

Drainage Reports

Abbreviated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

Case File Report



TECHNICAL MEMORANDUM

To: City of Scottsdale
From: HILGARTWILSON
Date: March 13th, 2017
RE: Great Hearts Academies – Scottsdale Preparatory Field Preliminary Drainage Analysis

Introduction and Background

This technical memorandum has been prepared in support of the Great Hearts Academies (GHA) proposed athletic field (the Project) located southwest of Trailside View and 91st Street, east of Pima Road and the 101 Highway, in the City of Scottsdale (the City). Refer to Figure 1 (Vicinity Map). Specifically, this memorandum discusses the regulatory framework in which the Project will be designed in accordance with as well as preliminary drainage considerations.

Future drainage reports will be prepared in accordance with the most current version of the City of Scottsdale (COS) Design Standards & Policies Manual (DSPM) and the Flood Control District of Maricopa County's (FCDMC) current versions of the Drainage Policies and Standards (DPSM), Drainage Design Manuals (DDM) for Maricopa County, - Hydrology and - Hydraulics.

Hydrologic Flow Determination

In July 2013, T.Y. Lin prepared the *Pinnacle Peak South Area Drainage Master Study Draft* (ADMS) (T.Y. Lin 2013) on behalf of the FCDMC that details the hydrologic and hydraulic conditions of a 45 square mile drainage area extending from Frank Lloyd Wright Boulevard to Dynamite Boulevard and from Scottsdale Road into the McDowell Mountains. The primary goal of the study was to characterize regional flows using the most up to date hydrologic study of the watershed referencing the most current land uses, rainfall data, detailed topography, and analysis. The hydrologic and hydraulic analysis for the study area was completed using FLO-2D, a volume conserving, two-dimensional flood routing modeling program best suited for simulating shallow, distributary flows within a watershed. The ADMS reported a worst case scenario flow of 488 cfs entering the northwest corner of the Project via box culverts beneath, as well as overtopping, Trailside View from the north. The ADMS also reported smaller flows for the 100-year, 6-hour and 24-hour events of 217cfs and 257cfs respectively. FLO-2D results from the ADMS are included as Attachment 1.

Site Location Relative to Known FEMA Flood Hazard Zones

The property is located within the Federal Emergency Management Agency's (FEMA) Special Flood Hazard Area (SFHA) Zone AO as delineated on the FEMA Flood Insurance Rate Maps (FIRMS) panel number 04013C1320L, revised October 16, 2013, which are presented on Figure 2 (FEMA Flood Map). The SFHA Zone associated with this Project is defined below.

Zone AO:

The flood insurance rate zone that corresponds to areas subject to inundation by 1-percent annual chance (100-year storm event) shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone.

As the entire Project is located in a FEMA SFHA AO Zone, lowest floor elevations of nonresidential structures shall be elevated to conform to Chapter 37, Article I. Floodplain Management - Special Flood Hazard Areas, Section 37-22 of the Scottsdale Revised Ordinance Code.

Hydraulic Analysis

The 100-year water surface extents of the watercourse through the site were determined in order to identify the anticipated flooding impacts to the proposed field. The preliminary hydraulic analyses for the Project was performed using Hydraflow with parameters referenced from obtained topographic data for the Project. The top widths specified in the Hydraflow results were used to delineate the washes approximate water surface extents. The supporting hydraulic calculations are included as Attachment 2 and the estimated watersurface extents shown on Figure 3 (Drainage Summary Exhibit). It can be seen that based on the current field and parking lot layout, the worst case scenario flows crossing Trailside View do not impact the Project.

Onsite Design Requirements

The proposed Project will comply with the City's required drainage standards as well as Maricopa County Planning and Development Design guidelines and regulations. In accordance with the approved regional drainage report entitled DC Ranch Planning Unit I Part 4 Drainage Plan Study and stormwater storage waiver for the site, onsite stormwater storage is not anticipated to be required.

References

T.Y. Lin, 2013. *Pinnacle Peak South Area Drainage Master Study (Draft)*. Phoenix, Arizona. July 2013.

Attachments

Figure 1: Vicinity Map

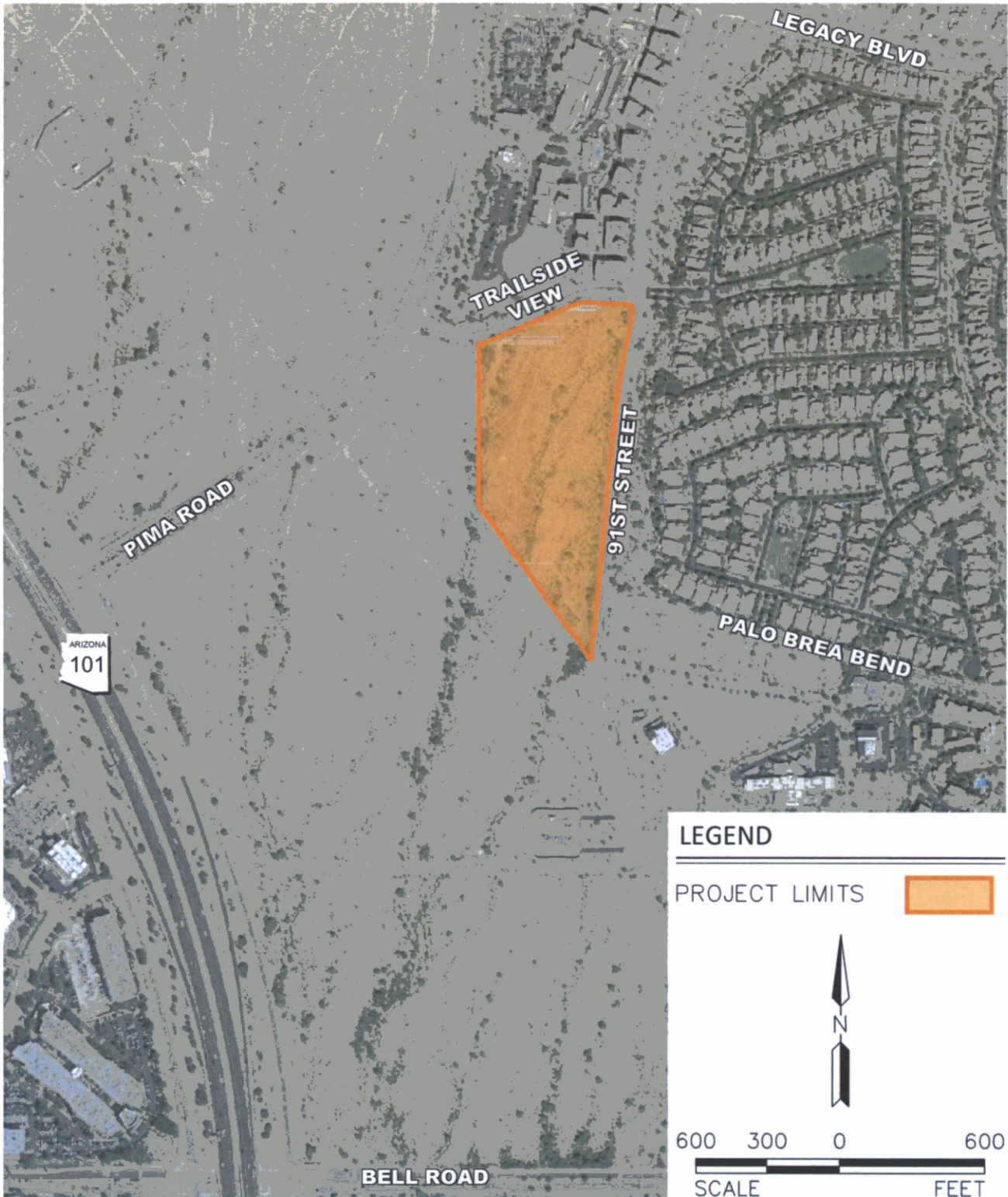
Figure 2: FEMA Flood Map

Figure 3: Drainage Summary Exhibit

Attachment 1: Pinnacle Peak South ADMS FLO-2D Results

Attachment 2: Hydraflow Calculations

HILGARTWILSON, LLC
2141 E Highland Avenue, Suite 250
Phoenix, Arizona 85016-4736
Phone: 602-490-0535



