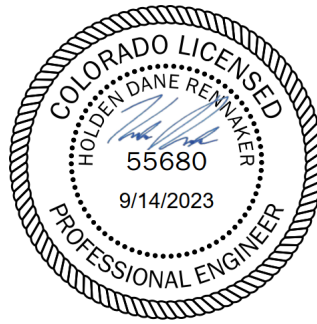


Haga Property – Master Plan
2107 Bayfield Parkway, Bayfield, CO
Drainage Narrative

September 14, 2023

By: PST Engineering LLC



Background

The Haga Property is a 17-acre parcel located south of US Highway 160, north and west of Bayfield Parkway, and east of the Church of Christ of Bayfield. The proposed development will consist of the subdivision of the parcel into 4 commercial and 2 multi-family residential lots, and 1 existing single family lot, as well as new Town of Bayfield right-of-way.

Existing Conditions

The site is currently irrigated grazing land with a single-family residence in the southwest corner that will remain with the proposed development. The Schroder Ditch flows across the site from north to south, between box culverts under US Highway 160 and Bayfield Parkway. The site generally flows from east to west to a ditch on the west property line and into an existing 18-in CMP culvert. This culvert was analyzed as the design point for this study. The Schroder Ditch cuts off any flow from east of the ditch from getting to this design point. Any runoff east of the Schroder Ditch enters the ditch and exits the site under Bayfield Parkway.

There are 3 existing culverts that enter the site, east of the Schroder Ditch, designated as Culverts A-C in the existing conditions summary in Appendix A. Culverts A & B cross under US Highway 160 while Culvert C is the pond outlet pipe of the pond across Bayfield Parkway at the Conoco gas station site. Basins were delineated and flows calculated for each of these culverts in Appendix A. These pipes were also addressed preliminarily in the *Master Drainage Plan for the Town of Bayfield, Colorado* prepared in September 2014 by Souder, Miller & Associates (*SMA Report*). Relevant pages from this study are included in Appendix O.

See Appendix A for Existing Drainage Conditions.

Proposed Conditions

The proposed improvements include the construction of two new Town roads (referred to as Road E-W and Road N-S), piping the irrigation ditch, development of six lots for future commercial and residential development, and one existing residential lot. Flows for the entire development area were designed to be conveyed via curb & gutter, inlets, storm drain, ditches, and culverts to the proposed detention pond. The pond outlet was designed to release matching the existing flows at the design point described in “Existing Conditions.”

To pipe the ditch and make the earthwork feasible for the parcel development, a “ridge” was proposed atop the piped irrigation alignment. Flows from east of this ridge were designed to be conveyed with 36-in culverts that pass under the piped irrigation (Culvert A & Culvert B).

Haga Property – Master Plan
2107 Bayfield Parkway, Bayfield, CO
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September 14, 2023

By: PST Engineering LLC



Assumptions were made regarding the future land cover and drainage patterns for future lot development. It will be the responsibility of future developers to verify that the future lot development drainage is consistent with the assumptions of this report.

See Appendix B for Proposed Drainage Conditions.

Assumptions & Methodology

Due to the extensive routing of basins through different ponds and drainage features, it was determined that the SCS method was most appropriate for analyzing stormwater for the proposed development. Using the *Hydraflow Hydrographs Extension for Autodesk Civil3D (Hydrographs)*, each basin was modeled with estimated land cover characteristics with rainfall depths taken from Table 5.1 of the Town of Bayfield Infrastructure *Design Standards*. These depths were compared to NOAA Atlas 14 data for the project location and were found to be more conservative.

For all developed flow calculations, future land covers were assumed based on conceptual land development as shown in Appendix B-1. To be conservative, all basins were modeled with a minimum time of concentration of 10-minutes per the *Design Standards* Section 5.2.2.B.

Further assumptions & methodologies are described further in the following subsections for detention and conveyance calculations.

Integration into Town of Bayfield 2014 Master Drainage Plan

In addition to the culverts described in the “Existing Conditions” section, the *SMA Report* also analyzed the proposed development site. The Haga property is divided into two basins in the *SMA Report*, 354 & 355. Basin 355 is east of Schroder Ditch while Basin 354 is a large basin that includes the Haga property west of Schroder Ditch and the west neighboring Church of Christ.

Table 1 provides a summary of the *SMA Report* basins that are part of the Haga Property as well as the analyzed design points. Basin 255 drains into Schroder Ditch and it appears the *SMA Report* does not analyze Schroder further. Culvert 61, a 15-in culvert that crosses Appaloosa Road west of the Church of Christ, is the design point for Basin 254. It was described as a “Medium Priority” in Table 8 of the *SMA Report*.

Haga Property – Master Plan
2107 Bayfield Parkway, Bayfield, CO
Drainage Narrative

September 14, 2023
 By: PST Engineering LLC



Table 1: SMA Report Summary Table

<i>SMA Report Basin</i>	<i>Total Area (Acres)</i>	<i>Q5 (cfs)</i>	<i>Q100 (cfs)</i>	<i>Design Point</i>
354 (West Haga + Church of Christ)	19.67 (Haga represents ~10.14 acres of this basin)	21.56	45.13	Culvert 61
355 (Haga East of Schroder)	9.53	8.66	17.54	Schroder Ditch

As described further in the “Detention” section Basin 355 and off-site flows from the north and east, will be crossing the piped Schroder Ditch and reaching Culvert 61 in the proposed development. A detention facility was designed to reduce the flows from the proposed development and off-site basins to match the existing flows at the Haga site outlet.

Relevant pages from the SMA Report can be found in Appendix O.

Total Area of Disturbance

The total anticipated area of disturbance for all improvements is 15.3 acres.

Soils

Using the NRCS Web Soil Survey Mapping, the soils for the site were found to be classified as Hydrological Soil Group D. Onsite soils are all Corta loam, with 1 to 3 percent slopes described as well drained with medium runoff.

See Appendix C for Soils Data.

Detention

Per Section 5.2.4-J of the *Design Standards* “Detention ponds shall be sized to limit the major storm post-development flow to the minor storm predevelopment flow.” Section 5.2.1-A defines the minor storm as the storm with a 5-year recurrence interval.

As part of the development, the Schroder Ditch will be piped and will no longer intercept runoff from the east. This increases the developed design point basin area from the existing design point basin area by including more off-site runoff to the site. The Schroder Ditch has been on the property for over 140 years, and developments downstream have had flow upstream of the ditch intercepted for that long.

Haga Property – Master Plan
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As such, the proposed pond was designed with adequate storage to detain the difference between the existing runoff volume west of the ditch for the 100-year storm and the proposed 100-year runoff volume for the development and off-site basins that convey to the pond with the proposed design. This volume is greater than if the development were to adhere to the standards of 5.2.4-J while allowing off-site flow to pass through the pond undetained.

An outlet structure was designed to pass flows from the 100-year event without overflowing the pond via the emergency spillway. In the event the outlet structure becomes clogged, the emergency spillway has been designed to convey the 100-year peak flow. The elevation of the spillway was set at the proposed 100-year water surface elevation, 0.75-ft below the top of the berm. Additionally, the top of the outlet box was designed above the 100-year peak flow water surface elevation, 1-ft below the top of the berm.

Peak flow rates were determined using the SCS TR-55 Runoff Method using *Hydrographs*; see Appendix D for *Hydrographs* output for the existing conditions and Appendix E for *Hydrographs* output for the proposed conditions. Hydrologic modeling and routing were performed using *Hydrographs*; see Appendix F for Routed Hydrographs, Appendix G for the Stage/Storage Curves and Appendix H for pond overflow design.

Table 2: Peak Flow Rates at Design Point from TR-55

Basin	Q5 (cfs)	Q100 (cfs)
Existing Design Point	4.0	12.2
Proposed (Main Pond Inflow)*	29.9	65.2
Proposed (Detained & Routed)**	3.9	11.3

*Pond Inflow includes off-site basins and on-site basin east of Schroder ditch not included in the existing design point flow calculations per Appendix A

**Section 5.2.4-J requires on site developed Q100 to be detained to release at pre-development Q5 while allowing off-site flows to pass through. Q100 flows from offsite basins (~19 cfs) would be allowed to pass through, per Code, yet pond release is 11.2 cfs. Therefore, matching flows at design point results in a greater detention volume than Section 5.2.4-J requirement.

In addition to the main pond, a pond at the NE Corner of the site, referred to as the Lot 4 pond, was designed to reduce flow from 3 off-site basins as they enter the project area. This pond was modeled with a 12-in outlet pipe to reduce flow per Table 3. Detention volumes for each pond are detailed in Table 4. See Appendix N for Pond Details.

Haga Property – Master Plan
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 By: PST Engineering LLC



Table 3: Lot 4 Inflow and Outflow Rates from TR-55

Description	Q5 (cfs)	Q100 (cfs)
Lot 4 Pond Inflow	5.5	15.9
Lot 4 Pond Outflow	2.7	6.0

Table 4: Haga Pond Storage Volumes

Description	100-Year Detention Volume (cuft)	100-Year Ponding Depth (ft)
Lot 4 Pond	36,361	2.99
Haga Main Pond	85,959	4.95

Conveyance

Proposed conveyance features include curb, gutter, inlets, storm drain pipe and ditches to convey flow to the detention pond. *Hydraflow Express Extension for Autodesk Civil3D (Express)* was used to model the capacity of the proposed pond spillway, culverts and ditches, as well as to model curb & gutter spread. Conveyance features are discussed in more detail in the following subsections.

