DRAINAGE REPORT

Navajo Lofts

Sedona, Arizona

Prepared for:

MKC HOLDINGS, LLC
15010 N 78TH Way, Suite 109
Scottsdale, AZ 85260

Prepared by:

LANDCOR CONSULTING

6859 E. Rembrandt Ave, #124
Mesa, AZ 85212
480-223-8573

April 2021
Job # 1763

DRAINAGE REPORT

FOR

NAVAJO LOFTS

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1.0 INTRODUCTION

This project consists of thirty new duplex buildings, each having two units, as well as associated site improvements including an office, pool, and ramada. The site is located just north of State Route 89A and east of Dry Creek Road in Sedona, AZ, in Section 11, Township 17 North, Range 5 East of the Gila and Salt River Base and Meridian. The site is bounded by Aria Street to the north, Symphony Way to the east, vacant land to the south, and Navajo Drive to the west. The terrain is typical high desert, and slopes generally from northeast to southwest.

This report presents the results of an analysis used to support the Preliminary Grading & Drainage Plan for the subject property prepared by Landcor Consulting. The drainage design presented with this report complies with the City of Sedona *Design Review, Engineering, and Administrative Manual* and the *Drainage Design Manual for Yavapai County* and is compatible with existing drainage conditions in the area.

2.0 FLOODPLAIN DESIGNATION

The site is located within FEMA Flood Zone "X" as shown on the FEMA Flood Insurance Rate Map 04025C1435G dated September 3, 2010 (see Figure 1).

Flood Zone "X" 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 site is located within a City of Sedona 100-yr Local Floodplain (see Figure 2). The zone is classified as "AO" with a depth of 0.5 feet, which is defined as:

> "Flood depths of 0.5 feet to 3 feet (usually sheet flow on sloped terrain); average depth determined.

3.0 OFFSITE DRAINAGE

Offsite flows enter the site on both the northern and eastern property lines flowing toward the south and southwest. There are existing culverts that cross Aria Street on both the northeast and northwest corners of the site. These culverts convey flow under Aria Street into swales that run north-south on the east and west property lines. The western swale continues south until reaching State Route 89A, the eastern swale terminates approximately 170-ft south of Aria Street at which point the stormwater sheet flows across the property to the southwest. There is also a culvert which crosses Symphony Way just north of Cantabile Street and outlets flow onto the site. From there, the flow sheets across the property toward the southwest.

A Floodplain Analysis of the local floodplain (Harmony Floodplain) was completed by Heritage Land Survey and Engineering in May of 2014. This study shows that roughly 103-cfs enters the property along the eastern boundary as sheet flow which passes through the site, leaving near the southwest property corner (see Appendix D).

Lastly, there is some amount of flow which enters the site on the north side of the property, sheet flowing across Aria Street. This flow enters as a result of the existing swale on the north side of Aria Street overtopping during larger storm events.

4.0 ON-SITE DRAINAGE

The existing culverts entering the site will be maintained in their current location without any modification. The existing swale along the west side of the property will also be maintained.

On the east side of the property, a new channel will be constructed to intercept the offsite flows entering along the eastern boundary. This channel will be sized for 103-cfs which is the 100-yr peak flow rate calculated in the Harmony Floodplain Study (see Appendix D). This channel will convey flow along the eastern and southern property boundary before releasing it in its historic location near the southwest property corner.

Flows crossing Aria Street will be intercepted in a swale along the south side of Aria Street and conveyed west into the existing swale along Navajo Street.

There will be no adverse impacts to adjacent properties as a result of these improvements. All flows will enter and exit the site in their historic locations.

5.0 STORMWATER RETENTION

Stormwater Retention will be provided for the pre- vs. post-development storm events. Retention will be stored in above ground basins located on the south side of the site. Stormwater will be collected and conveyed to the basins with catch basins and underground storm drain pipe. Storm Drain Hydraulic calculations will be performed during final design. See Appendix C for stormwater retention calculations.

6.0 FINISHED FLOOR

The finished floor elevations for the proposed condominium buildings will be set a minimum of 12 inches above the 100-year base flood elevation of the adjacent washes. Therefore, the finished floor elevation is established in accordance with City of Sedona requirements and is free from inundation by the 100-year peak runoff event.

7.0 CONCLUSIONS

- The project is located within FEMA flood Zone “X” and City of Sedona Local Floodplain Zone “AO” with a depth of 0.5 feet.
- All off-site flows will enter and exit the site as per historical conditions with no adverse effects to adjacent properties.
- Finished floor elevations for new construction are established in accordance with the minimum requirements of the City of Sedona and are free from inundation during a 100-year event.
- Stormwater Retention is being provided for the pre- vs. post-development flows.
- This report has been prepared in accordance with the current versions of the City of Sedona *Design Review, Engineering, and Administrative Manual* and the *Drainage*

Design Manual for Yavapai County and is compatible with existing drainage conditions in the area

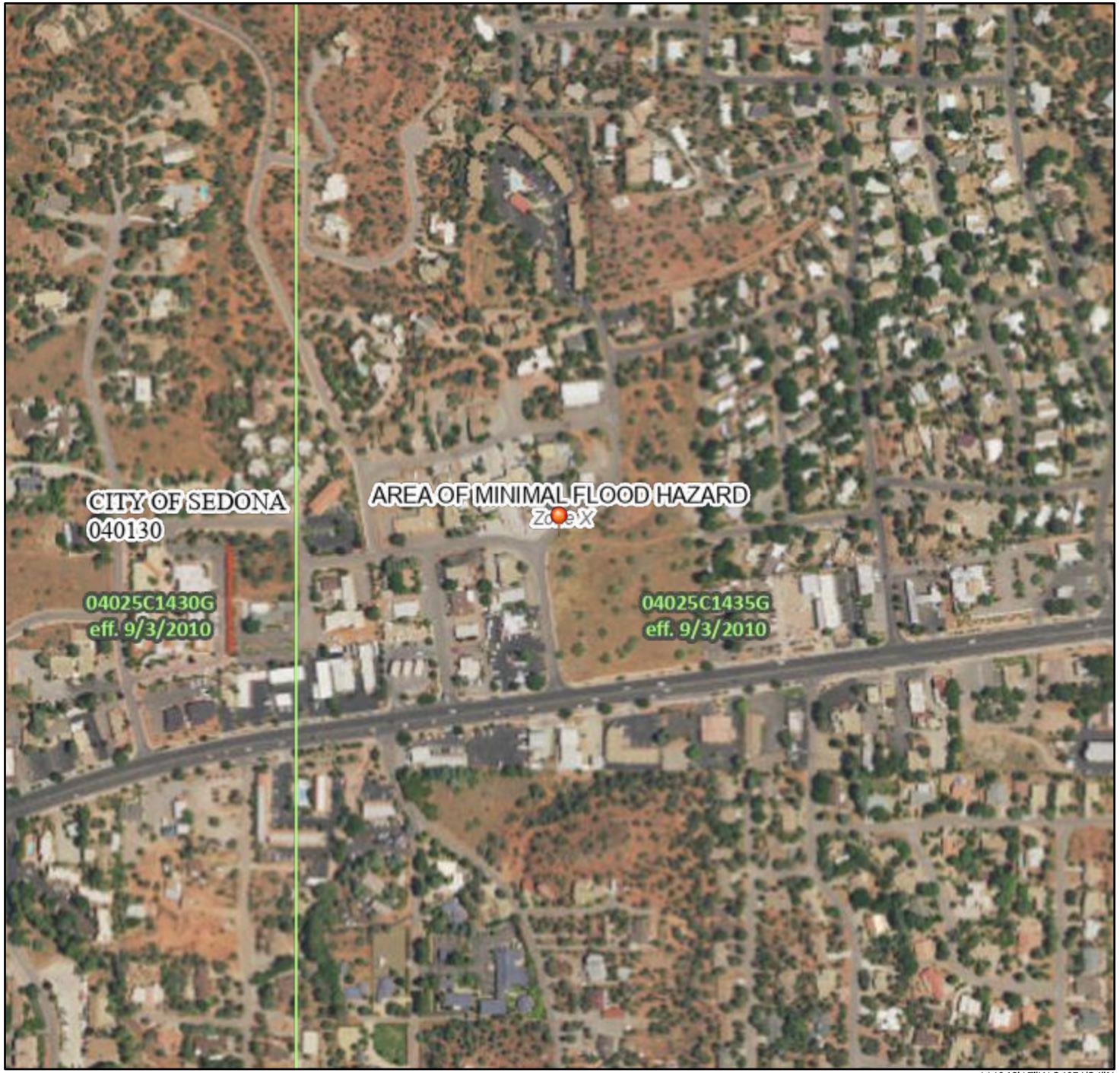
APPENDIX A

FIGURES

National Flood Hazard Layer FIRMette

FEMA

111°48'55"W 34°52'3"N



111°48'17"W 34°51'34"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- 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 D*

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

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / 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