LEGEND

PROJECT LIMITS 



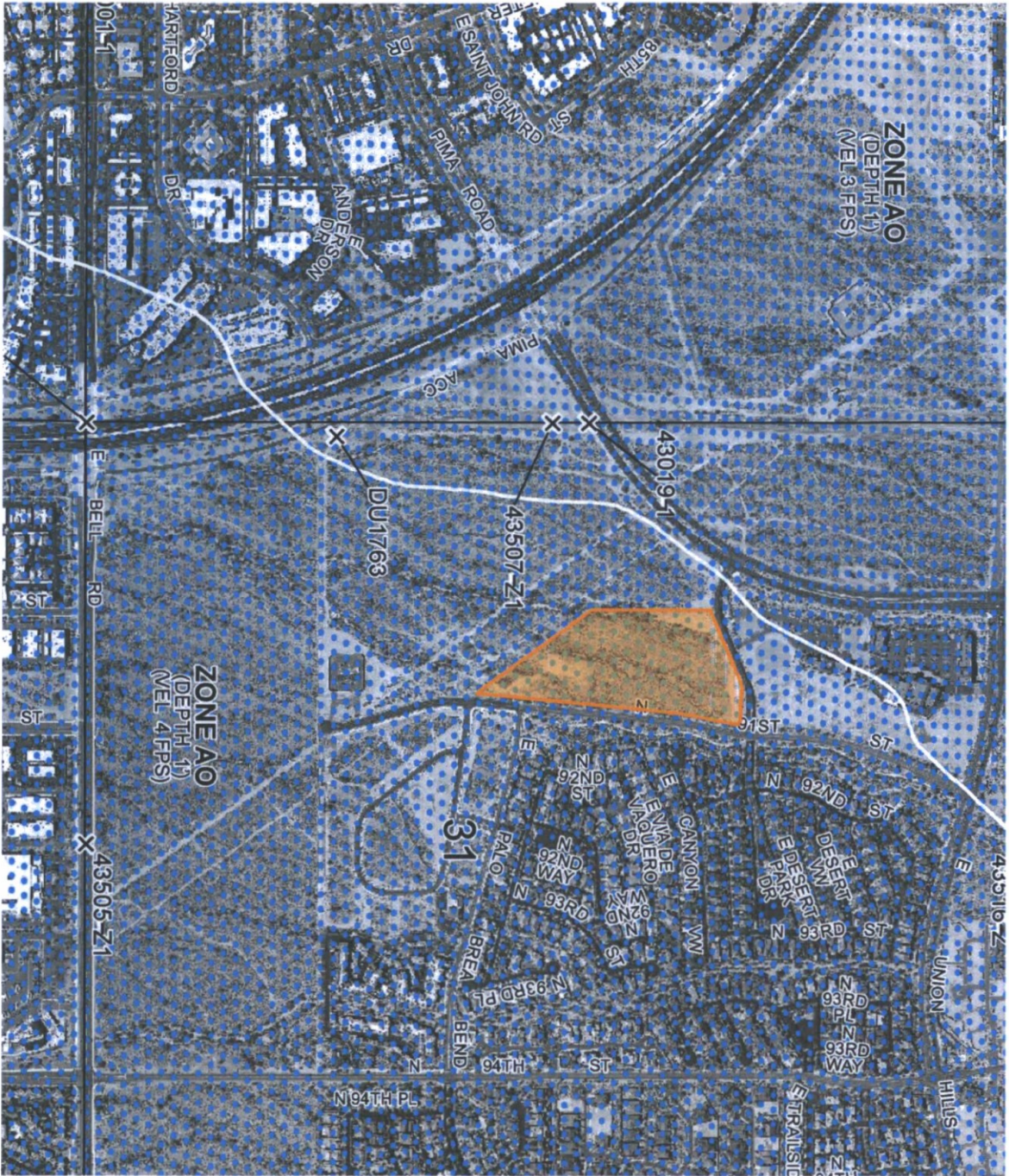
600 300 0 600
SCALE FEET

PROJ.NO.:	1792
DATE:	MAR 2017
SCALE:	1" = 600'
DRAWN BY:	SL
CHECKED BY:	AT

GREAT HEARTS ACADEMIES
 SCOTTSDALE PREPATORY FIELD
 SCOTTSDALE, ARIZONA

FIG. 1: VICINITY MAP


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NATIONAL FLOOD INSURANCE PROGRAM


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

PANEL 1320 OF 4425
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

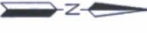
CONTAINS:	NUMBER:	PANEL:	SUFFIX:
ARIZONA COUNTY OF MARICOPA	040007	1320	L
INCORPORATED CITY OF SCOTTSDALE	040012	1320	L


 MAP NUMBER: 04013C1320L
 MAP REVISED: OCTOBER 18, 2013
 Federal Emergency Management Agency

LEGEND

PROJECT LIMITS 

600 300 0 600
SCALE FEET

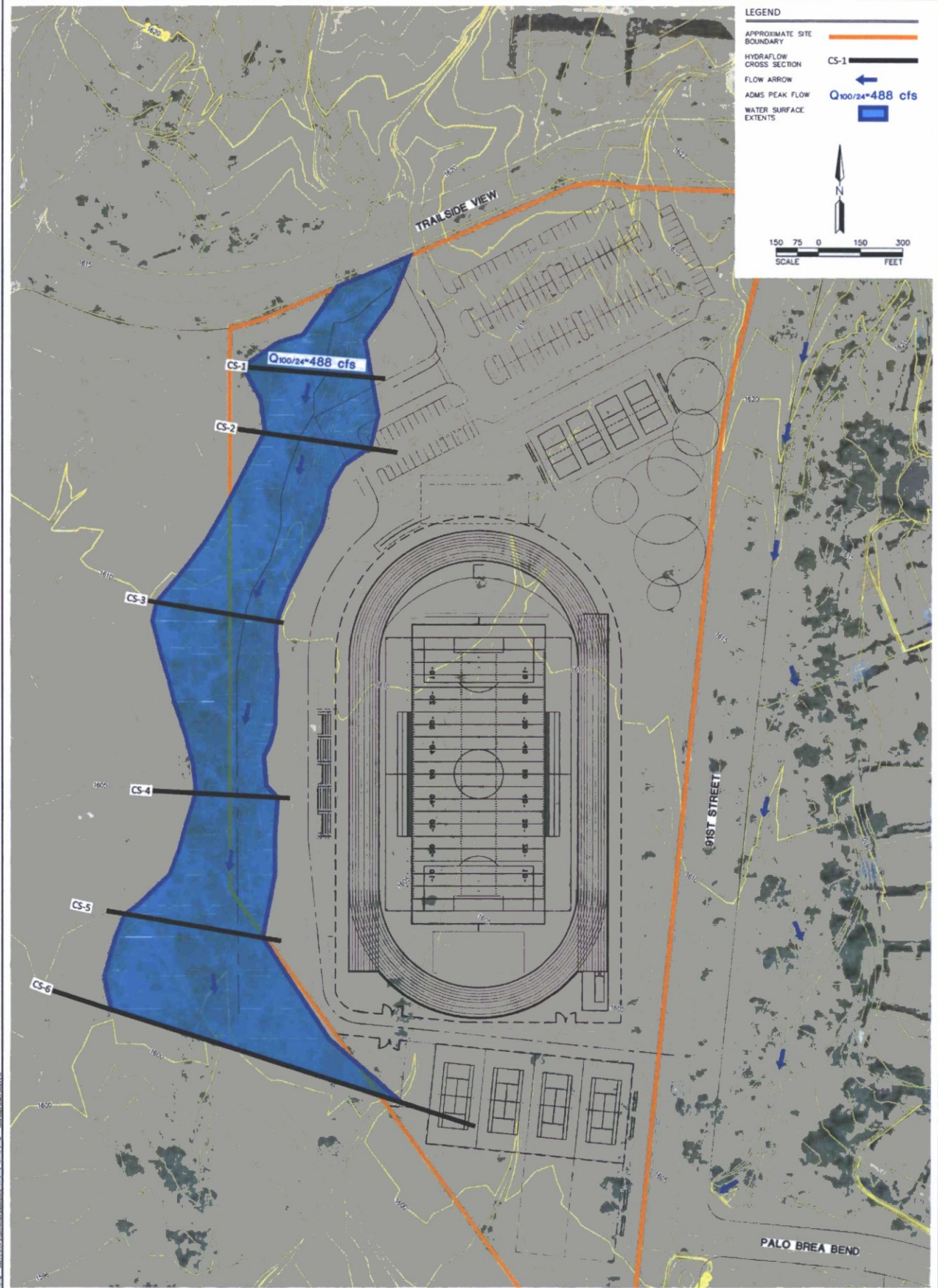


PROJ. NO.:	1792
DATE:	MAR 2017
SCALE:	1" = 600'
DRAWN BY:	SL
CHECKED BY:	AT

GREAT HEARTS ACADEMY
SCOTTSDALE PREPATORY FIELD
SCOTTSDALE, ARIZONA

FIG. 2: FEMA FLOOD MAP


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HILGARTWILSON 2141 E. HIGHLAND AVE., SUITE 200 PHOENIX, AZ 85016 P: 602.490.0535 F: 602.368.2436 WWW.HILGARTWILSON.COM	HILGARTWILSON PROJ NO.: 1792 DATE: MAR. 2017 SCALE: 1" = 50' DRAWN: BB DESIGNED: HW APPROVED: AT
--	---

GREAT HEARTS ACADEMIES
 SCOTTSDALE PREPARATORY FIELD
 SCOTTSDALE, ARIZONA
FIG. 3: PRELIMINARY DRAINAGE SUMMARY EXHIBIT


HILGARTWILSON
 ENGINEER | PLAN | SURVEY | MANAGE
 2141 E. HIGHLAND AVE., SUITE 200 | P. 602.490.0535 / F. 602.368.2436
 PHOENIX, AZ 85016 | www.hilgartwilson.com

REV.:



**ATTACHMENT 1
PINNACLE PEAK SOUTH ADMS FLO-2D RESULTS**

Flo2D Viewer

Model: 2D_PinnaclePeakSouth/100YR6HR_P

725648	725649	725650	725651	725652	725653	725654	725655	725656	725657	725658	725659	725660	725661
88 cfs	1621.34 ft	1622.78 ft	1623.5 ft	1624.56 ft	1625.12 ft	1625.24 ft	1624.9 ft	1622.23 ft	1621.98 ft	4 cfs	9 cfs	13 cfs	15 cfs
726307	726308	726309	726310	726311	726312	726313	726314	726315	726316	726317	726318	726319	726320
16 cfs	1622.39 ft	1622.74 ft	1623.51 ft	1624.85 ft	1625.07 ft	1625.22 ft	1624.23 ft	1621.9 ft	1621.09 ft	1 cfs	21 cfs	17 cfs	13 cfs
726967	726968	726969	726970	726971	726972	726973	726974	726975	726976	726977	726978	726979	726980
13 cfs	1622.26 ft	1622.56 ft	1622.93 ft	1624.5 ft	1624.94 ft	1624.81 ft	1623.31 ft	1620.62 ft	1619.34 ft	16 cfs	20 cfs	1620.22 ft	1621.18 ft
727627	727628	727629	727630	727631	727632	727633	727634	727635	727636	727637	727638	727639	727640
97 cfs	1620.26 ft	1622.02 ft	1621.93 ft	1622.77 ft	1623.32 ft	1622.06 ft	1621.32 ft	1619.25 ft	4 cfs	25 cfs	3 cfs	1620.36 ft	1621.01 ft
728288	728289	728290	728291	728292	728293	728294	728295	728296	728297	728298	728299	728300	728301
84 cfs	74 cfs	1618.59 ft	1620.12 ft	1620 ft	1619.62 ft	1619.6 ft	1618.69 ft	1617.58 ft	17 cfs	16 cfs	1618.56 ft	1619.86 ft	1620.48 ft
728949	728950	728951	728952	728953	728954	728955	728956	728957	728958	728959	728960	728961	728962
1617.54 ft	77 cfs	84 cfs	2 cfs	1616.08 ft	1617.74 ft	1617.53 ft	1617.37 ft	1 cfs	21 cfs	12 cfs	1618.4 ft	1619.42 ft	1620.03 ft
729611	729612	729613	729614	729615	729616	729617	729618	729619	729620	729621	729622	729623	729624
7 cfs	1616.25 ft	65 cfs	123 cfs	56 cfs	1616.48 ft	1616.77 ft	1616.75 ft	9 cfs	23 cfs	1617.2 ft	1618.4 ft	1619.12 ft	1619.8 ft
730273	730274	730275	730276	730277	730278	730279	730280	730281	730282	730283	730284	730285	730286
6 cfs	1614.99 ft	1614.86 ft	104 cfs	105 cfs	1614.42 ft	1616.42 ft	1616.23 ft	23 cfs	10 cfs	1617.1 ft	1617.98 ft	1618.68 ft	1619.31 ft
730936	730937	730938	730939	730940	730941	730942	730943	730944	730945	730946	730947	730948	730949
5 cfs	1 cfs	1614.85 ft	18 cfs	153 cfs	16 cfs	1615.97 ft	1615.75 ft	28 cfs	2 cfs	1616.87 ft	1617.39 ft	1618.06 ft	1618.64 ft
731599	731600	731601	731602	731603	731604	731605	731606	731607	731608	731609	731610	731611	731612
4 cfs	1613.91 ft	1614.23 ft	5 cfs	126 cfs	55 cfs	1615.46 ft	7 cfs	23 cfs	1615.79 ft	1616.46 ft	1616.75 ft	1617.02 ft	1617.64 ft
732263	732264	732265	732266	732267	732268	732269	732270	732271	732272	732273	732274	732275	732276
2 cfs	1613.66 ft	1613.98 ft	6 cfs	88 cfs	62 cfs	1614.78 ft	20 cfs	14 cfs	1615.46 ft	1615.65 ft	1615.93 ft	1616.42 ft	1616.94 ft
732927	732928	732929	732930	732931	732932	732933	732934	732935	732936	732937	732938	732939	732940
1 cfs	1613.34 ft	1613.71 ft	1613.47 ft	117 cfs	10 cfs	4 cfs	24 cfs	1614.41 ft	1614.84 ft	1614.96 ft	1615.72 ft	1615.92 ft	1616.33 ft
733592	733593	733594	733595	733596	733597	733598	733599	733600	733601	733602	733603	733604	733605
1612.63 ft	1613.05 ft	1613.33 ft	1 cfs	116 cfs	12 cfs	8 cfs	18 cfs	1614.23 ft	1 cfs	1614.71 ft	1615.54 ft	1615.5 ft	1615.71 ft
734257	734258	734259	734260	734261	734262	734263	734264	734265	734266	734267	734268	734269	734270
1612.44 ft	1612.71 ft	1612.82 ft	5 cfs	114 cfs	12 cfs	16 cfs	10 cfs	1613.73 ft	1 cfs	1614.66 ft	1615.47 ft	1615.14 ft	1614.94 ft
734923	734924	734925	734926	734927	734928	734929	734930	734931	734932	734933	734934	734935	734936
1612.07 ft	1612.12 ft	1612.21 ft	9 cfs	110 cfs	13 cfs	17 cfs	2 cfs	1613.11 ft	1 cfs	1614.57 ft	1615.12 ft	1614.93 ft	1 cfs

1:774

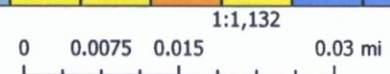


DISCLAIMER: The Flood Control District of Maricopa County (FCD) has made every reasonable effort to obtain and maintain this data as accurately as possible. The FCD assumes no responsibility arising from the use of this information. The data and maps are provided without warranty of any kind, either expressed or implied. The FCD does not guarantee the accuracy, completeness, timeliness or correct sequencing of the data and information requested and hereby expressly disclaims any responsibility for the truth, lack of truth, validity, invalidity, accuracy, inaccuracy, errors or omissions or for the use or results obtained from the use of any said data and information. You, the viewer or user, agree to indemnify the FCD, its officers, and employees from any liability that may arise from any such data or information in its actual or altered form. Any download for commercial intent or resale of this information is prohibited except in accordance with a sublicensing agreement, and will be enforced in accordance with approved FCD policy and Arizona State Statutes 39-121-03. It is ultimately the viewer/users responsibility to verify accuracy prior to acceptance.