Ditches

There are 5 ditches across the site that were designed to convey flow to the pond as shown in Appendix B. Offsite Ditches 1 & 2 were designed to prevent off-site flow from entering the commercial lots and Ditches A, B, & C were designed to convey flow along Road E-W to the pond. All ditches have routed hydrographs per Appendix F to calculate the flow. *Express* was used to model these flows in the proposed ditch geometry to show the ditch can adequately convey the flows.

See Appendix I for *Express* output.

Culverts A & B

There were two main culverts designed to convey flow from east of the piped Schroder Ditch to the west side – Culverts A & B. *Express* was used to size these pipes to allow flow from the 100-year storm to pass through without overtopping Ditches A & B described in the previous section. Both pipes are sized to provide about 1-ft of free-board in the ditch and to be large enough (36-in) to reduce clogging risk.

See Appendix J for *Express* output.

Haga Property – Master Plan
2107 Bayfield Parkway, Bayfield, CO
Drainage Narrative

September 14, 2023

By: PST Engineering LLC



Inlets

The low point of Road E-W east of the piped irrigation was designed to be drained by Inlets X1 & Inlets X2. The west end of Road E-W was designed to be drained by two 2-ft curb cuts. All inlets were designed as Town of Bayfield standard single inlets with combination grates in a sag condition. The inlets were modelled in *Express* with a 50% clogging factor. *Express* modelling shows that curb overtopping is not expected during the major storm event. *Express* modelling also shows the 2-ft curb cuts are adequate to convey the major storm event without curb overtopping.

See Appendix K for *Express* output.

Storm Drain

Storm drain pipe from the inlets described in the previous section were all designed with the Town of Bayfield minimum size – 18". *Hydraflow Storm Sewer Extension for Autodesk Civil3D (Storm Sewer)* was used to model the proposed storm drain pipes and shows that the hydraulic grade line remains in the pipe for the major storm events.

See Appendix L for *Storm Sewer* output.

Bayfield Parkway Spread – West of Road N-S

Proposed curb and gutter was designed to be installed along Bayfield Parkway from Road N-S to the west property line of Lot 1. The gutter will collect runoff from Bayfield Parkway and convey to the west where it will spill into the existing roadside ditch.

Basin “West BFP” was delineated as shown in Appendix B-1 and the 100-year flow was calculated to be 2.2-cfs. *Express* was used to model the proposed configuration and calculate the maximum spread. The spread is expected to be 7-ft with no curb overtopping. This spread is expected to cross into the westbound travel lane 0.5-ft during the 100-year storm.

See Appendix M for *Express* output.

Haga Property – Master Plan
2107 Bayfield Parkway, Bayfield, CO
Drainage Narrative

September 14, 2023

By: PST Engineering LLC



LIST OF APPENDICES

Appendix A: Existing Drainage Conditions

Appendix B: Proposed Drainage Conditions

Appendix C: Soils Information

Appendix D: TR-55 Results Summary Sheet

Appendix E: TR-55 Input and Results for Existing & Proposed Conditions

Appendix F: Routed Hydrographs

Appendix G: Stage/Storage

Appendix H: Overflow /Weir Capacity Analysis

Appendix I: Ditch Capacity Analysis

Appendix J: Culverts A & B Capacity Analysis

Appendix K: Curb & Gutter Spread Analysis (Inlets X1-2 & Curb Cuts)

Appendix L: Storm Drain

Appendix M: West Bayfield Parkway Spread

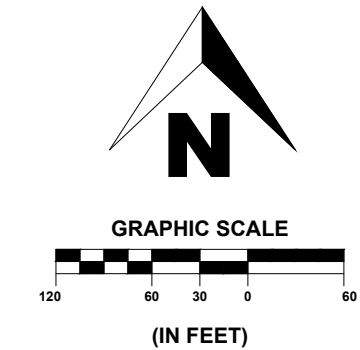
Appendix N: Detention Pond Details

Appendix O: Relevant Pages from *Master Drainage Plan for the Town of Bayfield, Colorado* prepared in September 2014 by Souder, Miller & Associates

APPENDIX A-1: EXISTING DRAINAGE SUMMARY

*SEE APPENDIX A-2 FOR OFFSITE BASIN ANALYSIS FOR OFFSITE BASINS A-C

DESIGN POINT FLOW SUMMARY		
BASIN	Q5 (CFS)	Q100 (CFS)
EXISTING	4.0	12.2



SHEET 1 OF 1

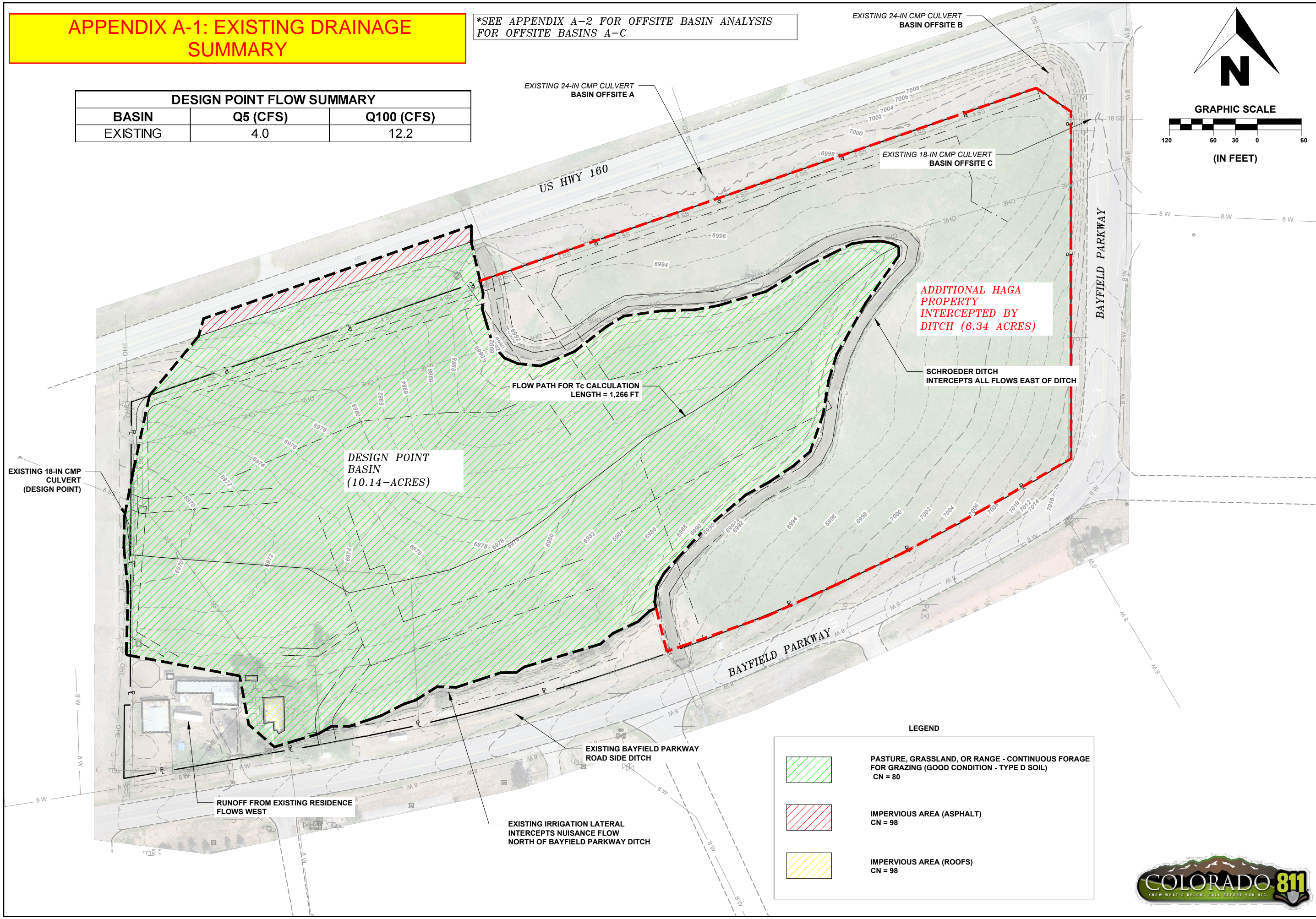
PST ENGINEERING, LLC
3520 BENNETT ST.
DURANGO, CO 81301
970-403-5492

HAGA PROPERTY
MASTER PLAN
2107 BAYFIELD PARKWAY
BAYFIELD, CO 81122
EXISTING DRAINAGE
CONDITIONS

#	DATE	DESCRIPTION	SHEET

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DRAWN BY: HR
CHECKED BY: SP

PRELIMINARY

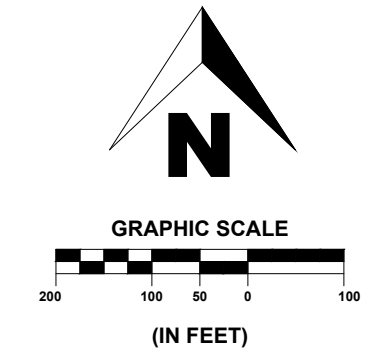


LEGEND

	PASTURE, GRASSLAND, OR RANGE - CONTINUOUS FORAGE FOR GRAZING (GOOD CONDITION - TYPE D SOIL) CN = 80
	IMPERVIOUS AREA (ASPHALT) CN = 98
	IMPERVIOUS AREA (ROOFS) CN = 98



