

February 11, 2019

SMOKE TREE RESORT

Town of Paradise Valley, AZ

Prepared for:

Gentree, LLC

3620 E Campbell Ave, Suite B
Phoenix, AZ 85018
(602) 952-8811

Prepared by:

CVL Consultants, Inc.

4550 N 12th Street
Phoenix, AZ 85014
(602) 264-6831



Job #:1-01-03153-01

Preliminary Drainage Report

For

Smoke Tree Resort

Paradise Valley, Arizona

February 11, 2019

Prepared for:

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Smoke Tree Resort**

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1.0 INTRODUCTION

1.1 SCOPE

Coe & Van Loo Consultants, Inc. (CVL) has been contracted by Gentree, LLC to provide engineering services in support of the proposed improvements to Smoke Tree Resort, herein referred to as the site. The purpose of this report is to provide on-site and off-site hydrologic and hydraulic analysis for the proposed development.

This report is focused on providing design information, evaluation, and analysis for statistical flood events up to and including the 100-year storm. The scope of this assessment does not include, neither did CVL's client request that, evaluation of storm-water runoff resulting from storm events exceeding the 100-year frequency event. Hence, it should be noted that a storm event exceeding the 100-year frequency may cause or create the risk of greater flood impact than is addressed and presented in this assessment.

The procedures used herein are derived from, and performed with, currently accepted engineering methodologies and practices.

1.2 REGULATORY JURISDICTION

The development is designed to meet the drainage requirements as stated in the Town of Paradise Valley's *Storm Drain Design Manual (1987)* [1] and Flood Control District of Maricopa County (FCDMC), *Drainage Design Manuals for Maricopa County, Arizona, Volume I, Hydrology* [2], *Volume II, Hydraulics* [3], and *Drainage Policies and Standards Manual for Maricopa County, Arizona* [4].

2.0 SITE CONDITIONS

2.1 LOCATION

The site is located within the Town of Paradise Valley, Maricopa County, Arizona. The site is bordered on the north by Lincoln Drive, on the east by commercial property, on the south by the Andaz Resort Hotel and on the west by Quail Run Road and custom residences. Furthermore, the site is located within Section 10, Township 2 North, Range 4 East of the Gila and Salt River Base and Meridian, Arizona.

2.2 EXISTING CONDITIONS

A field reconnaissance of the 5.3-acre resort and its surroundings was performed on February 5th, 2019. It was observed that the site and surrounding properties are flat and generally drain to east then to the north towards Lincoln Drive. The resort's landscaping is characterized by hedges around all but the north perimeter, mature trees throughout the site and open space consisting of lawn and dirt drive lanes and parking.

2.3 PROPOSED CONDITIONS

The resort was originally opened in 1966 and has yet to undergo any significant renovations beyond general maintenance measures. The resort is notably dated and in need of renovations and refurbishment of amenities. The vision for the transformation of the Smoke Tree Resort is to welcome guests to a four-star "local-centric" hospitality experience in both form and substance. This is to be achieved through active forward-facing components and lifestyle programmatic aspects. The existing resort often goes unnoticed in its unassuming character along Lincoln Drive, with only 23 of its 32 guest rooms currently in use. The revitalization of the site will retain its charming essence while providing the scale and quality of amenities sought by today's traveler; the specifics of which include 150 guest rooms, 30 resort dwelling units, special event venues, and a neighborhood local-centric fresh market & eatery concept. The relaxed, pedestrian friendly environment will not include the typical resort perimeter walls or gates; instead, setbacks that align with existing buildings are desired, including a bicycle/pedestrian path that shall weave the resort into the local tapestry.

3.0 FLOOD ZONE INFORMATION

The Maricopa County, Arizona and Incorporated Areas Flood Insurance Rate Map (FIRM), panel numbers 04013C1770L, Map Revised October 16, 2013 [5], indicates the site falls within Zone "D."

Zone "D" is defined by FEMA as:

"The Zone D designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted. The Zone D designation is also used when a community incorporates portions of another community's area where no map has been prepared."

Refer to Figure 2 for a copy of the Flood Insurance Rate Map (FIRM).

