	0.0241	3.00	8.06	
18	1.70	750	23	0.0307	3.45	3.62	5.00
19	4.60	830	15	0.0181	2.60	5.32	
20	9.80	1400	36	0.0257	3.05	7.65	
21	6.50	1450	29	0.0200	2.80	8.63	
22	4.40	770	19	0.0247	3.05	4.21	5.00
23	4.20	1060	23	0.0217	2.40	7.36	
24	2.80	600	14	0.0233	3.00	3.33	5.00
25	1.00	500	16	0.0320	3.50	2.38	5.00
26	0.94	400	11	0.0275	3.25	2.05	5.00

The combined subbasins shown at the end of the 100-year peak discharge table are calculated for design purposes of pipe culverts and drainage channels on the eastern side of the property and for the wash crossings at various roadways within the site itself.

3.0 PROPOSED DRAINAGE IMPROVEMENTS

Retention Basins

The project site is divided into 8 distinctive drainage subbasins with retention areas that will be utilized to accommodate the 100-year, 2-hour storm event of 2.82 inches of rainfall per City of Scottsdale criteria.

The retention basins will accept flow from parking lot, and building areas by surface drainage or by collection within an interior storm drain and catch basin system, which will convey flows to each retention basin respectively. The following table shows the required and provided retention volumes for each subbasin respectively. Refer to the Concept Grading and Drainage Plan sheets for subbasin and retention basin locations.

Each basin will be positively drained with a 8" HDPE pipe to natural washes downstream of each basin or to a storm drain system that outlets to a downstream retention basin. At an average of 1 cfs outflow, the 8" diameter pipe will drain 129,600 cubic feet within the 36 hour time criteria. The combined retention volume of subbasin 7 and subbasin 1 is 89,577 cubic feet and this represents the largest amount of volume to be dissipated. This volume would drain in approximately 25 hours and the remainder of the retention basins would drain accordingly in less time as volumes range from 16,247 to 53,865 cubic feet.

Offsite Drainage

South side

The eastern side of the property is impacted by offsite stormwater flows. These impacts are divided into two distinct areas. The area north of the main wash running east to west through the center of the site and the area south of the main wash. Both of these areas ultimately reach the center wash at some point downstream of the eastern property line in the existing condition. At this preliminary stage, it is envisioned that the drainage area south of the main wash will be collected in a system of terraced channels and storm drain pipe along the east side of the property and will be conveyed to the north to a pipe arch culvert that will convey these flows west to an outlet point in the main channel. The amount of 100-year runoff collected along the east property line (south of the main wash) varies from 5.7 cfs at the south end to 124.6 cfs combined flow at at offsite subwatershed 5. A 65" x 40" pipe arch culvert will convey a flow of 136 cfs at maximum capacity. It is anticipated that drop inlets and appropriately sized connector pipe will be provided at each offsite wash collection point to intercept the offsite flows respectively. Refer to the Appendix for a copy of the capacity calculations.

North side

The north side area of the main wash has relatively small offsite watersheds that impact the site. The combined flow of the north area is 30.5 cfs. It is envisioned that this flow will be collected in a terraced channel integrated into a portion of the retaining wall on the east side of the property. The terraced channel will be approximately 10 feet wide with a minimum slope of 1.0% at the south end. The normal depth of the flow is 0.61 feet deep with a velocity of around 5.0 feet per second, therefore, the channel requires a depth of around 1.5 feet to provide freeboard. The terraced channel will release flows into the

main wash at the center of the subject site at an elevation of 2258.0 and the invert of the main channel is at an elevation of 2256.0. Refer to the Appendix for the normal depth calculation.

Main Wash Through Site

The main wash running east to west through the center of the site will be crossed by several driveway crossings. The 100-year peak flow computed at the east side of the site is 213.8 cfs. A box culvert is envisioned at the driveway located on the east side of the site. The size of this culvert is comprised of 3 – 10' x 3' cells with the driveway arching over the top of the box culvert. The high water elevation of this culvert at 213 cfs is 2257.50 which is well within the banks of the wash at this location with a top of bank elevation of 2259.5 providing a freeboard of approximately 2.0 feet.

The remainder of the driveway/culvert crossing will consist of a combination of 6-3 foot diameter culverts located at each crossing. These culverts will convey a 100-year peak discharge of 339 cfs with a 4.5 depth behind the culvert crossing. This is adequate to pass the required flow and still maintains freeboard between 1.5 and 2.5 feet. Refer to the Appendix for box culvert and pipe culvert calculations.

Onsite Culverts and Catch Basins

A number of onsite culverts and catch basins will be incorporated throughout the interior of the project site. It is envisioned that these catch basins will be MAG. Std. Dtl. 535, Type "F". The culverts will consist of 12" to 36" HDPE pipe culverts that will convey onsite flows to each respective retention basin. There are anticipated ponding areas within the pavement that will help to attenuate flows to the retention basins. More complete calculations will be provided as design becomes more final at first submittal.

4.0 CONCLUSIONS

The Summit at Scottsdale project has been designed in accordance with City of Scottsdale Drainage Design Criteria and will incorporate retention for the 100-year, 2-hour storm event. The finished floors were set to minimize the visual impacts to adjacent land owners. This includes excavating the finished floor elevations of the proposed users on the east side of the site. Retaining walls and terraced channels along with pipe culverts will collect offsite flows along the east side of the property and convey the flows to the center wash running east and west through the site.