APPENDIX A-2: HAGA EXISTING OFF-SITE FLOW SUMMARY



OFFSITE BASIN A
AREA = 3.5 ACRES
T_c = 51 MINUTES
CN = 80

OFFSITE BASIN B
AREA = 5.3 ACRES
T_c = 54 MINUTES
CN = 84 (~1.28 ACRES OF CN= 98 AND 4.0 ACRES OF CN=80)

OFFSITE BASIN C
AREA = 12.3 ACRES
T_c = 54 MINUTES
CN = 80

CULVERT A
CONVEYS OFFSITE FLOW FROM BASIN A

CULVERT B
CONVEYS FLOW FROM BASIN B UNDER US HIGHWAY 160

CULVERT C
POND #19 POND OUTLET (PIPE 120 IN 2014 STUDY)

POND #19
(IN 2014 BAYFIELD MASTER STUDY)

2014 BAYFIELD MASTER DRAINAGE PLAN VS. CURRENT STUDY

CULVERT A:

- NOT ACKNOWLEDGED IN 2014 STUDY
- AREA IS PART OF BASIN 162 WHICH DRAINS COMPLETELY TO SCHROEDER DITCH IN 2014 STUDY
- BASIN A DELINEATED FOR CURRENT STUDY AND FLOW CALCULATIONS PERFORMED USING SCS METHOD

CULVERT B:

- NOT ACKNOWLEDGED IN 2014 STUDY
- "OFFSITE BASIN B" IN CURRENT STUDY GENERALLY MATCHES "BASIN 183" IN 2014 STUDY
- BASIN B DELINEATED FOR CURRENT STUDY AND FLOW CALCULATIONS PERFORMED USING SCS METHOD

CULVERT C:

- PIPE 120 IN 2014 STUDY. OUTLET OF POND #19
- POND RECEIVES FLOW FROM GAS STATION, ADJACENT STREETS, HIGHWAY 160 AND PONDS 20 & 21
- POND 20 RECEIVES FLOW FROM CINNAMON HEIGHTS SUBDIVISION
- POND 21 RECEIVES FLOW FROM CINNAMON DRIVE AND NEIGHBORING PROPERTIES
- CALCULATED POND OUTLET FROM 2014 STUDY Q₅ = 1.62 CFS & Q₁₀₀ = 2.29 CFS
- CURRENT STUDY CONSERVATIVELY ASSUMES POND RELEASES TO MATCH UNDEVELOPED FLOWS PER BASIN C.
- FLOWS ARE MODELED AS HIGHER THAN 2014 STUDY CALCULATED POND RELEASE

BASIN	Q ₅ (CFS)	Q ₁₀₀ (CFS)
A	1.0	3.0
B	2.1	5.6
C	3.3	10.1

HAGA PROPERTY
MASTER PLAN
2107 BAYFIELD PARKWAY
BAYFIELD, CO 81122
OFFSITE FLOW ANALYSIS

#	DATE	DESCRIPTION	SHEET

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CHECKED BY: SP

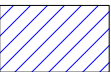


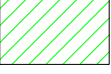


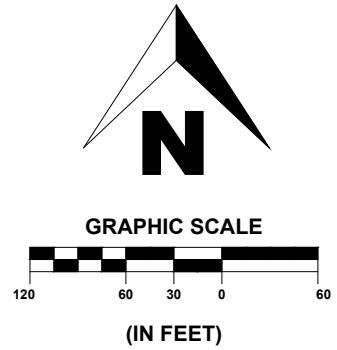
PRELIMINARY

APPENDIX B-1: DEVELOPED BASIN SUMMARY

*SEE APPENDIX A.2 FOR OFFSITE BASIN ANALYSIS FOR OFFSITE BASINS A-C

LEGEND

-  COMMERCIAL DISTRICT (CN = 95)
-  RESIDENTIAL DISTRICT - TOWNHOMES (CN = 92)
-  IMPERVIOUS (CN = 98)
-  OPEN SPACE - GOOD CONDITION (CN = 80)



SHEET 1 OF 1

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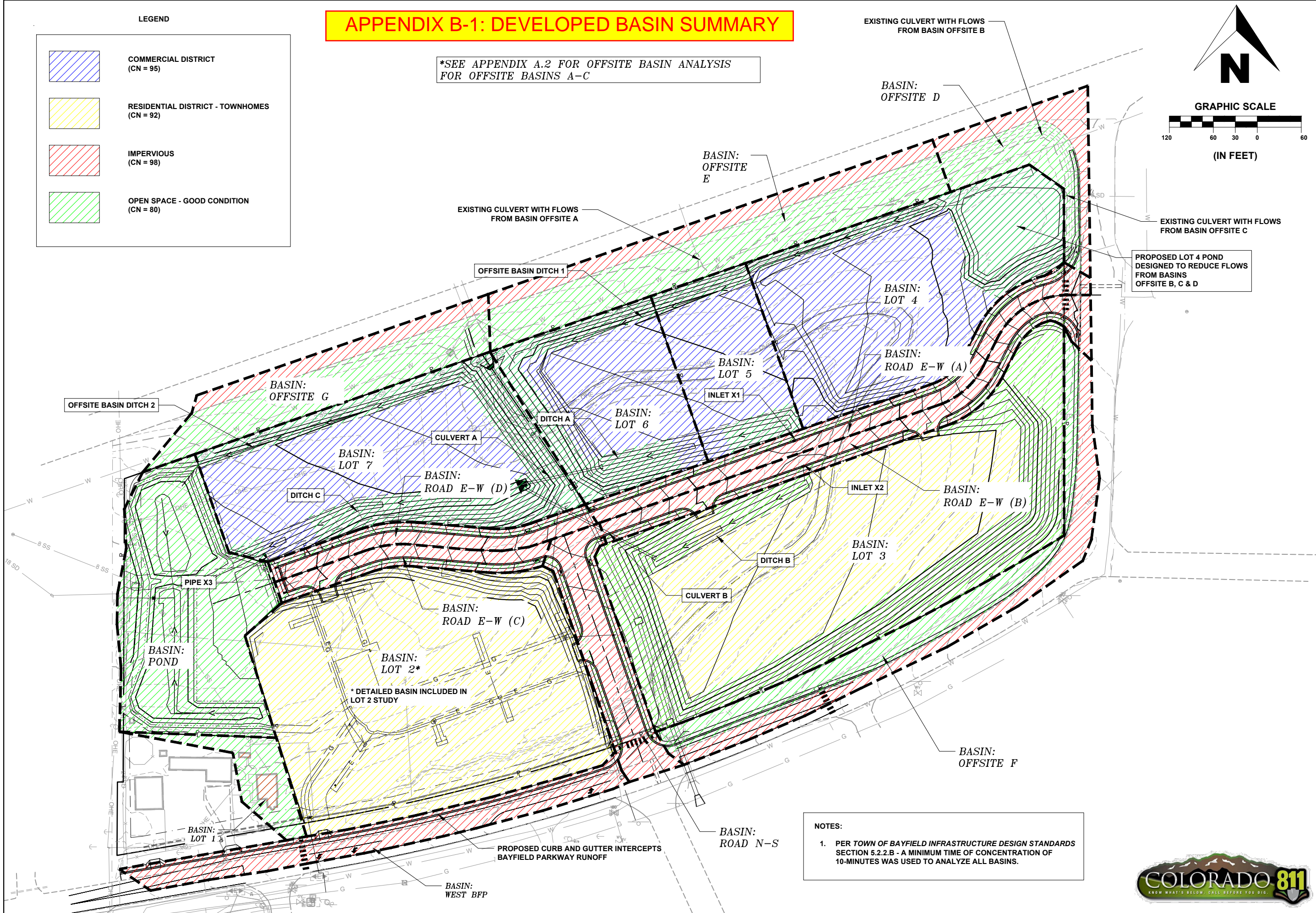