4.0 OFFSITE AND ONSITE RUNOFF

4.1 OFFSITE RUNOFF MANAGEMENT PLAN

The offsite watershed affecting the site is urbanized by mainly low density custom residential lots to the west. These residential lots are flat with no concentrated flow paths. During the field reconnaissance, it was observed that some of the custom residences with perimeter block walls have weepholes in order to keep flow moving through their sites while others do not. At a meeting with the Paradise Valley Town Engineer on January 30th, 2019, it was agreed that the proposed site would handle offsite runoff similarly by allowing it to move through the site. The proposed site will consist of small drainage swales and/or weepholes along the west and east perimeter walls to ensure offsite flows are safely conveyed through the site. Additionally, Quail Run Road will be fully improved with curb and gutter from Lincoln Drive to the south boundary of the site. These additional improvements will further reduce the amount of offsite runoff impacting the site from the west.

4.2 ONSITE RUNOFF MANAGEMENT PLAN

The resort was developed in 1966 when drainage regulations were non-existent. The site has a single small drain/drywell located just south of the abandoned restaurant building for localized flow. The remainder of the site is graded to drain to the east. The site currently provides no onsite retention. The proposed improvements to the resort will utilize parking and drive corridors as drainage pathways to drain flow to the east and north where runoff will be captured by grated catch basins. These catch basins will drain to underground retention basins in the form of 12-ft diameter pipes. Onsite retention will be provided for the pre vs. post condition. Basins will be designed to dispose of the storm water within 36 hours through drywells. Rainfall data was taken from NOAA Atlas 14 (see Appendix A). Retention and drywell calculations can be found in Appendix B. Runoff coefficients based on land use [1] for pre-development and post-development condition (see Appendix B).

5.0 STORM WATER POLLUTION PREVENTION PLAN

During final engineering design, the Storm Water Pollution Prevention Plan (SWPPP) will be prepared and submitted for approval.

