Monday, November 28, 2022

CONCEPTUAL
DRAINAGE REPORT
For
PINNACLE PEAK
"PET RESORT"

7474 E. Pinnacle Peak Road
Scottsdale, Arizona
Maricopa County

APN #212-05-531

Prepared By
Keogh Engineering, Inc.
650 N. 137TH Avenue #110
Goodyear, Arizona 85338

Job No. 22270

November, 2022

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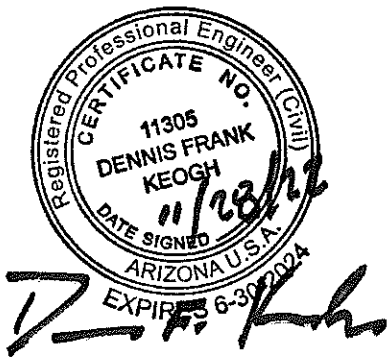
EXHIBITS



APPENDICES

1. INTRODUCTION

1.1 Location and Site Description

The project is located at 7474 E. Pinnacle Peak Road in Scottsdale, Arizona, Maricopa County, as shown on the Vicinity Map. The 0.95 ac. site is a commercial lot located in FEMA Zone AE.

1.2 Existing Conditions

The proposed site as of today consists of a barren dirt commercial lot with water and sewer stubouts.

1.3 Proposed Project

This site consists of a new commercial building on a compacted pad, The site will also connect to existing onsite water and sewer stubouts.

2. HYDROLOGIC ANALYSIS

2.1 Discussion

The grading and drainage plan shows the passing of historical drainage flows entering the site from the north property line and traversing as concentrated flows in drainage easements located along the east and south property lines (see the Onsite Drainage Exhibit).

- The site is also affected by FEMA LOMR 1509-1857P enacted in 6/10/16. The under the building pad will require 2'-3' of compacted fill to be imported to the site.
- To create more site developable area the 50' drainage easement is being proposed to reduce by 25' along the east side of the parcel and reduced by 15' along the south side of the parcel.
- The reduction of the drainage easements will require the installation of retaining flood scour walls of approximately 9' in height along the new edges of the drainage easement. The total length of retaining flood scour walls is 335 L.F. more or less.
- The sites on site drainage will be collected by a storm drain system of 200 L. F. of 18" pipe And 80 L.F. of 24" pipe including a Vortech style manhole prior to releasing runoff into the drainage easement at the south west corner of the site.
- This drainage report and grading and drainage plan is being prepared to support the drainage and FEMA required designs.

2.2 Offsite Hydrology

There are offsite flows entering the site. The only offsite runoff that apply to this project is the runoff that enter the existing drainage easements located along the east and south property lines (see the "Onsite Drainage Exhibit). Qs were taken from plans prepared by Gilbertson Associates for the design of Pinnacle Peak Office Park.

This report calculates and shows in Appendix B typical Cross-Sections with water surface elevation and spreads that indicate that the Q100=223 c.f.s. and q100= 234 C.F.S. will not spread outside the proposed, reduced in width, drainage easement. .

This report also shows that the construction of the new commercial building is free from inundation from the offsite 100-yr. storm event and that the integrity of the structure is not undermined.

Peak Discharge From the "PINNACLE PEAK OFFICE PARK" Grading and Drainage Plans By "Gilberson Associates"

The 223 c.f.s. from the *From the "PINNACLE PEAK OFFICE PARK" Grading and Drainage Plans By "Gilberson Associates"* that enters the reduced, 50' to 25', drainage easement from the north flows south and west. Hydraulic capacity calculations for the proposed 25' wide drainage easement are provided in Appendix D.

Existing Drainage Easement REDUCED In Wide from 50' to 25'

The reduction of the drainage easement will required the installation of retaining flood scour walls of approximately 9' in height along the new edges of the drainage easement.

Hydraulic water surface elevations and spread calculations for the 25' drainage easement are provided in Appendix D. The spread from the 223 cfs and 234 cfs are Contained in the drainage easement as indicated in the cross section in Appendix B

2.3 Onsite Hydrology / Retention Statement

See "Onsite Drainage Exhibit"

2.3.1 Discussion

The sites onsite drainage will be collected by a storm drain system of 200 L.F. of 18" pipe and 80 L.F. of 24" pipe including a Vortech style manhole prior to releasing runoff into the drainage easement at the south west corner of the site (see "Onsite Drainage Exhibit").

No onsite retention is required per:

Ordinance: (Case 15-DR-2004#2)

E. On May 4, 2004, the City's Stormwater management Devision approved a Stormwater Storage Waiver for the Pinnacle Peak Office Park. The proposed development is located within the boundaries of the Office Park and is included in the approved waiver. The approval was based on the following conditions:

(1) All storage requirements were waived.

F. With the final improvement plans submittal to the Planning and Development Services Department, the developer shall submit a final drainage report and plan, subject to City staff approval.

G. Underground Stormwater Storage:

(1) Underground stormwater storage is prohibited unless approval is obtained from the City's Floodplain Administrator.

(a) Drywells are not permitted.

2.3.2 Erosion Protection-per Appendix D

The calculated erosion setback for the new 15.3' and falls inside the 20' minimum. Because the velocity in 8.28 f.p.s. at Cross-Section B-B, erosion protection is provided by the retaining flood/scour wall.

2.3.3 FEMA Note:

This site is located within Zone AE as delineated on Insurance Rate Map/flood Hazard Boundary Map Panel No. 04013C1310M dated July 20, 2021 and published by the Federal Emergency Management Agency. .

The site is also affected by LOMR 1509-1857P enacted in 6/10/2016.

The BFE calculated at the leading edge of the structure by interpolating between BFE shown on the Firmette of BFE 1869.5 and BFE 1876.7 is BFE=1872.00. The RFE=1873.00.

2.3.4 Site Ultimate Outfall

The site ultimate outfall is at the southwest property corner at elevation 1862.96.

2.3.5 Typical Cross-Sections Description

Post-Development Cross-Sections in Appendix C are provided that indicate that the building is free from inundation from the 100-yr storm event and that the spreads from the 223 c.f.s. and 223 c.f.s. are contained in the 25' and 35' drainage easements.

2.3.6 Hydraulic Analysis of Pre vs Post Development

Pre-Development and Post-Development sections are provided in Appendix B and C with the following results:

PRE-DEV. – Cross-Section B-B (On report equals Section A-A on plans)
Q100=223 c.f.s.
Vel. = 5.20 f.p.s.
WSE = 1869.53 ft.

POST-DEV. – Cross-Section B-B (On report equals Section A-A on plans)
Q100=223 c.f.s.
Vel. = 8.28 f.p.s.
WSE = 1869.16 ft.

PRE-DEV. – Cross-Section E-E (On report equals Section B-B on plans)
Q100=234 c.f.s.
Vel. = 5.41 f.p.s.
WSE = 1865.88 ft.

POST-DEV. – Cross-Section E-E (On report equals Section B-B on plans)
Q100=234 c.f.s.
Vel. = 5.31 f.p.s.
WSE = 1865.45 ft.

The pre vs post Q100s at Cross-Section B-B are the same, the velocities are different by 3.08 f.p.s., and the water surface elevation increased by 0.37'.

The pre vs post Q100s at Cross-Section E-E are the same, the velocities are different by 0.10 f.p.s. and the water surface elevations increased by 0.43'.

No special erosion protection is required.

3. CONCLUSION

- Offsite runoff flows entering the site of Q100 of 223 and 234 c.f.s. are contained in the 25' (east) and 35' (south) drainage easement.
  Release of drainage easements will be applied for respectively.

- The Finish floor elevation of 1873.00 for the new commercial building is free from inundation from the 100-year storm event and set at RFE=1873.00, one foot above the BFE of 1872.00 making it free from inundation from the FEMA 100-yr event.

- The construction of the project will not cause adverse condition to adjacent properties.