Flo2D Viewer

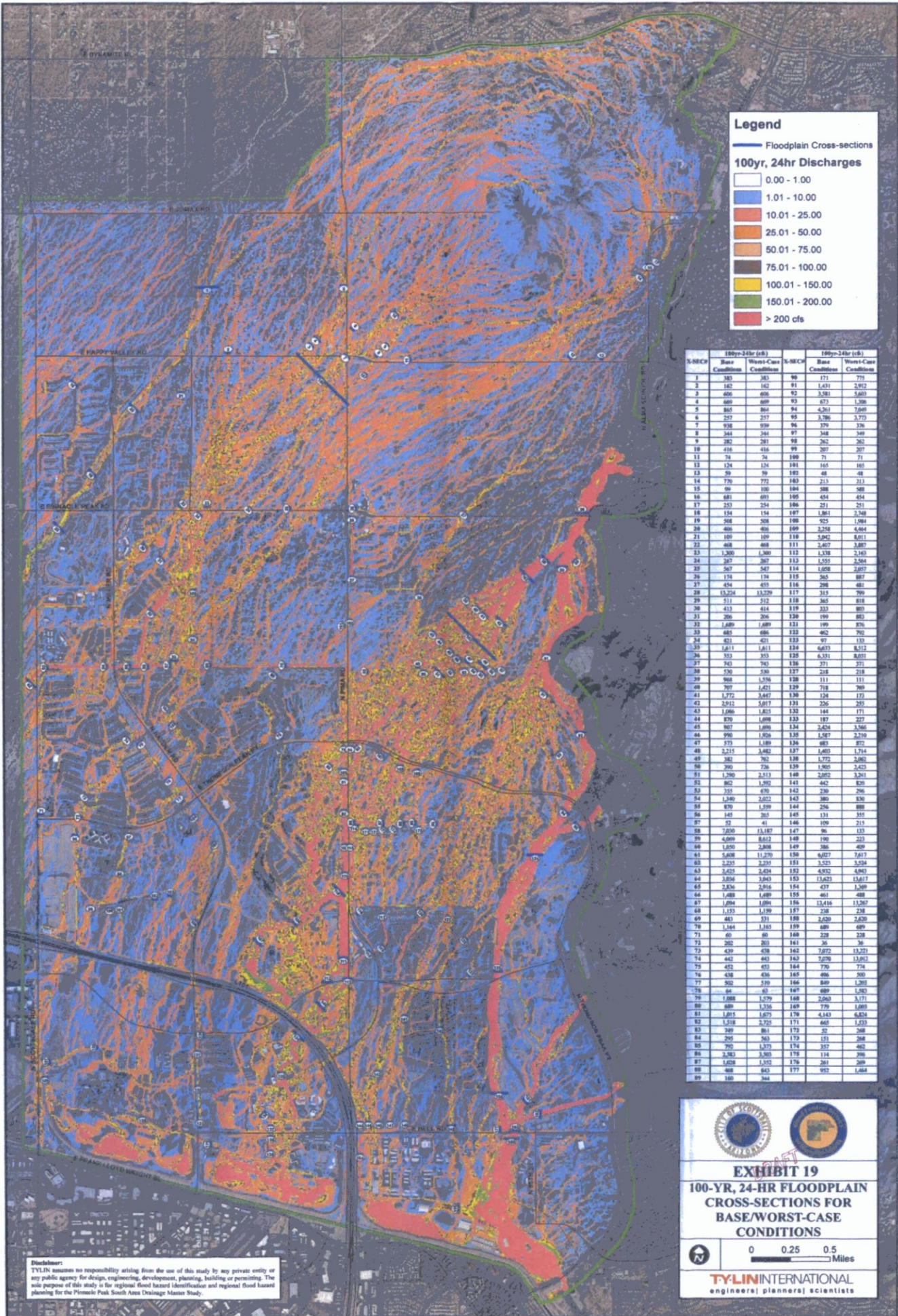
Model: 2D_PinnaclePeakSouth/100YR24HR_P

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2 cfs	2 cfs	2 cfs	3 cfs	66 cfs	101 cfs	1621.34 ft	1622.77 ft	1623.5 ft	1624.56 ft	1625.12 ft	1625.23 ft	1624.89 ft	1622.23 ft	1621.98 ft	4 cfs	11 cfs	15 cfs	17 cfs	24 cfs	25 cfs	14 cfs	10 cfs	25 cfs	36 cfs	47 cfs	32 cfs
726302	726303	726304	726305	726306	726307	726308	726309	726310	726311	726312	726313	726314	726315	726316	726317	726318	726319	726320	726321	726322	726323	726324	726325	726326	726327	726328
2 cfs	2 cfs	2 cfs	3 cfs	13.4 cfs	23 cfs	1622.39 ft	1622.73 ft	1623.51 ft	1624.85 ft	1625.07 ft	1625.22 ft	1624.23 ft	1621.89 ft	1621.08 ft	4 cfs	24 cfs	19 cfs	15 cfs	6 cfs	2 cfs	5 cfs	10 cfs	26 cfs	49 cfs	48 cfs	27 cfs
726962	726963	726964	726965	726966	726967	726968	726969	726970	726971	726972	726973	726974	726975	726976	726977	726978	726979	726980	726981	726982	726983	726984	726985	726986	726987	726988
2 cfs	1 cfs	1 cfs	1619.07 ft	135 cfs	21 cfs	1622.26 ft	1622.55 ft	1622.93 ft	1624.5 ft	1624.94 ft	1624.8 ft	1623.31 ft	1620.62 ft	1619.37 ft	30 cfs	33 cfs	1 cfs	1621.18 ft	1621.67 ft	1621.8 ft	6 cfs	10 cfs	29 cfs	59 cfs	52 cfs	22 cfs
727622	727623	727624	727625	727626	727627	727628	727629	727630	727631	727632	727633	727634	727635	727636	727637	727638	727639	727640	727641	727642	727643	727644	727645	727646	727647	727648
1616.12 ft	1617.08 ft	1 cfs	1618.79 ft	63 cfs	111 cfs	1620.26 ft	1621.02 ft	1621.92 ft	1622.77 ft	1623.32 ft	1622.06 ft	1621.32 ft	1619.34 ft	6 cfs	30 cfs	4 cfs	1620.36 ft	1621.01 ft	1621.22 ft	1620.91 ft	6 cfs	16 cfs	35 cfs	62 cfs	47 cfs	12 cfs
728283	728284	728285	728286	728287	728288	728289	728290	728291	728292	728293	728294	728295	728296	728297	728298	728299	728300	728301	728302	728303	728304	728305	728306	728307	728308	728309
1615.58 ft	1 cfs	2 cfs	4 cfs	1618.52 ft	97 cfs	86 cfs	1618.59 ft	1620.12 ft	1620 ft	1619.62 ft	1619.59 ft	1618.69 ft	1617.59 ft	22 cfs	20 cfs	1618.58 ft	1619.86 ft	1620.48 ft	1620.56 ft	1620.13 ft	9 cfs	24 cfs	45 cfs	56 cfs	36 cfs	9 cfs
728944	728945	728946	728947	728948	728949	728950	728951	728952	728953	728954	728955	728956	728957	728958	728959	728960	728961	728962	728963	728964	728965	728966	728967	728968	728969	728970
1615.06 ft	2 cfs	2 cfs	1 cfs	1617.17 ft	1617.54 ft	90 cfs	95 cfs	4 cfs	1616.08 ft	1617.74 ft	1617.52 ft	1617.37 ft	2 cfs	27 cfs	14 cfs	1618.4 ft	1619.41 ft	1620.03 ft	1620.03 ft	2 cfs	17 cfs	34 cfs	43 cfs	50 cfs	27 cfs	11 cfs
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1 cfs	3 cfs	1 cfs	1615.66 ft	1 cfs	8 cfs	1616.25 ft	77 cfs	119 cfs	51 cfs	1616.48 ft	1616.77 ft	1616.79 ft	13 cfs	27 cfs	1617.2 ft	1618.4 ft	1619.11 ft	1619.8 ft	1619.77 ft	4 cfs	23 cfs	36 cfs	41 cfs	47 cfs	20 cfs	11 cfs
730268	730269	730270	730271	730272	730273	730274	730275	730276	730277	730278	730279	730280	730281	730282	730283	730284	730285	730286	730287	730288	730289	730290	730291	730292	730293	730294
1614.21 ft	3 cfs	1614.77 ft	1615.05 ft	3 cfs	6 cfs	1614.99 ft	1614.87 ft	119 cfs	129 cfs	1614.42 ft	1616.42 ft	1616.26 ft	29 cfs	11 cfs	1617.1 ft	1617.97 ft	1618.68 ft	1619.31 ft	1619.32 ft	5 cfs	23 cfs	41 cfs	45 cfs	45 cfs	17 cfs	14 cfs
730931	730932	730933	730934	730935	730936	730937	730938	730939	730940	730941	730942	730943	730944	730945	730946	730947	730948	730949	730950	730951	730952	730953	730954	730955	730956	730957
2 cfs	3 cfs	1614.39 ft	1614.37 ft	3 cfs	5 cfs	1 cfs	1614.85 ft	23 cfs	177 cfs	18 cfs	1615.97 ft	2 cfs	33 cfs	4 cfs	1616.86 ft	1617.38 ft	1618.06 ft	1618.64 ft	1618.83 ft	2 cfs	24 cfs	40 cfs	52 cfs	44 cfs	21 cfs	16 cfs
731594	731595	731596	731597	731598	731599	731600	731601	731602	731603	731604	731605	731606	731607	731608	731609	731610	731611	731612	731613	731614	731615	731616	731617	731618	731619	731620
4 cfs	1613.32 ft	1613.71 ft	1613.68 ft	4 cfs	5 cfs	1613.91 ft	1614.23 ft	8 cfs	141 cfs	69 cfs	1615.47 ft	9 cfs	28 cfs	1615.8 ft	1616.46 ft	1616.74 ft	1617.02 ft	1617.63 ft	1618.12 ft	1 cfs	17 cfs	37 cfs	73 cfs	39 cfs	21 cfs	21 cfs
732258	732259	732260	732261	732262	732263	732264	732265	732266	732267	732268	732269	732270	732271	732272	732273	732274	732275	732276	732277	732278	732279	732280	732281	732282	732283	732284
2 cfs	1612.83 ft	1612.9 ft	2 cfs	5 cfs	4 cfs	1613.66 ft	1613.98 ft	8 cfs	97 cfs	80 cfs	1614.79 ft	25 cfs	17 cfs	1615.46 ft	1615.65 ft	1615.92 ft	1616.48 ft	1616.94 ft	1617.51 ft	1617.78 ft	13 cfs	39 cfs	72 cfs	43 cfs	26 cfs	26 cfs
732922	732923	732924	732925	732926	732927	732928	732929	732930	732931	732932	732933	732934	732935	732936	732937	732938	732939	732940	732941	732942	732943	732944	732945	732946	732947	732948
2 cfs	1612.11 ft	1 cfs	2 cfs	5 cfs	1 cfs	1613.34 ft	1613.71 ft	1613.48 ft	136 cfs	14 cfs	6 cfs	28 cfs	3 cfs	1614.83 ft	1614.95 ft	1615.72 ft	1615.92 ft	1616.32 ft	1616.81 ft	1617.04 ft	12 cfs	58 cfs	55 cfs	44 cfs	35 cfs	20 cfs
733587	733588	733589	733590	733591	733592	733593	733594	733595	733596	733597	733598	733599	733600	733601	733602	733603	733604	733605	733606	733607	733608	733609	733610	733611	733612	733613
1 cfs	1611.78 ft	3 cfs	6 cfs	2 cfs	1612.64 ft	1613.06 ft	1613.33 ft	3 cfs	132 cfs	19 cfs	12 cfs	22 cfs	1614.24 ft	1614.31 ft	1614.7 ft	1615.54 ft	1615.48 ft	1615.71 ft	1615.94 ft	1616.05 ft	20 cfs	62 cfs	52 cfs	59 cfs	32 cfs	11 cfs
734252	734253	734254	734255	734256	734257	734258	734259	734260	734261	734262	734263	734264	734265	734266	734267	734268	734269	734270	734271	734272	734273	734274	734275	734276	734277	734278
1611.17 ft	1611.15 ft	6 cfs	3 cfs	1611.97 ft	1612.45 ft	1612.72 ft	1612.83 ft	8 cfs	128 cfs	18 cfs	20 cfs	13 cfs	1613.73 ft	1 cfs	1614.65 ft	1615.47 ft	1615.13 ft	1614.94 ft	1615.01 ft	2 cfs	44 cfs	46 cfs	80 cfs	40 cfs	30 cfs	8 cfs
734918	734919	734920	734921	734922	734923	734924	734925	734926	734927	734928	734929	734930	734931	734932	734933	734934	734935	734936	734937	734938	734939	734940	734941	734942	734943	734944
1610.67 ft	4 cfs	6 cfs	1 cfs	1611.93 ft	1612.08 ft	1612.13 ft	1612.22 ft	13 cfs	124 cfs	17 cfs	21 cfs	4 cfs	1613.11 ft	1 cfs	1614.57 ft	1615.12 ft	1614.93 ft	1614.37 ft	4 cfs	9 cfs	55 cfs	68 cfs	66 cfs	23 cfs	10 cfs	5 cfs