This project has been designed to retain the 100-year, 2-hour rainfall amount of 2.82 inches of rainfall within onsite retention basins. Catch basins and pipe culverts will be installed to direct runoff to each respective retention basin.

A triple 10' x 3' box culvert and 6-36" pipe culverts will be installed at driveway locations on the main wash running from east to west through the center of the site. The drainage design effort on this project has been formulated to not impact upstream or downstream property owners.

Appendix

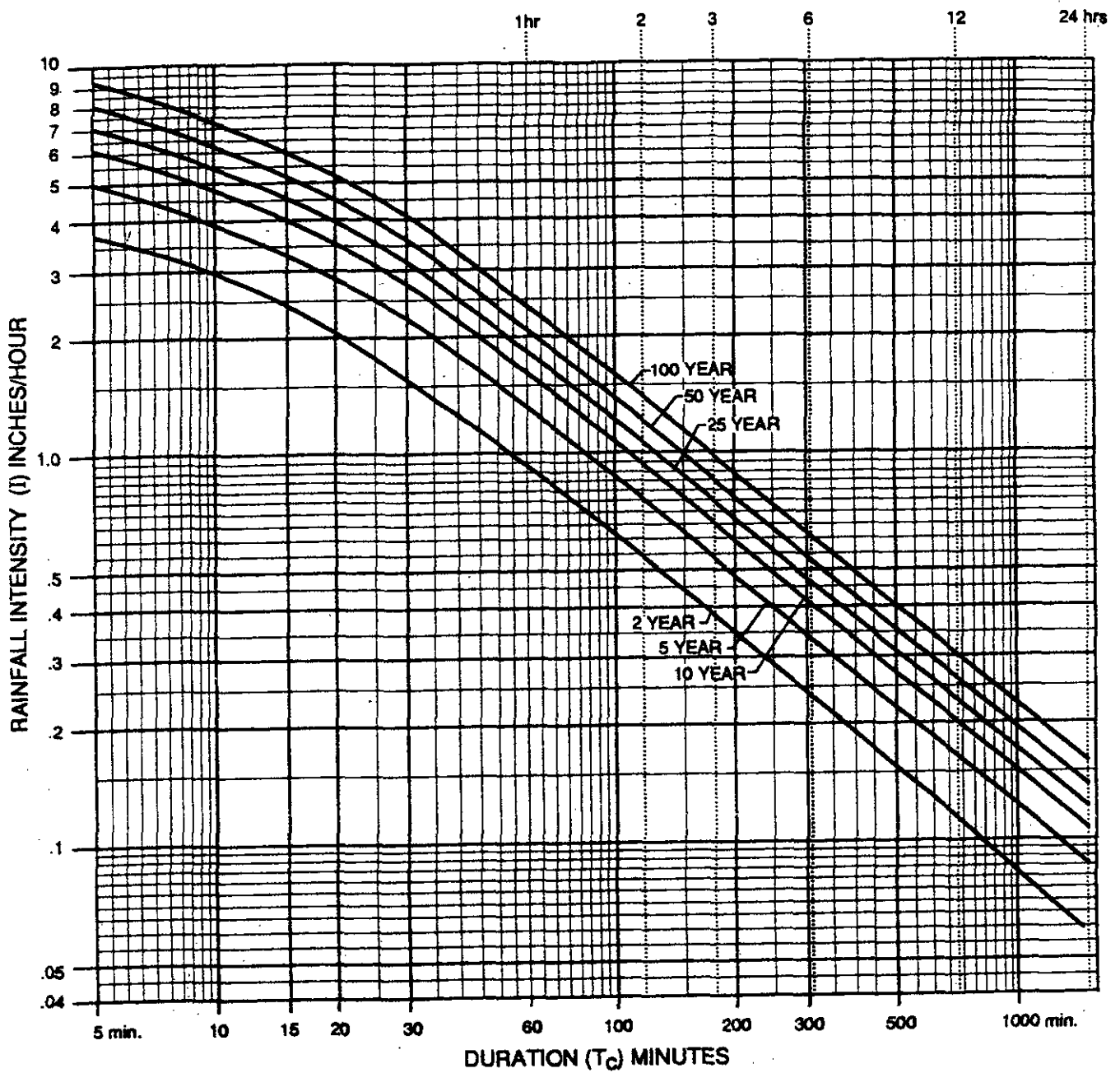
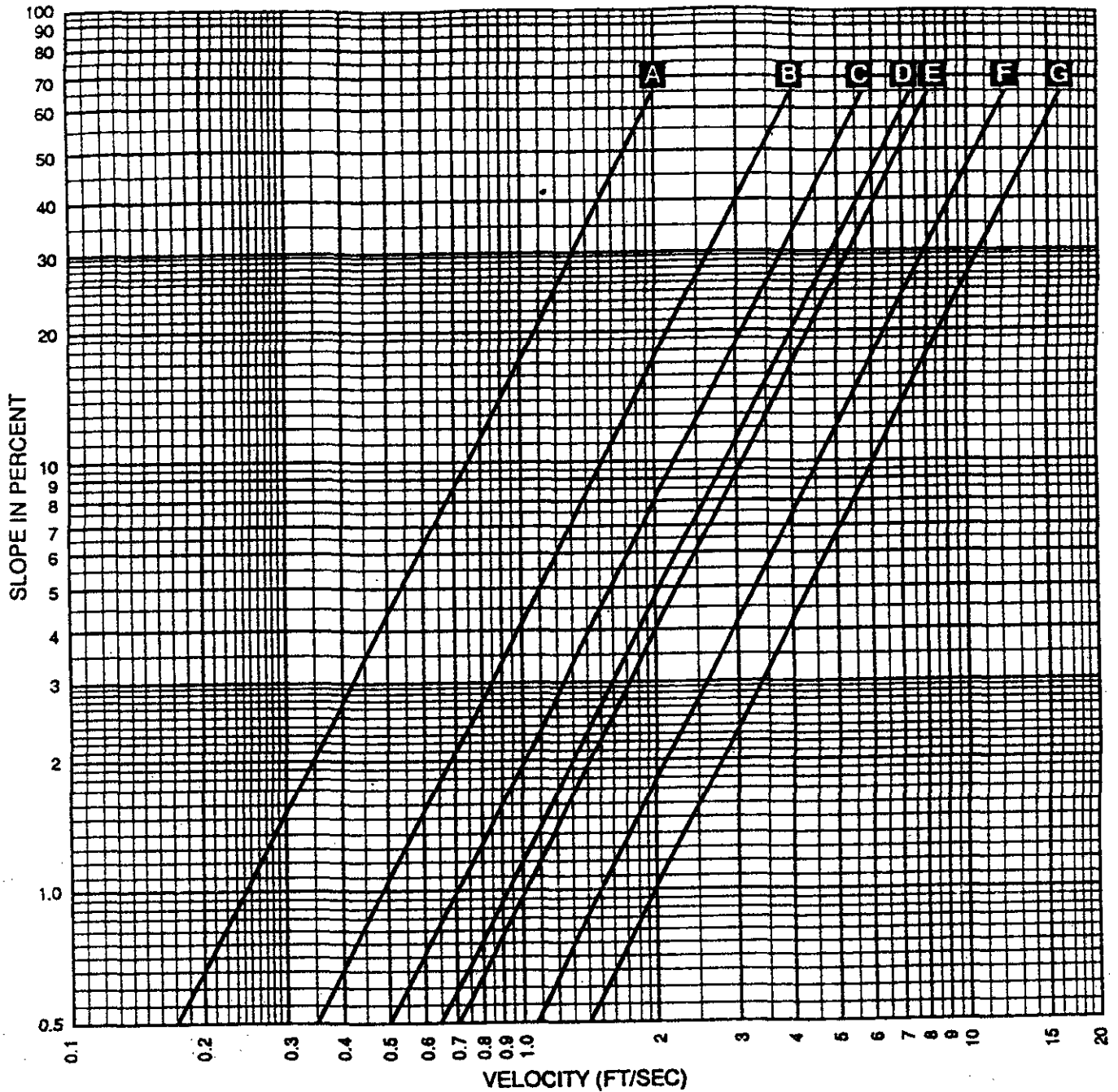