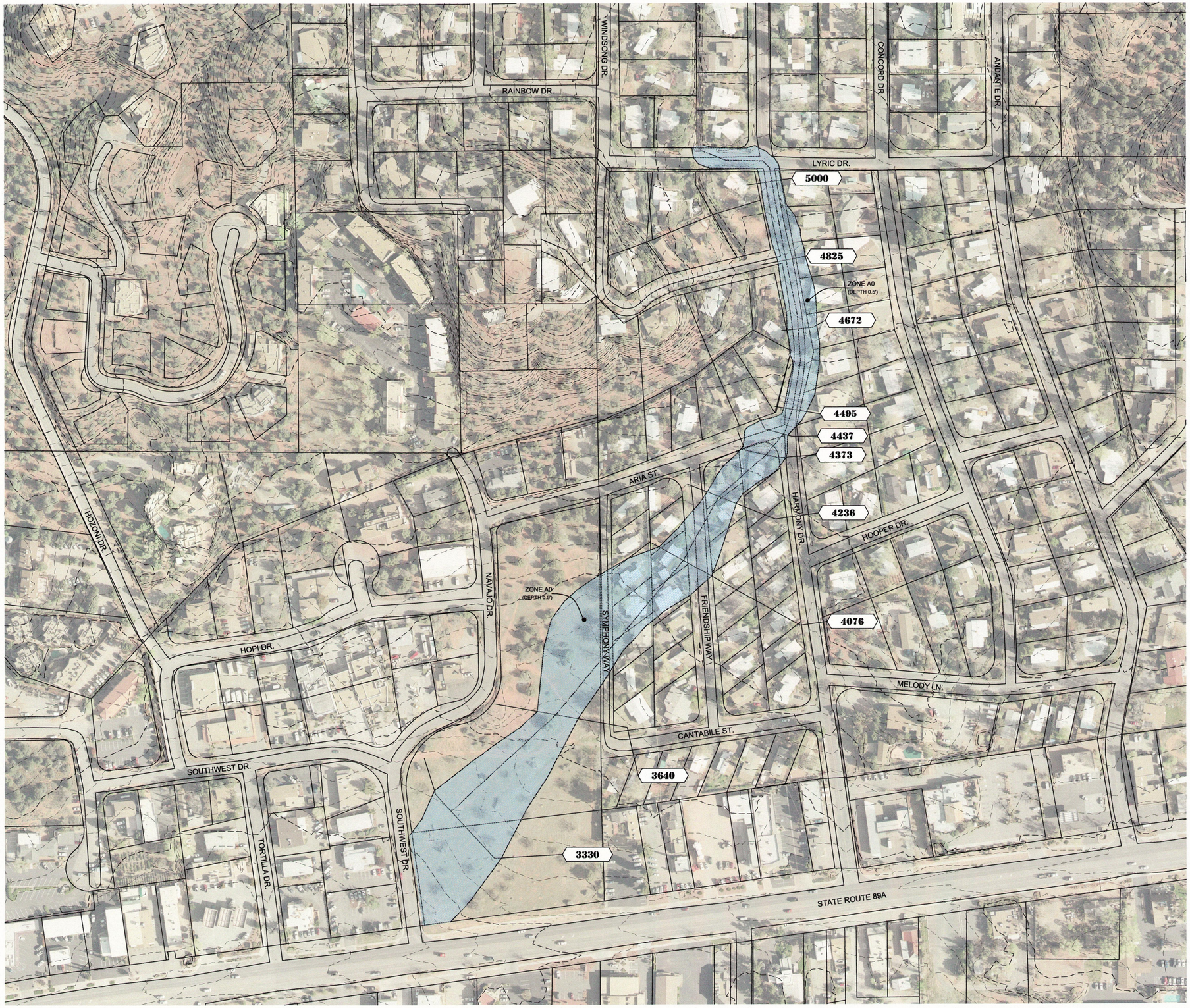
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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 4/29/2021 at 2:12 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.

FIGURE 1



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, and AO. The Base Flood Elevation is the water-surface elevation of the 1 % annual chance flood.

ZONE A	No Base Flood Elevation determined
ZONE AE	Base Flood Elevations determined
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding; Base Flood Elevations determined
ZONE AO	Flood depths of 0.5 to 3 feet (usually sheet flow on sloped terrain); average depths determined

FLOODPLAIN BOUNDARY

XXXX CROSS SECTION ID

N

S

0 50' 100' 200'

SCALE IN FEET

FIGURE 2

CITY OF SEDONA

Professional Engineer
CERTIFICATE NO.
37322
LUKE A. SEFTON
DATE SIGNED 3-31-17
ARIZONA, U.S.A.

EXPIRES 3/31/2017

HERITAGE LAND SURVEY & ENGINEERING
P.O. BOX 3270
CAMP VERDE, ARIZONA 86322
PH: (928) 301-5964
cbmcdonald78@gmail.com

SHEET TITLE: 100-YEAR FLOODPLAIN

PROJECT TITLE: **CITY OF SEDONA HARMONY**

DRAWN BY:	T.C.H.
SCALE:	1'=100'
DATE:	5/1/14
PROJECT NO:	14-0304
SHEET NO.	C-1

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PRELIMINARY GRADING & DRAINAGE PLAN
FOR
NAVAJO LOFTS

OWNER
MKC HOLDINGS LLC
15010 N 78TH WAY SUITE 109
SCOTTSDALE AZ 85260
PHONE: (602) 390-9401
CONTACT: KEITH HOLBEN
EMAIL: kh@mkcompany.com

ENGINEER
LANDCOR CONSULTING
6859 E. REMBRANDT AVE. #124
MESA, AZ 85212
PHONE: (480) 734-9157
CONTACT: JOEL D. MILLER, P.E.
EMAIL: joel@landcorconsulting.com

PROJECT DATA

ADDRESS:	10 NAVAJO DR CITY OF SEDONA
TAX ASSESSORS PARCEL NUMBER:	408-24-536B
ZONING	CO
PARCEL AREA:	196,020 SQFT. (4.5 ACRES)

LEGAL DESCRIPTION

PER 2019-0036008 YAVAPAI COUNTY RECORDER.

SHEET INDEX

COVER SHEET	C1.1
PRELIMINARY GRADING & DRAINAGE PLAN	C1.2 - 1.3

RETENTION CALCULATIONS

RETENTION VOLUME REQUIRED:

	A (S.F.)	
Area (gross)	196,020	4.50 AC

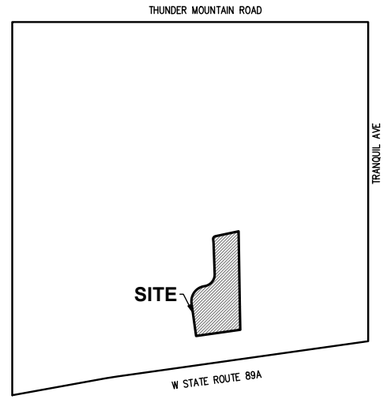
A = Drainage Area in square feet
Cpre = 0.50 Undeveloped Desert Rangeland
Cpost = 0.94 Multiple Family Residential
ΔC = Cpost - Cpre Runoff Coefficient
P = Precipitation Depth (100-yr, 2-hr) 2.64 inches
Vr = Retention Volume Required, cubic feet

Vr = C x P/12 x A

	Area (S.F.)	ΔC	Pre vs. Post Volume (C.F.)	First Flush Volume (C.F.)
DA1	196,020	0.44	18,975	8,168
Total Required	196,020		**18,975**	**8,168**

RETENTION VOLUME PROVIDED:

Basin No.	Top Area (S.F.)	Bot. Area (S.F.)	Depth (FT)	Volume Provided (C.F.)
1	6,760	3,617	3.0	15,566
2	1,908	757	3.0	3,998
			TOTAL =	**19,563**



VICINITY MAP
SEC 11, T17N, R5E
NTS

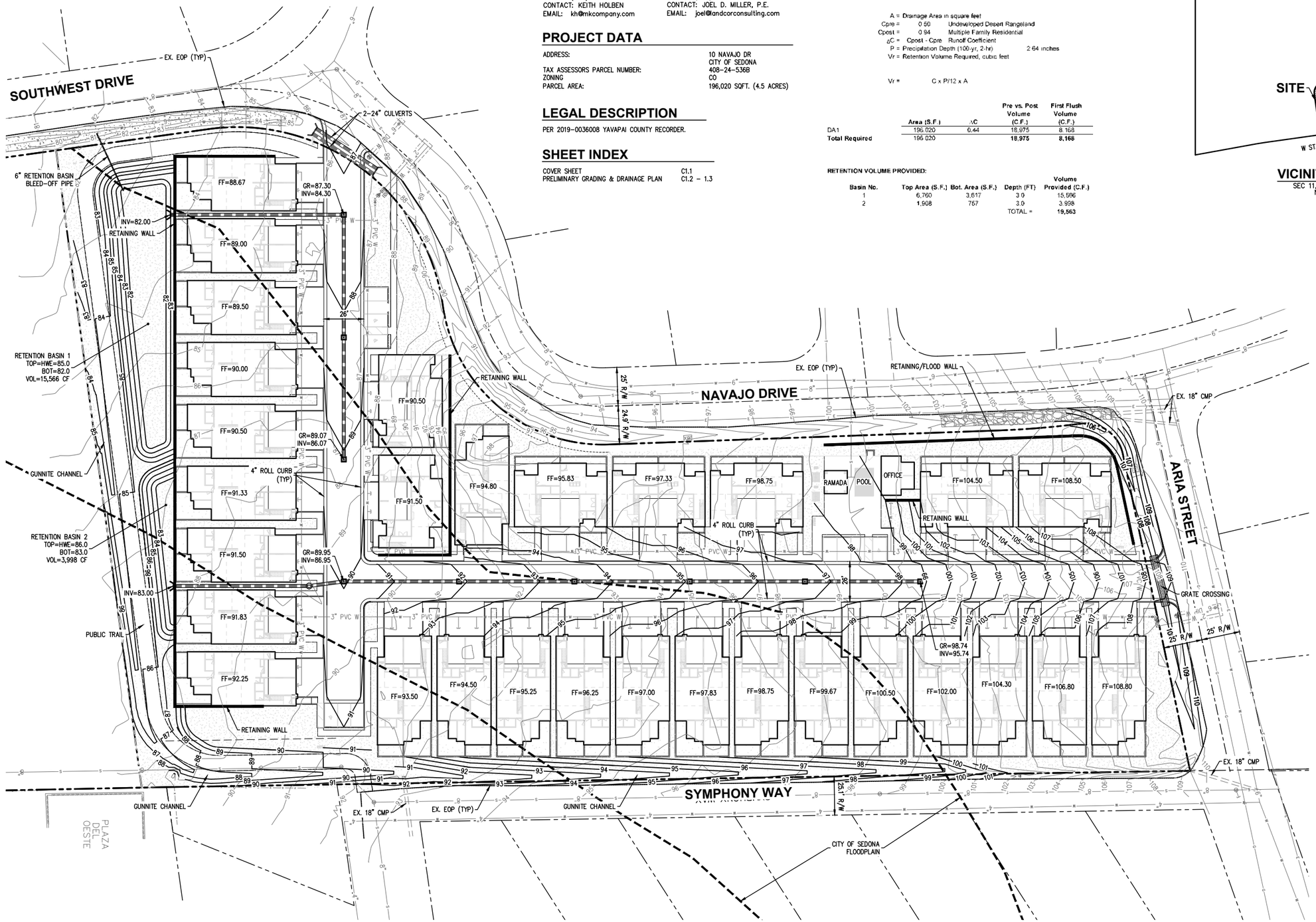


FIGURE 3

PRELIMINARY NOT FOR CONSTRUCTION

N

30 15 0 15 30 60
SCALE: 1"=30'