DISCLAIMER: The Flood Control District of Maricopa County (FCD) has made every reasonable effort to obtain and maintain this data as accurately as possible. The FCD assumes no responsibility arising from the use of this information. The data and maps are provided without warranty of any kind, either expressed or implied. The FCD does not guarantee the accuracy, completeness, timeliness or correct sequencing of the data and information requested and hereby expressly disclaims any responsibility for the truth, lack of truth, validity, invalidity, accuracy, inaccuracy, errors or omissions or for the use or results obtained from the use of any said data and information. You, the viewer or user, agree to indemnify the FCD, its officers, and employees from any liability that may arise from any such data or information in its actual or altered form. Any download for commercial intent or resale of this information is prohibited except in accordance with a sublicensing agreement, and will be enforced in accordance with approved FCD policy and Arizona State Statutes 39-121-03. It is ultimately the viewer/users responsibility to verify accuracy prior to acceptance.

PINNACLE PEAK SOUTH ADMS



Legend

Floodplain Cross-sections

100yr, 24hr Discharges

- 0.00 - 1.00
- 1.01 - 10.00
- 10.01 - 25.00
- 25.01 - 50.00
- 50.01 - 75.00
- 75.01 - 100.00
- 100.01 - 150.00
- 150.01 - 200.00
- > 200 cfs

S-NEC#	100yr-24hr (cfs)		100yr-24hr (cfs)	
	Base Conditions	Worst-Case Conditions	Base Conditions	Worst-Case Conditions
1	383	383	99	771
2	142	492	41	1,431
3	496	496	92	2,281
4	669	669	93	671
5	865	864	94	4,261
6	257	257	95	2,726
7	938	939	96	379
8	344	344	97	348
9	282	281	98	262
10	416	416	99	207
11	74	74	100	71
12	124	124	101	165
13	39	39	102	48
14	776	772	103	213
15	99	100	104	588
16	681	691	105	454
17	253	244	106	251
18	154	154	107	1,861
19	508	508	108	925
20	406	406	109	3,254
21	109	109	110	3,842
22	408	408	111	2,407
23	1,300	1,300	112	1,338
24	287	287	113	1,551
25	267	267	114	1,028
26	174	174	115	565
27	454	455	116	298
28	13,224	13,229	117	315
29	511	512	118	365
30	412	414	119	333
31	286	286	120	199
32	1,489	1,489	121	876
33	485	484	122	462
34	421	421	123	97
35	1,811	1,811	124	6,033
36	353	353	125	8,331
37	743	743	126	371
38	530	530	127	218
39	968	1,276	128	111
40	707	1,421	129	718
41	1,772	1,447	130	124
42	2,913	1,617	131	226
43	1,066	1,815	132	144
44	476	1,498	133	187
45	907	1,096	134	2,424
46	996	1,826	135	1,587
47	573	1,189	136	983
48	2,215	1,482	137	1,403
49	382	762	138	1,772
50	390	736	139	1,805
51	1,760	2,413	140	2,025
52	862	1,592	141	442
53	355	670	142	230
54	1,349	2,022	143	389
55	876	1,599	144	256
56	145	265	145	131
57	52	41	146	109
58	2,020	13,187	147	86
59	4,069	8,617	148	189
60	1,050	2,808	149	386
61	5,608	11,270	150	6,027
62	2,225	2,225	151	3,525
63	2,425	2,424	152	4,852
64	3,034	3,043	153	13,623
65	2,826	2,816	154	437
66	1,488	1,488	155	469
67	1,094	1,094	156	13,416
68	1,153	1,139	157	238
69	483	531	158	2,620
70	6,144	1,285	159	489
71	60	60	160	228
72	202	203	161	36
73	439	438	162	2,072
74	442	483	163	2,078
75	452	453	164	776
76	438	436	165	486
77	502	519	166	849
78	64	67	167	609
79	1,088	1,579	168	2,963
80	689	1,336	169	779
81	1,815	1,675	170	4,143
82	1,518	2,725	171	665
83	249	861	172	52
84	295	563	173	151
85	292	1,273	174	352
86	3,263	3,563	175	114
87	1,028	1,312	176	261
88	468	843	177	952
89	160	364		

Disclaimer:
TYLIN assumes no responsibility arising from the use of this study by any private entity or any public agency for design, engineering, development, planning, building or permitting. The sole purpose of this study is for regional flood hazard identification and regional flood hazard planning for the Pinnacle Peak South Area Drainage Master Study.




EXHIBIT 19
100-YR, 24-HR FLOODPLAIN CROSS-SECTIONS FOR BASE/WORST-CASE CONDITIONS

0 0.25 0.5 Miles

TYLIN INTERNATIONAL
engineers | planners | scientists



**ATTACHMENT 2
HYDRAFLOW CALCULATIONS**

Channel Report

CS-1

User-defined

Invert Elev (ft) = 1614.00
Slope (%) = 1.75
N-Value = 0.032

Calculations

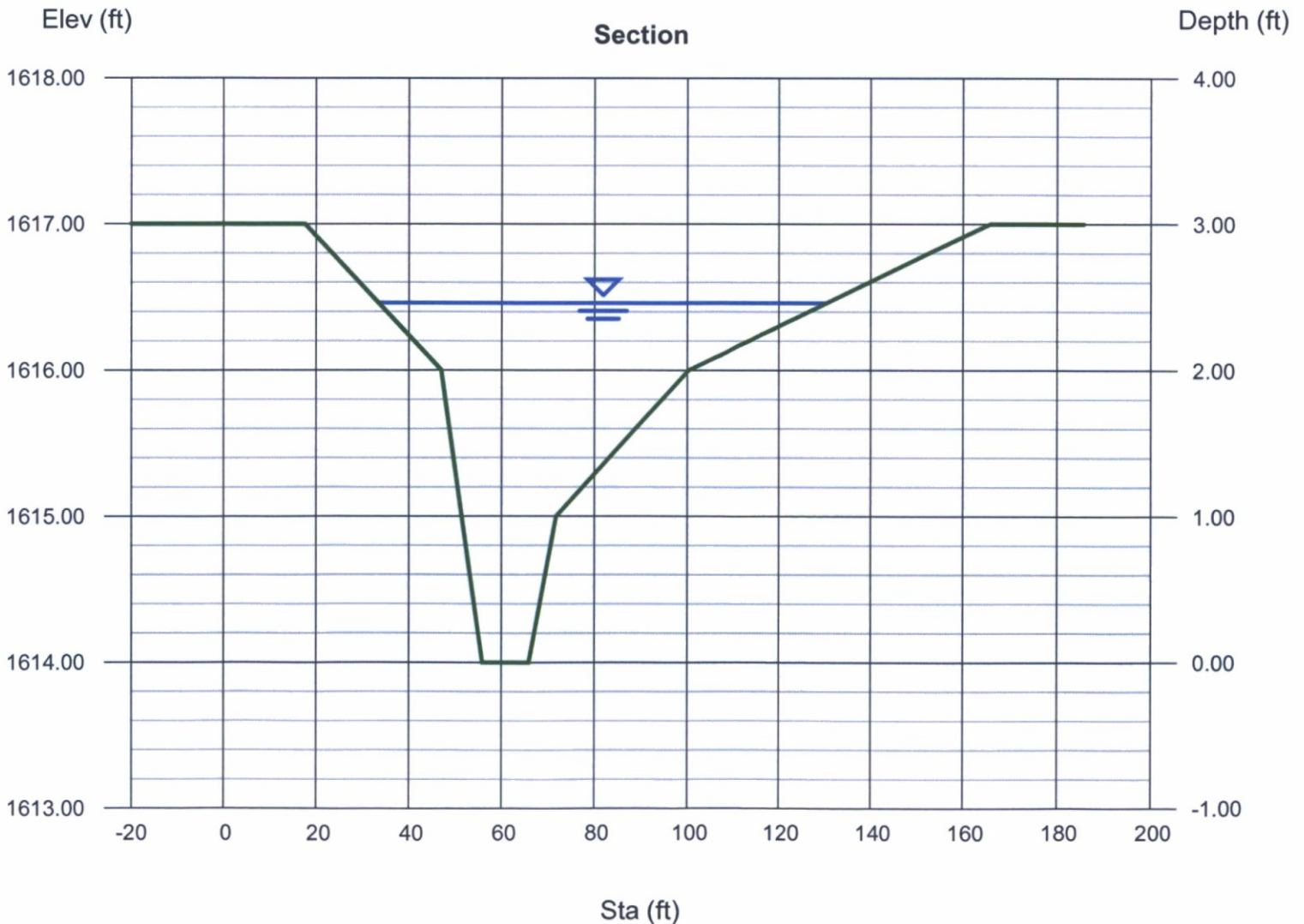
Compute by: Known Q
Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 2.46
Q (cfs) = 488.00
Area (sqft) = 86.59
Velocity (ft/s) = 5.64
Wetted Perim (ft) = 97.24
Crit Depth, Yc (ft) = 2.51
Top Width (ft) = 96.90
EGL (ft) = 2.95