FIGURE 2.2-13

Rainfall Intensity (I) Values for Use in Rational Method

Source: Hydrologic Design Manual for Maricopa County



- A** Forest with heavy ground litter & hay meadow (overland flow)
- B** Trash fallow or minimum tillage cultivation; contour or strip cropped & woodland (overland flow)
- C** Short grass pasture (overland flow)
- D** Cultivated, straight row (overland flow)
- E** Nearly bare and untilled (overland flow); alluvial fans western mountain regions
- F** Grassed waterway
- G** Paved area (sheet flow); small upland gullies

FIGURE 2.2-14

Overland Flow Velocities for Upland Method of Estimating T_c

SUMMIT AT SCOTTSDALE

North Area Channel Capacity Calculation

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION
November 21, 1999

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Flow Rate (cubic feet per second).....	30.5
Channel Bottom Slope (feet per foot).....	0.0100
Manning's Roughness Coefficient (n-value).....	0.0200
Channel Side Slope - Left Side (horizontal/vertical)....	0.10
Channel Side Slope - Right Side (horizontal/vertical)...	0.10
Channel Bottom Width (feet).....	10.0

PROGRAM RESULTS:

DESCRIPTION	VALUE
Normal Depth (feet).....	<u>0.61</u>
Flow Velocity (feet per second).....	<u>4.97</u>
Froude Number (Flow is Super-Critical).....	1.125
Velocity Head (feet).....	0.38
Energy Head (feet).....	0.99
Cross-Sectional Area of Flow (square feet).....	6.14
Top Width of Flow (feet).....	10.12

TRAPEZOIDAL CHANNEL ANALYSIS COMPUTER PROGRAM, Version 1.1 (c) 1986
Dodson & Associates, Inc., 7015 W. Tidwell, #107, Houston, TX 77092
(713) 895-8322. A manual with equations & flow chart is available.

