

Drainage Reports

Abbreviated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application



DAVID EVANS
AND ASSOCIATES INC.

July 2017

City of Scottsdale, Drainage Department
7447 E. Indian School Road, Suite 125
6263 Scottsdale Road, Suite 330
Scottsdale, AZ 85251

Plan #	_____
Case #	<u>21-DR-2017</u>
Q-S #	_____
<input checked="" type="checkbox"/> Accepted	
<input type="checkbox"/> Corrections	
<u>N. Baronas</u>	<u>8-2-17</u>
Reviewed By	Date

Subject: Drainage Letter for Parcel L

This letter is intended to summarize the drainage conditions for the proposed improvements on Parcel L of Scottsdale Quarter. The intent of the design is to illustrate that the proposed buildings will not flood during the 100-year design storm event and that the development of the site will not adversely impact adjacent development and match the Master Planning drainage conditions. This letter is based on the approved Master Drainage Report for Scottsdale Quarter, dated July 2008 prepared by David Evans and Associates, Inc.

Parcels L is located north of the northeastern corner of North 73rd Place and Butherus Drive in Section 11, Township 3 North, Range 4 East of the Gila and Salt River Base and Meridian. The project is approximately 1.8 acres that occupies the eastern middle portion of the Scottsdale Quarter project.

The current published FEMA Flood Insurance Rate Map (FIRM) for the site is map number 04013C1760L, Effective date is October 16, 2013 shows that the entire site falls under Zone X (shaded). Zone X (shaded) is defined as "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." The pertinent portion of the FIRM panel Figure 2 is provided in the Supporting Documents Section attached to this letter.

Existing Conditions:

The existing 1.8± acre site consists of dirt that is graded and used for construction staging and parking during Parcel M construction. There are no trees/shrubs onsite. The site slopes at flat slope in a southerly direction towards Parcel M. No offsite flow directly impacts the site.

Runoff is captured by stormdrain system onsite along N 73rd Place, which is an improved street with curb and gutter that slopes in a southerly direction with existing catch basins along the street that convey runoff into the storm drain system for all of Scottsdale Quarter.

Bounding Parcel L to the east is 73rd Street which is an improved street with curb and gutter and slopes in a southerly direction. Runoff from the street is conveyed into Butherus Dive. Butherus Drive is an improved street with curb and gutter and slopes in a westerly direction towards Scottsdale Road.

West of the site, is Phases 1 and 2 of Scottsdale Quarter that are graded to slope away from the site. Previous phases have an existing storm drain system that accounts for retention from Parcel L. Stubs are also in place to connect the proposed onsite development to the existing underground stormdrain system.

Proposed Conditions:

During developed conditions, the valet parking along 73rd Place will be removed and Parcel L will be constructed with retail, residential, garage structures, a new valet spot, and surrounding hardscape areas.

On-site improvements include large buildings, surrounding hardscape and landscape areas. The proposed buildings' roof drains will connect to the existing storm drain system onsite. The onsite storm drain will be sized based on the flows from Parcel L. The proposed catch basins have been sized to allow the 100- year runoff without inundating the finished floor, existing adjacent catch basins have also been checked for capacity. The flow is then conveyed to the existing underground retention built during the previous phases. See Supporting Section for calculations and exhibits.

Retention for the site is provided as part of the stormdrain/detention system installed during the previous phases of Scottsdale Quarter. Pertinent excerpts from the Master Drainage Report for Scottsdale Quarter are included in the supporting documents section of this letter for reference. As can be seen, drainage areas BL1 and BL2 are accounted for in the Master Drainage report.

No offsite improvements are part of the project development and drainage conditions along the adjacent streets are kept the same.

The finish floors of the proposed buildings are set higher than adjacent hardscape areas. There are storm water outfalls of the small hardscape areas taken into account adjacent to the buildings, so that runoff does not inundate the buildings. A challenge is allowing for separation between finished floor elevations and the area drains for the small hardscape areas adjacent to the proposed building. The separation was designed to be as much as slopes allow in those areas without exceeding ADA design.