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

(0.00, 1617.00)-(17.60, 1617.00, 0.032)-(47.00, 1616.00, 0.032)-(51.40, 1615.00, 0.032)-(55.90, 1614.00, 0.032)-(65.90, 1614.00, 0.032)-(71.80, 1615.00, 0.032)-(100.30, 1616.00, 0.032)-(165.70, 1617.00, 0.032)



Channel Report

CS-2

User-defined

Invert Elev (ft) = 1611.00
Slope (%) = 1.13
N-Value = 0.032

Calculations

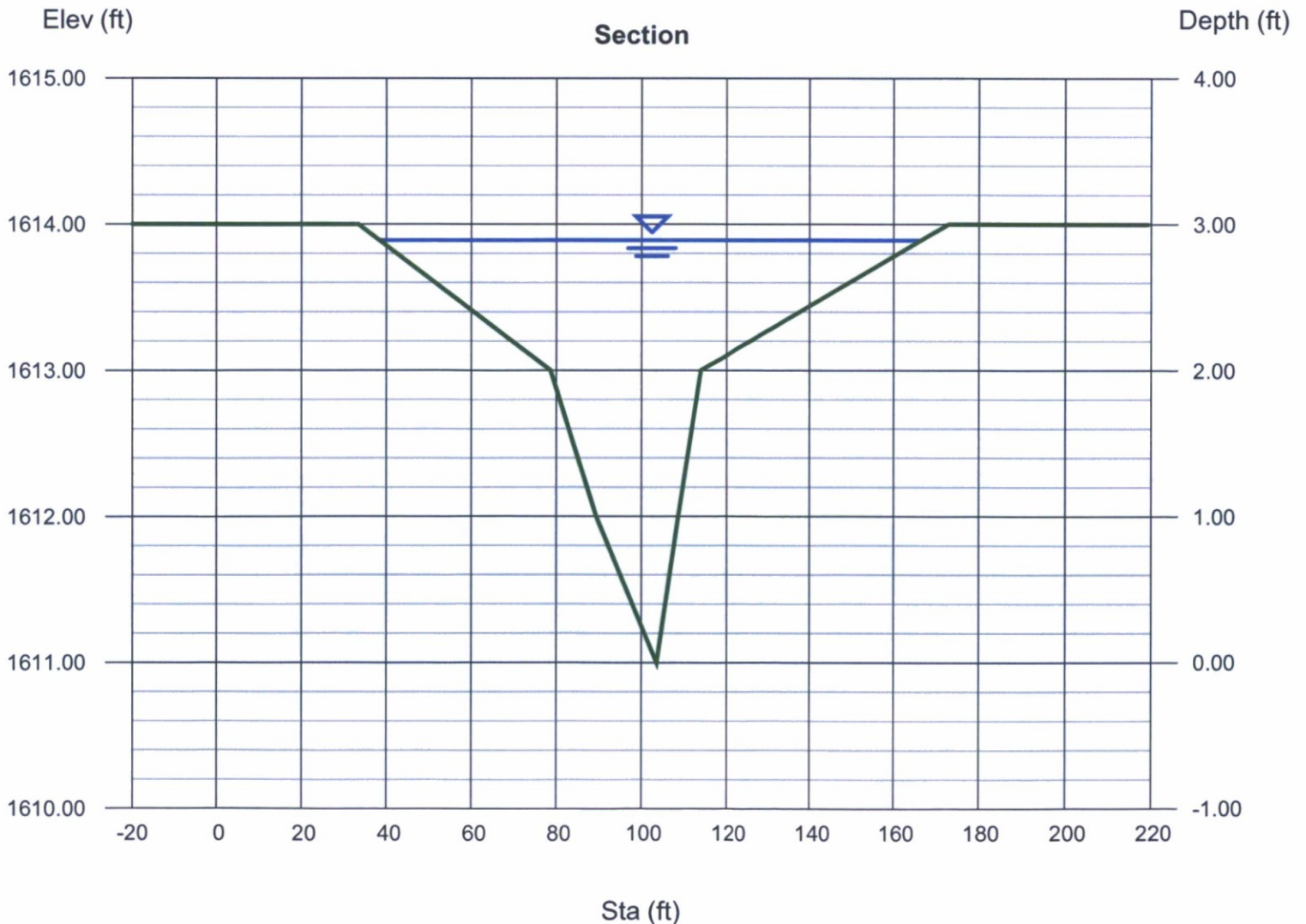
Compute by: Known Q
Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 2.89
Q (cfs) = 488.00
Area (sqft) = 109.68
Velocity (ft/s) = 4.45
Wetted Perim (ft) = 128.42
Crit Depth, Yc (ft) = 2.77
Top Width (ft) = 128.13
EGL (ft) = 3.20

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

(0.00, 1614.00)-(33.40, 1614.00, 0.032)-(78.70, 1613.00, 0.032)-(89.40, 1612.00, 0.032)-(103.60, 1611.00, 0.032)-(108.70, 1612.00, 0.032)-(114.00, 1613.00, 0.032)-(173.00, 1614.00, 0.032)-(199.30, 1614.00, 0.032)



Channel Report

CS-3

User-defined

Invert Elev (ft) = 1608.00
Slope (%) = 2.33
N-Value = 0.032

Calculations

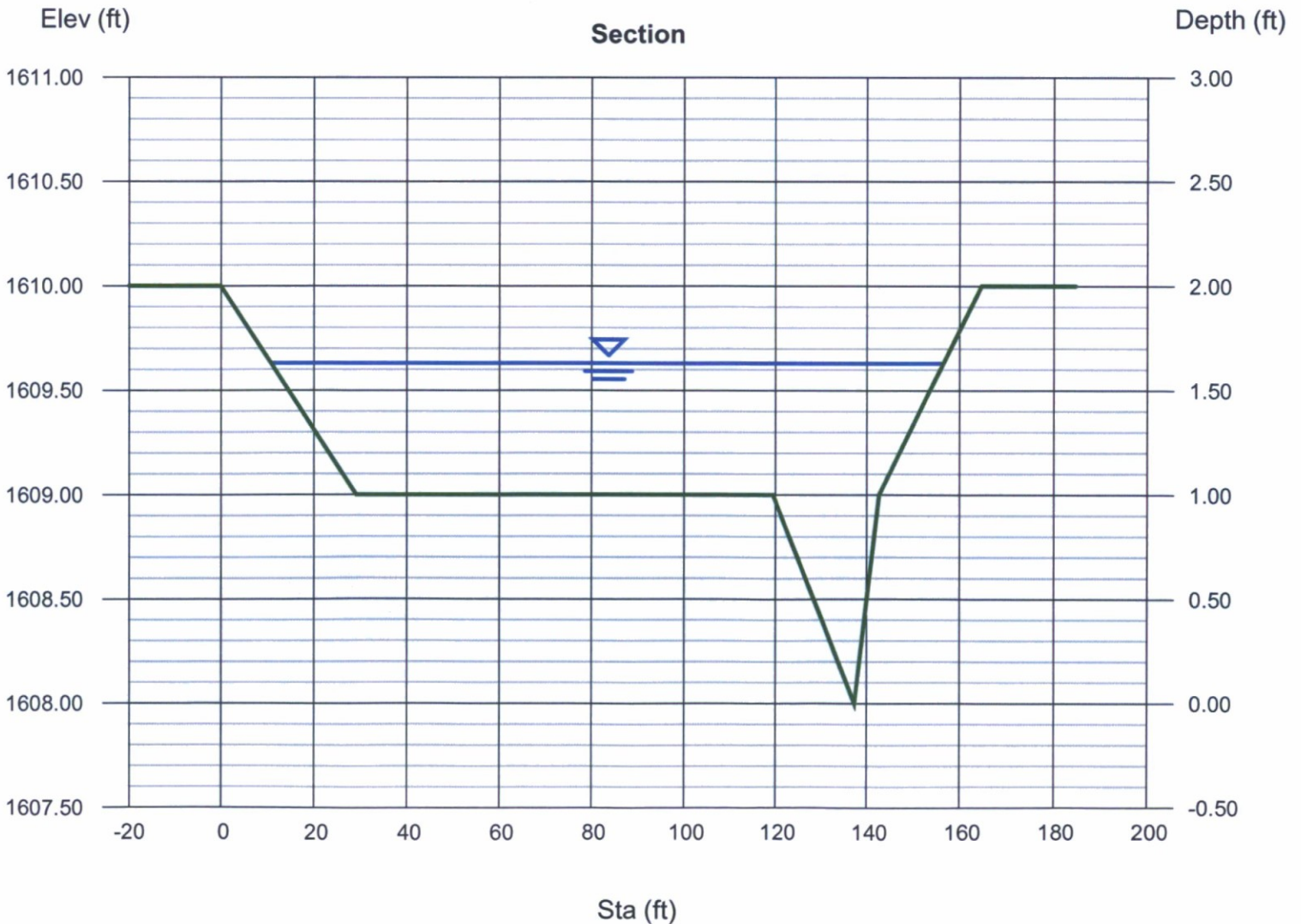
Compute by: Known Q
Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 1.63
Q (cfs) = 488.00
Area (sqft) = 93.31
Velocity (ft/s) = 5.23
Wetted Perim (ft) = 145.94
Crit Depth, Yc (ft) = 1.70
Top Width (ft) = 145.79
EGL (ft) = 2.06