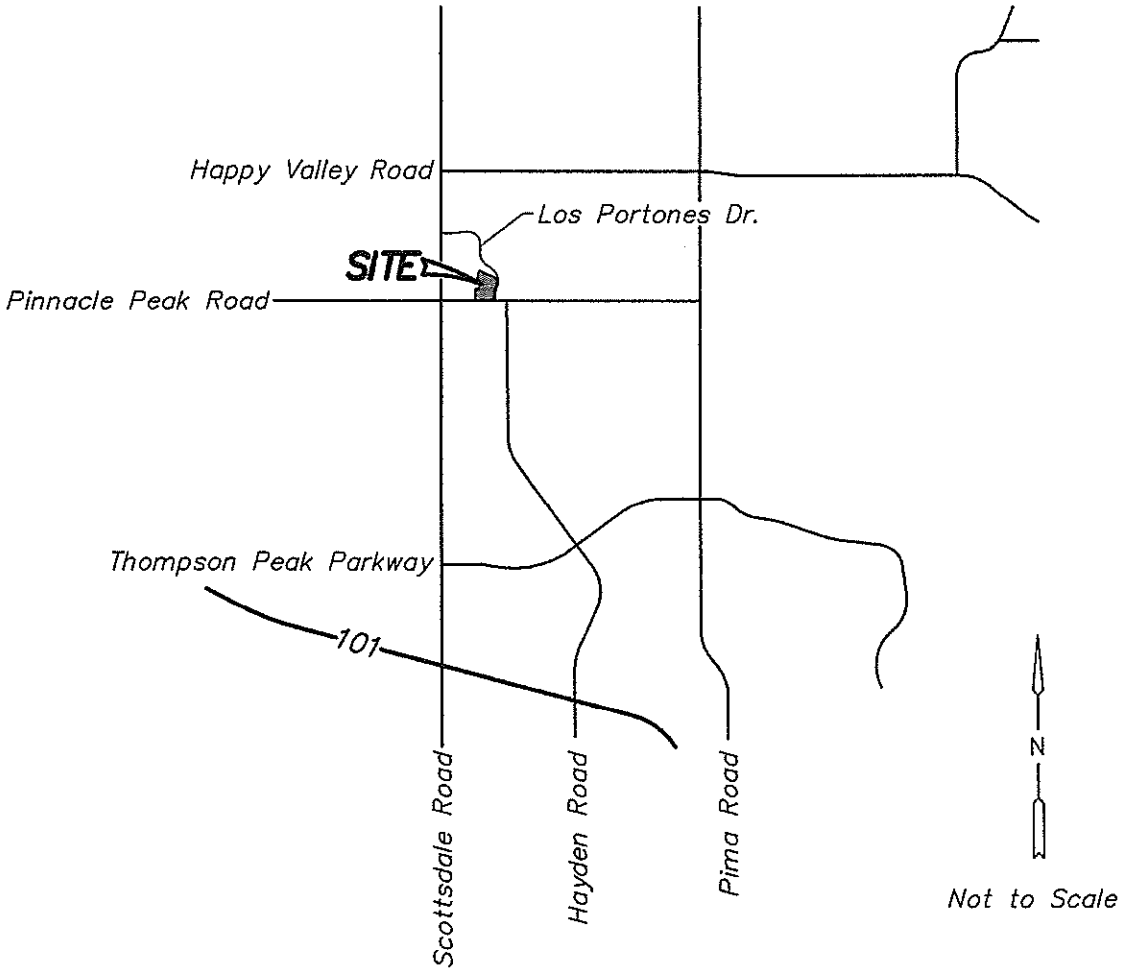
- Erosion protection is provided by the installation of the retaining flood/scour wall.

- No onsite retention is required.

FIGURES

Figure 1 - VICINITY MAP

Figure 2 - FEMA FLOOD INSURANCE RATE MAP



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DESIGNED	DATE	JOB NO.
DFK/RMV	11-13-22	22270

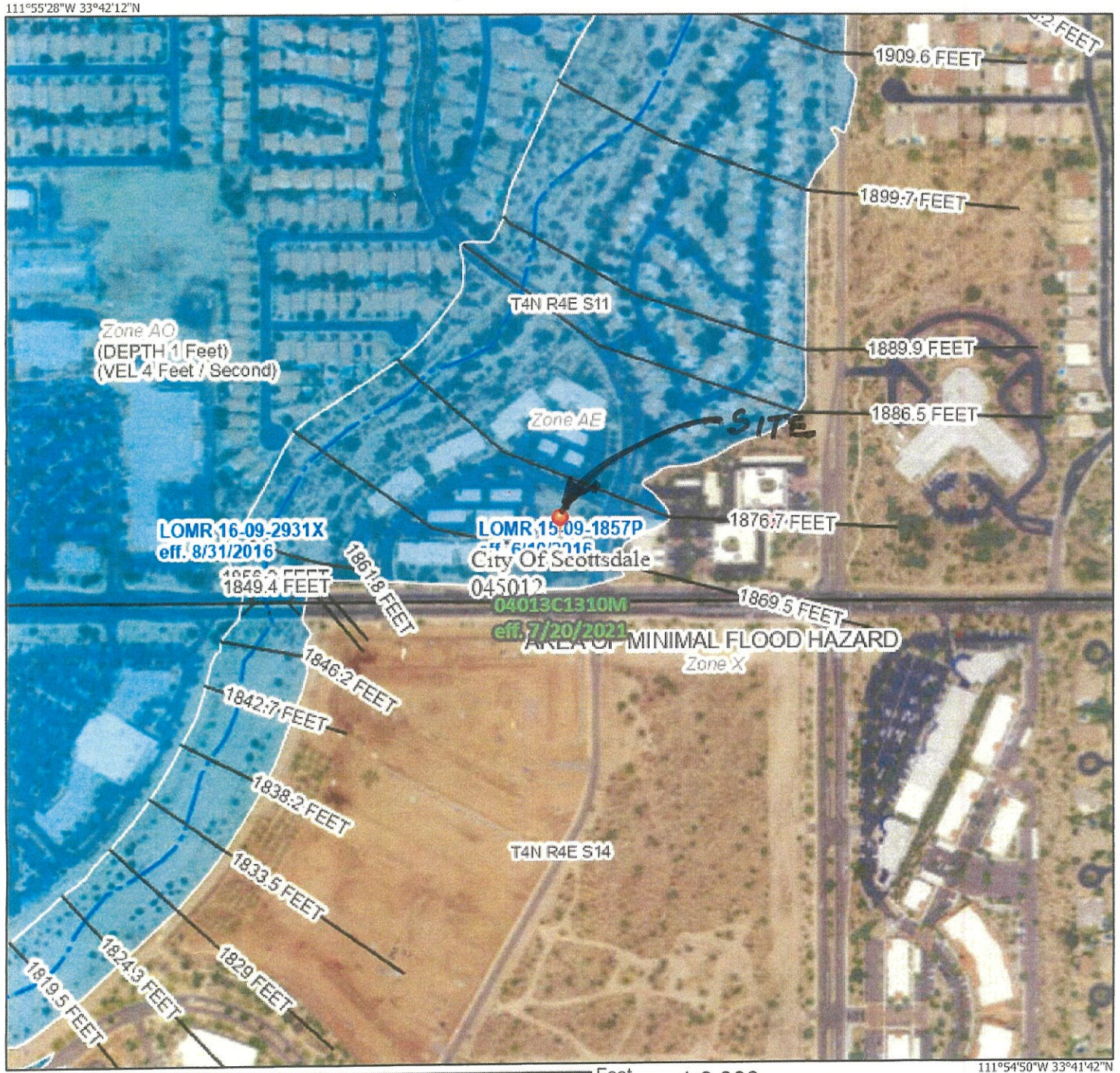
DRAINAGE REPORT
"PET"
~~ATLANTIC DEVELOPMENT~~

"VICINITY MAP"

7474 E. PINNACLE PEAK ROAD
SCOTTSDALE, ARIZONA 85255

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

#22170

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **10/27/2022 at 6:14 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

EXHIBITS

Pinnacle Peak

"PET RESORT"

ONSITE DRAINAGE EXHIBITS

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Pinnacle Peak

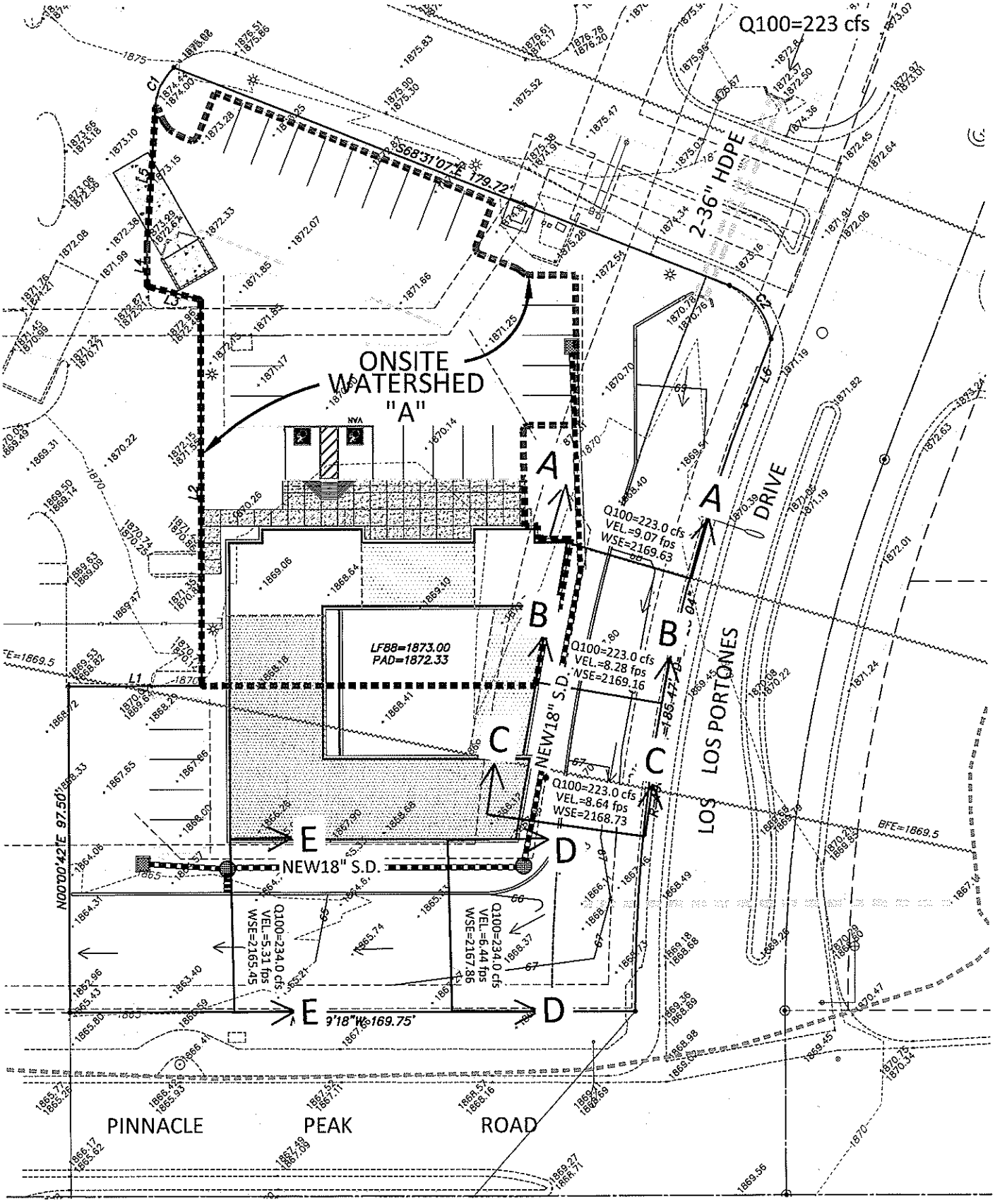
"OFFICE PARK"