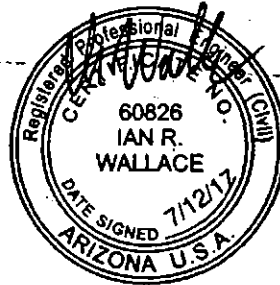
Conclusion:

There are no storage requirements for the proposed site since the required design retention volume is accounted for in the existing detention system for the Scottsdale Quarter project. As mentioned above, the site will be tying into the storm drain system for the Scottsdale Quarter and the improvements will not impact the adjacent properties. The extreme outfall of the site is set, along the southwestern portion of the site, at an elevation of 1470.50 which is 15" below the lowest finished floor elevation.

Sincerely,

DAVID EVANS AND ASSOCIATES, INC.

Ian Wallace, P.E.

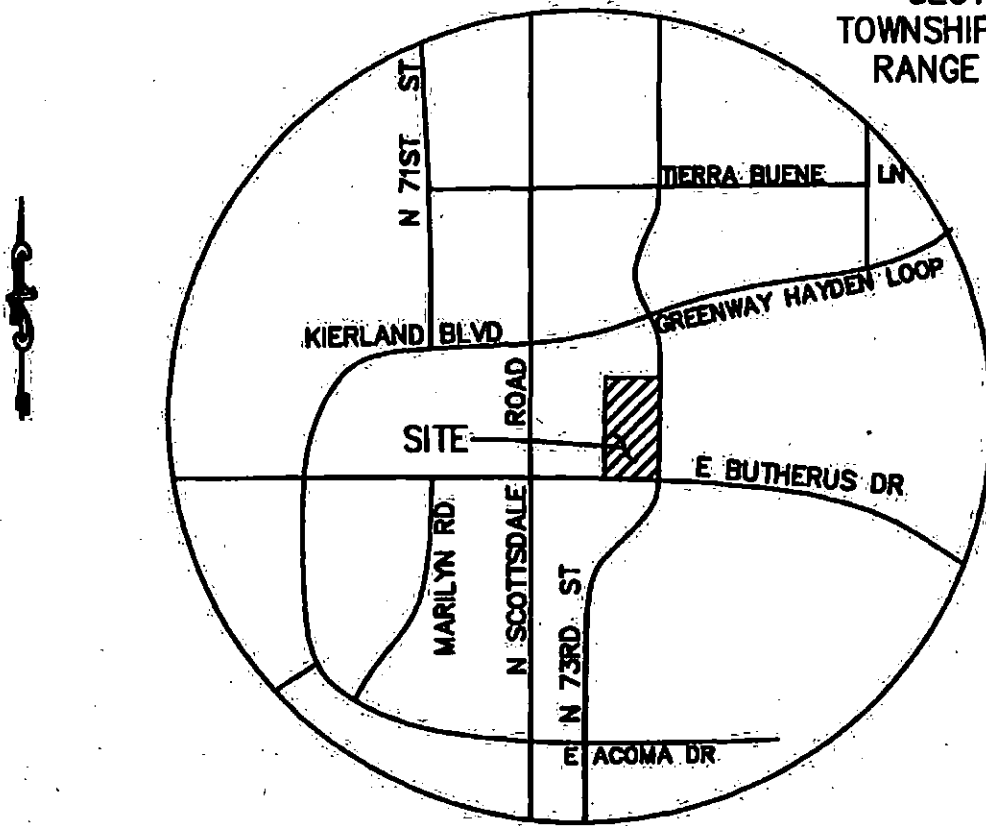


Expires: 12/31/2018

Supporting Section

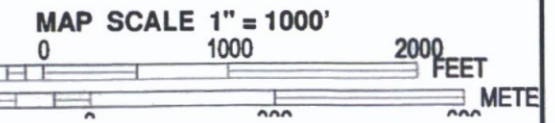
21-DR-2017
7/11/17

SECTION 11
TOWNSHIP 3 NORTH
RANGE 4 EAST



VICINITY MAP
NTS

FIGURE 1



PROJECT SITE

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 3 NORTH, RANGE 5 EAST AND TOWNSHIP 3 NORTH, RANGE 4 EAST.