LANDCOR CONSULTING
6859 E. Rembrandt Ave. #124
Mesa, AZ 85212
Ph: (480) 233-8573
landcorconsulting.com

NAVAJO LOFTS
PRELIMINARY GRADING & DRAINAGE PLAN
10 NAVAJO DRIVE
SEDONA, ARIZONA

DATE:

REVISIONS:

PRELIMINARY GRADING & DRAINAGE PLAN

DATE: 4/29/21

PROJ. # : 1763

C1.1

1 OF 3

APPENDIX B

HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Apr 29 2021

TRAPEZOIDAL CHANNEL ON EAST PROPERTY LINE

Trapezoidal

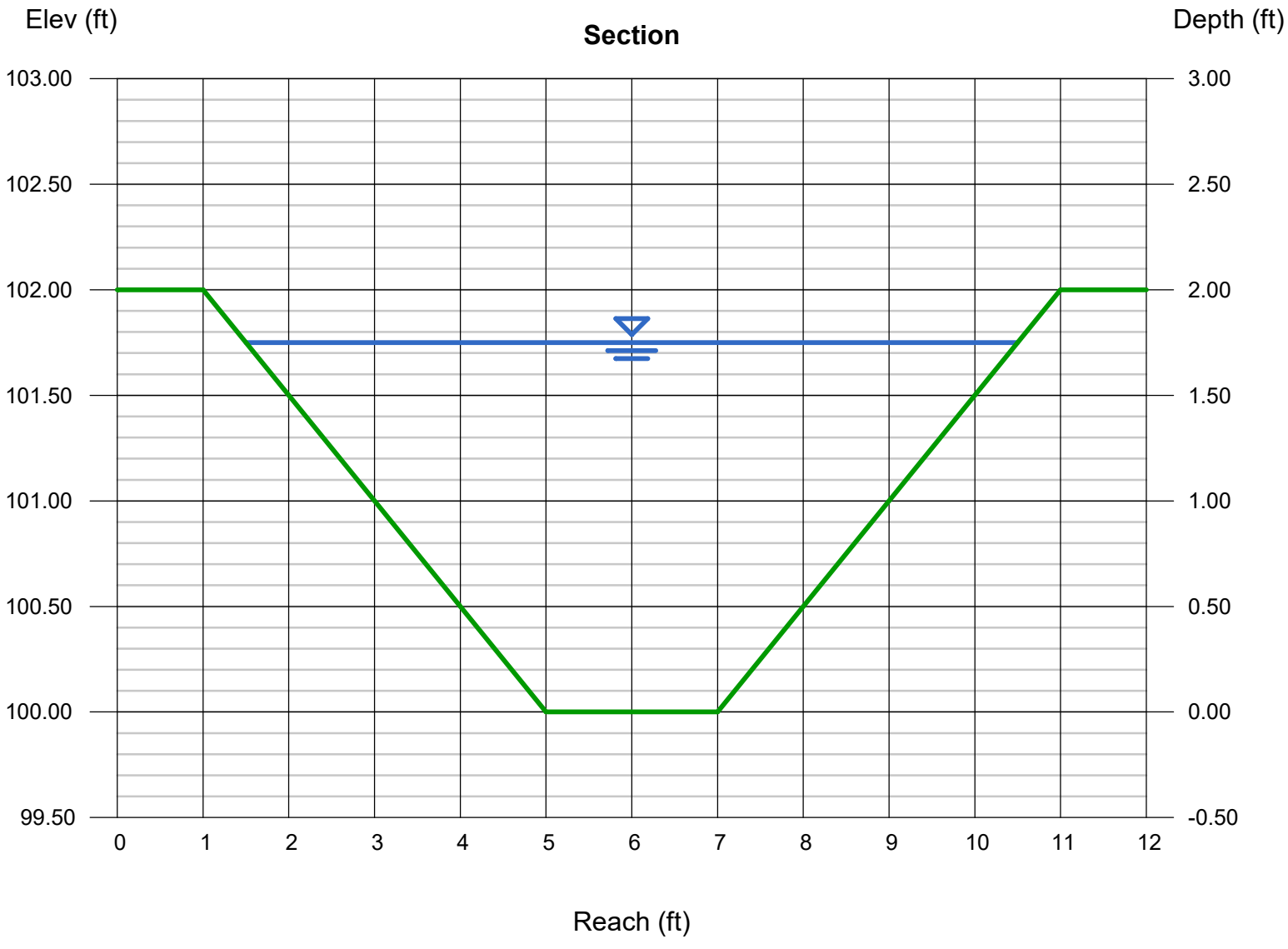
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.77
N-Value	= 0.018

Calculations

Compute by:	Known Q
Known Q (cfs)	= 103.00

Highlighted

Depth (ft)	= 1.75
Q (cfs)	= 103.00
Area (sqft)	= 9.62
Velocity (ft/s)	= 10.70
Wetted Perim (ft)	= 9.83
Crit Depth, Yc (ft)	= 2.00
Top Width (ft)	= 9.00
EGL (ft)	= 3.53



APPENDIX C

STORMWATER RETENTION CALCULATIONS

RETENTION CALCULATIONS

4/29/2021

Sedona Lofts

RETENTION VOLUME REQUIRED:

	A (S.F.)	
Area (gross)	196,020	4.50 AC

A = Drainage Area in square feet
Cpre = 0.50 Undeveloped Desert Rangeland
Cpost = 0.94 Multiple Family Residential
ΔC = Cpost - Cpre Runoff Coefficient
P = Precipitation Depth (100-yr, 2-hr) 2.64 inches
Vr = Retention Volume Required, cubic feet

Vr = C x P/12 x A

	Area (S.F.)	ΔC	Pre vs. Post Volume (C.F.)	First Flush Volume (C.F.)
DA1	196,020	0.44	18,975	8,168
Total Required	196,020		**18,975**	**8,168**

RETENTION VOLUME PROVIDED:

Basin No.	Top Area (S.F.)	Bot. Area (S.F.)	Depth (FT)	Volume Provided (C.F.)
1	6,760	3,617	3.0	15,566
2	1,908	757	3.0	3,998
			TOTAL =	**19,563**

APPENDIX D

HARMONY FLOODPLAIN ANALYSIS

Since 1993
Heritage Land Survey & Engineering
P.O. BOX 3270
CAMP VERDE, ARIZONA, 86322

SERVING: AZ. CO. NM. OK. (PHONE: 928-567-9170

May 6, 2014

David Peck
City of Sedona Public Works
104 Roadrunner Drive
Sedona, Arizona 86336

Subject: COS Harmony Floodplain Analysis
Final Report

Mr. Peck,

The purpose of this letter is to provide a report of the floodplain analysis performed on Profile 4400B as identified within the City of Sedona Floodplain Management Study dated May 1994. Within the original 1994 Floodplain Management Study, Profile 4440 had a break-out flow occur at Lyric Drive which resulted in two different flow profiles from Lyric Drive to State Route 89A, Profile 4400 and Profile 4400B. The City of Sedona has completed a drainage improvement project, extending from State Route 89A to Thunder Mountain Road, which was designed to contain storm flows up to the 25-year frequency event. This report assumes the new drainage system does contain storm flows up to the 25-year event. Based on the changes in hydrologic conditions, a floodplain analysis was performed from Lyric Drive to State Route 89A to show changes to the 100-year floodplain of Profile 4400B. As a result of the drainage improvements completed by the City of Sedona, the hydrology and hydraulics of the area have been modified; therefore, the 100-year floodplain of Profile 4400B, as identified within the 1994 City of Sedona Floodplain Management Study, is not effective.

Hydrology

A hydrologic review was conducted to determine the break-out discharge near Lyric Drive since the completion of the drainage improvements, during the 100-year storm event. We have reviewed the Harmony-Windsong Drainage Improvements Design Report for Phase III prepared by Dibble Engineering and the Final Drainage Report for Harmony-Windsong Phase IV prepared by Shephard Wesnitzer. Based on the results presented within these two drainage studies we have determined that a break-out flow of **40 cfs** will occur near Lyric Drive.

According to the drainage studies for Harmony-Windsong Phase III and Phase IV, the system was designed to capture and convey peak discharges for storm events up to the 25-year event. The Harmony-Windsong Phase I through Phase IV projects extend from Thunder Mountain Road to the south side of State Route 89A. At Concentration Point A33AC located at Thunder Mountain Road, the 25-year peak discharge and the 100-year peak discharge are 537.9 cfs and 590.5 cfs respectively. Since the system has a 25-year

capacity, there will be an overflow of 52.6 cfs during the 100-year storm event at this location. A hydraulic analysis of the improved channel, extending from CP-A33AC to Manhole 4A & 4B as shown in the construction plans for Phase IV, shows the overflow will be contained within the channel, at an approximate depth of 1 foot. At Manhole 4A & 4B, approximately 20 cfs of the 52.6 cfs overflow will drain back into the dual pipes, and allow 32.6 cfs to bypass the grated manholes, and continue down the improved channel to Manhole 3A & 3B. At Manhole 3A & 3B, the 32.6 cfs will combine with runoff flow from Sub-Basin A29B-1. Sub-Basin A29B-1 has a 25-year and 100-year peak discharge of 33.1 cfs and 42.1 cfs respectively. Flows through each of the manholes were determined with a 50% clogging factor. Since the improved drainage system was designed to accept discharges up to the 25-year event, the amount of runoff from A29B-1 bypassing Manhole 3A & 3B is 9 cfs. Of the 32.6 cfs coming from upstream, another 20 cfs will drain back into the dual pipes, and allow 12.6 cfs to bypass the grated manhole. The combination of the 9 cfs and the 12.6 cfs will then overtop Moonglow Drive, and add to the overflow from Sub-Basin A29B-2. Sub-Basin A29B-2 has a 25-year and 100-year peak discharge of 43.3 cfs and 55.1 cfs respectively. The improved drainage system will accept the 25-year event; therefore approximately 11.8 cfs will combine with the 21.6 cfs overtopping Moonglow Drive upstream, and drain to Manhole 2A & 2B. The combined flow of 33.4 cfs will be contained within the improved channel between Moonglow Drive and Manhole 2A & 2B. At Manhole 2A & 2B, the 33.4 cfs will bypass the grated manholes and continue within the improved channel to Manhole 1A & 1B, since the system at this point will be under pressure during the 100-year storm event. At Manhole 1A & 1B, the 33.4 cfs will again bypass the opening during the 100-year storm event. The improved drainage system accepting runoff from Sub-Basin A29B-3, and conveying the flow to the dual pipes, has the capacity to contain the peak discharges from the basin up to the 100-year storm event; therefore there will be no overflow from Sub-Basin A29B-3. The overflow of 33.4 cfs, from Manhole 1A & 1B, will combine with the overflow from Sub-Basin A29B-4. Sub-Basin A29B-4 has a 25-year and 100-year peak discharge of 23.5 cfs and 29.8 cfs respectively. Since the improved drainage system was designed to accept discharges up to the 25-year storm event, the amount of runoff bypassing the 24-in pipe beneath Lyric Drive is 6.3 cfs. A combined flow of **40 cfs** will then overtop Lyric Drive.