SUMMIT AT SCOTTSDALE

CURRENT DATE: 11-21-1999
CURRENT TIME: 13:09:37

FILE DATE: 11-21-1999
FILE NAME: SUMM8

8" HDPE RETENTION
BASIN DISSIPATION PIPE

***** FHWA CULVERT ANALYSIS *****
***** HY-8, VERSION 4.0 *****

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	10.00	8.20	60.03	1 RCP	0.67	0.67	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: SUMM8 DATE: 11-21-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
10.00	0	0	0	0	0	0	0	0	1
10.53	1	1	0	0	0	0	0	0	1
10.76	1	1	0	0	0	0	0	0	1
11.47	2	2	0	0	0	0	0	0	1
12.28	2	2	0	0	0	0	0	0	1
12.71	3	3	0	0	0	0	0	0	30
12.94	4	3	0	0	0	0	0	0	30
13.04	4	3	0	0	0	0	0	1	20
13.06	5	3	0	0	0	0	0	2	9
13.07	5	3	0	0	0	0	0	3	8
13.08	6	3	0	0	0	0	0	3	7
13.00	3	3	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SUMM8 DATE: 11-21-1999

ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
10.00	0.00	0	0	0.00
10.53	0.00	1	0	0.00
10.76	0.00	1	0	0.00
11.47	0.00	2	0	0.00
12.28	0.00	2	0	0.00
12.71	-0.01	3	0	11.22
12.94	-0.01	4	1	22.79
13.04	-0.00	4	0	0.99
13.06	-0.00	5	0	0.74
13.07	-0.00	5	0	0.70
13.08	-0.00	6	0	0.78

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-21-1999
CURRENT TIME: 13:09:37

FILE DATE: 11-21-1999
FILE NAME: SUMM8

***** TAILWATER *****

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH (FT) 5.00
SIDE SLOPE H/V (X:1) 2.0
CHANNEL SLOPE V/H (FT/FT) 0.025
MANNING'S N (.01-0.1) 0.035
CHANNEL INVERT ELEVATION (FT) 8.20
CULVERT NO.1 OUTLET INVERT ELEVATION 8.20 FT

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	8.20	0.000	0.00	0.00	0.00
0.60	8.29	0.768	0.09	1.30	0.14
1.00	8.32	0.801	0.12	1.58	0.19
1.80	8.37	0.837	0.17	1.97	0.27
2.40	8.40	0.854	0.20	2.19	0.32
3.00	8.43	0.867	0.23	2.37	0.36
3.60	8.46	0.877	0.26	2.53	0.40
4.20	8.48	0.885	0.28	2.67	0.44
4.80	8.51	0.892	0.31	2.80	0.48
5.40	8.53	0.898	0.33	2.92	0.51
6.00	8.55	0.903	0.35	3.02	0.54

***** ROADWAY OVERTOPPING DATA *****

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH (FT) 2.00
CREST LENGTH (FT) 50.00
OVERTOPPING CREST ELEVATION (FT) 13.00

SUMMIT AT SCOTTSDALE

CURRENT DATE: 11-21-1999
CURRENT TIME: 14:10:22

FILE DATE: 11-21-1999
FILE NAME: SUMMARCH

SOUTH AREA
PIPE ARCH CALCULATION

***** FHWA CULVERT ANALYSIS *****
***** HY-8, VERSION 4.0 *****

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	45.00	42.50	540.01	1 RCPA	5.42	3.33	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: SUMMARCH DATE: 11-21-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
45.00	0	0	0	0	0	0	0	0	1
46.00	13	13	0	0	0	0	0	0	1
46.49	25	25	0	0	0	0	0	0	1
46.92	38	38	0	0	0	0	0	0	1
47.36	50	50	0	0	0	0	0	0	1
47.80	63	63	0	0	0	0	0	0	1
48.27	75	75	0	0	0	0	0	0	1
48.75	88	88	0	0	0	0	0	0	1
49.27	100	100	0	0	0	0	0	0	1
49.71	110	110	0	0	0	0	0	0	1
50.42	125	125	0	0	0	0	0	0	1
51.00	136	136	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SUMMARCH DATE: 11-21-1999

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
45.00	0.00	0	0	0.00
46.00	0.00	13	0	0.00
46.49	0.00	25	0	0.00
46.92	0.00	38	0	0.00
47.36	0.00	50	0	0.00
47.80	0.00	63	0	0.00
48.27	0.00	75	0	0.00
48.75	0.00	88	0	0.00
49.27	0.00	100	0	0.00
49.71	0.00	110	0	0.00
50.42	0.00	125	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-21-1999
CURRENT TIME: 14:10:22

FILE DATE: 11-21-1999
FILE NAME: SUMMARCH

***** TAILWATER *****

***** REGULAR CHANNEL CROSS SECTION *****
BOTTOM WIDTH (FT) 10.00
SIDE SLOPE H/V (X:1) 2.0
CHANNEL SLOPE V/H (FT/FT) 0.020
MANNING'S N (.01-0.1) 0.035
CHANNEL INVERT ELEVATION (FT) 42.50
CULVERT NO.1 OUTLET INVERT ELEVATION 42.50 FT

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	42.50	0.000	0.00	0.00	0.00
12.50	42.89	0.853	0.39	3.01	0.48
25.00	43.08	0.891	0.58	3.86	0.73
37.50	43.24	0.911	0.74	4.44	0.92
50.00	43.37	0.924	0.87	4.89	1.09
62.50	43.49	0.933	0.99	5.27	1.24
75.00	43.60	0.939	1.10	5.59	1.37
87.50	43.70	0.945	1.20	5.88	1.50
100.00	43.79	0.950	1.29	6.13	1.62
110.00	43.87	0.953	1.37	6.32	1.71
125.00	43.97	0.957	1.47	6.58	1.83

***** ROADWAY OVERTOPPING DATA *****

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH (FT) 5.00
CREST LENGTH (FT) 50.00
OVERTOPPING CREST ELEVATION (FT) 51.00