OFFSITE DRAINAGE EXHIBIT

Excerpt from the "Pinnacle Peak Office Park"

By

Gilbertson Associates



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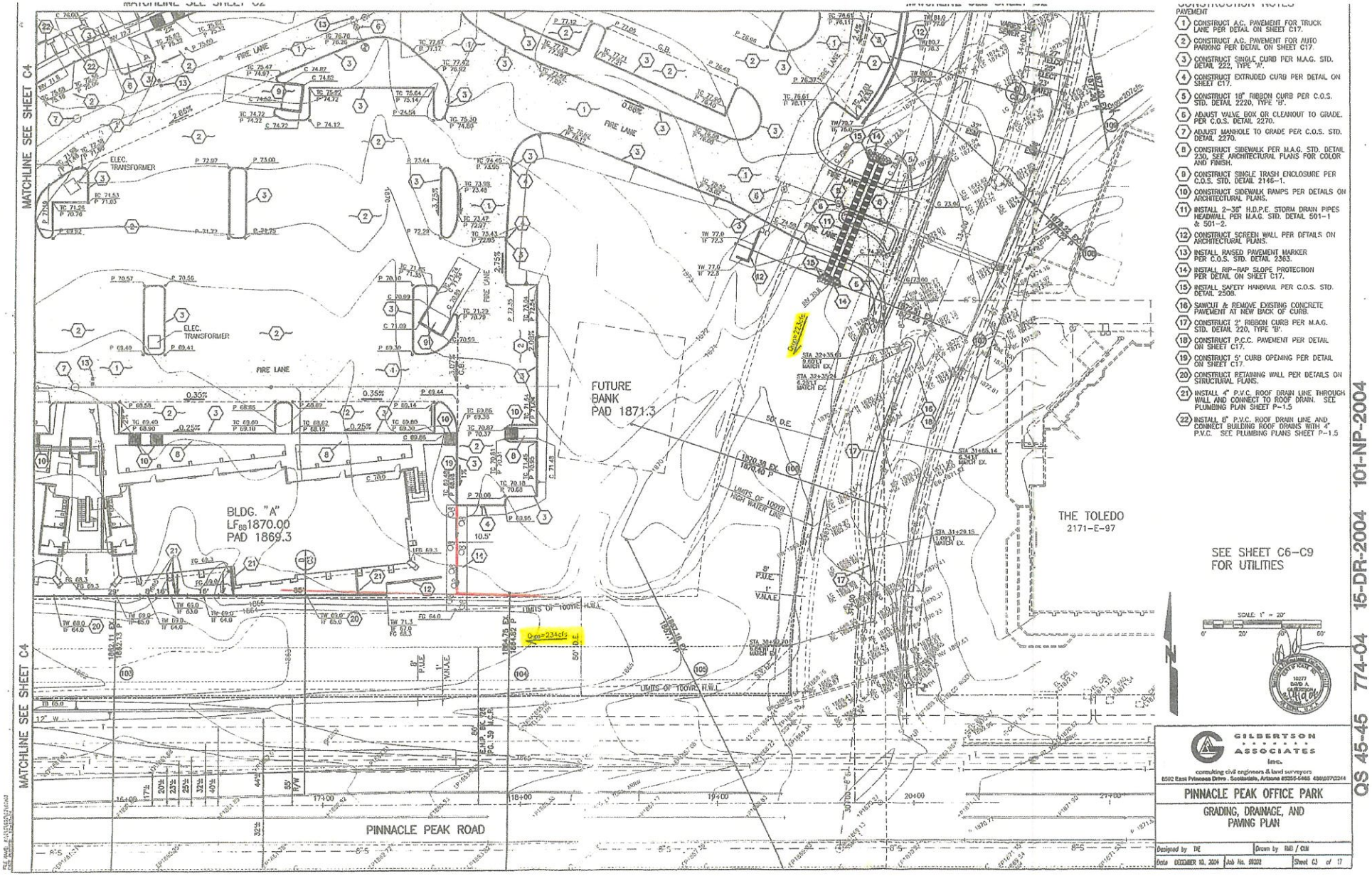
DESIGNED	DATE	JOB NO.
DFK/RMV	11-2-22	22270

DRAINAGE REPORT

"PINNACLE PEAK PET RESORT"

ONSITE DRAINAGE EXHIBIT

7474 E. PINNACLE PEAK ROAD
SCOTTSDALE, ARIZONA 85255



Q100's FROM
GILBERTSON ASSOCIATES
G&D PLANS

APPENDIX A

Peak Discharge
per
Drainage Design Management System for Windows
Program
(DDMSW)

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: 22270-ATLANTIC DEV.

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
A	0.4	142	1,874.40	1,871.90	93.0	0.042	Q (cfs)	1.1	1.5	1.8	2.5	2.9	3.2
							C	0.85	0.85	0.85	0.94	0.95	0.95
							CA (ac)	0.34	0.34	0.34	0.38	0.38	0.38
							Volume (ac-ft)	0.0101	0.0138	0.0165	0.0230	0.0267	0.0294
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.32	4.52	5.42	6.62	7.55	8.48

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: 22270-ATLANTIC DEV.

11/14/2022

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
A	240	0.40	100.0	0.042	0.85	0.85	0.85	0.94	0.95	0.95	Regional Commercial (500,000 to 1,000,000 sq. ft.)
		0.400	**100.0**								

Flood Control District of Maricopa County
Drainage Design Management System
RAINFALL DATA
Project Reference: 22270-ATLANTIC DEV.

11/14/2022

ID	Method	Duration	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DEFAULT	NOAA14	5 MIN	0.258	0.348	0.418	0.511	0.582	0.655
	NOAA14	10 MIN	0.393	0.529	0.635	0.777	0.886	0.998
	NOAA14	15 MIN	0.487	0.656	0.788	0.964	1.098	1.237
	NOAA14	30 MIN	0.655	0.884	1.061	1.298	1.479	1.665
	NOAA14	1 HOUR	0.811	1.094	1.313	1.606	1.830	2.061
	NOAA14	2 HOUR	0.939	1.250	1.489	1.813	2.059	2.314
	NOAA14	3 HOUR	1.022	1.336	1.585	1.932	2.208	2.494
	NOAA14	6 HOUR	1.209	1.544	1.811	2.174	2.457	2.752
	NOAA14	12 HOUR	1.366	1.724	2.006	2.386	2.677	2.978
	NOAA14	24 HOUR	1.610	2.083	2.459	2.985	3.403	3.841

APPENDIX B

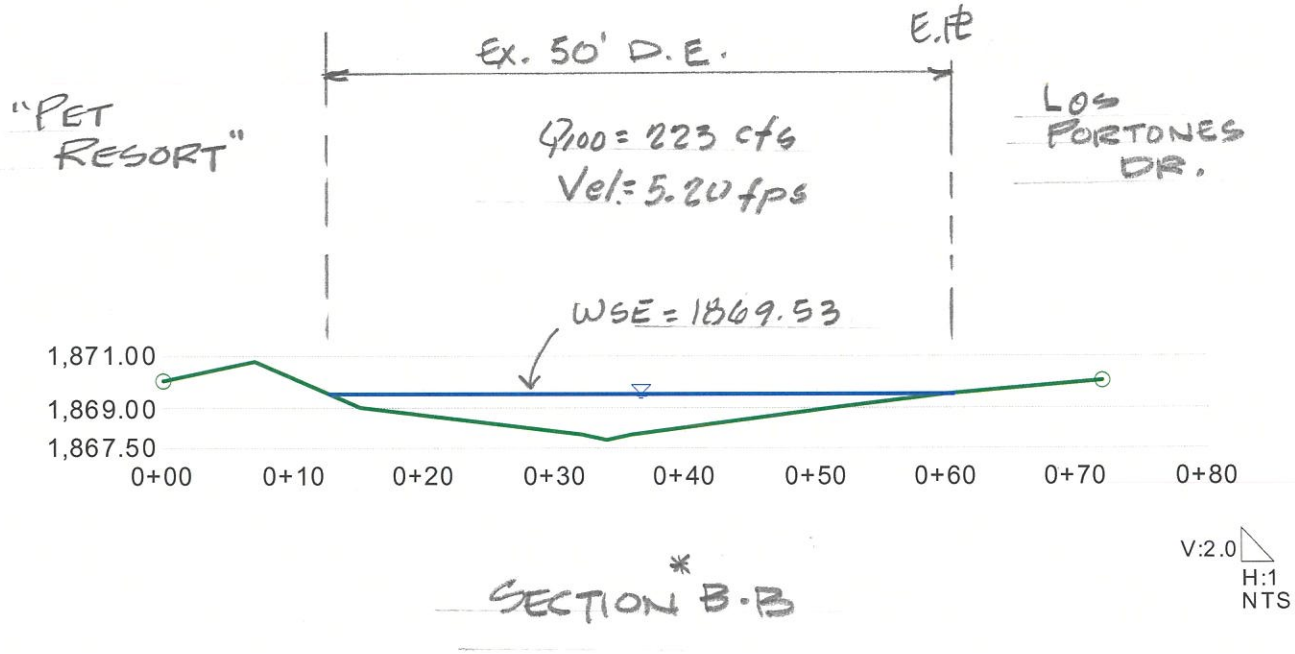
Pre-Development
Typical Cross-Sections

(see "Onsite Drainage Exhibit)