Of the **40 cfs** crossing Lyric Drive, **10 cfs** will continue directly across the street to a small drainage channel along the westside of the improved drainage system. Therefore approximately **30 cfs** will flow east down Lyric Drive towards the intersection of Harmony Drive and Lyric Drive.

Local drainage through Basin A37B as identified within the City of Sedona Stormwater Master Plan was determined, and added to the break-out flow near Lyric Drive. The Basin A37B was sub-divided into 6 sub-basins. The Rational Method was used to calculate the 25-year and 100-year peak discharges. Calculations were based on a Time of Concentration of 10 minutes, since this is the minimum time that could be used for the Rational Method. The 25-year rainfall intensity and 100-year rainfall intensity were 6.06 inches per hour and 8.22 inches per hour, respectively. The rainfall intensities was based on the precipitation data within Table 8.3 of the City of Sedona Land Development Code Article 8.

Since 1993
Heritage Land Survey & Engineering
P.O. BOX 3270
CAMP VERDE, ARIZONA, 86322

SERVING: AZ. CO. NM. OK. (PHONE: 928-567-9170

Table 8.3

Upper Limit Precipitation Frequency Estimates

Freq (yr)	5-min	10-min	15-min	30-min	60-min	120-min	3-hr	6-hr	12-hr	24-hr	2-day	4-day	7-day	10-day	20-day
1	0.26	0.39	0.48	0.65	0.80	0.93	0.99	1.16	1.49	1.88	2.23	2.57	3.00	3.43	4.43
2	0.33	0.50	0.62	0.83	1.03	1.18	1.26	1.44	1.84	2.36	2.79	3.21	3.75	4.27	5.50
5	0.44	0.67	0.83	1.12	1.39	1.55	1.60	1.79	2.24	2.94	3.47	4.02	4.64	5.26	6.68
10	0.54	0.82	1.01	1.36	1.69	1.87	1.91	2.10	2.57	3.41	4.01	4.68	5.39	6.05	7.56
25	0.67	1.02	1.26	1.70	2.10	2.31	2.34	2.54	3.03	4.05	4.77	5.60	6.43	7.10	8.70
50	0.78	1.19	1.47	1.98	2.46	2.69	2.71	2.89	3.38	4.55	5.36	6.34	7.27	7.94	9.56
100	0.90	1.37	1.70	2.29	2.84	3.12	3.14	3.29	3.76	5.08	5.99	7.14	8.16	8.80	10.40
200	1.03	1.57	1.95	2.63	3.25	3.57	3.59	3.72	4.14	5.63	6.66	7.97	9.06	9.66	11.21
500	1.23	1.88	2.33	3.12	3.88	4.24	4.27	4.37	4.70	6.40	7.56	9.18	10.37	10.84	12.26
1,000	1.40	2.13	2.65	3.56	4.41	4.79	4.85	4.90	5.15	7.02	8.28	10.15	11.39	11.74	13.05

Using the Rational Method, the accumulated flow from the sub-basins of Basin A37B, was determined to equal 179.60 cfs for the 100-year storm event. According to the City of Sedona Dry Creek HEC-1 Model Output, which was calculated using HEC-1 methodology, the Basin A37B had a 100-year peak discharge of 156 cfs. The difference in the peak discharges can be attributed to the different hydrology methods used but an attempt was made to match the output from the City of Sedona Master Plan.

Hydraulics

A steady state hydraulic analysis of the break-out flow through the area was performed using HEC-RAS version 4.1.0 to determine the hydraulic conditions, including the depth of flow, through the project area. Ten cross-sections were delineated along a 1900 feet reach from Lyric Drive to State Route 89A, using the City of Sedona 2-ft topography. The Manning's Roughness Coefficients ranged from 0.065 to 0.100, since the project area was identified as dense residential. Smooth surfaces, such as road surfaces were assigned a roughness coefficient of 0.015. The flow path through the project area has an average slope of 1% along the reach; therefore the steady state boundary condition used for the model was based on a Normal Depth of 0.01 foot per foot.

The 100-year peak discharges, along the flow path, were adjusted based on the 100-year hydrologic calculations for local drainage within Basin A37B. It should be noted that each cross section is not located

Since 1993
Heritage Land Survey & Engineering
P.O. BOX 3270
CAMP VERDE, ARIZONA, 86322

SERVING: AZ. CO. NM. OK. (PHONE: 928-567-9170

at a well-defined concentration point but the associated discharge does account for the hydraulic conditions at or near the cross section location.

Conclusion

The hydraulic results from the HEC-RAS model were used to determine the effective flood hazard area and the depth of flow. A Special Flood Hazard Map identifying the 100-year floodplain area with depth of flow has been provided. The hydraulic conditions within this report represent the current conditions at the time this report was developed.

If you have any questions, please contact me at (928) 202-3999.

Sincerely,

Registered Professional Engineer (Civil) CERTIFICATE NO. 37322 LUKE A. SEFTON Date Signed 11/4/16 ARIZONA U.S.A.

Expires 3/31/17

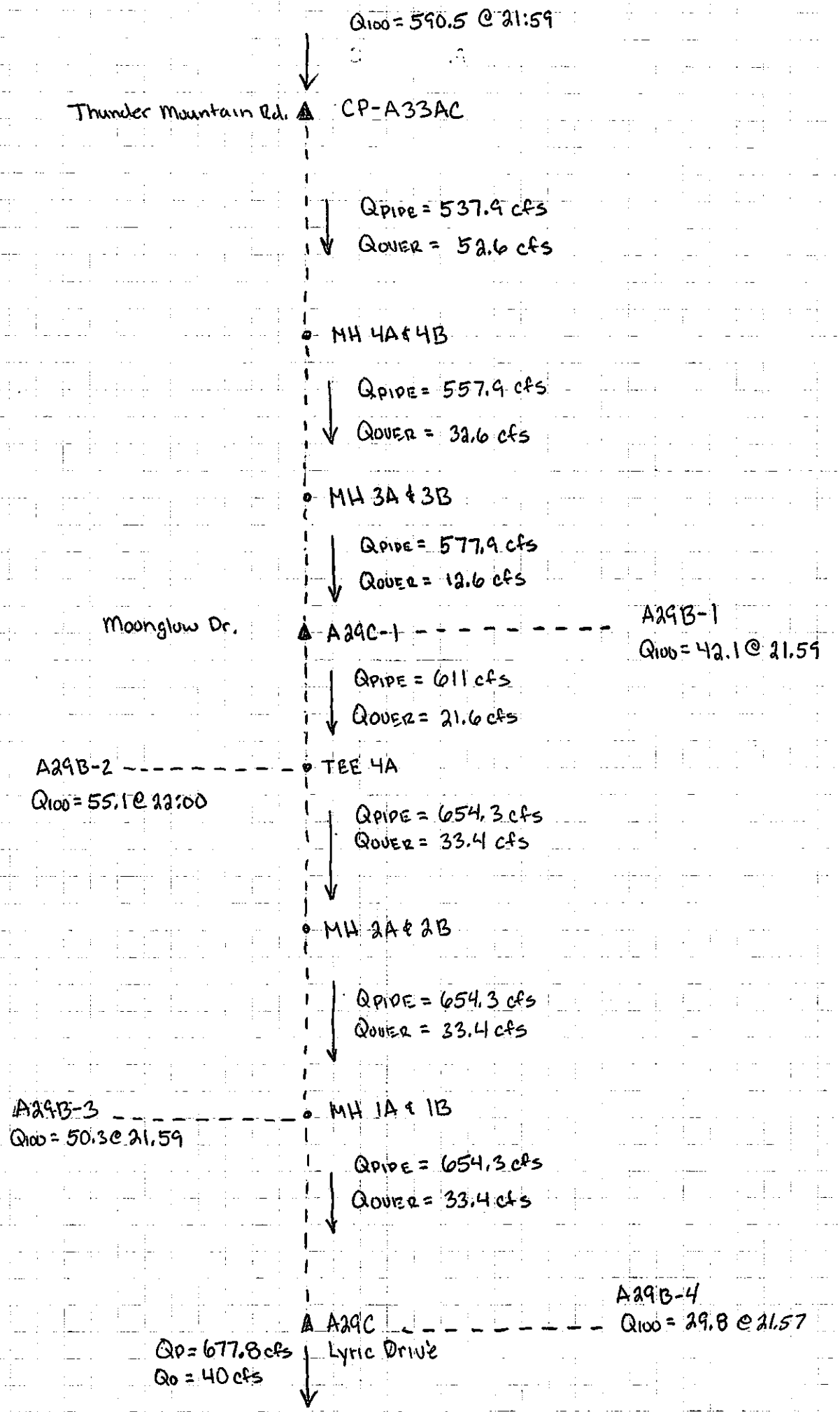
Luke A. Sefton, P.E.
President

Attachment: Hydrologic Map Network
Hydraulic Structure Calcs
HEC-RAS Summary Table
HEC-RAS Cross Sections
100-year Floodplain Map
Drainage Map