CITY OF SCOTTSDALE
045012

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1760L

FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY,
ARIZONA
AND INCORPORATED AREAS

PANEL 1760 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1760	L
PARADISE VALLEY TOWN OF	040049	1760	L
PHOENIX, CITY OF	040051	1760	L
SCOTTSDALE, CITY OF	045012	1760	L

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
04013C1760L
MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance

RATIONAL METHOD

Conc. Point	Contributing Areas	Area (ac)	Length (ft)	High Pt. (ft)	Low Pt. (ft)	Slope (ft/ft)	Land Use	k_b	C_2	C_{10}	C_{100}	T_{C2} (min)	T_{C10} (min)	T_{C100} (min)	I_2 (in/hr)	I_{10} (in/hr)	I_{100} (in/hr)	Q_2 (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
CP1A	1A	0.24	152	73.67	72.77	0.0059	A	0.044	0.80	0.80	0.90	5.2	4.3	3.6	2.96	4.84	7.60	0.6	0.9	1.6
CP2A	2A	0.23	157	73.78	72.70	0.0069	A	0.044	0.80	0.80	0.90	5.0	4.2	3.5	2.99	4.84	7.60	0.5	0.9	1.6
CP3A	3A	0.24	104	74.85	72.34	0.0241	A	0.044	0.80	0.80	0.90	2.9	2.3	1.9	2.99	4.84	7.60	0.6	0.9	1.6
CP4A	4A	0.15	83	73.67	72.07	0.0193	A	0.045	0.80	0.80	0.90	3.0	2.4	1.9	2.99	4.84	7.60	0.4	0.5	1.0
*	5A	0.40	191	73.67	73.00	0.0035	A	0.042	0.80	0.80	0.90	7.0	5.7	4.7	2.70	4.69	7.60	0.9	1.5	2.7
*	6A	1.31	230	73.67	72.80	0.0038	A	0.039	0.80	0.80	0.90	7.2	5.8	4.8	2.67	4.64	7.60	2.8	4.9	9.0
*	7A	0.35	114	73.67	72.80	0.0076	A	0.043	0.80	0.80	0.90	4.3	3.5	2.9	2.99	4.84	7.60	0.8	1.3	2.4
CP8A	8A	0.60	250	72.25	69.69	0.0102	A	0.041	0.80	0.80	0.90	5.5	4.5	3.8	2.92	4.84	7.60	1.4	2.6	4.1
CP9A	9A	0.17	50	71.75	71.50	0.0050	A	0.045	0.80	0.80	0.90	3.2	2.6	2.2	2.99	4.84	7.60	0.4	0.7	1.2
CP10A	10A	0.36	138	71.75	70.45	0.0094	A	0.043	0.80	0.80	0.90	4.2	3.5	3.0	2.99	4.84	7.60	0.9	1.6	2.5
Q=CiA																				
$T_c = 11.4 * L^{0.5} + K_b^{0.52} * S^{-0.31} * I^{-0.38}$																				
Minimum $T_c = 5$ minutes																				
$K_b = -0.00625 * \log_{10} Area^2 + 0.04$							$K_b = -0.025 * \log_{10} Area^2 + 0.85$							$K_b = -0.030 * \log_{10} Area^2 + 0.20$						
L= Length																				
S=Slope																				
I = intensity at T_c																				
* These areas are roof areas and will flow in roof drains that will be designed in the final drainage report.																				

PROJECT NAME Scottsdale Quarter - L
PROJECT NUMBER LENN 00019

Maricopa County Drainage Design Manual-
 Hydraulics Equation 3.13

Maricopa County Drainage Design Manual-Hydraulics
 Equation 3.7

Sump: $L_r = Q_r / (C_w D^{1.5})$

L_r = Length of Curb Opening (ft)

Q = Total Gutter Flow (cfs)

C_w = Weir Coefficient = 3.0

D = Depth of Flow (0.5 ft for 6" curb)

On-Grade: $L_r = 0.6Q^{0.42}S^{0.3}(1/nS_x)^{0.6}$

L_r = Length of Curb Opening (ft)