6.0 SUMMARY AND CONCLUSIONS

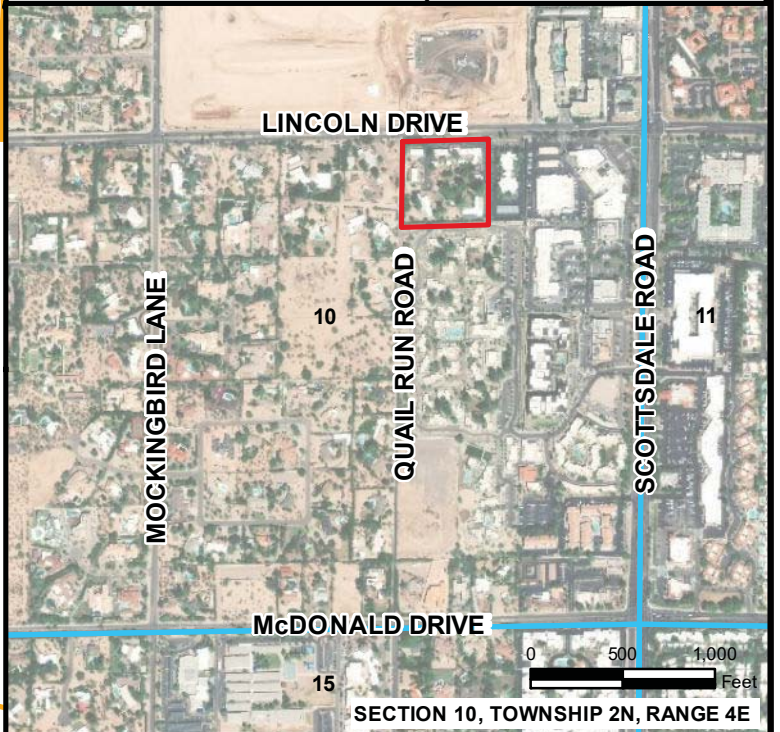
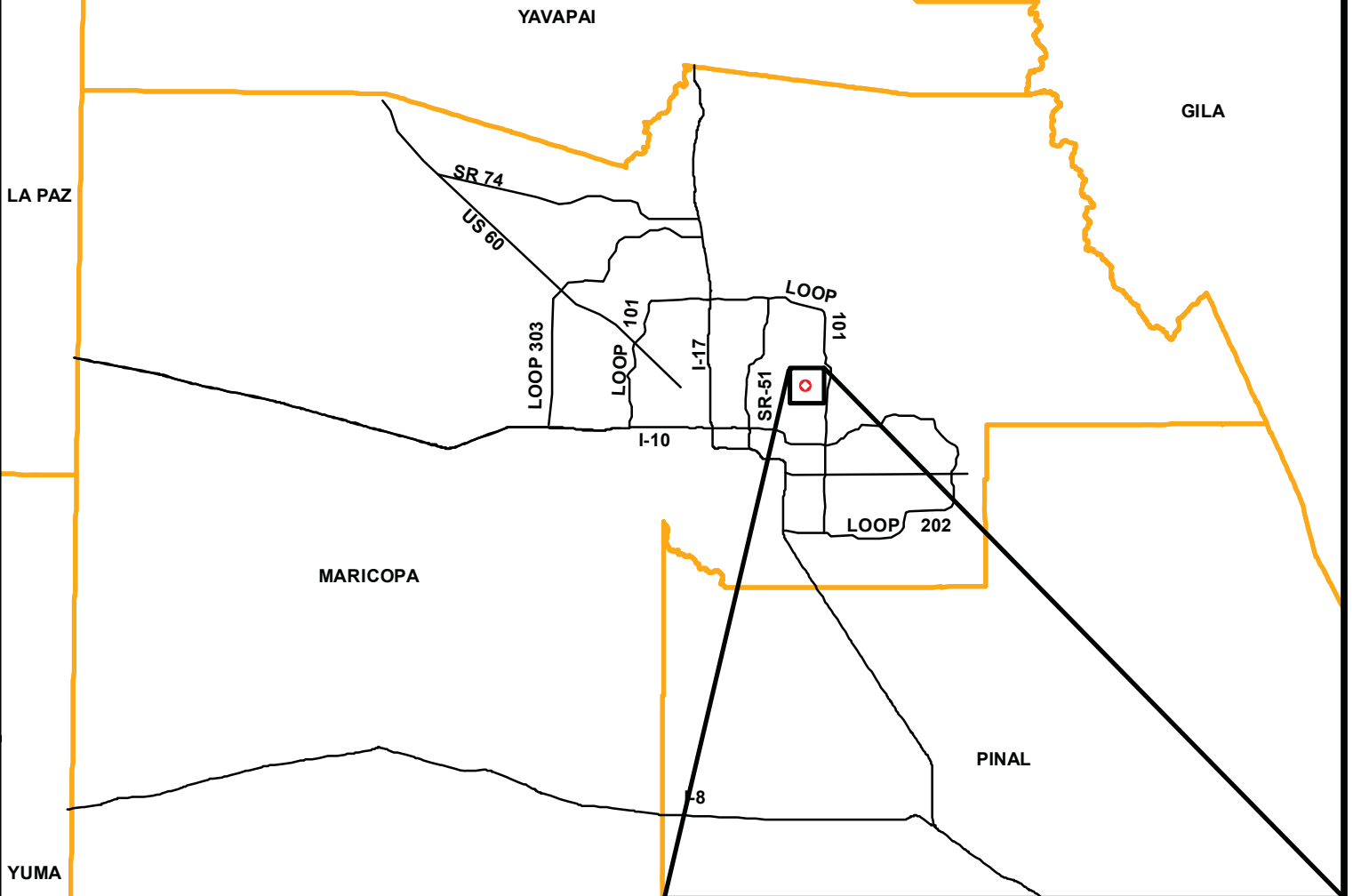
1. Retention will be provided for pre-development versus post-development conditions.
2. Underground retention basins will be designed to drain within 36 hours.
3. According to the FIRM panel number 04013C1770L, Map Revised: October 16, 2013, the site is located in Zone "D."
4. All finished floor elevations (FFE) will be at least 14 inches above the lowest drainage outfall for the site.

7.0 REFERENCES

- [1] Town of Paradise Valley, "Storm Drain Design Manual," March 12, 1987.
- [2] Flood Control District of Maricopa County, "Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology," December 14, 2018.
- [3] Flood Control District of Maricopa County, Arizona, "Drainage Design Manual for Maricopa County, Volume II, Hydraulics," December 14, 2018.
- [4] Flood Control District of Maricopa County, "Drainage Policies and Standards," Revised August 22, 2018.
- [5] Federal Emergency Management Agency (FEMA), "National Flood Insurance Program, Flood Insurance Rate Map, Maricopa County, Arizona and Incorporated Areas, Panel Number 04013C1770L," Revised October 16, 2013.

FIGURES

CVL



Legend



SITE

— FREEWAY/MAJOR ROADS

— COUNTY BOUNDARY



SECTION ID



0 10 20
Miles



4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

SMOKE TREE RESORT

VICINITY & LOCATION MAP

JOB NO.

01-03153-01

FIGURE 1

Legend

 SMOKE TREE RESORT

10

LINCOLN DRIVE

LINCOLN DR

24536-1

SCOTTS DALE ROAD

ROSE LN

ZONE D

TOWN OF PARADISE VALLEY
040049

24547-1

McDONALD DRIVE

DU1341

PANEL 1770L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY,

ARIZONA

AND INCORPORATED AREAS

PANEL 1770 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	FLOOD	PANEL	SHEET
MARICOPA COUNTY	040049	1770	L
PARADISE VALLEY TOWN OF	040049	1770	L
250788A F.O.T.V. OF	040049	1770	L

Revised: Use the Map Number shown below should be used after 2013 100-0000. The Community Number shown above should be used on insurance policies for the subject community.