LAS:tch

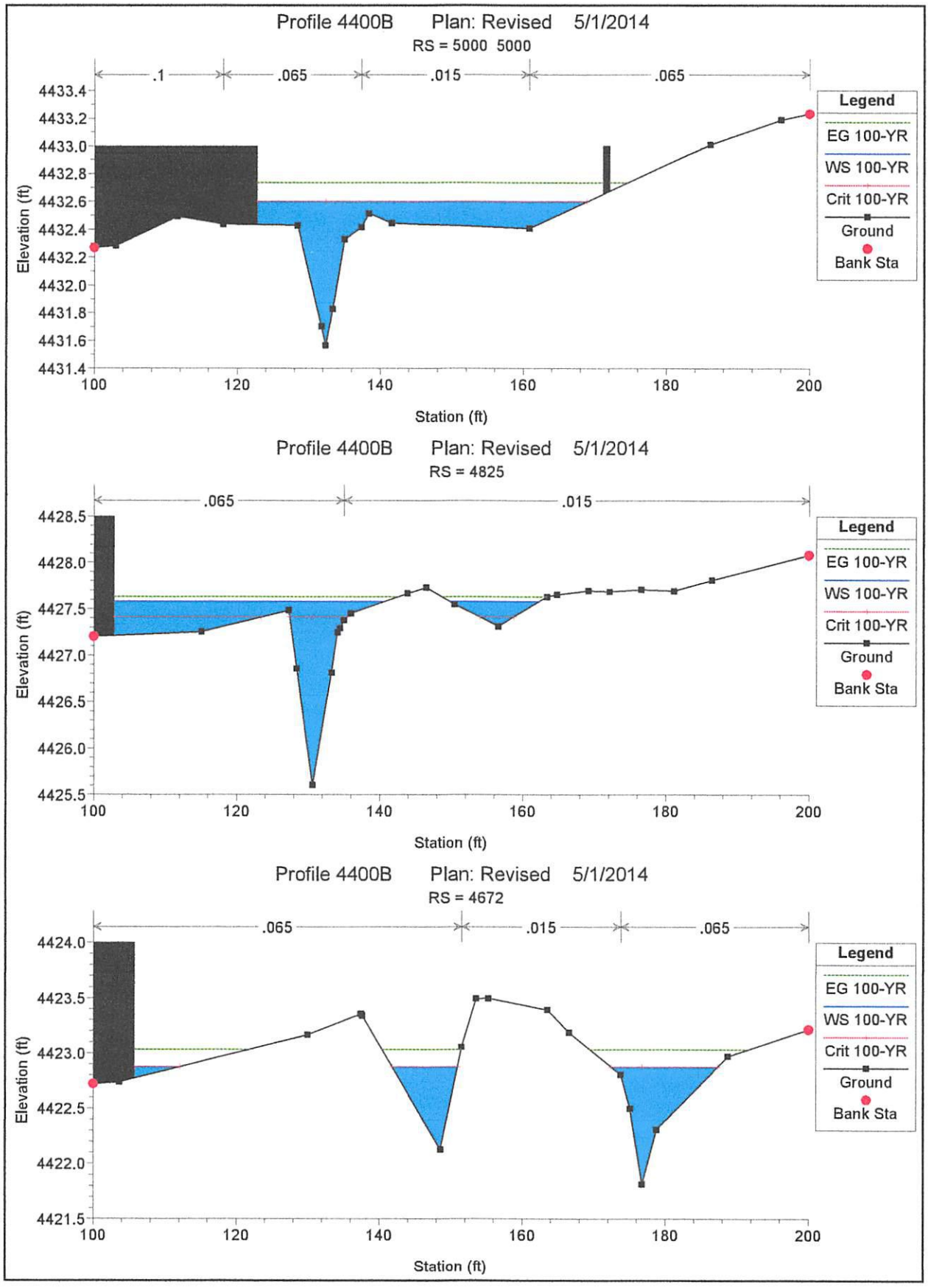
14-0304

* Dugan L. Mc Donald, R.L.S., P.L.S., (928-301-5964) * Clinton Gillespie R.L.S. (928-301-3072) * Shane Nauert, R.L.S. (928-451-2493)
* Daniel L. Mc Donald, S.P.C. (928-301-7206) * Jesse Sharp S.P.C. (928-301-6238)
* Luke Sefton, P.E. (928-646-3494) * Timothy Huskett, E.I.T (928-707-2078)


Q100 = 590.5 @ 21:59
Thunder Mountain Rd.
CP-A33AC
QPIPE = 537.9 cfs
QOVER = 52.6 cfs
MH 4A & 4B
QPIPE = 557.9 cfs
QOVER = 32.6 cfs
MH 3A & 3B
QPIPE = 577.9 cfs
QOVER = 12.6 cfs
Moonglow Dr.
A29C-1
A29B-1
Q100 = 42.1 @ 21.59
QPIPE = 611 cfs
QOVER = 21.6 cfs
A29B-2
Q100 = 55.1 @ 22:00
TEE 4A
QPIPE = 654.3 cfs
QOVER = 33.4 cfs
MH 2A & 2B
QPIPE = 654.3 cfs
QOVER = 33.4 cfs
A29B-3
Q100 = 50.3 @ 21.59
MH 1A & 1B
QPIPE = 654.3 cfs
QOVER = 33.4 cfs
A29B-4
Q100 = 29.8 @ 21.57
A29C
QD = 677.8 cfs
QO = 40 cfs
Lyric Drive

HEC-RAS Plan: Revised River: Profile 4400B Reach: Harmony Profile: 100-YR

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Harmony	5000	100-YR	30.00	4431.57	4432.60	4432.60	4432.73	0.026751	2.95	10.17	46.08	1.11
Harmony	4825	100-YR	30.00	4425.61	4427.58	4427.41	4427.63	0.015241	1.79	16.72	50.33	0.55
Harmony	4672	100-YR	30.00	4421.82	4422.88	4422.88	4423.04	0.083887	3.19	9.40	30.40	1.01
Harmony	4495	100-YR	30.00	4414.60	4415.32	4415.32	4415.43	0.018533	2.74	10.93	50.44	1.04
Harmony	4437	100-YR	30.00	4412.80	4413.30	4413.30	4413.38	0.014530	2.32	12.95	77.22	1.00
Harmony	4373	100-YR	55.00	4410.82	4412.08	4411.84	4412.12	0.013953	1.68	32.83	67.40	0.42
Harmony	4236	100-YR	55.00	4406.53	4407.08	4407.08	4407.24	0.216976	3.23	17.05	53.36	1.01
Harmony	4076	100-YR	80.30	4402.65	4403.55		4403.58	0.010173	1.40	57.34	140.61	0.39
Harmony	3640	100-YR	102.85	4391.07	4391.72	4391.72	4391.89	0.086790	3.32	30.94	89.21	0.99
Harmony	3330	100-YR	102.85	4383.67	4384.37	4384.13	4384.40	0.010019	1.23	83.54	211.67	0.35