22270 - Atlantic Dev. - CROSS-SECTION B-B (PRE-CONDITION)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTION B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.035	
Slope	0.017500	ft/ft
Water Surface Elev	1,869.53	ft
Elevation Range	67.80 to 1,870.80	
Discharge	223.00	cfs



SECTION B-B *

* EQUALS SECTION A-A ON G & D PLANS

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22270 - Atlantic Dev. - CROSS-SECTION B-B (PRE-CONDITION)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTION B-B
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	017500	ft/ft
Discharg	223.00	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.035	
Water Surface Elev	1,869.53	ft
Elevation Range	37.80 to 1,870.80	
Flow Area	42.9	ft²
Wetted Perimeter	48.16	ft
Top Width	48.01	ft
Actual Depth	1.73	ft
Critical Elevation	1,869.51	ft
Critical Slope	0.018686	ft/ft
Velocity	5.20	ft/s
Velocity Head	0.42	ft
Specific Energy	1,869.95	ft
Froude Number	0.97	
Flow Type	Subcritical	

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+72	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,870.00
0+07	1,870.80
0+15	1,869.00
0+32	1,868.00
0+34	1,867.80
0+36	1,868.00
0+52	1,869.00
0+60	1,869.50
0+72	1,870.00

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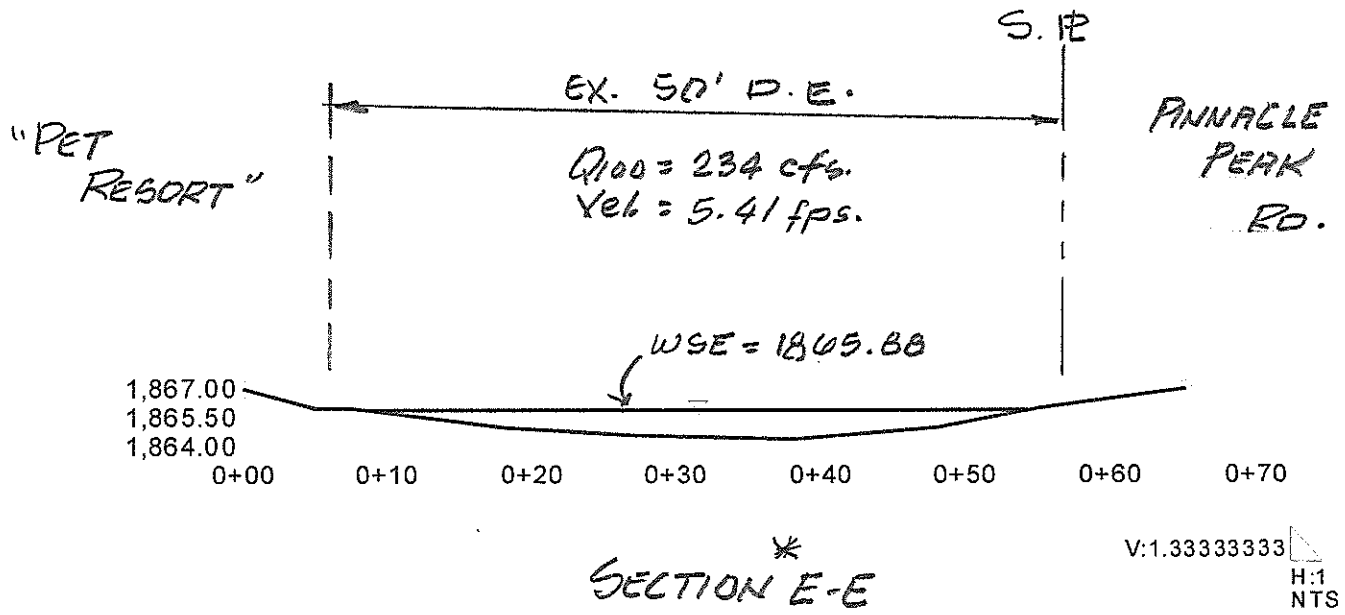
22270 - Atlantic Dev. - CROSS-SECTION E-E (PRE-DEVELOPMENT)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTION E-E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.035	
Slope	0.017300	ft/ft
Water Surface Elev	1,865.88	ft
Elevation Range	34.40 to 1,867.00	
Discharge	234.00	cfs



* SECTION E-E

* EQUALS SECTION B-B ON G&D PLANS

22270 - Atlantic Dev. - CROSS-SECTION E-E (PRE-DEVELOPMENT)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTION E-E
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	017300	ft/ft
Discharg	234.00	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.035	
Water Surface Elev	1,865.88	ft
Elevation Range	34.40 to 1,867.00	
Flow Area	43.3	ft²
Wetted Perimeter	45.46	ft
Top Width	45.33	ft
Actual Depth	1.48	ft
Critical Elevation	1,865.86	ft
Critical Slope	0.018270	ft/ft
Velocity	5.41	ft/s
Velocity Head	0.45	ft
Specific Energy	1,866.33	ft
Froude Number	0.98	
Flow Type	Subcritical	

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+65	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,867.00
0+05	1,866.00
0+08	1,866.00
0+18	1,865.00
0+27	1,864.60
0+38	1,864.40
0+48	1,865.00
0+55	1,866.00
0+65	1,867.00

APPENDIX C

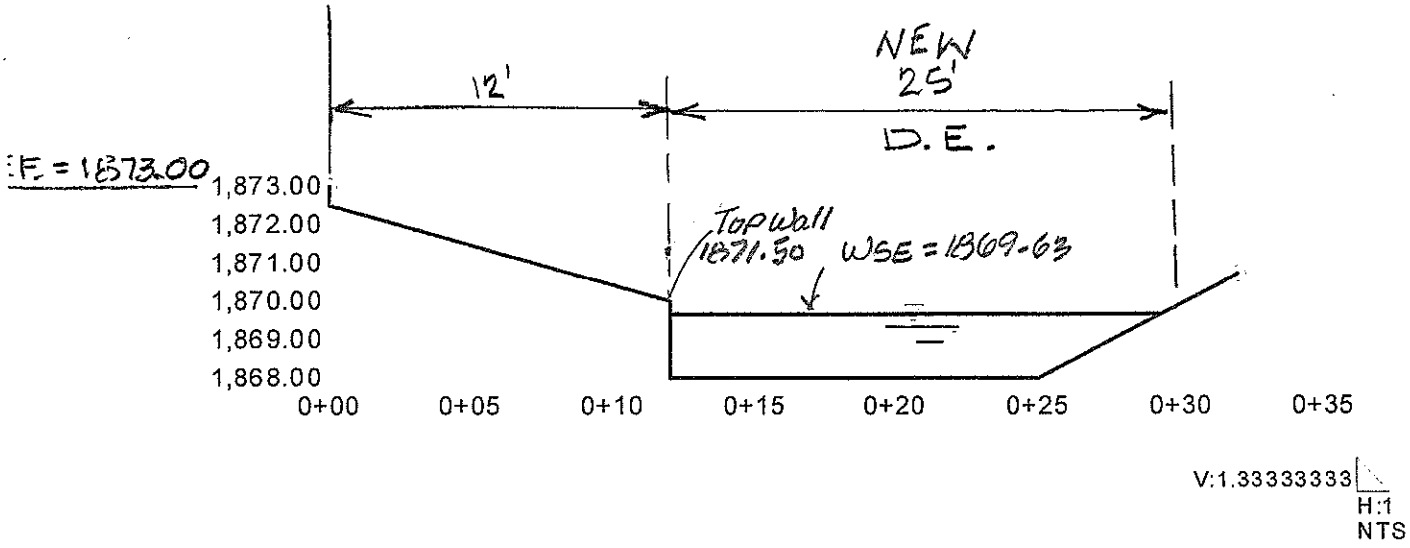
Post-Development
Typical Cross-Sections

(see "Onsite Drainage Exhibit)

22270 - Atlantic Dev. - CROSS-SECTION A-A (WSE)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficier	0.025	
Slope	0.016700	ft/ft
Water Surface Elev	1,869.63	ft
Elevation Range	38.00 to 1,873.00	
Discharge	223.00	cfs



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22270 - Atlantic Dev. - CROSS-SECTION A-A (WSE)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	016700	ft/ft
Discharg	223.00	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.025	
Water Surface Elev	1,869.63	ft
Elevation Range	38.00 to 1,873.00	
Flow Area	24.6	ft²
Wetted Perimeter	19.15	ft
Top Width	17.22	ft
Actual Depth	1.63	ft
Critical Elevation	1,869.95	ft
Critical Slope	0.009000	ft/ft
Velocity	9.07	ft/s
Velocity Head	1.28	ft
Specific Energy	1,870.91	ft
Froude Number	1.34	
Flow Type	Supercritical	