HAGA PROPERTY
MASTER PLAN
2107 BAYFIELD PARKWAY
BAYFIELD, CO 81122
PROPOSED DRAINAGE
CONDITIONS

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PRELIMINARY

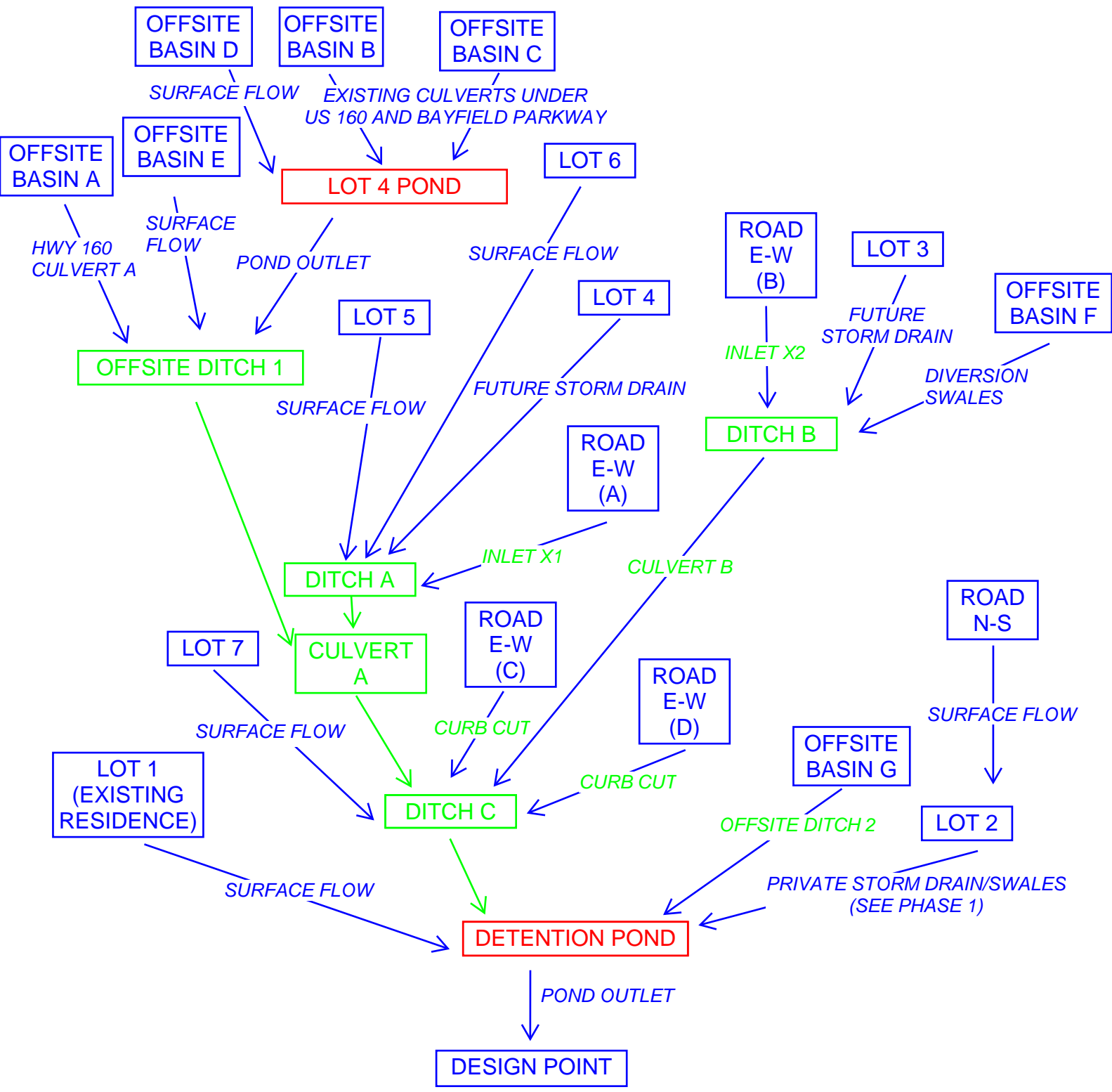


NOTES:

- PER TOWN OF BAYFIELD INFRASTRUCTURE DESIGN STANDARDS SECTION 5.2.2.B - A MINIMUM TIME OF CONCENTRATION OF 10-MINUTES WAS USED TO ANALYZE ALL BASINS.



APPENDIX B-2: HAGA MASTER PLAN FLOW SCHEMATIC



**RED FEATURES ARE DETENTION FACILITIES
SEE APPENDIX G**

**GREEN FEATURES ARE CONVEYANCE FEATURES W/ SUPPORTING SIZING CALCULATIONS IN REPORT
SEE APPENDICES I-L**

TABLE 1 - BASIN FLOW SUMMARY

BASIN ID	AREA (ac)	CURVE NUMBER	Tc (min)	Q5 (cfs)	Q100 (cfs)
Existing Site - West of Ditch	10.15	80	32.1	4.0	12.2
Off-Site Basin A	3.50	80	51.4	1.0	3.0
Off-Site Basin B	5.28	84	54.1	2.1	5.6
Off-Site Basin C	12.30	80	54.3	2.3	10.2
Off-Site Basin D	0.55	88	10	0.7	1.6
Off-Site Basin E	1.14	85	10	1.2	3.0
Lot 4	2.01	91	10	3.2	6.5
Lot 5	0.75	91	10	1.2	2.4
Lot 6	1.12	89	10	1.6	3.4
Road E-W (A)	0.54	95	10	1.1	2.0
Lot 3	4.84	88	10	6.3	14.2
Road E-W (B)	0.56	95	10	1.1	2.0
Offsite F	0.99	88	10	1.3	2.9
Lot 7	2.00	88	10	2.6	5.9
Offsite G	0.78	85	10	0.8	2.0
Road E-W (C)	0.31	95	10	0.6	1.1
Road E-W (D)	0.39	95	10	0.8	1.4
Pond Area	1.44	80	10	1.0	3.0
Lot 1 (Contributing Area)	0.24	82	10	0.3	0.5
Road N-S	0.51	96	10	1.1	1.9
Lot 2	3.12	92	10	5.3	10.5
West BFP	0.57	98	10	1.5	2.2

APPENDIX B-3: HAGA MASTER PLAN FLOW/ CONVEYANCE SUMMARY TABLES

TABLE 2 - ROUTED FLOW SUMMARY*

HYDROGRAPH ID	Q5 (cfs)	Q100 (cfs)
LOT 4 POND INFLOW	5.5	15.9
OFFSITE DITCH 1	3.3	8.2
DITCH A	7.0	14.4
CULVERT A	8.9	19.7
CULVERT B-DITCH B	8.7	19.1
DITCH C	21.6	47.2
LOT 2 OUTFALL	6.3	12.4
MAIN POND INFLOW	29.5	64.4

* SEE APPENDIX B-2 FOR ROUTING SCHEMATIC

TABLE 3 - DETENTION FACILITY SUMMARY

DETENTION FACILITY - STORM EVENT	INFLOW (cfs)	OUTFLOW (cfs)	POND BOTTOM ELEV	WATER SURFACE ELEV	PONDING DEPTH (ft)	STORAGE VOLUME (cf)	OUTLET DESCRIPTION	OVERFLOW DESCRIPTION
LOT 4 POND - 5-YEAR	5.5	2.7	6995.00	6996.28	1.28	11,537	12-IN PVC PIPE	OVERTOPS INTO OFFSITE DITCH 1 AT ELEV: 6998.00
LOT 4 POND - 100-YEAR	15.9	6.0	6995.00	6997.99	2.99	36,361		
HAGA MAIN POND - 5-YEAR	29.9	3.9	6967.00	6970.34	3.34	44,029	CDOT TYPE C INLET W/ ORIFICES	RIP RAPPED OVERFLOW WEIR AT ELEV: 6972.25
HAGA MAIN POND -100-YEAR	65.2	11.3	6967.00	6971.98	4.98	86,818		

TABLE 4 - INLET SUMMARY

INLET	DESCRIPTION	CONDITION	Q5 (cfs)	Q100 (cfs)	CAPTURE %	DEPTH AT INLET (Q100) (in)	SPREAD (Q100) (ft)
INLET X1	TOWN OF BAYFIELD COMBINATION	SAG	1.1	2.0	100	4.11	7.28
INLET X2	TOWN OF BAYFIELD COMBINATION	SAG	1.1	2.0	100	4.18	7.58

TABLE 5 - DITCH SUMMARY

DITCH	DESCRIPTION	DEPTH (ft)	MIN. SLOPE	MANNING'S N VALUE	Q100 (cfs)	Q100 VELOCITY (ft/s)	Q100 FLOW DEPTH (ft)	Q100 FREE BOARD (ft)
OFFSITE 1	Triangle w/ 2.5:1 Side Slopes	2.0	0.50%	0.026	8.2	2.57	1.13	0.87
OFFSITE 2	Triangle w/ 2.5:1 Side Slopes	2.0	1.00%	0.026	2.0	2.32	0.59	1.41
DITCH A	Trapezoid w/ 7-ft Wide Bottom and 3:1 Side Slopes	3.0	0.75%	0.026	14.4	2.9	0.57	2.43
DITCH B	Trapezoid w/ 7-ft Wide Bottom and 3:1 Side Slopes	3.0	1.00%	0.026	19.1	3.55	0.91	2.09
DITCH C	Trapezoid w/ 7-ft Wide Bottom and 3:1 Side Slopes	3.0	1.00%	0.026	47.2	4.66	1.01	1.99

TABLE 6 - CULVERT SUMMARY

CULVERT	DESCRIPTION	LENGTH (ft)	SLOPE	Q5 (cfs)	Q100 (cfs)	AVAILABLE HEADWATER (ft)*	REQUIRED Hw TO CONVEY Q100 (ft)	FREE BOARD (ft)
CULVERT A	36-IN SLCPP	102.8	1.95%	8.9	19.7	3.00	2.09	0.91
CULVERT B	36-IN SLCPP	200.0	1.00%	8.7	19.1	3.00	2.05	0.95

*AVAILABLE HEADWATER IS DEPTH BEFORE UPSTREAM DITCH OVERTOPS OUT OF DRAINAGE EASEMENTS IN LOTS 3 & 6

REVISIONS	DESCRIPTION	DATE	SHEET
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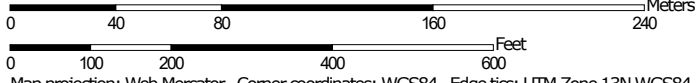
DATE: 09/11/2023
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CHECKED BY: SP

PRELIMINARY



Soil Map may not be valid at this scale.