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

(0.00, 1610.00)-(29.10, 1609.00, 0.032)-(119.50, 1609.00, 0.032)-(137.40, 1608.00, 0.032)-(142.70, 1609.00, 0.032)-(164.70, 1610.00, 0.032)



Channel Report

CS-4

User-defined

Invert Elev (ft) = 1604.00
Slope (%) = 2.06
N-Value = 0.032

Calculations

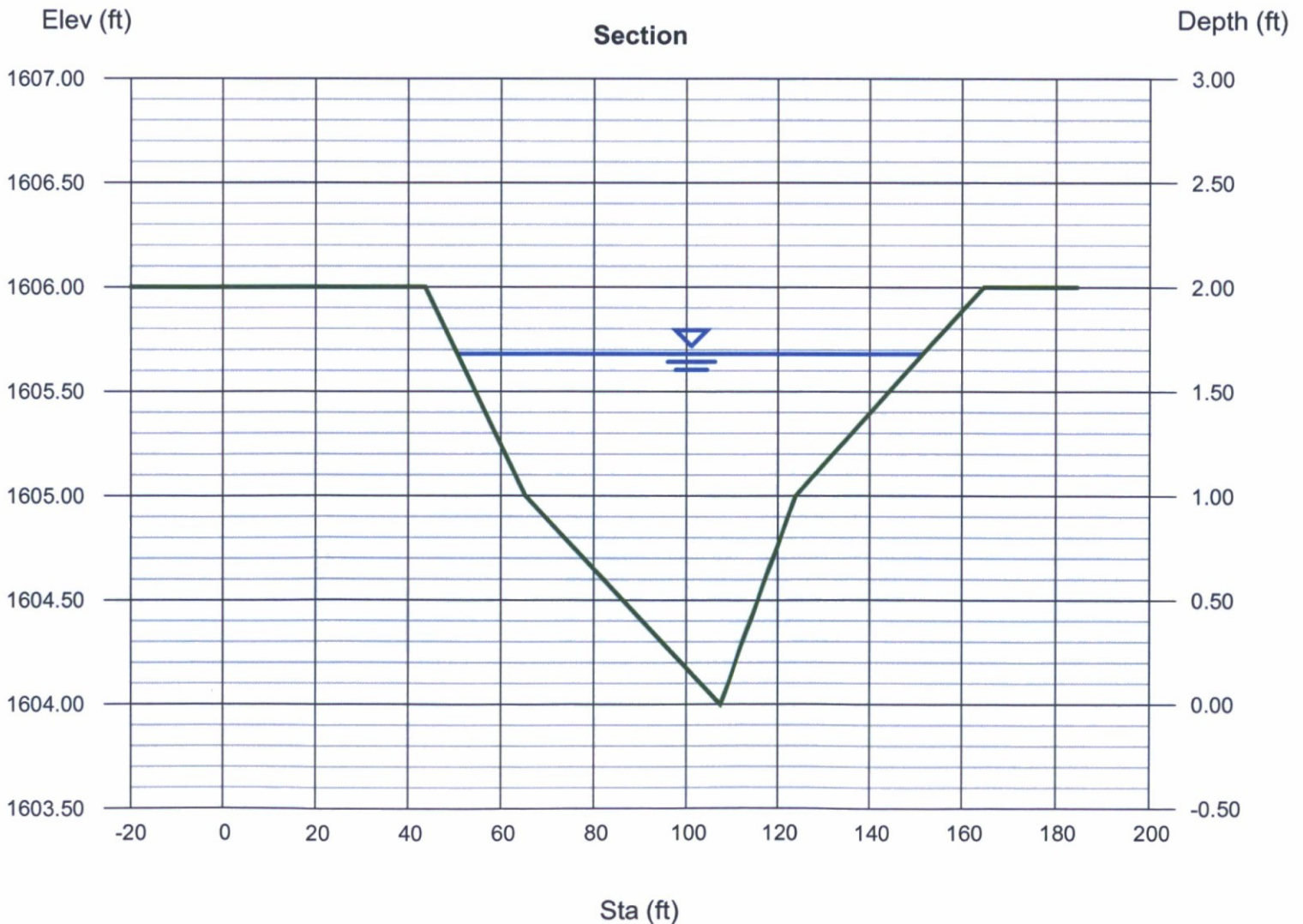
Compute by: Known Q
Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 1.68
Q (cfs) = 488.00
Area (sqft) = 83.56
Velocity (ft/s) = 5.84
Wetted Perim (ft) = 101.03
Crit Depth, Yc (ft) = 1.77
Top Width (ft) = 100.97
EGL (ft) = 2.21

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

(0.00, 1606.00)-(43.70, 1606.00, 0.032)-(65.30, 1605.00, 0.032)-(107.40, 1604.00, 0.032)-(123.90, 1605.00, 0.032)-(164.60, 1606.00, 0.032)



Channel Report

CS-5

User-defined

Invert Elev (ft) = 1601.00
 Slope (%) = 1.82
 N-Value = 0.032

Calculations

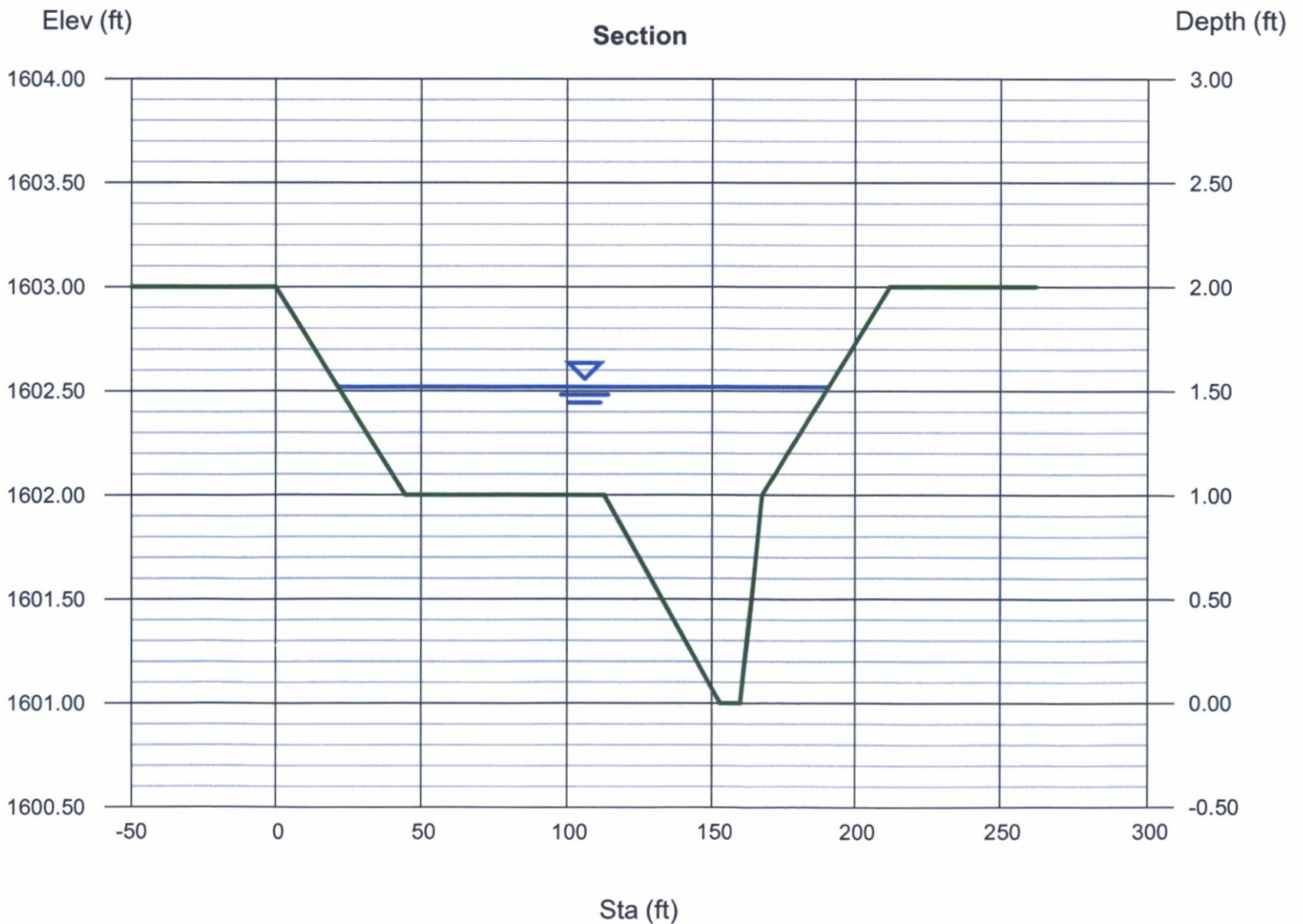
Compute by: Known Q
 Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 1.52
 Q (cfs) = 488.00
 Area (sqft) = 107.17
 Velocity (ft/s) = 4.55
 Wetted Perim (ft) = 169.48
 Crit Depth, Yc (ft) = 1.53
 Top Width (ft) = 169.39
 EGL (ft) = 1.84

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

(0.00, 1603.00)-(44.70, 1602.00, 0.032)-(112.80, 1602.00, 0.032)-(152.80, 1601.00, 0.032)-(160.20, 1601.00, 0.032)-(167.70, 1602.00, 0.032)-(212.20, 1603.00, 0.0)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.