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+32	0.025

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,873.00
0+00	1,872.50
0+12	1,870.00
0+12	1,868.00
0+25	1,868.00
0+32	1,870.70

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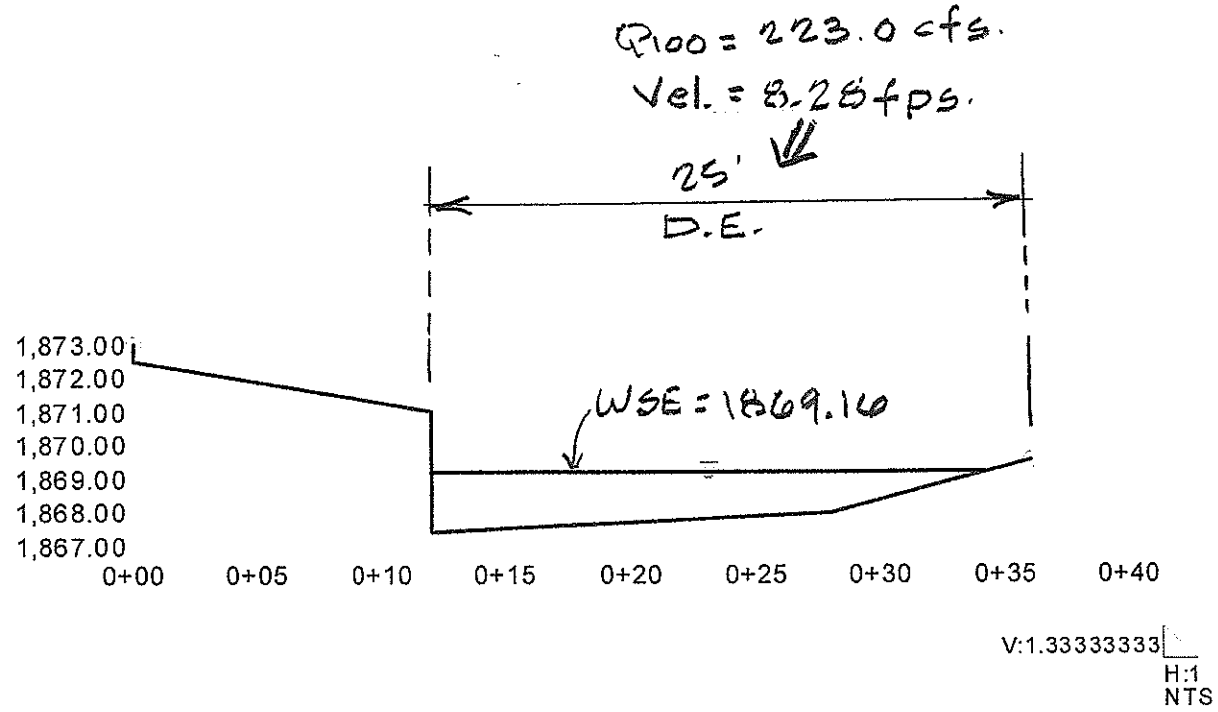
22270 - Atlantic Dev. - CROSS-SECTION B-B (WSE)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficier	0.025	
Slope	0.016700	ft/ft
Water Surface Elev	1,869.16	ft
Elevation Range	37.40 to 1,873.00	
Discharge	223.00	cfs



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22270 - Atlantic Dev. - CROSS-SECTION B-B (WSE)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	016700	ft/ft
Discharg	223.00	cfs

Options	
Current Roughness Meth	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.025	
Water Surface Elev	1,869.16	ft
Elevation Range	37.40 to 1,873.00	
Flow Area	26.9	ft²
Wetted Perimeter	24.06	ft
Top Width	22.18	ft
Actual Depth	1.76	ft
Critical Elevation	1,869.43	ft
Critical Slope	0.009147	ft/ft
Velocity	8.28	ft/s
Velocity Head	1.07	ft
Specific Energy	1,870.22	ft
Froude Number	1.32	
Flow Type	Supercritical	

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+36	0.025

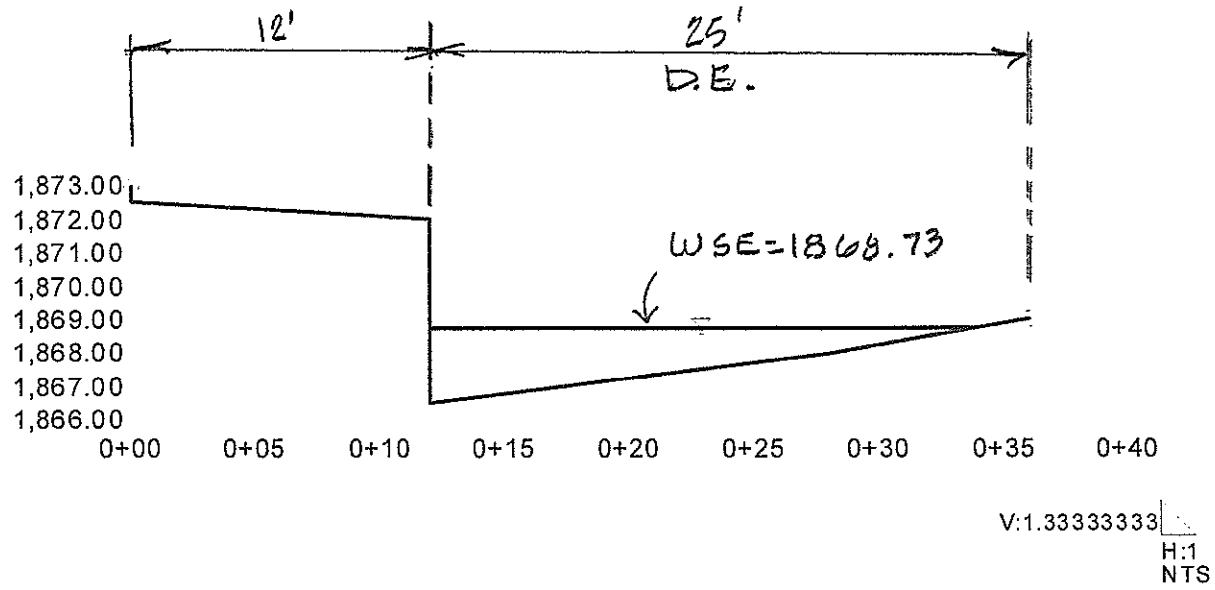
Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,873.00
0+00	1,872.50
0+12	1,871.00
0+12	1,867.40
0+28	1,868.00
0+36	1,869.50

Keogh Enginerring, Inc.
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

22270 - Atlantic Dev. - CROSS-SECTION C-C (WSE)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.025	
Slope	0.019400	ft/ft
Water Surface Elev	1,868.73	ft
Elevation Range	36.50 to 1,873.00	
Discharge	223.00	cfs



22270 - Atlantic Dev. - CROSS-SECTION C-C (WSE)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	019400	ft/ft
Discharg	223.00	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.025	
Water Surface Elev	1,868.73	ft
Elevation Range	36.50 to 1,873.00	
Flow Area	25.8	ft²
Wetted Perimeter	24.18	ft
Top Width	21.84	ft
Actual Depth	2.23	ft
Critical Elevation	1,869.06	ft
Critical Slope	0.009429	ft/ft
Velocity	8.64	ft/s
Velocity Head	1.16	ft
Specific Energy	1,869.89	ft
Froude Number	1.40	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+36	0.025

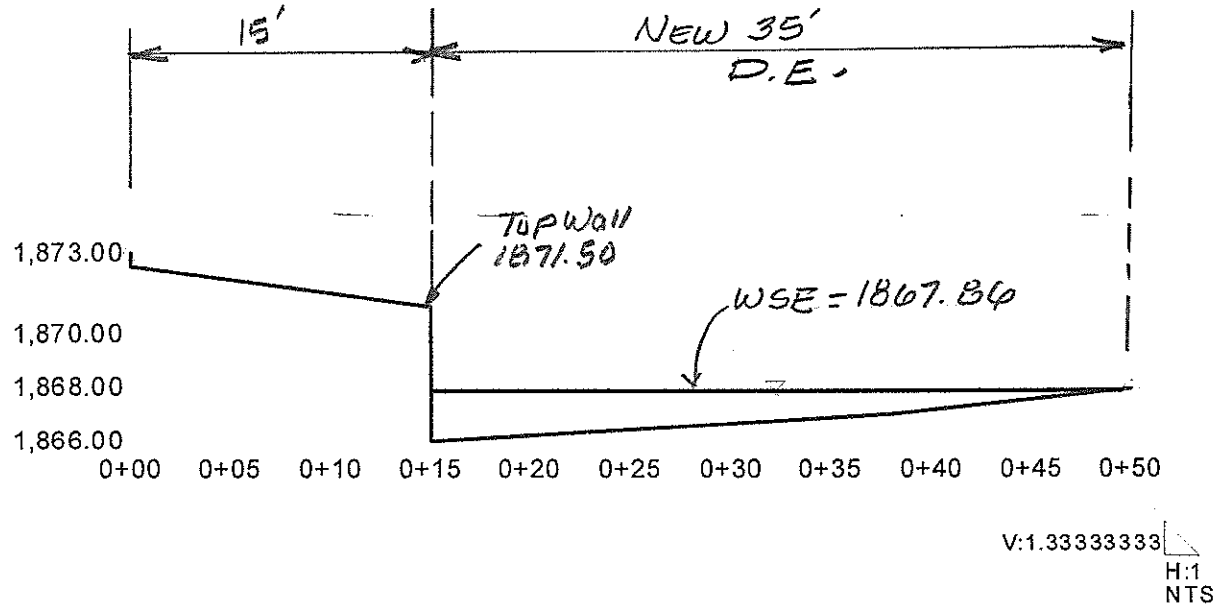
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	1,873.00
0+00	1,872.50
0+12	1,872.00
0+12	1,866.50
0+28	1,868.00
0+36	1,869.00