Profile 4400B Plan: Revised 5/1/2014
RS = 5000 5000
.1
.065
.015
.065
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Profile 4400B Plan: Revised 5/1/2014
RS = 4825
.065
.015
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Profile 4400B Plan: Revised 5/1/2014
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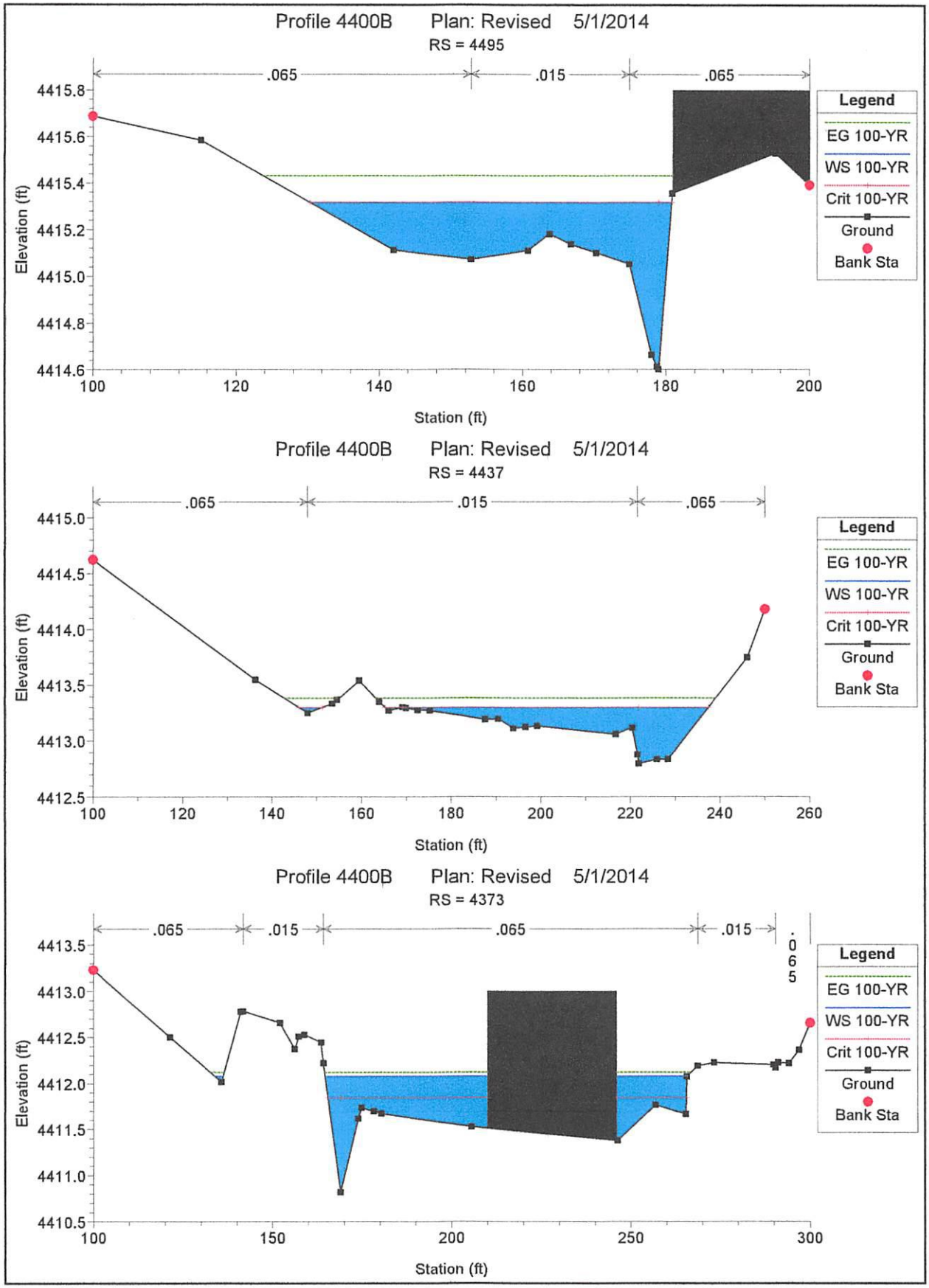
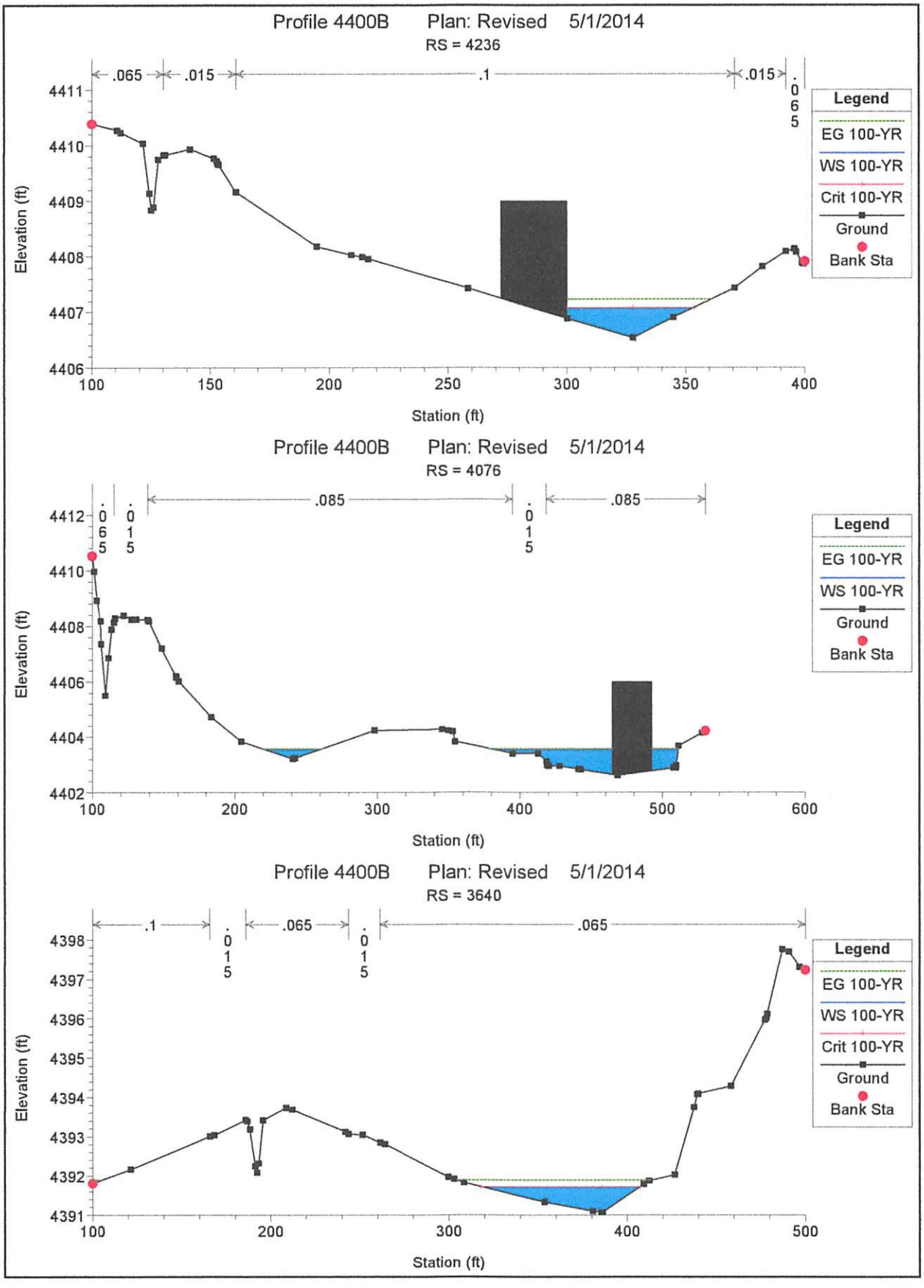
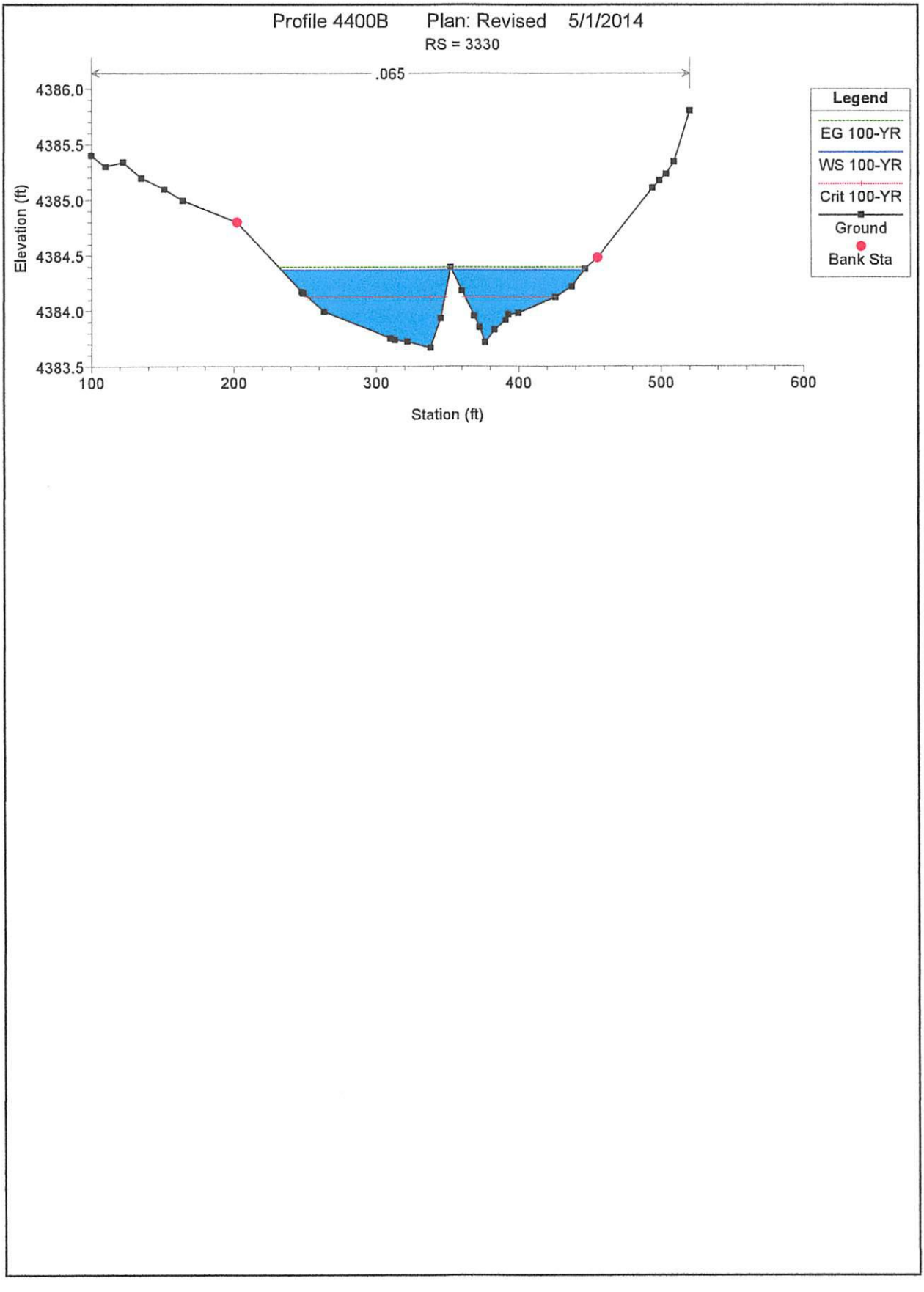
.015
.065
Elevation (ft)
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta


Profile 4400B Plan: Revised 5/1/2014
RS = 4495
.065
.015
.065
Elevation (ft)
4415.8
4415.6
4415.4
4415.2
4415.0
4414.8
4414.6
100
120
140
160
180
200
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Profile 4400B Plan: Revised 5/1/2014
RS = 4437
.065
.015
.065
Elevation (ft)
4415.0
4414.5
4414.0
4413.5
4413.0
4412.5
100
120
140
160
180
200
220
240
260
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Profile 4400B Plan: Revised 5/1/2014
RS = 4373
.065
.015
.065
.015
.065
Elevation (ft)
4413.5
4413.0
4412.5
4412.0
4411.5
4411.0
4410.5
100
150
200
250
300
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta


Profile 4400B Plan: Revised 5/1/2014
RS = 4236
.065
.015
.1
.015
.065
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
Profile 4400B Plan: Revised 5/1/2014
RS = 4076
.065
.015
.085
.015
.085
Legend
EG 100-YR
WS 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
Profile 4400B Plan: Revised 5/1/2014
RS = 3640
.1
.015
.065
.015
.065
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta
Elevation (ft)
Station (ft)


Profile 4400B Plan: Revised 5/1/2014
RS = 3330
.065
4386.0
4385.5
4385.0
4384.5
4384.0
4383.5
Elevation (ft)
100
200
300
400
500
600
Station (ft)
Legend
EG 100-YR
WS 100-YR
Crit 100-YR
Ground
Bank Sta

Culvert Report

Hydraflow Express by Intelisolve — Thursday, Mar 13 2014, 1:3 PM

Inlet A29B3

Invert Elev Dn (ft)	=	4432.98
Pipe Length (ft)	=	169.20
Slope (%)	=	5.03
Invert Elev Up (ft)	=	4441.49
Rise (in)	=	30.0
Shape	=	Cir
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.023
Inlet Edge	=	Sq Edge
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