Map Scale: 1:2,860 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

La Plata County Area, Colorado

22—Corta loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1yn1
Elevation: 6,700 to 7,200 feet
Mean annual precipitation: 18 to 22 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Corta and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Corta

Setting

Landform: Ridges, mesas, pediments
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-textured alluvium derived from shale and/or loess

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 60 inches: clay

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3c
***Hydrologic Soil Group:* D**
Ecological site: F048AY925CO - Ponderosa Pine Forest
Hydric soil rating: No

Minor Components

Falfa

Percent of map unit: 20 percent
Hydric soil rating: No

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
				EXISTING Q5 WEST OF DITCH					
1	SCS Runoff	3.976	2	734	19,411	----	----	----	Existing Design Point_Ditch Intercept
3	SCS Runoff	0.970	2	748	6,662	----	----	----	Offsite A
4	SCS Runoff	2.123	2	746	13,420	----	----	----	Offsite B
5	SCS Runoff	3.251	2	750	23,061	----	----	----	Offsite C
6	SCS Runoff	0.720	2	720	1,872	----	----	----	Offsite D
7	SCS Runoff	1.208	2	722	3,176	----	----	----	Offsite E
8	SCS Runoff	3.197	2	720	8,297	----	----	----	Lot 4
9	SCS Runoff	1.193	2	720	3,096	----	----	----	Lot 5
10	SCS Runoff	1.568	2	720	4,068	----	----	----	Lot 6
11	SCS Runoff	1.074	2	720	2,863	----	----	----	Road E-W (A)
12	SCS Runoff	6.335	2	720	16,473	----	----	----	Lot 3
13	SCS Runoff	1.113	2	720	2,969	----	----	----	Road E-W (B)
14	SCS Runoff	1.296	2	720	3,369	----	----	----	Offsite F
15	SCS Runoff	2.618	2	720	6,807	----	----	----	Lot 7
16	SCS Runoff	0.826	2	722	2,173	----	----	----	Offsite G
17	SCS Runoff	0.616	2	720	1,644	----	----	----	Road E-W (C)
18	SCS Runoff	0.775	2	720	2,068	----	----	----	Road E-W (D)
19	SCS Runoff	1.018	2	722	2,805	----	----	----	Pond Area
20	SCS Runoff	0.202	2	722	542	----	----	----	Lot 1 (Contributing Area)
21	SCS Runoff	1.063	2	720	2,877	----	----	----	Road N-S
22	SCS Runoff	5.270	2	720	13,718	----	----	----	Lot 2
23	SCS Runoff	1.281	2	720	3,638	----	----	----	West BFP
24	Combine	5.457	2	748	38,353	4, 5, 6,	----	----	Lot 4 Pond Inflow
25	Reservoir	2.676	2	788	38,336	24	6996.28	11,537	Lot 4 Pond Outflow
27	Combine	3.321	2	778	48,174	3, 7, 25,	----	----	Offsite Basin Ditch 1
28	Combine	7.032	2	720	18,323	8, 9, 10,	----	----	Ditch A
29	Combine	8.888	2	722	66,497	11, 27, 28	----	----	Culvert A
30	Combine	8.744	2	720	22,811	12, 13, 14,	----	----	Culvert B - Ditch B
32	Combine	21.57	2	720	99,826	15, 17, 18,	----	----	Ditch C
33	Combine	6.333	2	720	16,594	29, 30, 21, 22,	----	----	Lot 2 Outfall
34	Combine	29.91	2	720	121,940	16, 19, 20, 32, 33	----	----	Main Pond Inflow
36	Reservoir	3.935	2	DEVELOPED Q5 DESIGN POINT			6970.34	44,029	Main Pond Outfall
Haga_Final.gpw					Return Period: 5 Year			Monday, 09 / 11 / 2023	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
				EXISTING Q100 WEST OF DITCH					
1	SCS Runoff	12.23	2	734	53,737	----	----	----	Existing Design Point_Ditch Intercept
3	SCS Runoff	3.027	2	746	18,444	----	----	----	Offsite A
4	SCS Runoff	5.564	2	746	33,307	----	----	----	Offsite B
5	SCS Runoff	10.15	2	748	63,843	----	----	----	Offsite C
6	SCS Runoff	1.611	2	720	4,204	----	----	----	Offsite D
7	SCS Runoff	2.963	2	720	7,683	----	----	----	Offsite E
8	SCS Runoff	6.548	2	720	17,345	----	----	----	Lot 4
9	SCS Runoff	2.443	2	720	6,472	----	----	----	Lot 5
10	SCS Runoff	3.405	2	720	8,919	----	----	----	Lot 6
11	SCS Runoff	1.972	2	720	5,446	----	----	----	Road E-W (A)
12	SCS Runoff	14.18	2	720	36,998	----	----	----	Lot 3
13	SCS Runoff	2.045	2	720	5,647	----	----	----	Road E-W (B)
14	SCS Runoff	2.901	2	720	7,568	----	----	----	Offsite F
15	SCS Runoff	5.860	2	720	15,288	----	----	----	Lot 7
16	SCS Runoff	2.027	2	720	5,257	----	----	----	Offsite G
17	SCS Runoff	1.132	2	720	3,126	----	----	----	Road E-W (C)
18	SCS Runoff	1.424	2	720	3,933	----	----	----	Road E-W (D)
19	SCS Runoff	2.975	2	720	7,765	----	----	----	Pond Area
20	SCS Runoff	0.546	2	720	1,418	----	----	----	Lot 1 (Contributing Area)
21	SCS Runoff	1.904	2	720	5,343	----	----	----	Road N-S
22	SCS Runoff	10.49	2	720	28,009	----	----	----	Lot 2
23	SCS Runoff	2.201	2	720	6,438	----	----	----	West BFP
24	Combine	15.86	2	746	101,354	4, 5, 6,	----	----	Lot 4 Pond Inflow
25	Reservoir	5.966	2	790	101,336	24	6997.99	36,361	Lot 4 Pond Outflow
27	Combine	8.229	2	758	127,464	3, 7, 25,	----	----	Offsite Basin Ditch 1
28	Combine	14.37	2	720	38,182	8, 9, 10,	----	----	Ditch A
29	Combine	19.66	2	720	165,645	11, 27, 28	----	----	Culvert A
30	Combine	19.13	2	720	50,212	12, 13, 14,	----	----	Culvert B - Ditch B
32	Combine	47.20	2	720	238,205	15, 17, 18, 29, 30,	----	----	Ditch C
33	Combine	12.40	2	720	33,352	21, 22,	----	----	Lot 2 Outfall
34	Combine	65.15	2	720	285,997	16, 19, 20, 32, 33	----	----	Main Pond Inflow
36	Reservoir	11.28	2	DEVELOPED Q100 DESIGN POINT			6971.98	86,818	Main Pond Outfall
Haga_Final.gpw					Return Period: 100 Year			Monday, 09 / 11 / 2023	

Hyd. No. 1

Existing Design Point_Ditch Intercept

Hydrograph type	= SCS Runoff	Peak discharge	= 3.976 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 19,411 cuft
Drainage area	= 10.150 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 1.93 in.	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

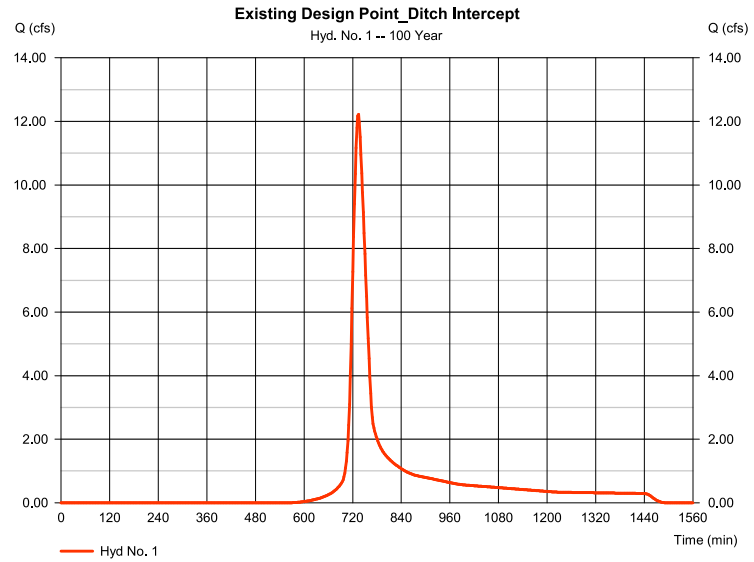
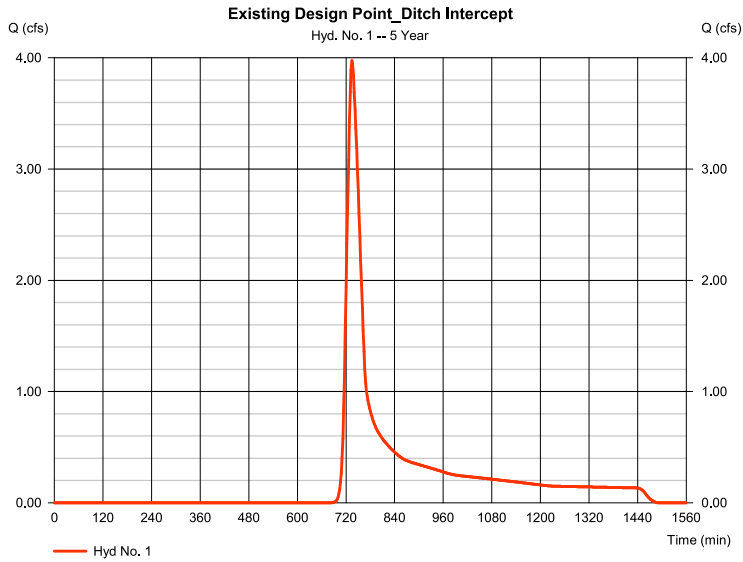
* Composite (Area/CN) = [(0.190 x 98) + (9.930 x 80) + (0.030 x 98)] / 10.150

Hyd. No. 1

Existing Design Point_Ditch Intercept

Hydrograph type	= SCS Runoff	Peak discharge	= 12.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 53,737 cuft
Drainage area	= 10.150 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 3.25 in.	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.190 x 98) + (9.930 x 80) + (0.030 x 98)] / 10.150