22270 - Atlantic Dev. - CROSS-SECTION D-D (WSE)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.025	
Slope	0.011800	ft/ft
Water Surface Elev	1,867.86	ft
Elevation Range	36.00 to 1,873.00	
Discharge	234.00	cfs



22270 - Atlantic Dev. - CROSS-SECTION D-D (WSE)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	011800	ft/ft
Discharg	234.00	cfs

Options	
Current Roughness Metho	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin	Horton's Method

Results		
Mannings Coefficie	0.025	
Water Surface Elev	1,867.86	ft
Elevation Range	36.00 to 1,873.00	
Flow Area	36.3	ft²
Wetted Perimeter	36.42	ft
Top Width	34.51	ft
Actual Depth	1.86	ft
Critical Elevation	1,867.94	ft
Critical Slope	0.009469	ft/ft
Velocity	6.44	ft/s
Velocity Head	0.65	ft
Specific Energy	1,868.51	ft
Froude Number	1.11	
Flow Type	Supercritical	

Roughness Segments

Start Station	End Station	Mannings Coefficient
0+00	0+50	0.025

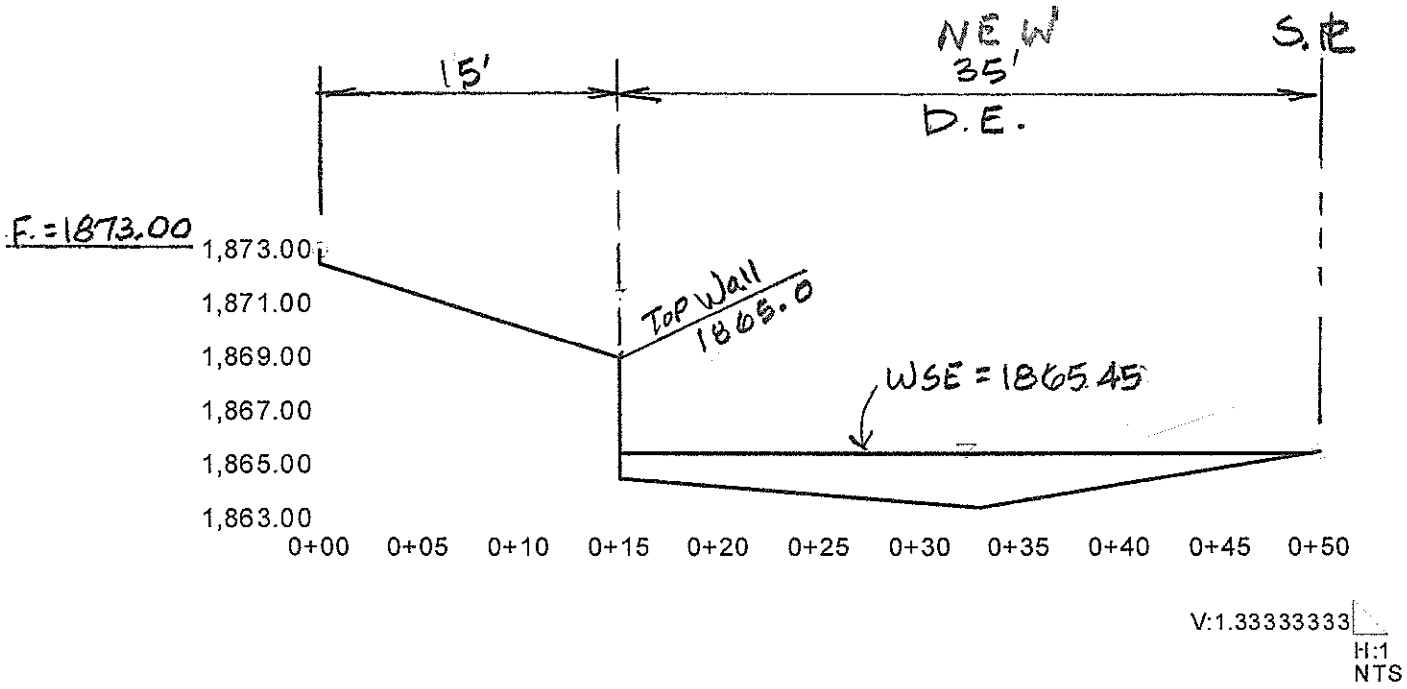
Natural Channel Points

Station (ft)	Elevation (ft)
0+00	1,873.00
0+00	1,872.50
0+15	1,871.00
0+15	1,866.00
0+38	1,867.00
0+50	1,867.90

22270 - Atlantic Dev. - CROSS-SECTION E-E (WSE)
Cross Section for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficie	0.035	
Slope	0.011800	ft/ft
Water Surface Elev	1,865.45	ft
Elevation Range	33.40 to 1,873.00	
Discharge	234.00	cfs



22270 - Atlantic Dev. - CROSS-SECTION E-E (WSE)
Worksheet for Irregular Channel

Project Description	
Worksheet	22270 - Atlantic Dev. - CROSS-SECTIC
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Slope	011800	ft/ft
Dischargı	234.00	cfs

Options	
Current Roughness Methc	ved Lotter's Method
Open Channel Weighting	ved Lotter's Method
Closed Channel Weightin(	Horton's Method

Results		
Mannings Coefficiel	0.035	
Water Surface Elev	1,865.45	ft
Elevation Range	33.40 to 1,873.00	
Flow Area	44.1	ft²
Wetted Perimeter	35.73	ft
Top Width	34.62	ft
Actual Depth	2.05	ft
Critical Elevation	1,865.28	ft
Critical Slope	0.017656	ft/ft
Velocity	5.31	ft/s
Velocity Head	0.44	ft
Specific Energy	1,865.89	ft
Froude Number	0.83	
Flow Type	Subcritical	

Roughness Segments		
Start Station	End Station	Mannings Coefficient
0+00	0+50	0.035

Natural Channel Points	
Station (ft)	Elevation (ft)
0+00	1,873.00
0+00	1,872.50
0+15	1,869.00
0+15	1,864.50
0+33	1,863.40
0+50	1,865.50

APPENDIX D

Erosion Setback Line
Calculations
per

Arizona Department of Water Resources

SSA 5-96

"PINNACLE PEAK PET RESORT"
#22270

ARIZONA DEPARTMENT OF WATER RESOURCES
FLOOD WARNING AND DAM SAFETY SECTION

Watercourse System Sediment Balance

500 North Third Street
Phoenix, Arizona 85004

(602) 417-2445

STATE STANDARD ATTACHMENT
SSA 5-96

SEPTEMBER 1996

"PINNACLE PEAK PET RESORT"
#22270

For watercourses which have drainage areas of less than 30 square miles, the recommended setback allowances are as follows:

for straight channel reaches or reaches with minor curvature:	setback = $1.0(Q_{100})^{0.5}$
for channels with obvious curvature or channel bend:	setback = $2.5(Q_{100})^{0.5}$

where setback is in feet and Q_{100} is in cubic feet per second.

S.B. $= 1.0(Q_{100})^{0.5}$

$= 1.0(234\ cfs)^{0.5}$

$= 15.3'$ (20 min.)

APPENDIX E

Scour Depth Calculations
per
Arizona Department of Water Resources
SSA 5-96

FOR STRAIGHT CHANNEL REACHES OR REACHES WITH MINOR CURVATURE

ARIZONA DEPARTMENT OF WATER RESOURCES
SSA 5-96

LEVEL I

THIS LEVEL OF ANALYSIS REQUIRES THE FOLLOWING INFORMATION;

Q_{100} = 223.00 C.F.S.