CURRENT DATE: 11-21-1999
CURRENT TIME: 17:04:35

FILE DATE: 11-21-1999
FILE NAME: SUMMBOX

SUMMIT AT SCOTTSDALE
3-10' x 3'
BOX CULVERTS AT EAST
DRIVEWAY ON MAIN WASH

***** FHWA CULVERT ANALYSIS *****
***** HY-8, VERSION 4.0 *****

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	55.50	55.00	60.00	3 RCB	10.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: SUMMBOX DATE: 11-21-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
55.50	0	0	0	0	0	0	0	0	1
56.10	35	35	0	0	0	0	0	0	1
56.44	70	70	0	0	0	0	0	0	1
56.74	105	105	0	0	0	0	0	0	1
57.00	140	140	0	0	0	0	0	0	1
57.23	175	175	0	0	0	0	0	0	1
57.44	210	210	0	0	0	0	0	0	1
57.65	245	245	0	0	0	0	0	0	1
57.85	280	280	0	0	0	0	0	0	1
58.04	315	315	0	0	0	0	0	0	1
58.22	350	350	0	0	0	0	0	0	1
60.50	733	733	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SUMMBOX DATE: 11-21-1999

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
55.50	0.00	0	0	0.00
56.10	0.00	35	0	0.00
56.44	0.00	70	0	0.00
56.74	0.00	105	0	0.00
57.00	0.00	140	0	0.00
57.23	0.00	175	0	0.00
57.44	0.00	210	0	0.00
57.65	0.00	245	0	0.00
57.85	0.00	280	0	0.00
58.04	0.00	315	0	0.00
58.22	0.00	350	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-21-1999
 CURRENT TIME: 17:04:35

FILE DATE: 11-21-1999
 FILE NAME: SUMMBOX

 ***** TAILWATER *****

***** REGULAR CHANNEL CROSS SECTION *****
 BOTTOM WIDTH (FT) 30.00
 SIDE SLOPE H/V (X:1) 2.0
 CHANNEL SLOPE V/H (FT/FT) 0.015
 MANNING'S N (.01-0.1) 0.035
 CHANNEL INVERT ELEVATION (FT) 55.00
 CULVERT NO.1 OUTLET INVERT ELEVATION 55.00 FT

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	55.00	0.000	0.00	0.00	0.00
35.00	55.41	0.772	0.41	2.79	0.38
70.00	55.62	0.819	0.62	3.64	0.58
105.00	55.78	0.845	0.78	4.25	0.73
140.00	55.93	0.864	0.93	4.73	0.87
175.00	56.06	0.878	1.06	5.13	0.99
210.00	56.18	0.889	1.18	5.49	1.11
245.00	56.29	0.899	1.29	5.80	1.21
280.00	56.40	0.907	1.40	6.09	1.31
315.00	56.50	0.913	1.50	6.35	1.41
350.00	56.60	0.919	1.60	6.59	1.50

 ***** ROADWAY OVERTOPPING DATA *****

ROADWAY SURFACE PAVED
 EMBANKMENT TOP WIDTH (FT) 5.00
 CREST LENGTH (FT) 50.00
 OVERTOPPING CREST ELEVATION (FT) 60.50

CURRENT DATE: 11-21-1999
CURRENT TIME: 16:24:10

FILE DATE: 10-06-1999
FILE NAME: SUMMIT36

SUMMIT AT SCOTTSDALE

6-36" PIPE CULVERTS
AT DRIVEWAY CROSSING
OF MAIN WASH.

***** FHWA CULVERT ANALYSIS *****
***** HY-8, VERSION 4.0 *****

C U L V #	SITE DATA			CULVERT SHAPE, MATERIAL, INLET				
	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1	46.50	45.00	60.02	6 RCP	3.00	3.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (CFS) FILE: SUMMIT36 DATE: 10-06-1999

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
46.50	0	0	0	0	0	0	0	0	1
47.67	50	50	0	0	0	0	0	0	1
48.34	100	100	0	0	0	0	0	0	1
48.87	150	150	0	0	0	0	0	0	1
49.36	200	200	0	0	0	0	0	0	1
49.87	250	250	0	0	0	0	0	0	1
50.46	300	300	0	0	0	0	0	0	1
51.09	350	345	0	0	0	0	0	4	5
51.38	400	364	0	0	0	0	0	35	4
51.60	450	378	0	0	0	0	0	70	3
51.80	500	390	0	0	0	0	0	109	3
51.00	339	339	0	0	0	0	0	0	OVERTOPPING

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: SUMMIT36 DATE: 10-06-1999

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
46.50	0.00	0	0	0.00
47.67	0.00	50	0	0.00
48.34	0.00	100	0	0.00
48.87	0.00	150	0	0.00
49.36	0.00	200	0	0.00
49.87	0.00	250	0	0.00
50.46	0.00	300	0	0.00
51.09	-0.00	350	1	0.24
51.38	-0.00	400	1	0.14
51.60	-0.01	450	2	0.41
51.80	-0.00	500	1	0.26

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT DATE: 11-21-1999
CURRENT TIME: 16:24:10