TR55 Tc Worksheet

2

Hyd. No. 1

Existing Design Point_Ditch Intercept

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 1.55	0.00	0.00	
Land slope (%)	= 2.70	0.00	0.00	
Travel Time (min)	= 25.15	+ 0.00	+ 0.00	= 25.15
Shallow Concentrated Flow				
Flow length (ft)	= 650.00	0.00	0.00	
Watercourse slope (%)	= 1.70	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 2.10	0.00	0.00	
Travel Time (min)	= 5.15	+ 0.00	+ 0.00	= 5.15
Channel Flow				
X sectional flow area (sqft)	= 3.00	0.00	0.00	
Wetted perimeter (ft)	= 6.30	0.00	0.00	
Channel slope (%)	= 2.10	0.00	0.00	
Manning's n-value	= 0.030	0.015	0.015	
Velocity (ft/s)	= 4.38	0.00	0.00	
Flow length (ft)	(({0})466.0	0.0	0.0	
Travel Time (min)	= 1.77	+ 0.00	+ 0.00	= 1.77
Total Travel Time, Tc				32.10 min

Hyd. No. 3

Offsite A

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 3.500 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 0.970 cfs
 Time to peak = 746 min
 Hyd. volume = 6,662 cuft
 Curve number = 80
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 51.40 min
 Distribution = Type II
 Shape factor = 484

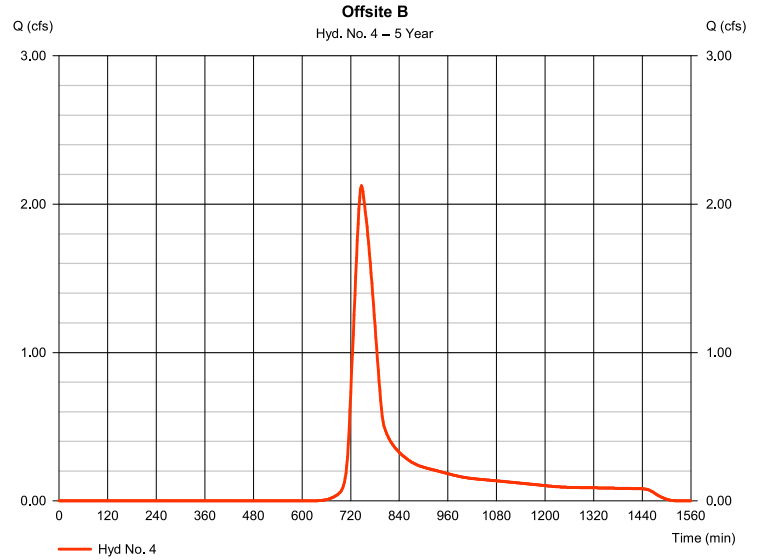
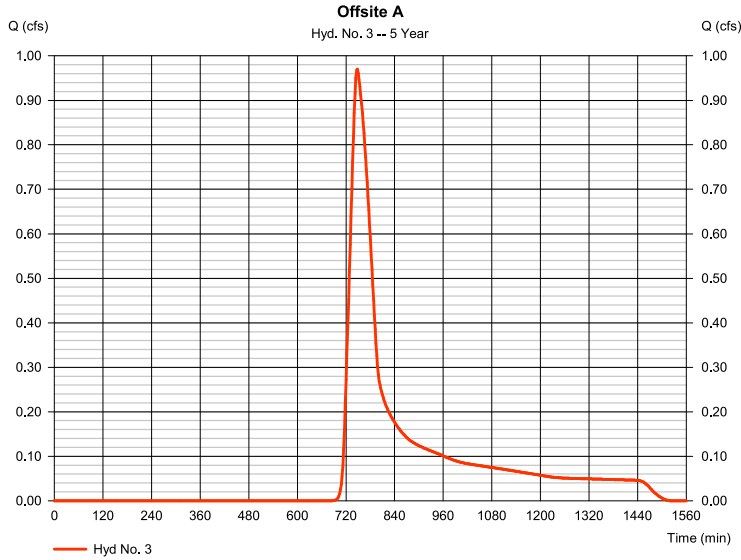
Hyd. No. 4

Offsite B

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 5.280 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 2.123 cfs
 Time to peak = 746 min
 Hyd. volume = 13,420 cuft
 Curve number = 84*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 54.09 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(4,000 x 80) + (1,280 x 98)] / 5,280



Hydrograph Report

Hyd. No. 5

Offsite C

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 12.300 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 3.261 cfs
 Time to peak = 750 min
 Hyd. volume = 23,061 cuft
 Curve number = 80
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 54.30 min
 Distribution = Type II
 Shape factor = 484

Hydrograph Report

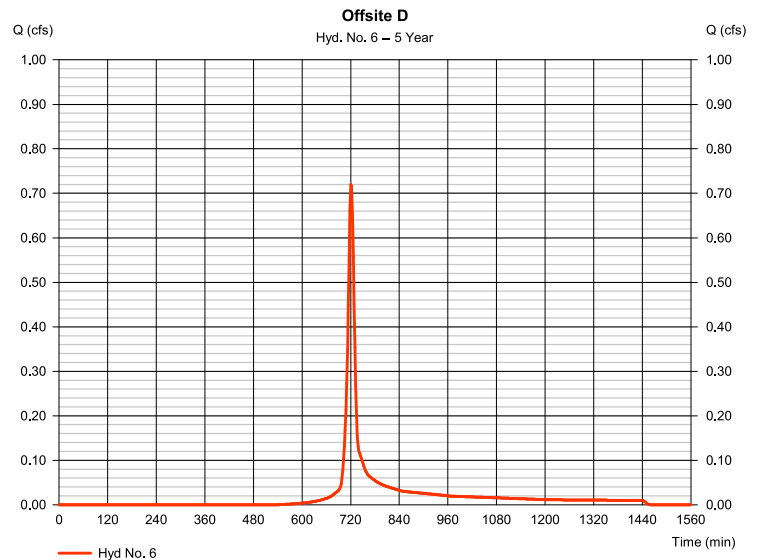
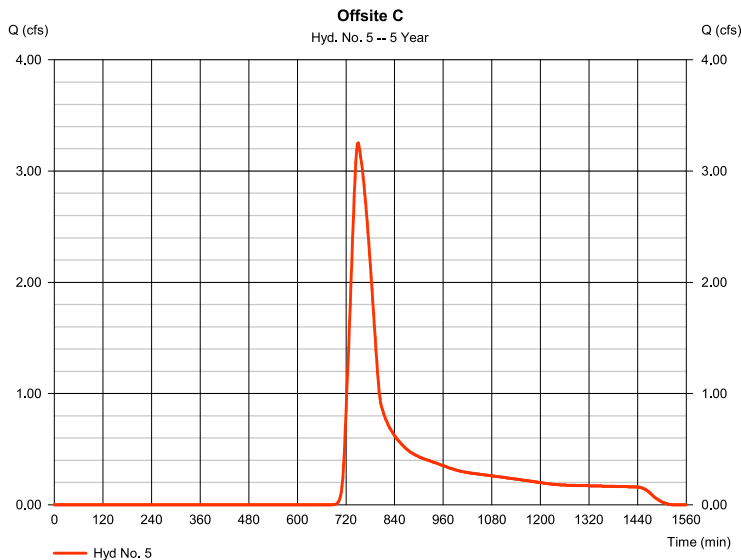
Hyd. No. 6

Offsite D

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 0.550 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 0.720 cfs
 Time to peak = 720 min
 Hyd. volume = 1,872 cuft
 Curve number = 88*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(0,300 x 80) + (0,250 x 98)] / 0,550



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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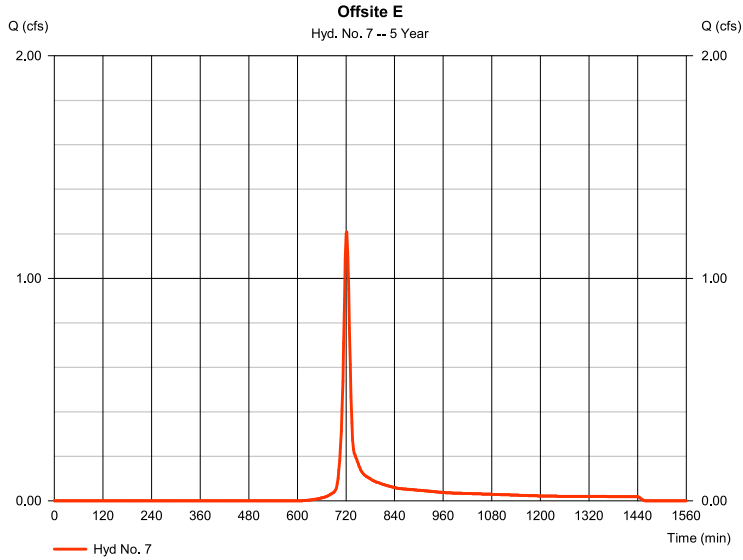
Hyd. No. 7

Offsite E

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 1.140 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 1,208 cfs
 Time to peak = 722 min
 Hyd. volume = 3,176 cuft
 Curve number = 85*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(0,310 x 98) + (0,830 x 80)] / 1,140