Q = Total Gutter Flow (cfs)

S = Longitudinal Slope = (0.004 ft/ft)

S_x = Pavement Cross-Slope = (0.02 ft/ft)

n = Manning's Roughness
 Coefficient = 0.015

CP	Q10 (cfs)	Q100 (cfs)	Opening Location (On-Grade/Sump)	Minimum Required Curb Opening Length (ft)*	Provided Curb Opening Length (ft)
CP1A	0.9	1.6	Sump	1.9	3' Existing
CP3A	0.9	1.6	Sump	1.9	3.5' Existing
CP4A	0.5	1.0	Sump	1.1	3.5' Existing
CP8A	2.6	4.1	Sump	4.8	6' Existing
CP10A	1.6	2.5	Sump	2.9	3.5' Existing

*The curb opening length shown on this summary is the minimum required opening length for Q100. The actual length shown on the plans may be longer than the length shown here. The curb opening lengths account for a 20% clogging factor.

Capacity of a catch basin in a Sag operating as an Orifice

$$Q = C A (2gd)^{0.50}$$

C = 0.67 Orifice Coefficient, g=32.2 ft/s²

Concentration Point **CP2A MAG 535**

High Water at Weir= 1473.2 Allowed ponding depth

Rim of Catch Basin= 1472.7

Head on Rim= 0.5

Total Area of Grate= 4.8

50% of Open area of the inlet sq. ft.

Depth of water ponding on the inlet ft.

Capacity of the inlet = cfs*

Concentration Point **CP9A and CP9B 18" Nyloplast**

High Water at Weir= 1471.75 Allowed ponding depth

Rim of Catch Basin= 1471.5

Head on Rim= 0.25

Total Area of Grate= 0

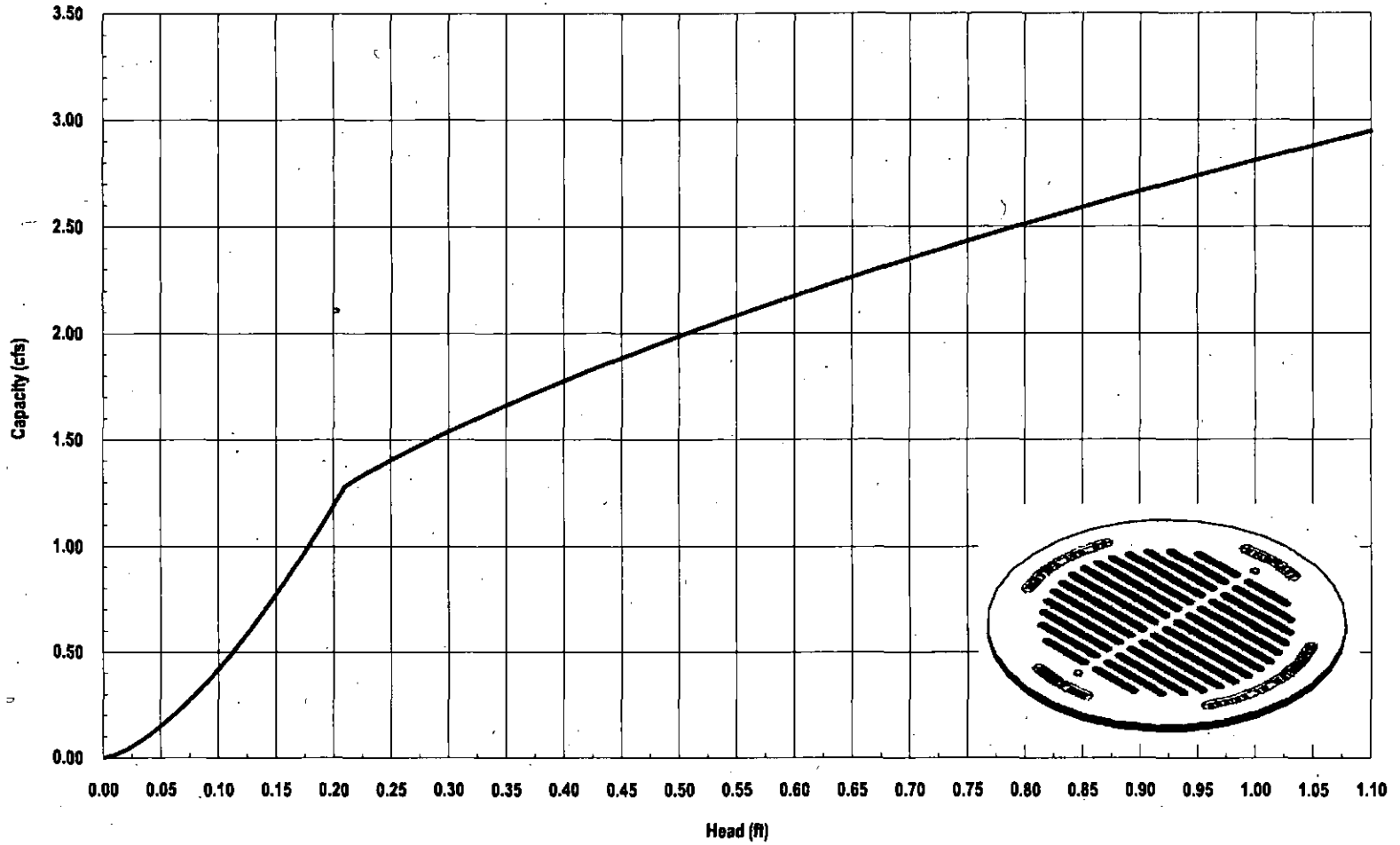
50% of Open area of the inlet sq. ft.