FILE DATE: 10-06-1999
FILE NAME: SUMMIT36

***** TAILWATER *****

***** REGULAR CHANNEL CROSS SECTION *****

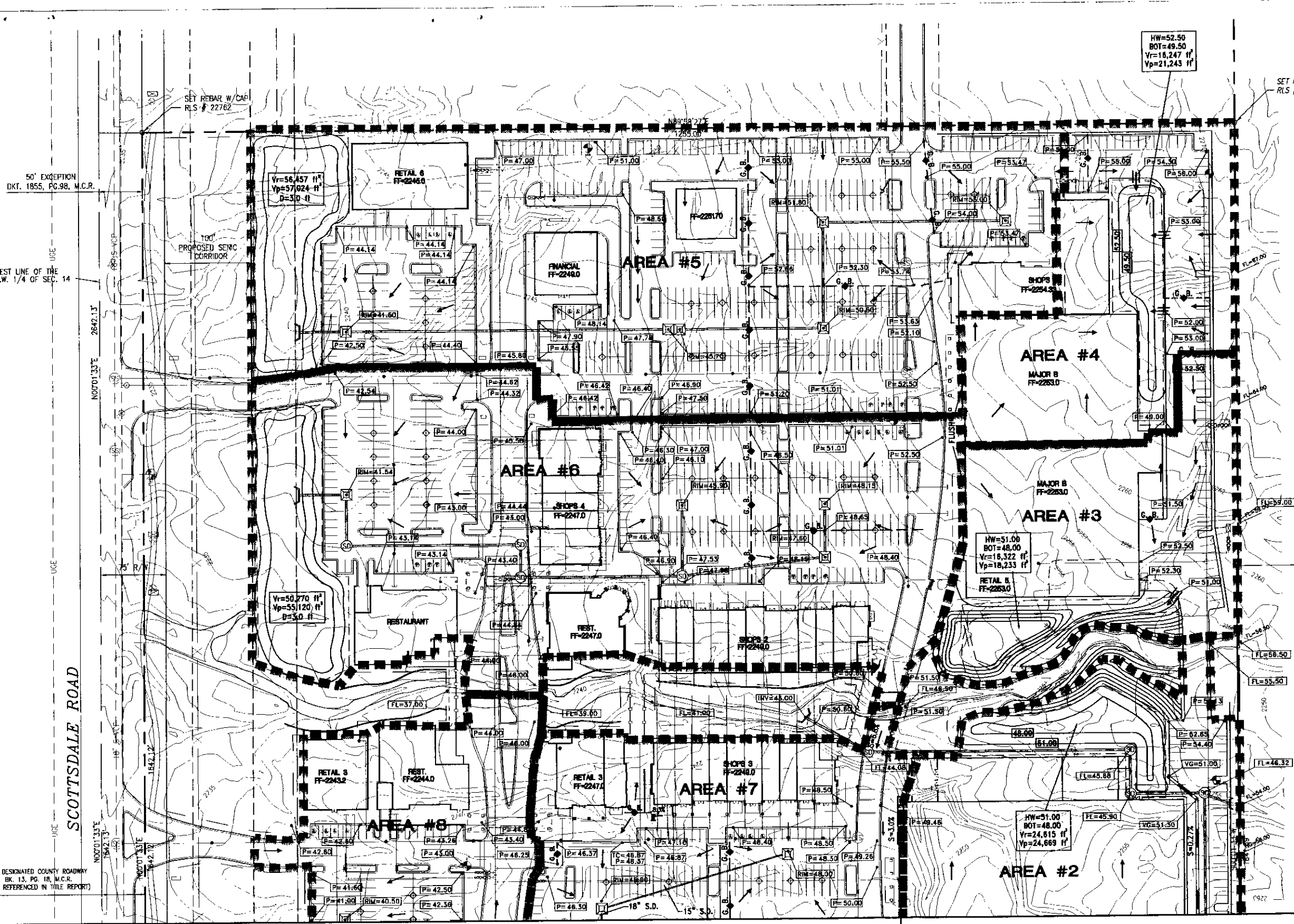
BOTTOM WIDTH (FT) 20.00
SIDE SLOPE H/V (X:1) 2.0
CHANNEL SLOPE V/H (FT/FT) 0.020
MANNING'S N (.01-0.1) 0.035
CHANNEL INVERT ELEVATION (FT) 45.00
CULVERT NO.1 OUTLET INVERT ELEVATION 45.00 FT

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (CFS)	W.S.E. (FT)	FROUDE NUMBER	DEPTH (FT)	VEL. (FPS)	SHEAR (PSF)
0.00	45.00	0.000	0.00	0.00	0.00
50.00	45.59	0.926	0.59	4.03	0.73
100.00	45.88	0.973	0.88	5.19	1.10
150.00	46.12	0.997	1.12	6.00	1.40
200.00	46.33	1.014	1.33	6.63	1.66
250.00	46.52	1.025	1.52	7.16	1.89
300.00	46.68	1.034	1.68	7.62	2.10
350.00	46.84	1.041	1.84	8.02	2.30
400.00	46.99	1.047	1.99	8.38	2.48
450.00	47.13	1.052	2.13	8.71	2.66
500.00	47.26	1.057	2.26	9.02	2.82