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

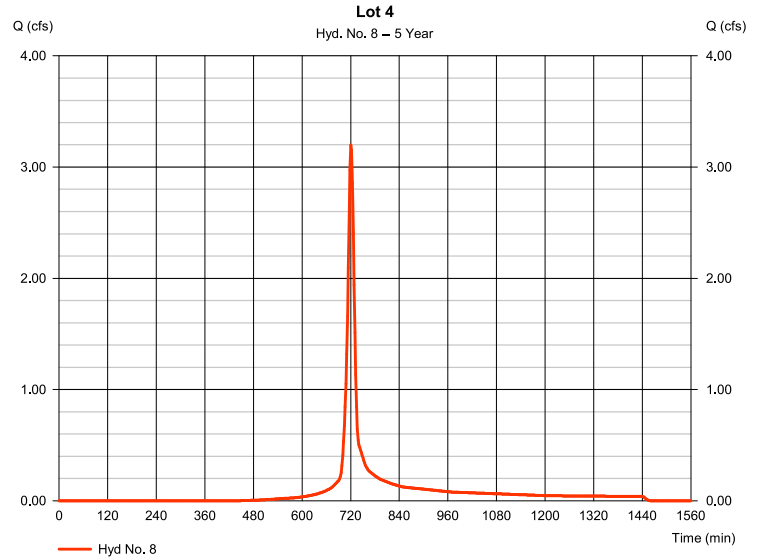
Hyd. No. 8

Lot 4

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 2.010 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 3,197 cfs
 Time to peak = 720 min
 Hyd. volume = 8,297 cuft
 Curve number = 91*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(0,600 x 80) + (1,410 x 95)] / 2,010



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

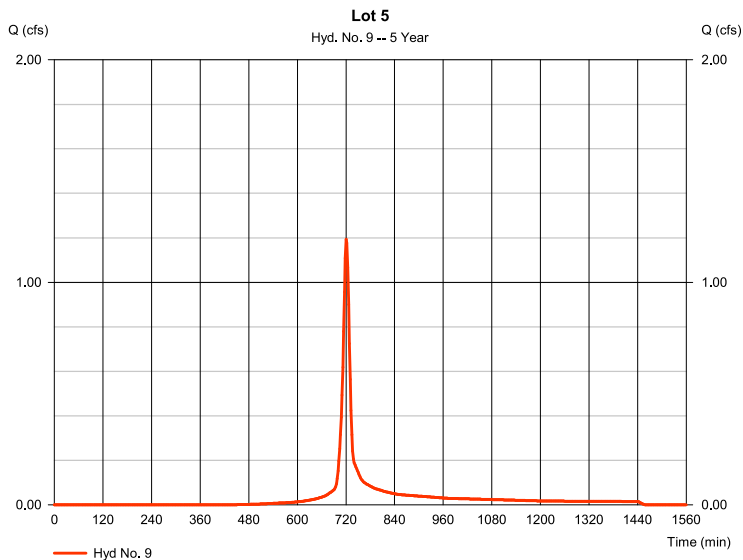
Hyd. No. 9

Lot 5

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 0.750 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 1,193 cfs
 Time to peak = 720 min
 Hyd. volume = 3,096 cuft
 Curve number = 91*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(0,180 x 80) + (0,570 x 95)] / 0,750



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

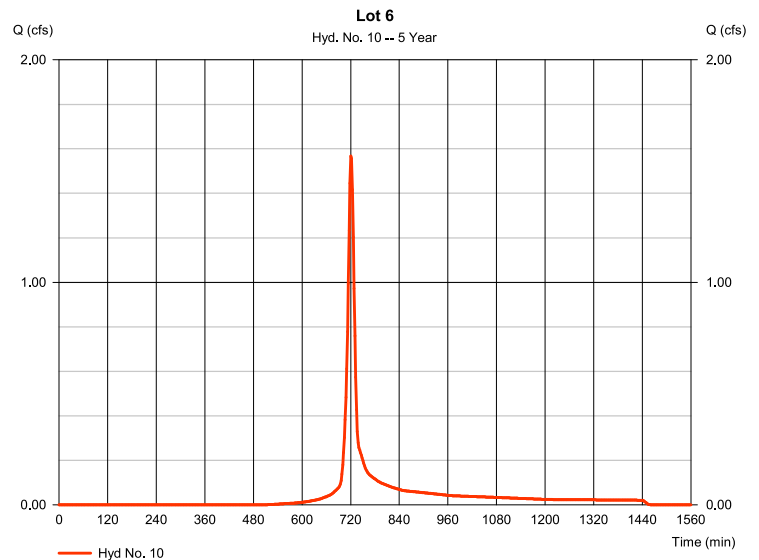
Hyd. No. 10

Lot 6

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 1.120 ac
 Basin Slope = 0.0 %
 Tc method = User
 Total precip. = 1.93 in
 Storm duration = 24 hrs

Peak discharge = 1,568 cfs
 Time to peak = 720 min
 Hyd. volume = 4,068 cuft
 Curve number = 89*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 10.00 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = [(0,430 x 80) + (0,690 x 95)] / 1,120



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

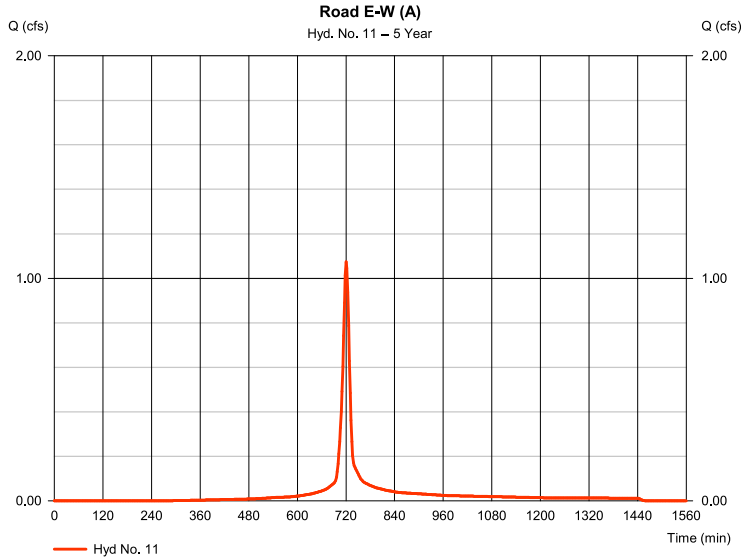
Hyd. No. 11

Road E-W (A)

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 0.540 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 1.074 cfs
Time to peak = 720 min
Hyd. volume = 2,863 cuft
Curve number = 95*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.080 x 80) + (0.460 x 98)] / 0.540



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

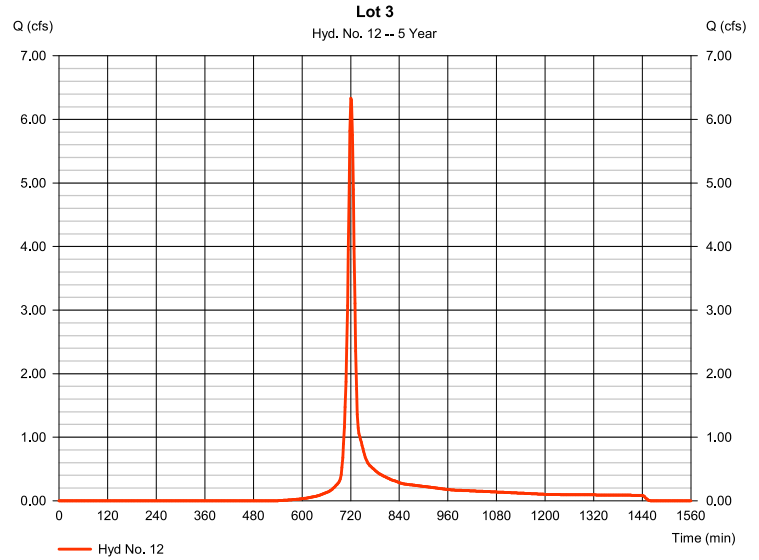
Hyd. No. 12

Lot 3

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 4.840 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 6.335 cfs
Time to peak = 720 min
Hyd. volume = 16,473 cuft
Curve number = 88*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(3.080 x 92) + (1.760 x 80)] / 4.840



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

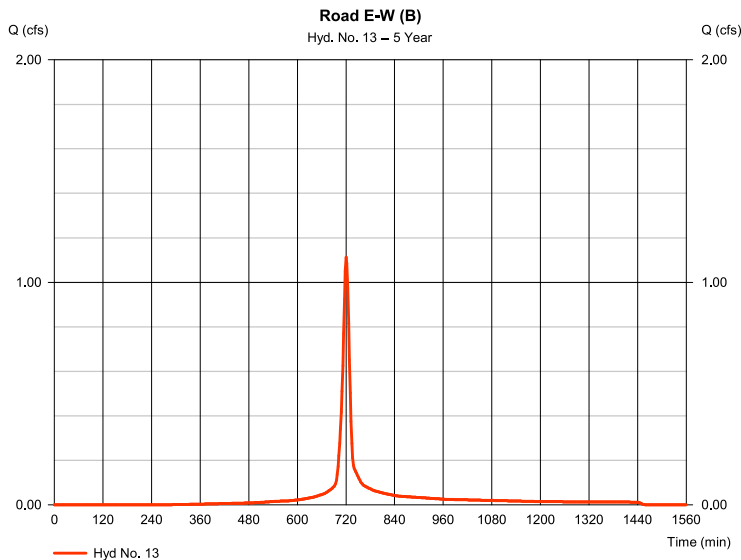
Hyd. No. 13

Road E-W (B)

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 0.560 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 1.113 cfs
Time to peak = 720 min
Hyd. volume = 2,969 cuft
Curve number = 95*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.480 x 98) + (0.080 x 80)] / 0.560