Depth of water ponding on the inlet ft.

Capacity of the inlet = cfs*

*See attached inlet capacity chart from Nyloplast ~1.4 cfs, assuming 50% clogging =0.70 cfs for each catch basin
There are 2 outfall elevations for Area 9A, in order to insure high water does nto inundate the Finished floor.

Nyloplast 18" Drop In Grate Inlet Capacity Chart



Nyloplast

3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490
© Nyloplast Inlet Capacity Charts June 2012

Pertinent Excerpts Master Drainage Report

MASTER DRAINAGE REPORT
FOR
Scottsdale Quarter

PREPARED FOR

GLIMCHER
150 East Gay Street, 24th Floor
Columbus, OH 43215
(614) 887-5671

PREPARED BY

DAVID EVANS AND ASSOCIATES, INC.
2141 E. Highland Ave., Suite 200
PHOENIX, AZ 85016
(602) 678-5151

July 2008

DEA PROJECT NO. GLIR00000001



EXPIRES 12/31/09

flows conveyed in Scottsdale Road and Greenway-Hayden Loop were analyzed using the HEC-1 flow rates minus the flow full capacity of the associated storm drain systems, which reduced peak flows through the street sections. The resulting flow depths were used to determine finished floor elevations for proposed structures adjacent to its corresponding road. Flowmaster calculations are included in Appendix D.

3.3 On-Site Storm Water Storage

City of Scottsdale requires new development to store runoff onsite that is generated by a "rainfall event up to and including the 100-year, 2-hour duration event" (Reference #1). The required storage volume for the project site will be estimated as follows:

$$V_R = (D/12) * A * C_w$$

Where:

- V_R = Required storage volume in acre-feet
- C_w = Weighted Runoff coefficient
- D = Rainfall depth for the 100-year, 2-hour event = 2.82" (Reference #1)
- A = Drainage area in acres

Underground storage facilities in the form of 96" aluminized CMP, located throughout the development) and StormTrap® (a pre-fabricated concrete system located near the southwest corner of the site - Reference 8) will be used to retain the runoff and satisfy the storm water retention requirement. Contech and StormTrap® manufacturer documentation is included in Appendix F. The owner will be responsible for maintaining all the storm water conveyance and storage facilities per manufacturer's recommendations. A slurry back fill to the CMP springline will be used during installation of the pipe (see construction plans for call out). A geotechnical report by Speedie and Associates (Reference 9) is included in Appendix H. An Addendum to the report, addressing the underground storage tanks is also included in Appendix H (Reference 10).