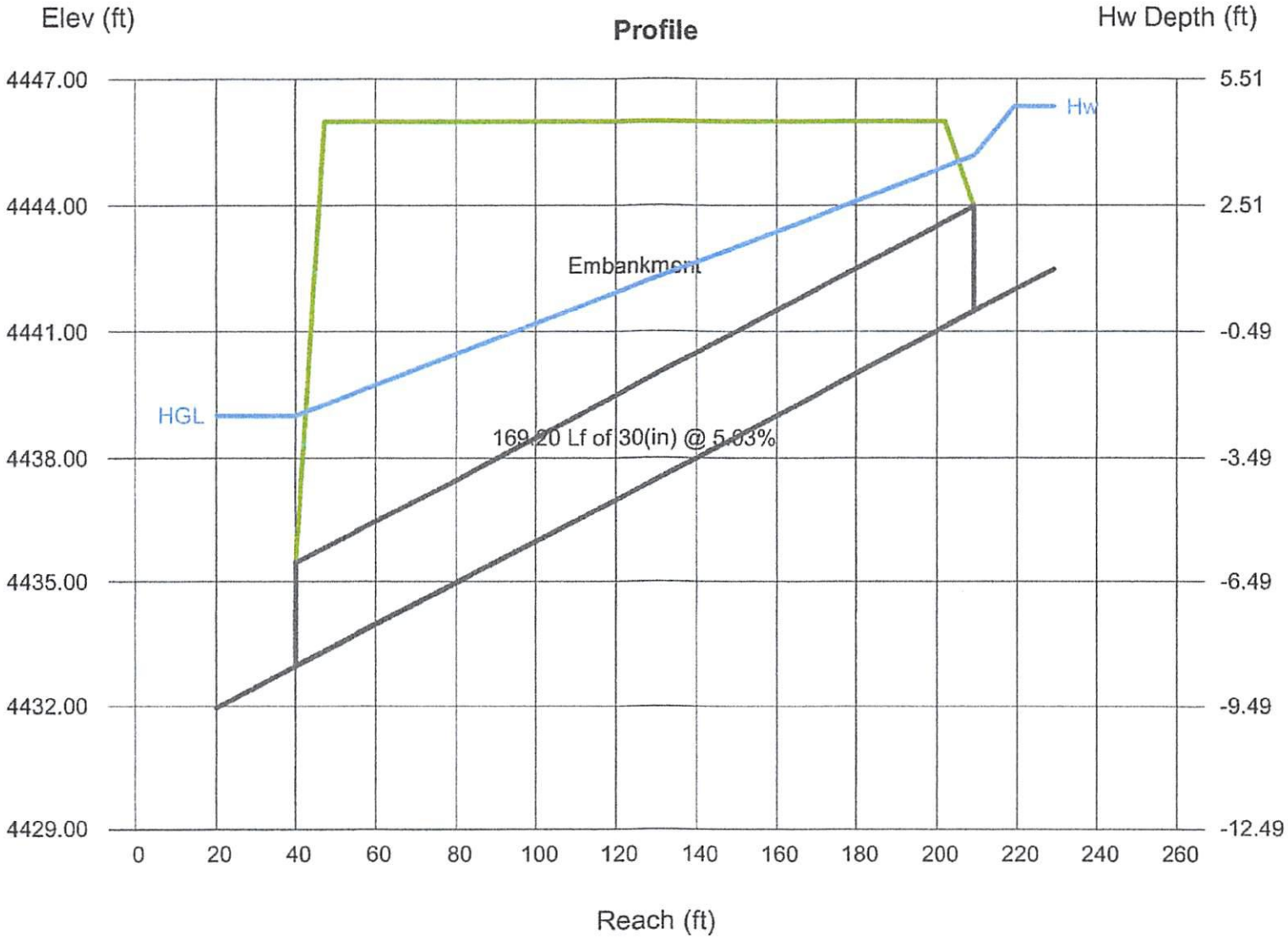
Top Elevation (ft)	=	4446.00
Top Width (ft)	=	155.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	42.00
Qmax (cfs)	=	50.00
Tailwater Elev (ft)	=	4439.02

Highlighted

Qtotal (cfs)	=	50.00
Qpipe (cfs)	=	44.24
Qovertop (cfs)	=	5.76
Veloc Dn (ft/s)	=	9.01
Veloc Up (ft/s)	=	9.01
HGL Dn (ft)	=	4439.02
HGL Up (ft)	=	4445.19
Hw Elev (ft)	=	4446.34
Hw/D (ft)	=	1.94
Flow Regime	=	Inlet Control



Channel Report

Hydraflow Express by Intelisolve — Thursday, Mar 13 2014, 1:5 PM

Drainage Channel Above Pipe

User-defined

Invert Elev (ft)	= 97.25
Slope (%)	= 5.50
N-Value	= 0.023

Calculations

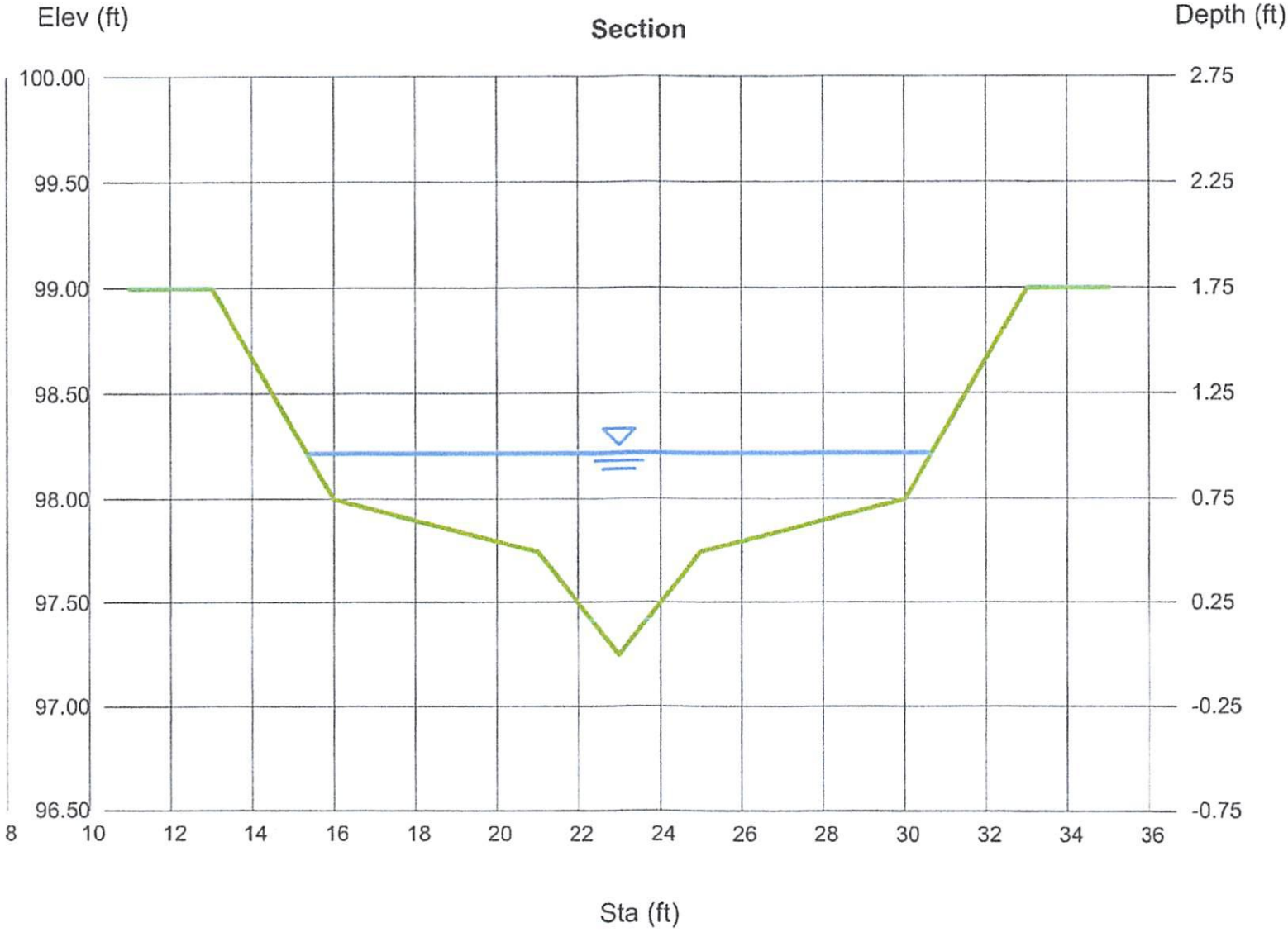
Compute by:	Known Q
Known Q (cfs)	= 53.00

Highlighted

Depth (ft)	= 0.97
Q (cfs)	= 53.00
Area (sqft)	= 6.48
Velocity (ft/s)	= 8.19
Wetted Perim (ft)	= 15.53
Crit Depth, Yc (ft)	= 1.28
Top Width (ft)	= 15.32
EGL (ft)	= 2.01

(Sta, El, n)-(Sta, El, n)...

(13.00, 99.00)-(16.00, 98.00, 0.023)-(21.00, 97.75, 0.023)-(23.00, 97.25, 0.023)-(25.00, 97.75, 0.023)-(30.00, 98.00, 0.023)-(33.00, 99.00, 0.023)



Inlet Report

Hydraflow Express by Intelisolve — Thursday, Mar 13 2014, 1:8 PM

<Name>

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 2.60
Grate Width (ft)	= 2.60
Grate Length (ft)	= 2.50
Grate Length (ft)	= 2.50

Gutter

Slope, Sw (ft/ft)	= 0.500
Slope, Sx (ft/ft)	= 0.500
Local Depr (in)	= -0-
Gutter Width (ft)	= 2.50
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