(1)

THE TOTAL SCOUR DEPTH, d_s , IS THE COMINATION OF GENERAL DEGRADATION AND LONG TERN DEGRADATION AND CAN BE COMPUTED AS FOLLOWS::

$$d_s = d_{gs} + d_{its}$$

d_s = TOTAL SCOUR, IN FEET

d_{gs} = GENERAL DEGRADATION IN FEET

d_{its} = LONG TERM DEGRADATION, IN FEET

(2)

GENERAL DEGRADATION IS COMPUTED AS FOLOOWS:

USE THIS FORMULA

d_{gs} = GENERAL DEGRADATION IN FEET

$$d_{gs} = 0.157(Q_{100})^{0.4}$$

$$d_{gs} = 0.157(223.0)^{0.4} = 1.37'$$

(3)

LONG TERM DEGRADATION IS COMPUTED AS FOLLOWS:

USE THIS FORMULA

d_{its} = LONG TERM DEGRADATION

$$d_{its} = 0.02(Q_{100})^{0.6}$$

$$d_{its} = 0.02(223.0)^{0.6} = 0.51'$$

(4)

THE TOTAL SCOUR DEPTH SHOULD BE APPLIED TO THE LOWEST POINT IN THE LOCAL CROSS SECTION FOR DETERMINATION OF THE ELEVATION TO WHICH SCOUR WILL OCCUR;

d_s = 1.37 $_{gs}$ + 0.51 $_{its}$ = 1.88'

3.0 Min.

Keogh Engineering, Inc.
650 N. 137TH AVENUE #110 • GOODYEAR, ARIZONA 85338
PHONE: (623) 535-7260 FAX: (623) 535-7262
EMAIL: keogh@keoghengineering.com

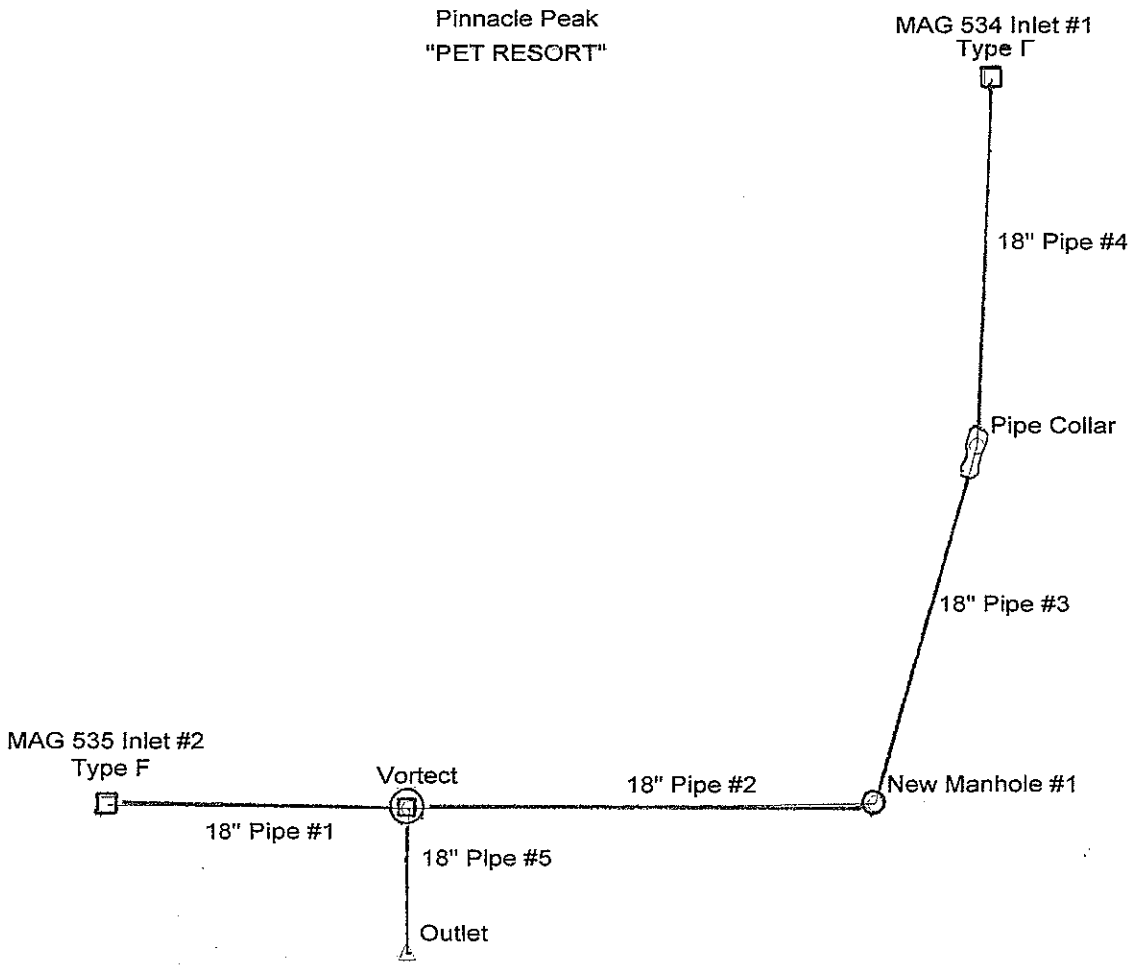
DESIGNED	DATE	JOB NO.
RMV/DFK		

PINNACLE PEAK "PET RESORT"

SCOUR DEPTH CALCULATIONS

APPENDIX F

New 18" Storm Drain Pipe and Inlet Design


Pinnacle Peak
"PET RESORT"
MAG 534 Inlet #1
Type Γ
18" Pipe #4
Pipe Collar
18" Pipe #3
MAG 535 Inlet #2
Type F
Vortect
18" Pipe #2
New Manhole #1
18" Pipe #1
18" Pipe #5
Outlet

Detailed Report for Pipe 18" Pipe #1

Section Material: PVC
Section Shape: Circular
Section Size: 18 inch
Number Sections: 1

Description		Description	
Discharge	2.00 cfs	Capacity	13.02 cfs
Mannings Coefficient	0.010	Hydraulic Drop	0.47e-2 ft
Length	22.00 ft	Energy Slope	0.000215 ft/ft
Constructed Slope	0.009091 ft/ft	Upstream Velocity	1.13 ft/s
Upstream Flow Time	0.00 min	Average Velocity	1.13 ft/s
Pipe Flow Time	0.32 min	Downstream Velocity	1.13 ft/s
System Flow Time	0.32 min		

Grade Elevations

Location	Invert (ft)	Ground (ft)	Crown (ft)	Cover (ft)	Depth (ft)	HGL (ft)	EGL (ft)
Upstream	1,866.45	1,869.00	1,867.95	1.05	1.67	1,868.12	1,868.14
Downstream	1,866.25	1,869.00	1,867.75	1.25	1.87	1,868.12	1,868.14

Messages:
Profile: Pressure profile.
Information: Surcharged condition

Detailed Report for Pipe 18" Pipe #2

Section Material: PVC
Section Shape: Circular
Section Size: 18 inch
Number Sections: 1

Description			Description		
Discharge	3.20	cfs	Capacity	15.67	cfs
Mannings Coefficient	0.010		Hydraulic Drop	-0.07	ft
Length	85.00	ft	Energy Slope	0.001674	ft/ft
Constructed Slope	0.013176	ft/ft	Upstream Velocity	4.10	ft/s
Upstream Flow Time	1.03	min	Average Velocity	2.96	ft/s
Pipe Flow Time	0.48	min	Downstream Velocity	1.81	ft/s
System Flow Time	1.51	min			

Grade Elevations

Location	Invert (ft)	Ground (ft)	Crown (ft)	Cover (ft)	Depth (ft)	HGL (ft)	EGL (ft)
Upstream	1,867.37	1,871.00	1,868.87	2.13	0.68	1,868.05	1,868.31
Downstream	1,866.25	1,869.00	1,867.75	1.25	1.87	1,868.12	1,868.17

Messages:
Profile: Steep subcritical backwater profile (S1).
Profile: Composite profile.
Profile: Critical depth assumed upstream.
Profile: Pressure profile.
Profile: Hydraulic jump formed.

Detailed Report for Pipe 18" Pipe #3

Section Material: PVC
Section Shape: Circular
Section Size: 18 inch
Number Sections: 1

Description		Description	
Discharge	3.20 cfs	Capacity	15.70 cfs
Mannings Coefficient	0.010	Hydraulic Drop	0.36 ft
Length	87.00 ft	Energy Slope	0.006509 ft/ft
Constructed Slope	0.013218 ft/ft	Upstream Velocity	4.10 ft/s
Upstream Flow Time	0.54 min	Average Velocity	2.96 ft/s
Pipe Flow Time	0.49 min	Downstream Velocity	1.82 ft/s
System Flow Time	1.03 min		

Grade Elevations

Location	Invert (ft)	Ground (ft)	Crown (ft)	Cover (ft)	Depth (ft)	HGL (ft)	EGL (ft)
Upstream	1,868.51	1,872.50	1,870.01	2.49	0.68	1,869.19	1,869.45
Downstream	1,867.36	1,871.00	1,868.86	2.14	1.47	1,868.83	1,868.89

Messages:
Profile: Steep subcritical backwater profile (S1).
Profile: Critical depth assumed upstream.
Profile: Hydraulic jump formed.

Detailed Report for Pipe 18" Pipe #4

Section Material: Concrete
Section Shape: Circular
Section Size: 18 inch
Number Sections: 1

Description		Description	
Discharge	3.20 cfs	Capacity	7.71 cfs
Mannings Coefficient	0.013	Hydraulic Drop	0.03 ft
Length	65.00 ft	Energy Slope	0.000892 ft/ft
Constructed Slope	0.005385 ft/ft	Upstream Velocity	2.20 ft/s
Upstream Flow Time	0.00 min	Average Velocity	2.01 ft/s
Pipe Flow Time	0.54 min	Downstream Velocity	1.82 ft/s
System Flow Time	0.54 min		

Grade Elevations

Location	Invert (ft)	Ground (ft)	Crown (ft)	Cover (ft)	Depth (ft)	HGL (ft)	EGL (ft)
Upstream	1,868.86	1,871.86	1,870.36	1.50	1.15	1,870.01	1,870.08
Downstream	1,868.51	1,872.50	1,870.01	2.49	1.46	1,869.97	1,870.03

Messages:
Profile: Steep subcritical backwater profile (S1).
Profile: Hydraulic grade increases in downstream direction.