MAP NUMBER
04013C1770L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency

SMOKE TREE RESORT

FLOOD INSURANCE RATE MAP

JOB NO.

1.01.03153.01

FIGURE 2



4550 NORTH 12TH STREET
PHOENIX, ARIZONA 85014
TELEPHONE (602) 264-6831

APPENDICES

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APPENDIX A
NOAA Atlas 14 Rainfall Data



NOAA Atlas 14, Volume 1, Version 5
Location name: Paradise Valley, Arizona, USA*
Latitude: 33.5306°, Longitude: -111.9293°
Elevation: 1310.38 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.186 (0.156-0.228)	0.243 (0.204-0.298)	0.331 (0.275-0.403)	0.397 (0.329-0.482)	0.487 (0.397-0.589)	0.556 (0.447-0.668)	0.627 (0.495-0.752)	0.700 (0.543-0.837)	0.796 (0.602-0.954)	0.870 (0.645-1.04)
10-min	0.284 (0.237-0.347)	0.371 (0.311-0.454)	0.503 (0.419-0.613)	0.605 (0.500-0.734)	0.742 (0.604-0.896)	0.847 (0.681-1.02)	0.955 (0.754-1.15)	1.07 (0.827-1.27)	1.21 (0.916-1.45)	1.32 (0.981-1.59)
15-min	0.352 (0.294-0.430)	0.459 (0.386-0.562)	0.624 (0.519-0.760)	0.750 (0.620-0.910)	0.919 (0.749-1.11)	1.05 (0.844-1.26)	1.18 (0.935-1.42)	1.32 (1.02-1.58)	1.50 (1.14-1.80)	1.64 (1.22-1.97)
30-min	0.473 (0.396-0.579)	0.619 (0.520-0.757)	0.840 (0.699-1.02)	1.01 (0.835-1.23)	1.24 (1.01-1.50)	1.41 (1.14-1.70)	1.60 (1.26-1.91)	1.78 (1.38-2.13)	2.02 (1.53-2.42)	2.21 (1.64-2.65)
60-min	0.586 (0.490-0.717)	0.766 (0.643-0.937)	1.04 (0.865-1.27)	1.25 (1.03-1.52)	1.53 (1.25-1.85)	1.75 (1.41-2.10)	1.97 (1.56-2.37)	2.20 (1.71-2.63)	2.50 (1.89-3.00)	2.74 (2.03-3.29)
2-hr	0.680 (0.577-0.814)	0.881 (0.748-1.06)	1.18 (0.995-1.41)	1.40 (1.17-1.67)	1.71 (1.42-2.03)	1.95 (1.59-2.30)	2.19 (1.76-2.59)	2.44 (1.92-2.88)	2.77 (2.13-3.27)	3.03 (2.28-3.60)
3-hr	0.748 (0.632-0.906)	0.959 (0.814-1.17)	1.26 (1.06-1.52)	1.49 (1.25-1.80)	1.83 (1.50-2.18)	2.09 (1.70-2.49)	2.37 (1.89-2.82)	2.65 (2.08-3.15)	3.05 (2.32-3.62)	3.37 (2.50-4.01)
6-hr	0.900 (0.777-1.07)	1.14 (0.985-1.35)	1.46 (1.25-1.72)	1.71 (1.46-2.01)	2.06 (1.73-2.40)	2.33 (1.93-2.71)	2.62 (2.13-3.04)	2.91 (2.33-3.38)	3.30 (2.58-3.84)	3.61 (2.75-4.21)
12-hr	1.00 (0.875-1.17)	1.27 (1.10-1.48)	1.61 (1.39-1.87)	1.87 (1.61-2.17)	2.23 (1.90-2.58)	2.50 (2.10-2.89)	2.78 (2.31-3.21)	3.07 (2.51-3.54)	3.45 (2.75-4.01)	3.75 (2.94-4.38)
24-hr	1.19 (1.05-1.38)	1.52 (1.33-1.75)	1.96 (1.72-2.27)	2.32 (2.02-2.68)	2.81 (2.44-3.24)	3.20 (2.75-3.68)	3.60 (3.08-4.15)	4.02 (3.41-4.63)	4.60 (3.85-5.30)	5.06 (4.20-5.84)
2-day	1.29 (1.13-1.48)	1.65 (1.45-1.90)	2.16 (1.90-2.49)	2.58 (2.25-2.96)	3.15 (2.74-3.62)	3.61 (3.11-4.14)	4.10 (3.51-4.70)	4.60 (3.91-5.28)	5.31 (4.46-6.10)	5.87 (4.88-6.77)
3-day	1.37 (1.20-1.57)	1.75 (1.54-2.01)	2.31 (2.02-2.65)	2.76 (2.40-3.16)	3.38 (2.94-3.87)	3.89 (3.35-4.45)	4.43 (3.79-5.07)	4.99 (4.24-5.72)	5.79 (4.86-6.63)	6.43 (5.34-7.39)
4-day	1.45 (1.27-1.66)	1.86 (1.63-2.13)	2.45 (2.15-2.80)	2.93 (2.56-3.35)	3.62 (3.14-4.13)	4.17 (3.59-4.76)	4.76 (4.07-5.43)	5.39 (4.57-6.16)	6.27 (5.26-7.16)	6.99 (5.80-8.01)
7-day	1.63 (1.43-1.87)	2.08 (1.82-2.39)	2.76 (2.40-3.17)	3.30 (2.87-3.79)	4.08 (3.52-4.67)	4.70 (4.04-5.37)	5.36 (4.57-6.14)	6.07 (5.13-6.96)	7.07 (5.90-8.10)	7.87 (6.51-9.04)
10-day	1.76 (1.54-2.02)	2.25 (1.98-2.58)	2.98 (2.60-3.40)	3.56 (3.10-4.07)	4.38 (3.80-4.99)	5.04 (4.34-5.72)	5.74 (4.91-6.53)	6.47 (5.50-7.37)	7.50 (6.29-8.54)	8.33 (6.92-9.50)
20-day	2.17 (1.91-2.47)	2.79 (2.46-3.18)	3.69 (3.25-4.20)	4.37 (3.83-4.96)	5.29 (4.62-6.00)	6.00 (5.21-6.80)	6.72 (5.81-7.63)	7.45 (6.41-8.47)	8.44 (7.20-9.61)	9.20 (7.79-10.5)
30-day	2.54 (2.23-2.89)	3.27 (2.87-3.72)	4.31 (3.78-4.90)	5.11 (4.47-5.79)	6.17 (5.37-7.00)	7.00 (6.07-7.92)	7.84 (6.77-8.87)	8.70 (7.47-9.83)	9.86 (8.40-11.2)	10.7 (9.10-12.2)
45-day	2.93 (2.59-3.32)	3.78 (3.33-4.28)	4.98 (4.39-5.64)	5.87 (5.17-6.64)	7.05 (6.18-7.97)	7.94 (6.93-8.98)	8.84 (7.68-10.00)	9.74 (8.43-11.0)	10.9 (9.39-12.4)	11.8 (10.1-13.5)
60-day	3.23 (2.86-3.64)	4.17 (3.70-4.71)	5.49 (4.86-6.19)	6.45 (5.70-7.28)	7.71 (6.79-8.68)	8.64 (7.57-9.73)	9.57 (8.36-10.8)	10.5 (9.12-11.8)	11.7 (10.1-13.2)	12.6 (10.8-14.3)