In the case of a storm event or multiple storm events in succession exceeding current design, excess runoff will exit the property through a local outfall point, which is also the historic outfall for the site, located at the southwestern corner of the site at the intersection of Scottsdale Road and Butherus Road, which has an elevation of approximately 1463'.

As previously mentioned, construction of the property will occur in three phases, where the defined Phase 1, 2 and 3 areas will be constructed sequentially. During Phase 1 a temporary retention basin will be constructed at the southeast corner (SEC) of the property to intercept the existing parking lot runoff and portions of the existing building runoff. A temporary drainage ditch will be graded and utilized to intercept runoff from part of the existing building and the existing parking lot along North 73rd Street (North Dial Boulevard). This temporary drainage ditch will

convey runoff to the temporary retention basin that will be graded at the SEC of the property. See Exhibit B for callout and location.

Also during Phase 1 most of the underground retention facilities will be installed around the Phase 1 buildings. The graded ditch and Temporary Retention Basin will continue to be used throughout Phase 1. Inlet protection will be provided during the construction of Phase 1 until stabilization of Phase 1 is complete.

When construction of Phase 2 begins, the temporary retention basin SEC will be backfilled and provided retention will be replaced by the underground storage facilities placed during Phase 2 that will serve for the provided retention for the entire site including Phase 3. A new temporary basin will be constructed to provide first flush requirements for the Phase 3 area as described in Section 3.1. As Phase 3 is developed, catch basins and smaller diameter storm drain will be added to Phase 3 to convey runoff to the underground retention system built in Phases 1 and 2.

Table 3
Storage Volume Summary

	Retention Required, CF	Retention provided, CF
Phase 1	185,618	270,256
Entire site	200,323	215,129

3.4 Bleed-off and Dissipation

A 6" in diameter orifice connected to an 18" storm drain pipe will be used for runoff dissipation. Calculations used to determine the orifice size are included in Appendix D. The 18" storm drain pipe will drain water from the underground storage facility to the existing 66" storm drain system on Scottsdale Road. The City of Scottsdale requires stored runoff to be discharged completely from the facility within 24-36 hours following the storm event (Reference #1). Furthermore, City of Scottsdale requires bleed off at an average rate of 1 cfs not to exceed 1.5 cfs (Reference #1).

The following flow vs. rate and time equation will be used to estimate the time required to drain the underground retention facilities:

$$Q = V_R / t$$

Where:

- V_R = Required storage volume in cubic feet
- Q = average rate of discharge (cubic feet per second)
- t = time (seconds)

Table 3.1

EXISTING SITE RETENTION				
LAND USE	AREA	C	DEPTH	REQ RETENTION (ft ³)
pavement/roof	376,677.00	0.90	0.24	84,093.14
landscape	648,043.00	0.35	0.24	53,301.54
	Total Retention Required (ft ³)			137,394.68
	Total Volume Provided (ft ³)			90,837.16
	Retention Shortage (ft ³)			-46,557.52

Table 3.2

PHASE 1 RETENTION				
LAND USE	AREA	C	DEPTH	REQ RETENTION (ft ³)
pavement/roof/ Dial building	459,979	0.95	0.24	102,690
Pavement (ex. Dial parking)	258,170.00	0.95	0.24	57,757
Landscape (Surrounding Dial Parking)	157,956	0.35	0.24	12,892
Landscape (Remainder)	148,073	0.35	0.24	12,179
	Total Retention Required (ft ³)			185,618
	Total Proposed Retention (ft ³)			267,015
	Excess Retention (ft ³)			81,397
	Retention Required for Dial Parking and surrounding landscape (ft ³)			70,749
	Proposed Retention for Dial parking and surrounding landscape (ft ³)			71,120
	Excess Retention for Dial Parking (ft ³)			370

Table 3.3

Self Retaining, FOR PHASE 1 ONLY				
ELEVATION	SURFACE AREA	AVG. AREA	DEPTH	VOLUME (ft ³)
1474	23,195	20,008	1	20,008
1473	16,821	13,140	1	33,148
1472	9,458			
	Retention Provided During Phase 1 (ft ³)			33,147