Detailed Report for Pipe 18" Pipe #5

Section Material: Aluminum
Section Shape: Circular
Section Size: 18 inch
Number Sections: 1

Description		Description	
Discharge	5.20 cfs	Capacity	20.51 cfs
Mannings Coefficient	0.024	Hydraulic Drop	0.65 ft
Length	5.00 ft	Energy Slope	0.130000 ft/ft
Constructed Slope	0.130000 ft/ft	Upstream Velocity	4.84 ft/s
Upstream Flow Time	1.51 min	Average Velocity	4.84 ft/s
Pipe Flow Time	0.02 min	Downstream Velocity	4.84 ft/s
System Flow Time	1.52 min		

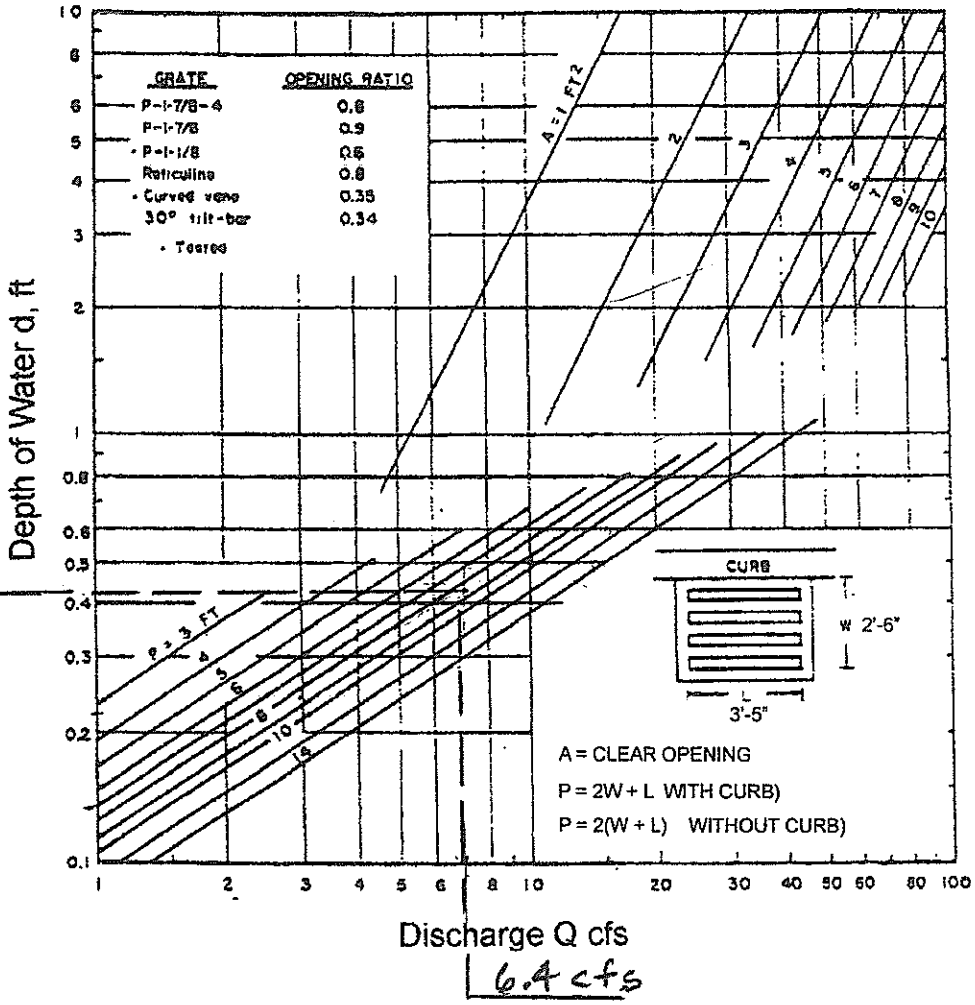
Grade Elevations

Location	Invert (ft)	Ground (ft)	Crown (ft)	Cover (ft)	Depth (ft)	HGL (ft)	EGL (ft)
Upstream	1,866.15	1,869.00	1,867.65	1.35	0.88	1,867.03	1,867.39
Downstream	1,865.50	1,869.00	1,867.00	2.00	0.88	1,866.38	1,866.74

Messages:
Profile: Steep subcritical backwater profile (S1).
Profile: Critical depth assumed upstream.
Profile: Hydraulic jump formed.

Job No. 22270
Job Name ATLANTIC DEV.

FIGURE 3.16
GRATE INLET CAPACITY IN SUMP CONDITIONS
(USDOT, FHWA, 1984, HEC-12, Chart 11)



0.41'

6.4 cfs

$Q_{100} = 3.2 \times 2 \text{ c.f.} = 6.4 \text{ cfs}$

$P = 2W + L$

$= 2(2.5") + 3.42"$

$= 8.4$

DEPTH = 0.42' < 0.50' OK

APPENDIX H

Riprap Sizing
Per
Arizona Department of Water Resources
SSA 7-98
Figure 1

ARIZONA DEPARTMENT OF WATER RESOURCES
FLOOD MITIGATION SECTION

Watercourse Bank Stabilization

500 North Third Street
Phoenix, Arizona 85004

(602) 417-2445

STATE STANDARD ATTACHMENT **MAY 1998**
SSA 7-98

PROJEC NAME "PET" ATLANTIC DEV.

PROJEC NO. 22270

ARIZONA DEPARTMENT OF WATER RESOURCES

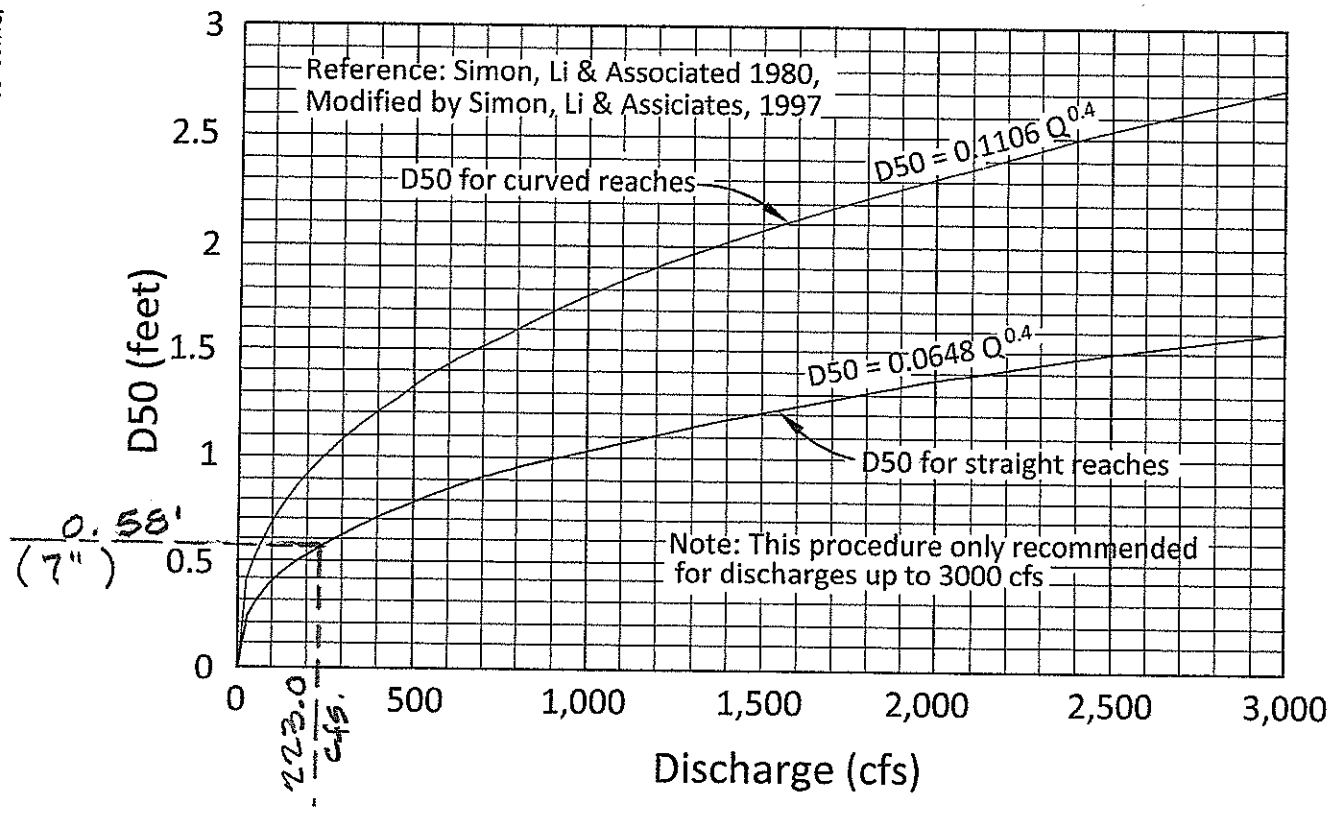
SSA 7-98

WATERCOURSE BANK STABILIZATION

RIPRAP SIZING

FIGURE 1

LEVEL 1 MEDIAN RIPRAP STONE SIZE (D50)



SSA 5-96 LMSA-3 September 1996

Q100 = 223.0 cfs.

D50 = 7"

T = 14"

"RIPRAP SIZING"
SSA 7-98

C:\ENGINEERING DESIGN\DRAINAGE DESIGN--CCCCCCCCCCCCCCCCCCCCLONE\RIPRAP CALCS\FIGUF RIPRAP SIZING ADWR SSA 7-98 OCT.13, 2022.DWG NODE