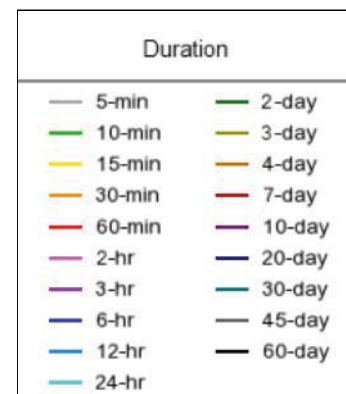
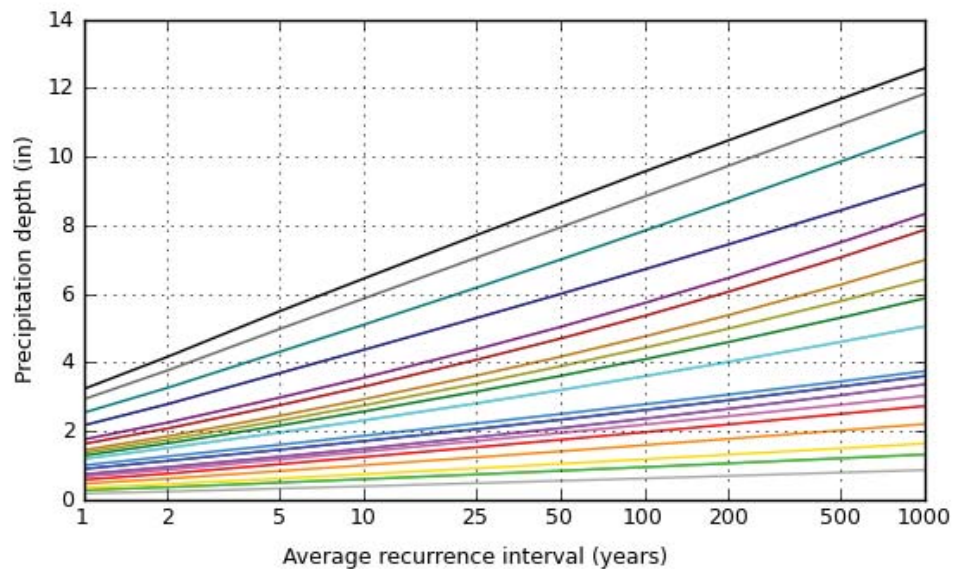
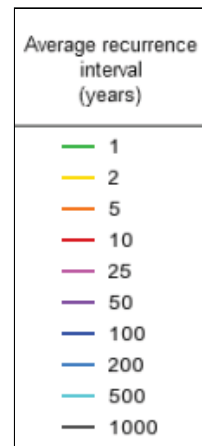
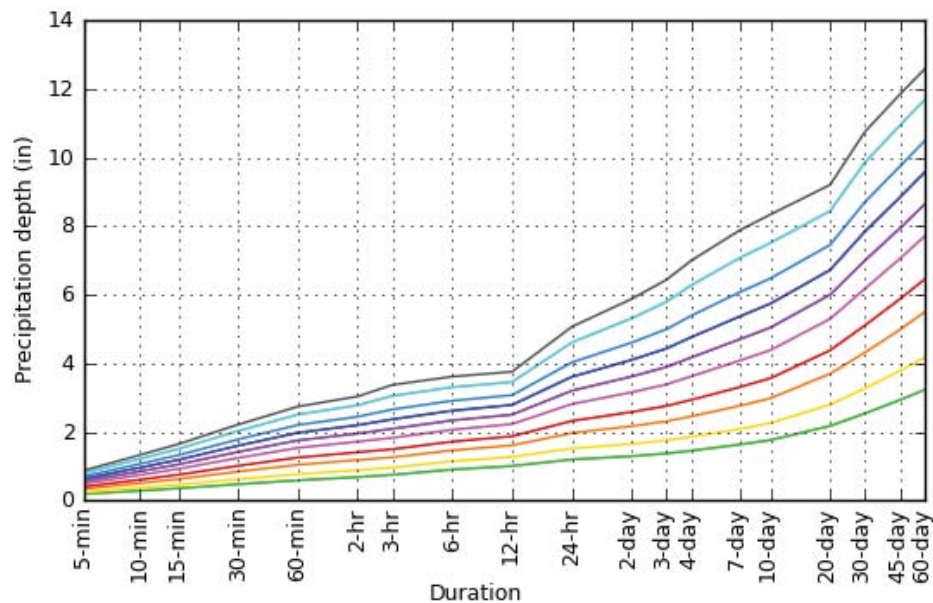
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