Table 3.4

STORAGE BASIN SEC. FOR PHASE 1 ONLY				
ELEVATION	SURFACE AREA	AVG. AREA	DEPTH	VOLUME (ft ³)
1464	28,637	26,966	1	26,966
1463	25,294	23,673	1	50,639
1462	22,052	20,481	1	71,120
1461	18,910			
Retention Provided During Phase 1 (ft ³)				71,120

Table 3.5

PHASE 1, 8' CMP RETENTION (to remain for phase 2)			
	Area	L.F.	Volume (ft ³)
8' CMP	50.27	2,651	133,254

Table 3.6

PHASE 1, STORM TRAP RETENTION (to remain for phase 2)			
	Area	Depth	Volume (ft ³)
Storm Trap	2,722	10	27,220

Table 3.7

PHASE 1 and 2 (FINAL) RETENTION				
LAND USE	AREA	C	DEPTH	RET. REQ (ft ³)
pavement/roof	897,302	0.95	0.24	200,323
	Total Retention Required (ft ³)			200,323
	*Retention Provided (ft ³)			215,129
	Excess Retention (ft ³)			14,806

* Retention provided includes 2,234 LF of 18" HDPE and 489 LF of 36" HDPE pipe

Table 3.8

PHASE 2, 8' CMP RETENTION			
	Area	L.F.	Volume (ft ³)
8' CMP	50.27	940	47,254

Scottsdale Quarter

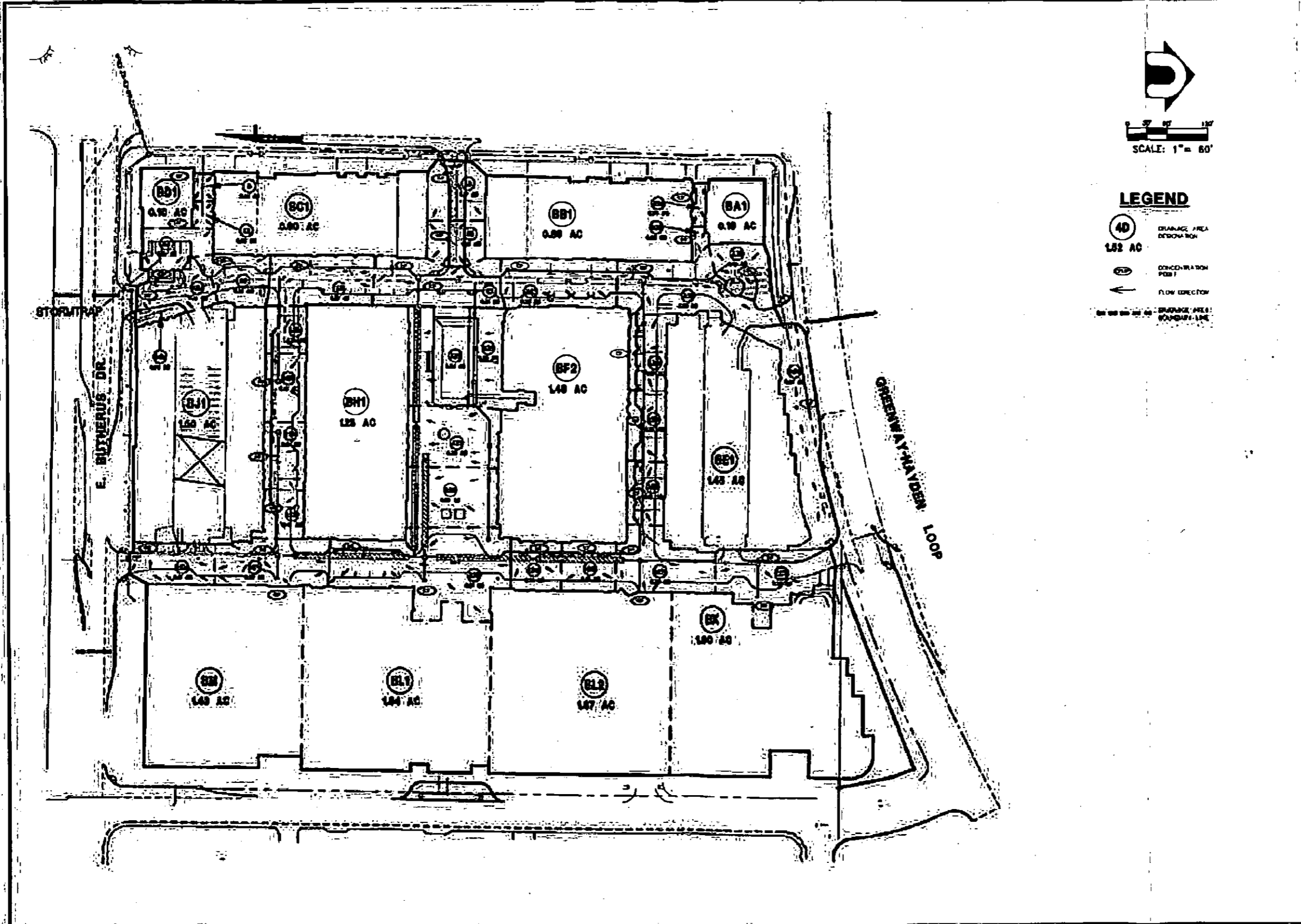
Required Retention

$V_{req} = A \cdot C \cdot D / 12$





C = 0.95 (from above)

D = 2.82 inches

Drainage Area	Area (ac)	Area (sf)	Required Volume (cf)
A	0.03	1,269	283
A2	0.03	1,301	290
A3	0.15	6,489	1,449
A4a	0.14	6,247	1,395
A4b	0.03	1,480	330
A5	0.14	6,270	1,400
A6	0.27	11,845	2,644
A7	0.31	13,418	2,996