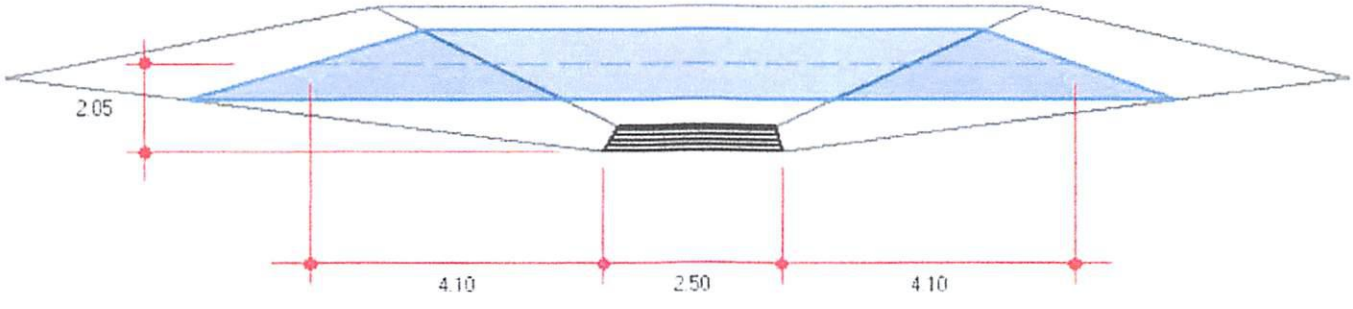
Calculations

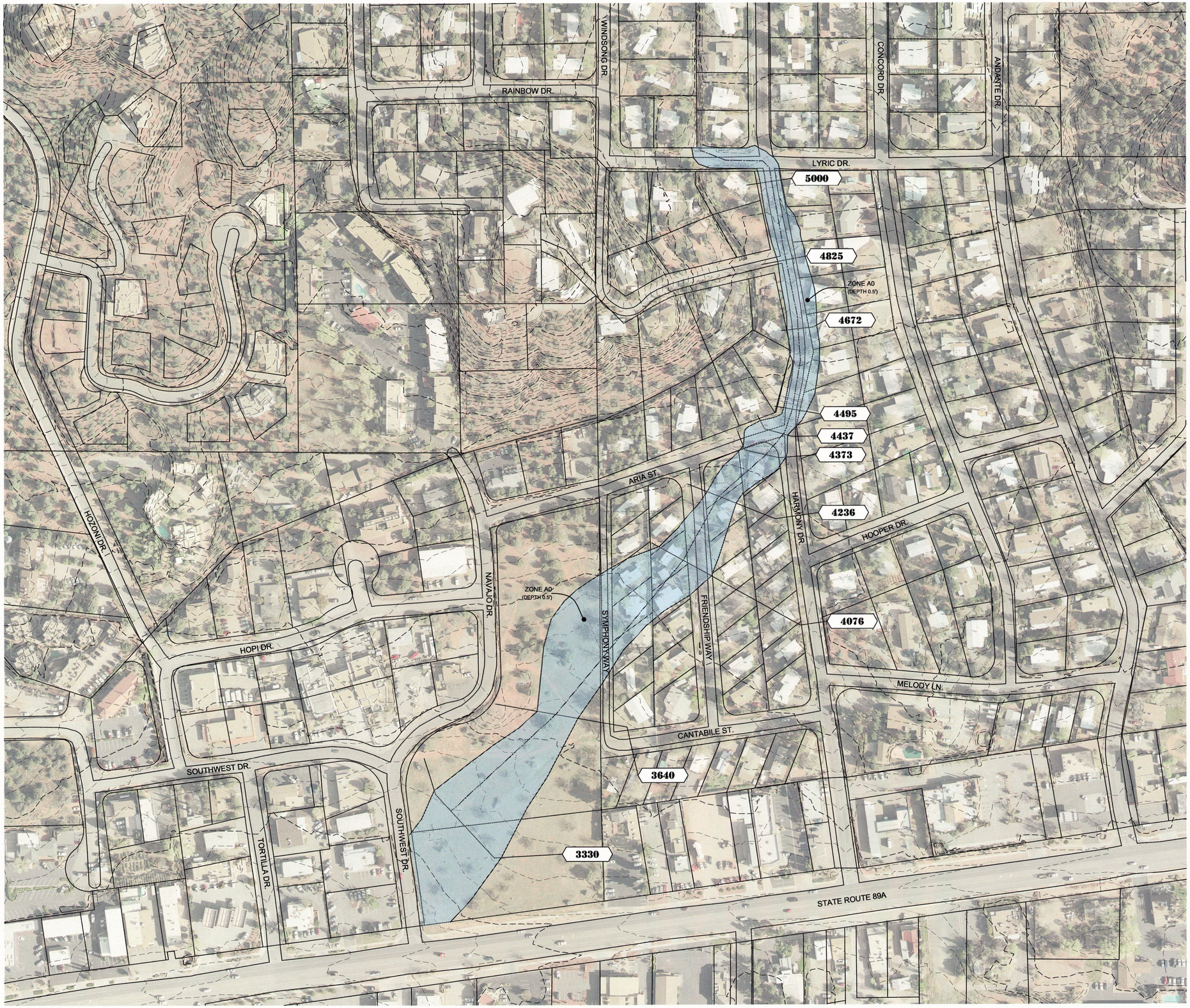
Compute by:	Known Q
Q (cfs)	= 20.00

Highlighted

Q Total (cfs)	= 20.00
Q Capt (cfs)	= 20.00
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 24.59
Efficiency (%)	= 100
Gutter Spread (ft)	= 10.70
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-

All dimensions in feet





LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year), also known as the base flood, is the flood that has a 1 % chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, and AO. The Base Flood Elevation is the water-surface elevation of the 1 % annual chance flood.

ZONE A	No Base Flood Elevation determined
ZONE AE	Base Flood Elevations determined
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding; Base Flood Elevations determined
ZONE AO	Flood depths of 0.5 to 3 feet (usually sheet flow on sloped terrain); average depths determined

FLOODPLAIN BOUNDARY

XXXX — CROSS SECTION ID

N
S

0 50' 100' 200'
SCALE IN FEET

CITY OF SEDONA

Registered Professional Engineer
CERTIFICATE NO.
37322
LUKE A. SEFTON
DATE SIGNED
ARIZONA, U.S.A.

EXPIRES 3/31/2017

HERITAGE LAND SURVEY
& ENGINEERING
P.O. BOX 3270
CAMP VERDE, ARIZONA 86322
PH: (928) 301-5964
dbmcdonald78@gmail.com

SHEET TITLE: 100-YEAR FLOODPLAIN

PROJECT TITLE: CITY OF SEDONA HARMONY

DRAWN BY:	T.C.H.
SCALE:	1'=100'
DATE:	5/1/14
PROJECT NO:	14-0304
SHEET NO.	C-1

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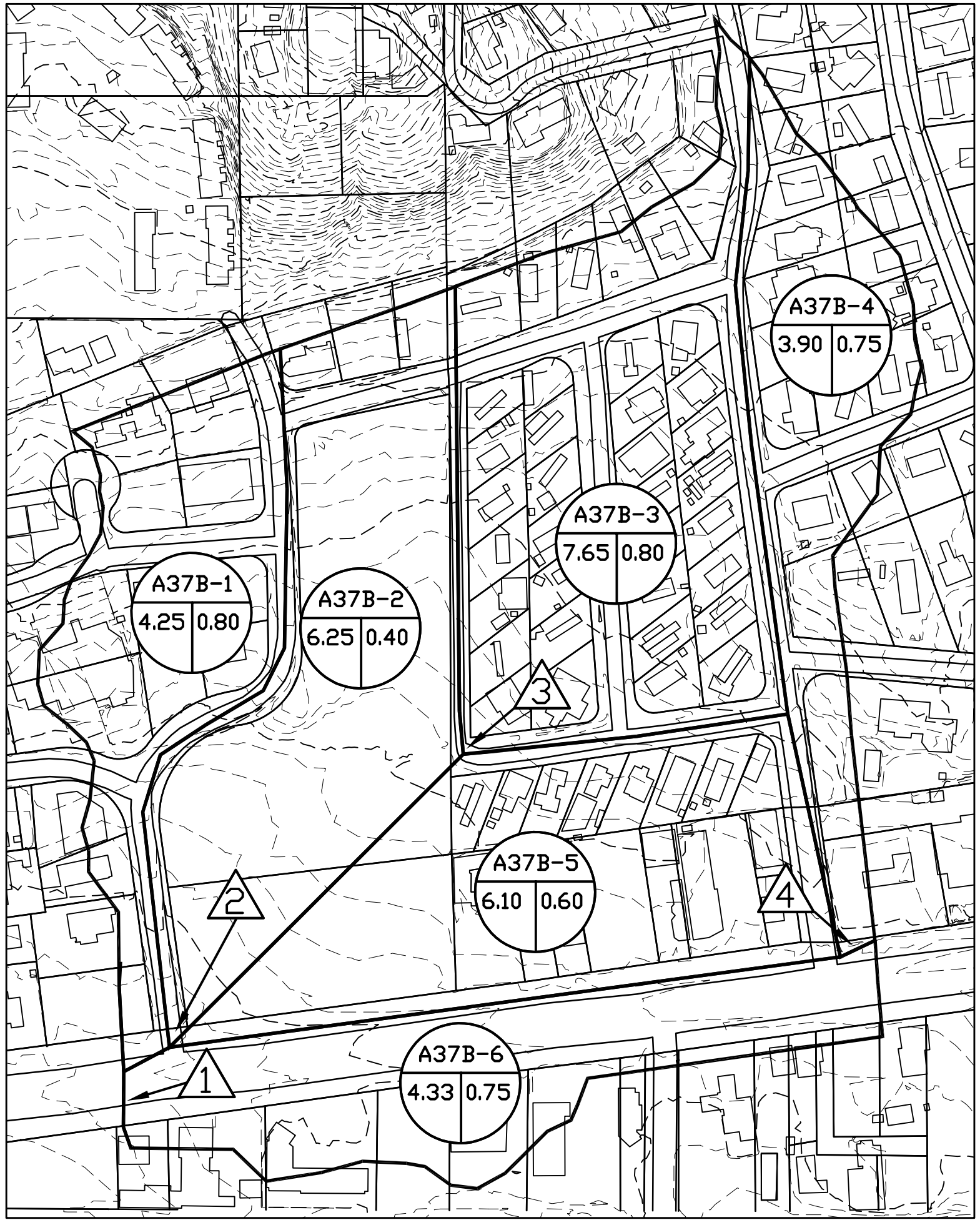

DRAINAGE MAP

PEAK DISCHARGES

SUB-BASIN	*2-yr PEAK (cfs)*	*5-yr PEAK (cfs)*	*10-yr PEAK (cfs)*	*25-yr PEAK (cfs)*	*50-yr PEAK (cfs)*	*100-yr PEAK (cfs)*
A37B-1	-	-	-	*20.60*	-	*27.95*
A37B-2	-	-	-	*15.15*	-	*20.55*
A37B-3	-	-	-	*37.10*	-	*50.30*
A37B-4	-	-	-	*17.70*	-	*24.00*
A37B-5	-	-	-	*22.20*	-	*30.10*
A37B-6	-	-	-	*19.70*	-	*26.70*
DESIGN PT						
1	-	-	-	*132.45*	-	*179.60*
2	-	-	-	*74.45*	-	*100.95*
3	-	-	-	*37.10*	-	*50.30*
4	-	-	-	*17.70*	-	*24.00*

A = BASIN DESIGNATION
B = AREA IN ACRES
C = COMPOSITE RUNOFF COEFFICIENTS

D = DESIGN POINT DESIGNATION

N

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NTS