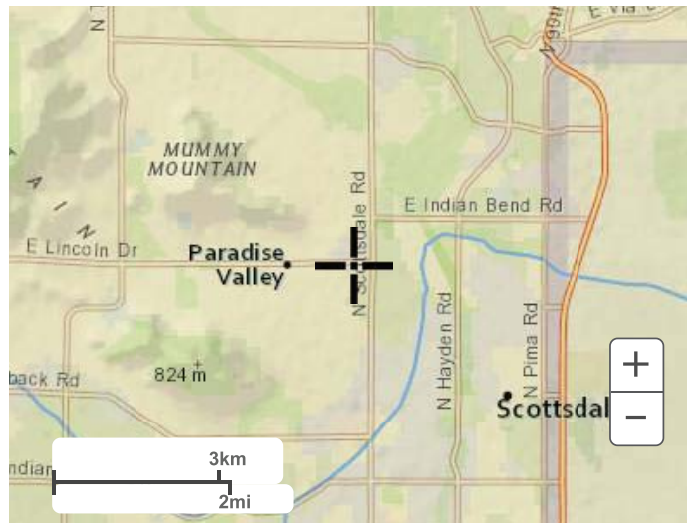
Latitude: 33.5306°, Longitude: -111.9293°



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Tue Feb 5 20:17:35 2019

[Back to Top](#)**Maps & aeriels****Small scale terrain**



Large scale terrain



Large scale map



Large scale aerial

APPENDIX B

Runoff Coefficients, Retention and Drywell Calculations

Used for Post-Development Conditions

RUNOFF CO-EFFICIENTS FOR USE WITH THE RATIONAL FORMULA $Q = CIA$

<u>Land Use</u>	<u>"C" Value</u>
Paved Street or Parking Lot	0.95
Commercial Areas	0.90
Residential Areas (Average lot zoning)	0.45
Townhouses	0.55
Apartments and Condominiums	0.65
Parks and Grassed Areas (no irrigation)	0.20
Railroad Yards	0.25
Undeveloped Desert	0.35
Mountain Terrain — slopes greater than 10%	0.70
Industrial Areas	0.90
Agricultural Areas	0.20

Used for Pre-Development Conditions

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Retention Volume Calculations

Pre vs. Post										
Development Condition	Drainage ⁽¹⁾ Area A (acres)	Drainage ⁽¹⁾ Area A (feet ²)	Runoff ⁽²⁾ Coefficient C	Precipitation ⁽³⁾ Depth P (inches)	Volume ⁽⁴⁾ Required V _{req} (acre-ft)	Volume ⁽⁴⁾ Required V _{req} (cubic feet)	Retention Basin/Tank ID	12' Dia. Underground Tank (LF)	Volume ⁽⁵⁾ Provided V _{prov} (acre-ft)	Volume ⁽⁵⁾ Provided V _{prov} (cubic feet)
PRE	4.89	212,908	0.90	2.19	0.80	34,970				
POST			0.55	2.19	0.49	21,371	RET	121	0.31	13,685
DIFFERENCE					0.31	13,600			0.31	13,685

Reference: [1] Storm Drain Design Manual for Town of Paradise Valley (1987)

Notes:

1. Drainage sub-basin delineated per Drainage Map (Plate 1).
2. Runoff coefficient values of 0.55 for Townhomes and 0.90 for Commercial per Town of Paradise Valley Storm Drain Design Manual (see Appendix B).
3. Precipitation depth per NOAA Atlas 14 rainfall data (see Appendix A).
4. $V_{req} = A \times C \times (P/12) = \text{Volume required}$
5. $V_{prov} = 12' \text{ Diameter Pipe LF} \times \pi (6')^2$

SMOKE TREE RESORT

Drywell Calculations

Retention Basin ID	Volume Required to Drain ⁽²⁾ (ft ³)	Soil Infiltration Rate ⁽³⁾ (ft ³ /hr/ft ²)	Flowrate Required to Drain Within 36 hrs ⁽⁴⁾ (cfs)	Drywell Flow Rate ⁽⁵⁾ (cfs)	Number Of Drywells Required ⁽⁶⁾	Number Of Drywells Provided*
RET	13,685	0.00	0.11	0.10	2	1
				TOTAL	2	1

Notes:

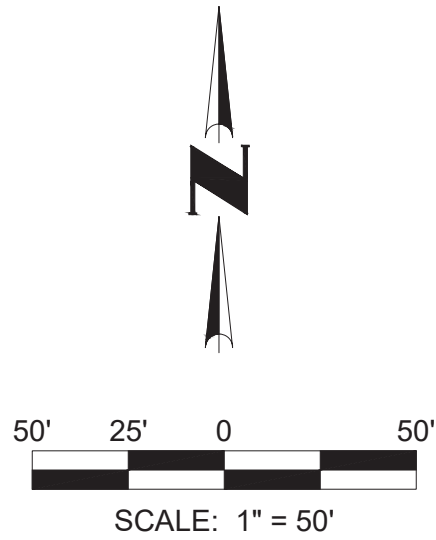
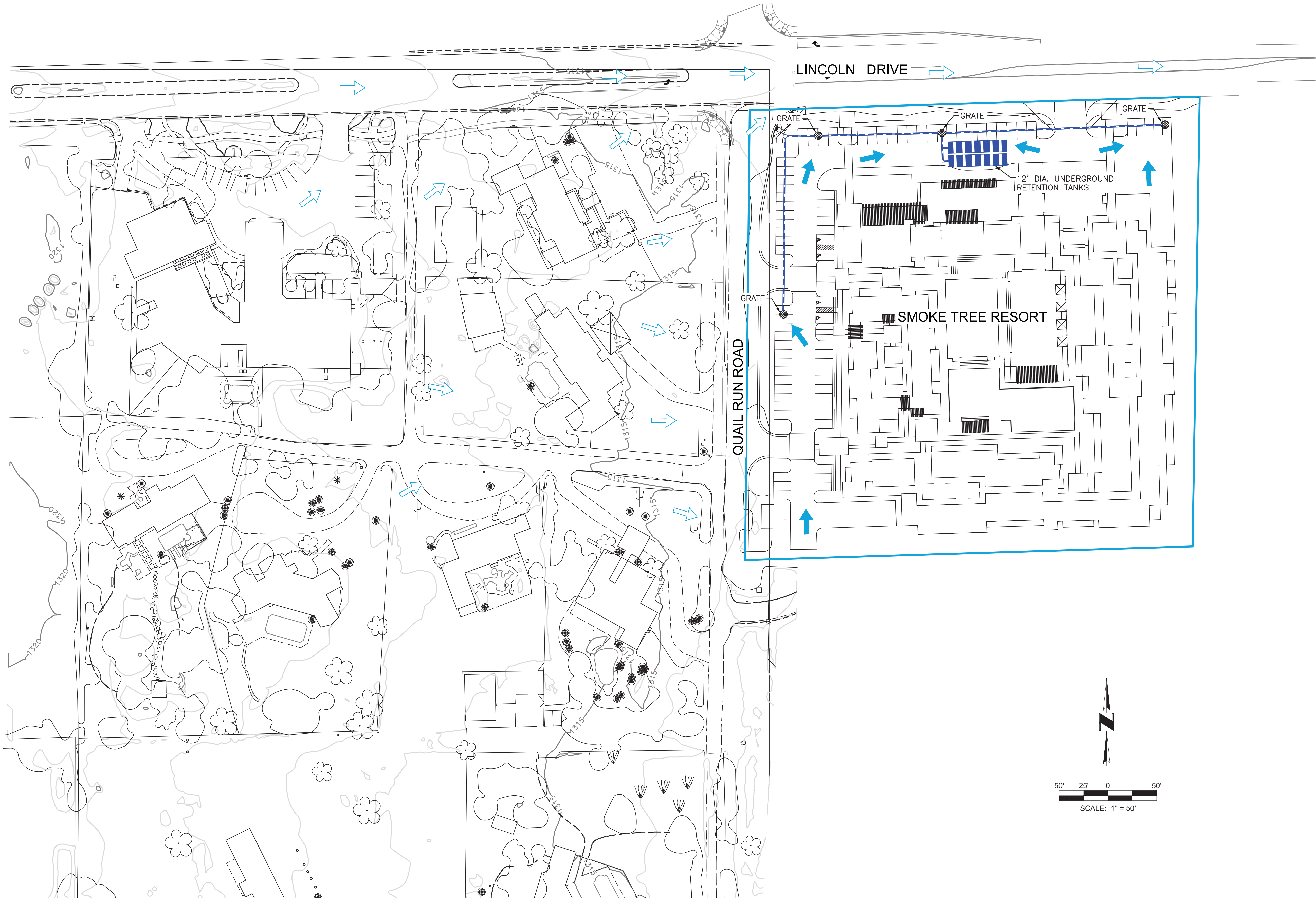
- (1) Bottom area per preliminary grading and drainage plans prepared by CVL Consultants, Inc.
- (2) Volume required to drain = Volume provided for retention basins.
- (3) Soil infiltration rate at the bottom of a compacted basin is below the minimum requirement of 0.5in/hr per DPSM Std 6.10.12, Hence, no infiltration was assumed.
- (4) Flowrate Required to Drain Basin Within 36 hrs = (Volume Required to Drain)/(36 x 3600)
- (5) Drywell flow rate assumed to be minimum required per DPSM Std 6.10.13. Field test should be performed to calculate actual dry well flow rate.
- (6) (Number Of Dry Well(s) Required)=(Flowrate Required to Drain Basin Within 36 hrs)/(Dry Well Flowrate Capacity)

Note to contractor:

*Initially one drywell will be installed and field tests performed per the DPSM Standard 6.10.12 to check the actual flow rate of drywell.
 Drywells will be provided and tested until the percolation requirement is achieved per DPSM Standard 6.10.12.
 The amount of drywells needed shall be changed in accordance to the newly calculated flow rate.

PLATE

CVL



1 SHEET OF 1	PLATE		DRAINAGE MAP		NO.		REVISION		DATE	
	SMOKE TREE RESORT TOWN OF PARADISE VALLEY, ARIZONA		Coe & Van Loo Consultants, Inc.							