***** ROADWAY OVERTOPPING DATA *****

ROADWAY SURFACE PAVED
EMBANKMENT TOP WIDTH (FT) 5.00
CREST LENGTH (FT) 50.00
OVERTOPPING CREST ELEVATION (FT) 51.00



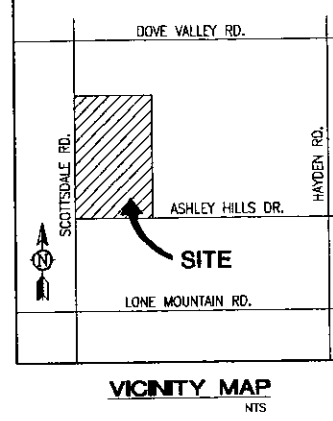
OWNER:
 DONAHUE/SHRIBER
 3501 JAMBOREE RD
 SUITE 300
 NEWPORT BEACH, CA 92660
 Ph: (909) 000-0000

DEVELOPER:
 KOLL DEVELOPMENT COMPANY
 2777 E. CAMELBACK RD
 SUITE 375
 PHOENIX, ARIZONA 85016
 Ph: (602) 000-0000

ENGINEER:
 DEI PROFESSIONAL SERVICES
 7600 N. 15TH STREET
 SUITE 290
 PHOENIX, ARIZONA 85020-4331
 Ph: (602) 954-0038

ARCHITECT:
 NELSON ARCHITECTS, INC.
 7031 E. CAMELBACK RD
 SUITE 100
 SCOTTSDALE, ARIZONA 85251
 Ph: (602) 000-0000

BENCHMARK:
 BRASS CAP IN HAND HOLE
 AT INTERSECTION OF
 SCOTTSDALE ROAD AND ASHLER DRIVE
 ELEV=2234.931
 (CITY OF SCOTTSDALE DATUM)



LEGEND OF EXISTING FEATURES:

- (S) EXIST. SANITARY SEWER MANHOLE
- (V) EXIST. WATER VALVE
- (M) WATER METER
- (F) EXIST. FIRE HYDRANT
- (R) 1/2" REBAR TO BE SET
- (B) Fd. BC IN HH
- (A) Fd. AS NOTED
- (S) SIGN
- (S) SAGUARO
- (I) IRRIGATION VALVE BOX
- (G) EXISTING GAS VALVE
- (T) TELCO J-BOX

LEGEND OF PROPOSED FEATURES:

- (C) CATCH BASIN
- (D) DRAIN INLET
- (S) PROPOSED STORM DRAIN MANHOLE
- (G-B) GRADE BREAK
- (A) DIRECTION OF FLOW
- (C-O) CURB OPENING
- (H) HEADWALL
- (S-D) STORM DRAIN
- (P-E) PAVEMENT ELEVATION
- (F-L) FLOW LINE ELEVATION
- (V-G) VALLEY GUTTER ELEVATION
- (F-F) FINISHED FLOOR ELEVATION

DEI
 PROFESSIONAL SERVICES, L.L.C.
 7600 N. 15TH STREET, SUITE 290
 PHOENIX, ARIZONA 85020
 PHONE: (602) 954-0038
 FAX: (602) 954-0000

1982-1999

17
 YEARS OF EXCELLENCE

DEI Professional Services, L.L.C.

SUMMIT AT SCOTTSDALE
 SCOTTSDALE, ARIZONA
 CONCEPTUAL GRADING AND DRAINAGE PLAN

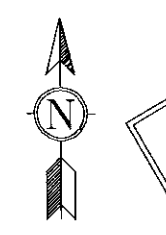
RETENTION CALCULATIONS

Volume Required = $\frac{D}{12} CA$
 D = 2.82 inch
 C = 0.84
 A = Area, Acres

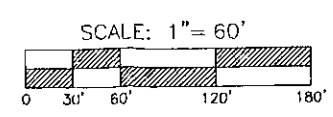
Volume Provided =

AREA #1	AREA #2	AREA #3	AREA #4	AREA #5	AREA #6	AREA #7	AREA #8
A=134,091 ft ²	A=124,698 ft ²	A=82,683 ft ²	A=82,304 ft ²	A=272,874 ft ²	A=248,031 ft ²	A=315,693 ft ²	A=201,168 ft ²
C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84
Vr=26,785 ft ³	Vr=24,908 ft ³	Vr=16,322 ft ³	Vr=16,247 ft ³	Vr=53,865 ft ³	Vr=48,961 ft ³	Vr=63,107 ft ³	Vr=39,711 ft ³
Vp=29,538 ft ³	Vp=26,810 ft ³	Vp=18,231 ft ³	Vp=21,243 ft ³	Vp=53,873 ft ³	Vp=57,624 ft ³	Vp=66,384 ft ³	Vp=41,250 ft ³

Note these figures do not agree entirely with those shown in the plan - also they don't agree with the drainage report (p.8) - Take Care!