Monday, Mar 13 2017

CS-6

User-defined

Invert Elev (ft) = 1600.00
Slope (%) = 1.62
N-Value = 0.032

Calculations

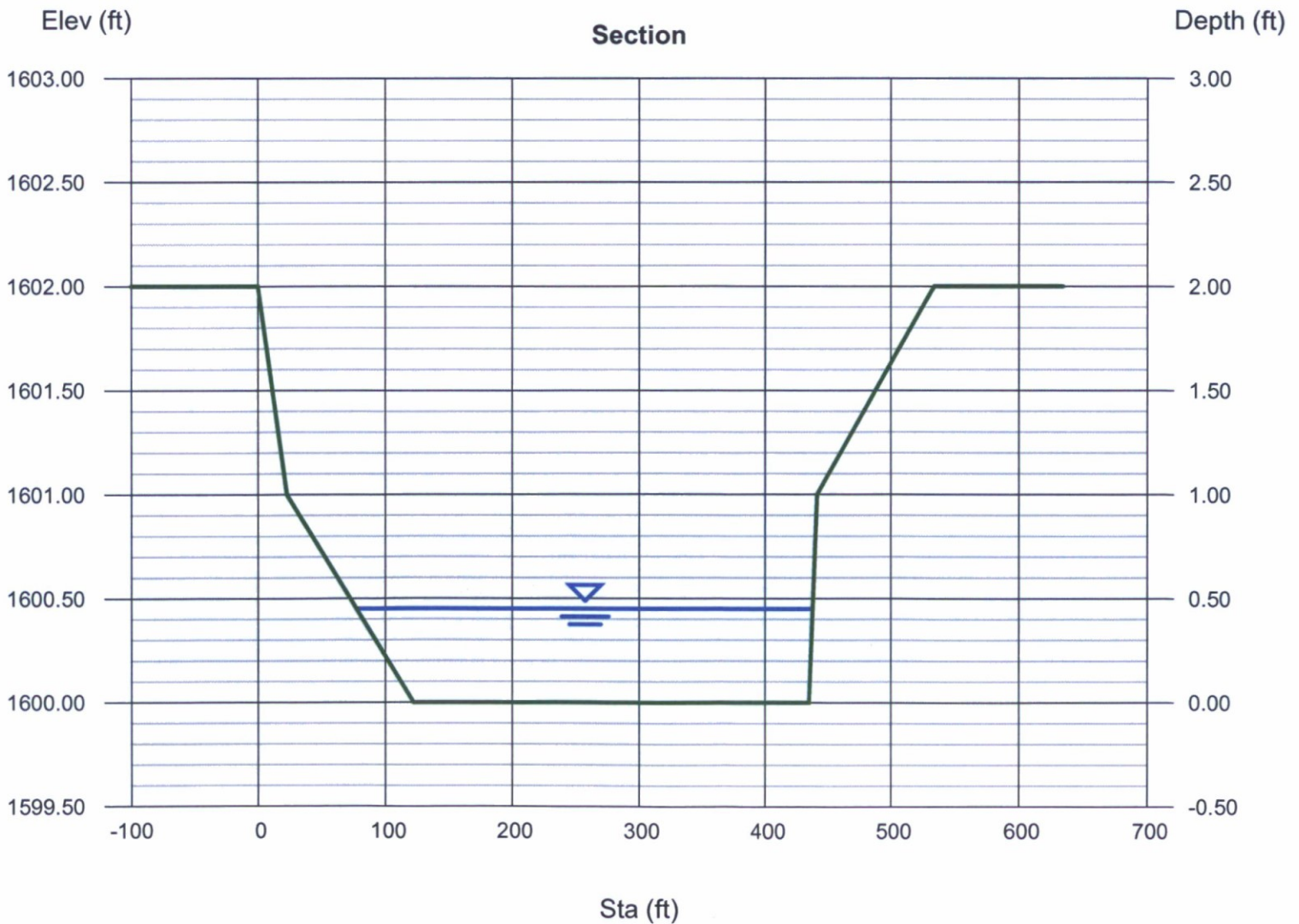
Compute by: Known Q
Known Q (cfs) = 488.00

Highlighted

Depth (ft) = 0.45
Q (cfs) = 488.00
Area (sqft) = 151.55
Velocity (ft/s) = 3.22
Wetted Perim (ft) = 360.69
Crit Depth, Yc (ft) = 0.42
Top Width (ft) = 360.65
EGL (ft) = 0.61

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

(0.00, 1602.00)-(22.60, 1601.00, 0.032)-(122.10, 1600.00, 0.032)-(435.10, 1600.00, 0.032)-(441.50, 1601.00, 0.032)-(534.40, 1602.00, 0.032)





MEMORANDUM

To: City of Scottsdale
From: HILGARTWILSON, LLC
Date: March 13, 2017
RE: Great Hearts Academies – Scottsdale Preparatory Field Water and Sewer Analysis
Project No.: 1792

Introduction and Background

This technical memorandum has been prepared to identify and evaluate the anticipated water and sewer requirements for the Great Hearts Academies (GHA) Scottsdale Preparatory Field (the Project) located southwest of Trailside View and 91st Street, east of Pima Road and the 101 Highway, in the City of Scottsdale (the City). This evaluation was prepared in accordance with the most current version of the City of Scottsdale (COS) Design Standards & Policies Manual (DSPM).

Currently, the proposed location of the Project is undeveloped desert land that generally from the north to the south.

The proposed development would include a soccer/football field with bleachers for spectators and with restroom facilities. The parking lot is planned to have 151 parking spaces and it assumed that the bleachers would hold approximately 250 people.

This memorandum will discuss the water and sewer demands as well as the existing and proposed water and sewer infrastructure for the Project.

Design Criteria

Per the City's DSPM, the water and sewer system design criteria are summarized in Table 1 and Table 2 below.

*Need to show
utilities on
B.O.D.*

Accepted For: *w/ comment*
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona

By: *[Signature]*
Date: 3/27/17

10

11

Table 1: Water System Design Criteria			
Item		Value	Unit
Average Day Demand			
	Institutional	1,340	gpd/acre
	Developed Open Space – Golf Course (assumed because irrigating football/soccer field)	4,285	gpd/acre
Peaking Factor			
	Max Day Demand = 2.0 x Average Day Demand		
	Peak Hour Demand = 3.5 x Average Day Demand		
Fire Flow Requirements			
	Commercial, Industrial, and Mult-Family	1,500	gpm
	Single Family Residential	1,000	gpm
Minimum Pipe Sizes			
	Water Main in Quarter Mile	8	inch
	Water Main in Mile and Half Mile	12	inch
	All Other Alignments	6	inch

Table 2: Water System Design Criteria			
Item		Value	Unit
Average Day Demand			
	School Without Cafeteria	30	gpd/student
Peaking Factor			
	Peaking Factor = 6.0 x Average Day Demand		
Maximum Manhole Spacing			
	Pipe Diameter 8 in. to 15 in.	500	ft
Minimum Pipe Sizes			
	Minimum Public Sewer	8	inch
Maximum Depth to Diameter Ratio			
	Pipes < 12-inches in diameter	0.65	
	Pipes > 12-inches in diameter	0.70	
Minimum Velocity			
	Assuming Manning's n = 0.013	2.5	ft/s
Maximum Velocity			
	Assuming Manning's n = 0.013	10	ft/s

Water and Sewer Demands

The proposed development is roughly 14.6 acres overall, of which approximately 7 acres will be irrigated sports field. Under these assumption and based on the criteria discussed above, the water demand for the 14.6 acre parcel will be:

Average Day Water Demand = $(1,340 + 4,285)$ gpd/acre \times 7 acres = 39,375 gpd (27.3 gpm).

The max day water demand will be: 78,750 gpd (54.7 gpm).

The peak hour water demand will be: 137,812 gpd (95.7 gpm)

The fire flow demand will be 1,500 gpm.

The sewer demand will be as follows:

Average Day Flow = 30 gpd/student \times 250 students = 7,500 gpd (5.2 gpm)

Peak Flow = 45,000 gpd (31.3 gpm)

Existing and Proposed Water and Sewer Infrastructure

The existing water infrastructure consists of an 8-inch water line in Trailside View to the north of the Project and a 12-inch waterline in 91st Street to the east of the Project. The required water line size for the property will be a minimum of 6-inches for fire and 3-inches for water services.

The existing sewer infrastructure consists of an existing 8-inch PVC sewer that runs from east to west in Trailside View to the north of the Project and a 10-inch PVC sewer that runs from north to south in 91st Street to the east of the property. The minimum on site sewer size is estimated to be 4-inch sewer. The City of Scottsdale minimum sewer size for public sewers is 8-inches.





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Handwritten note: Need to show Utilities on B.O.D.

Accepted For: w/ comments
City of Scottsdale
Water Resources Department
9379 E. San Salvador
Scottsdale, Arizona
By: [Signature]
Date: 3/27/17

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	Minimum Public Sewer	8	inch
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	Pipes < 12-inches in diameter	0.65	
	Pipes > 12-inches in diameter	0.70	
Minimum Velocity			
	Assuming Manning's n = 0.013	2.5	ft/s
Maximum Velocity			
	Assuming Manning's n = 0.013	10	ft/s



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