A8	0.13	5,602	1,251
A9	0.17	7,455	1,664
A10	0.28	12,401	2,769
A12	0.36	15,530	3,467
A13	0.15	6,639	1,482
A14	0.03	1,407	314
A15a	0.10	4,222	943
A15b	0.14	6,089	1,359
A16a	0.14	6,199	1,384
A16b	0.10	4,531	1,012
A17a	0.17	7,461	1,666
A17b	0.27	11,563	2,581
A18	0.61	26,680	5,956
A20	0.28	12,341	2,755
A21	0.28	12,342	2,755
A22	0.30	13,002	2,903
A23	0.20	8,589	1,917
A24a	0.13	5,511	1,230
A24b	0.14	5,881	1,313
A25	0.12	5,402	1,206
A26a	0.15	6,423	1,434
A26b	0.14	5,907	1,319
A27a	0.27	11,861	2,648
A27b	0.31	13,403	2,992
A39	0.02	1,075	240
A40	0.37	15,952	3,561
BA1	0.19	8,420	1,880
BB1	0.86	37,451	8,361
BC1	0.90	39,416	8,800
BD1	0.16	6,936	1,548
BE1	1.45	63,101	14,087
BF2	1.48	64,566	14,414
BH1	1.23	53,711	11,991
BJ1	1.50	65,487	14,620
BK	1.60	69,894	15,604
BL1	1.64	71,520	15,967
BL2	1.67	72,843	16,262
BM	1.43	62,172	13,880
TOTAL	20.60	897,304	200,323



LEGEND

-  DRAINAGE AREA DESIGNATION
-  CONCENTRATION POINT
-  FLOW DIRECTION
-  DRAINAGE AREA BOUNDARY LINE

PROJECT NO.	DATE	SCALE	BY	CHECKED
				
DAVID EVANS AND ASSOCIATES, INC. 2111 N. SCOTTSDALE AVENUE, SUITE 200 SCOTTSDALE, ARIZONA 85251 PHONE: 480.948.8800 FAX: 480.948.8801				
PROPOSED DRAINAGE PLAN SCOTTSDALE QUARTER 15101 N. SCOTTSDALE RD. SCOTTSDALE, ARIZONA				
DATE	BY	CHECKED		
				
SHEET NO. 001 OF 001				