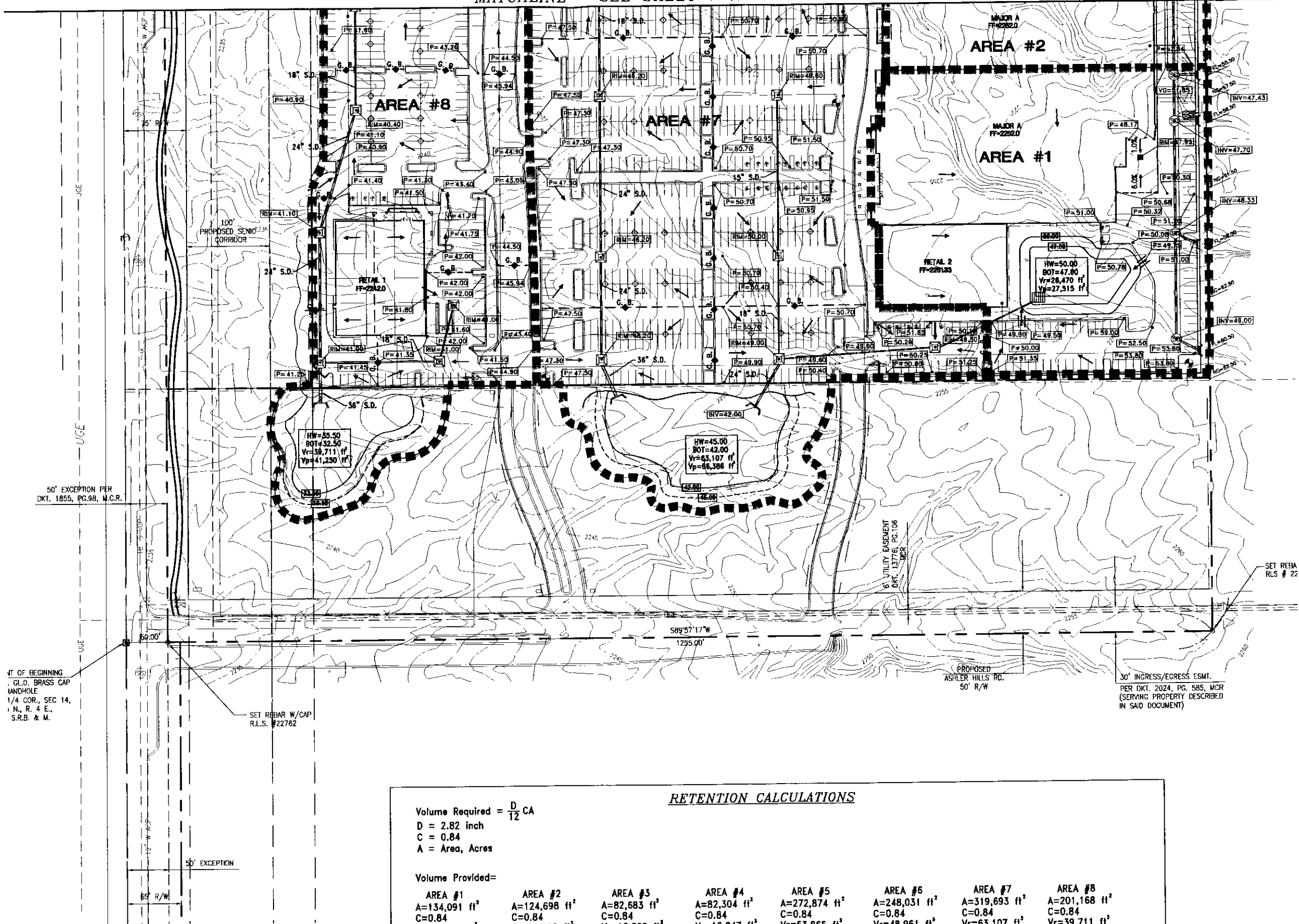
PRELIMINARY
 NOT FOR CONSTRUCTION
 OR RECORDING



REVISIONS

NO.	DATE	DESCRIPTION

DATE:	11/22/09
PROJ. NO.:	0102
DESIGN:	JSE
DRAWN:	RWS
CHECK:	JSE
SCALE:	1"=60'
CAD FILE:	0102C001



RETENTION CALCULATIONS

Volume Required = $\frac{D}{12} CA$
 D = 2.82 inch
 C = 0.84
 A = Area, Acres

Volume Provided=

AREA #1	AREA #2	AREA #3	AREA #4	AREA #5	AREA #6	AREA #7	AREA #8
A=134,091 ft ²	A=124,698 ft ²	A=82,683 ft ²	A=82,304 ft ²	A=272,874 ft ²	A=248,031 ft ²	A=319,693 ft ²	A=201,168 ft ²
C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84	C=0.84
Vr=26,785 ft ³	Vr=24,908 ft ³	Vr=16,322 ft ³	Vr=16,247 ft ³	Vr=53,865 ft ³	Vr=48,961 ft ³	Vr=63,107 ft ³	Vr=39,711 ft ³
Vp=29,538 ft ³	Vp=26,810 ft ³	Vp=18,231 ft ³	Vp=21,243 ft ³	Vp=53,873 ft ³	Vp=57,624 ft ³	Vp=66,384 ft ³	Vp=41,250 ft ³

50' EXCEPTION PER
DKT. 1855, PG.98, M.C.R.

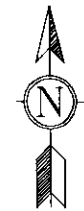
VT OF BEGINNING
G.L.O. BRASS CAP
LANDHOLE
1/4 COR., SEC 14,
N., R. 4 E.,
S.R.B. & M.

SET REBAR W/CAP
R.L.S. #22782

6" UTILITY EASEMENT
DKT. 13776, PG.106
M.C.R.

PROPOSED
ASHLER HILLS RD.
50' R/W

30' INGRESS/EGRESS ESMT.
PER DKT. 2024, PG. 585, MCR
(SERVING PROPERTY DESCRIBED
IN SAID DOCUMENT)



SCALE: 1" = 60'

PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING



REVISIONS

DATE	11/22/00
PROJ. NO.	9102
DESIGN	JSE
DRAWN	RWS
CHECK	JSE
SCALE	1"=60'
CAD FILE	9102CG02