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

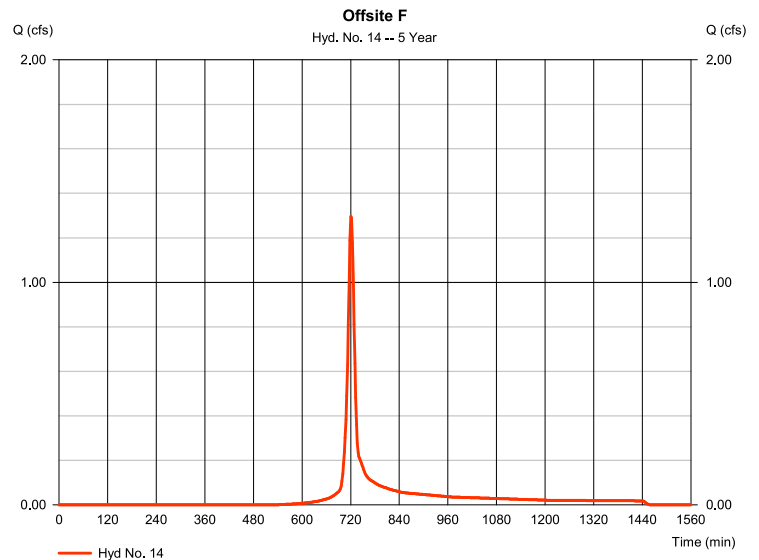
Hyd. No. 14

Offsite F

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 0.990 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 1.296 cfs
Time to peak = 720 min
Hyd. volume = 3,369 cuft
Curve number = 88*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.570 x 80) + (0.420 x 98)] / 0.990



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

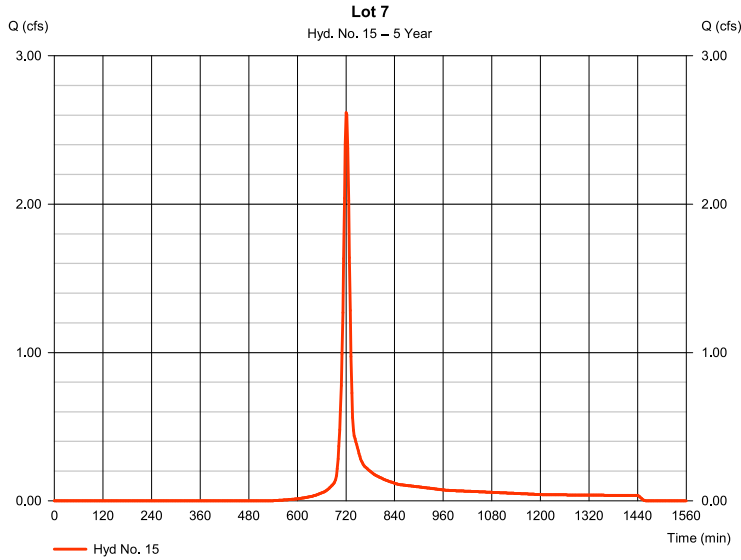
Hyd. No. 15

Lot 7

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 2.000 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 2.618 cfs
Time to peak = 720 min
Hyd. volume = 6,807 cuft
Curve number = 88*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0,880 x 80) + (1,120 x 95)] / 2,000



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

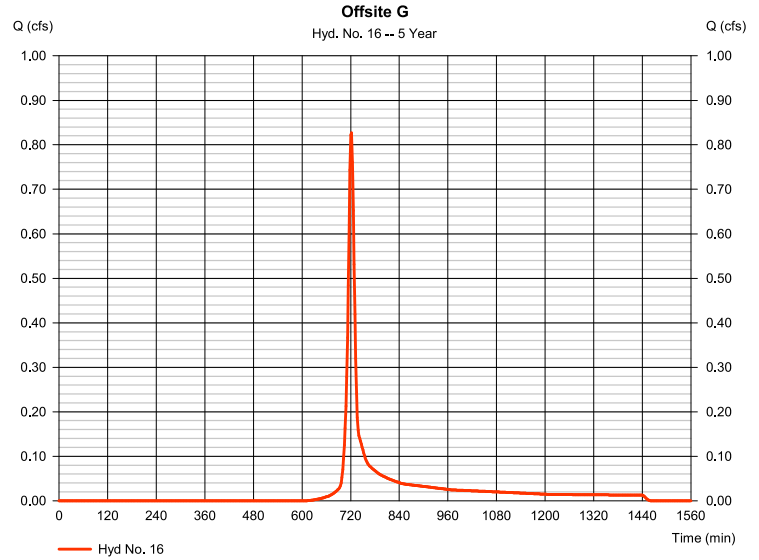
Hyd. No. 16

Offsite G

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 0.780 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 0.826 cfs
Time to peak = 722 min
Hyd. volume = 2,173 cuft
Curve number = 85*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0,200 x 98) + (0,580 x 80)] / 0,780



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

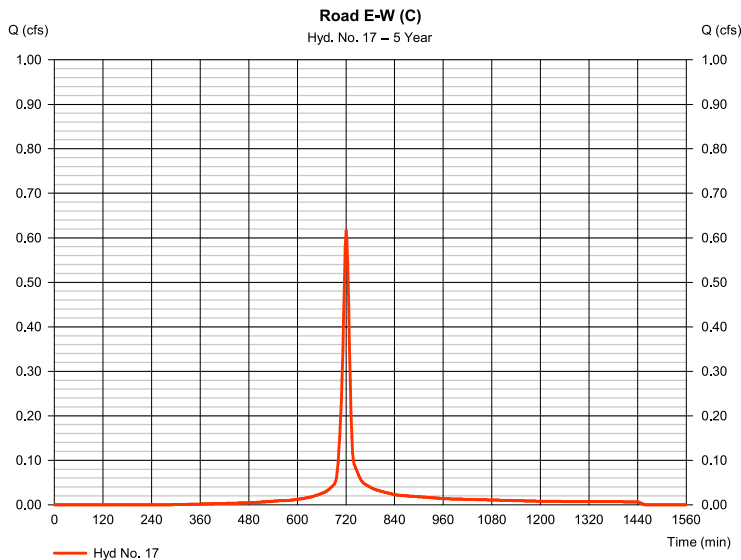
Hyd. No. 17

Road E-W (C)

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 0.310 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 0.616 cfs
Time to peak = 720 min
Hyd. volume = 1,644 cuft
Curve number = 95
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0,670 x 98) + (0,110 x 80)] / 0,390



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

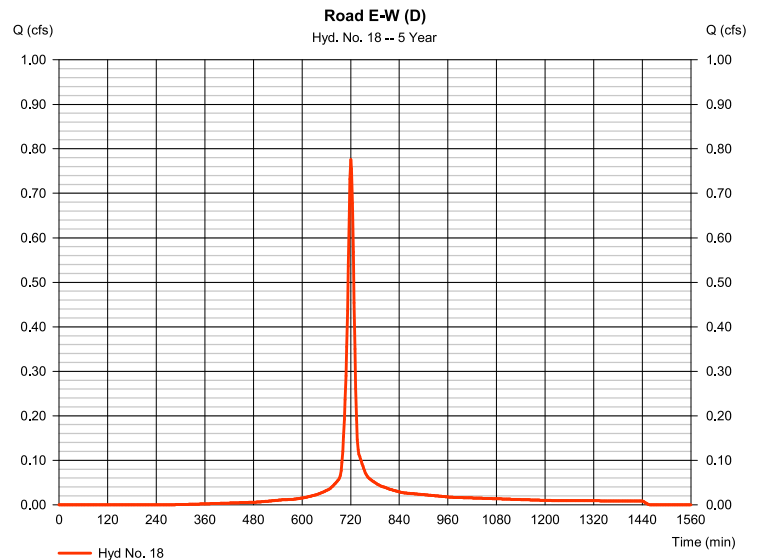
Hyd. No. 18

Road E-W (D)

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 0.390 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 0.775 cfs
Time to peak = 720 min
Hyd. volume = 2,068 cuft
Curve number = 95*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0,670 x 98) + (0,110 x 80)] / 0,390



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

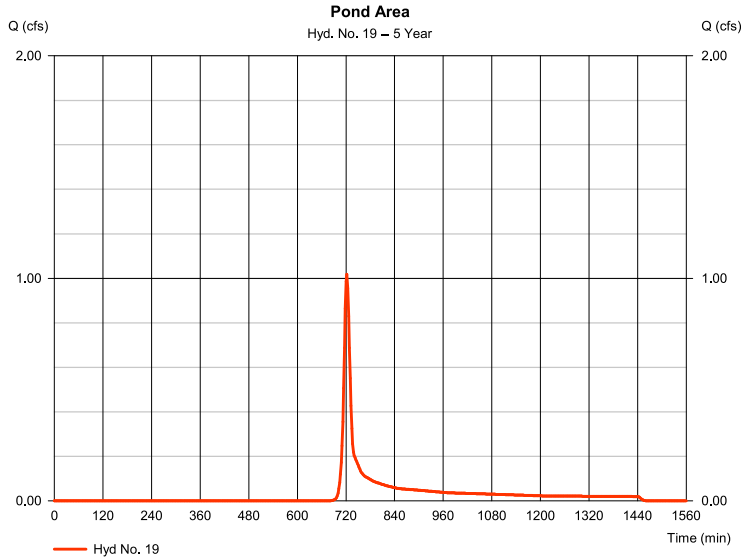
Monday, 09 / 11 / 2023

Hyd. No. 19

Pond Area

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 1.440 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 1.018 cfs
Time to peak = 722 min
Hyd. volume = 2,805 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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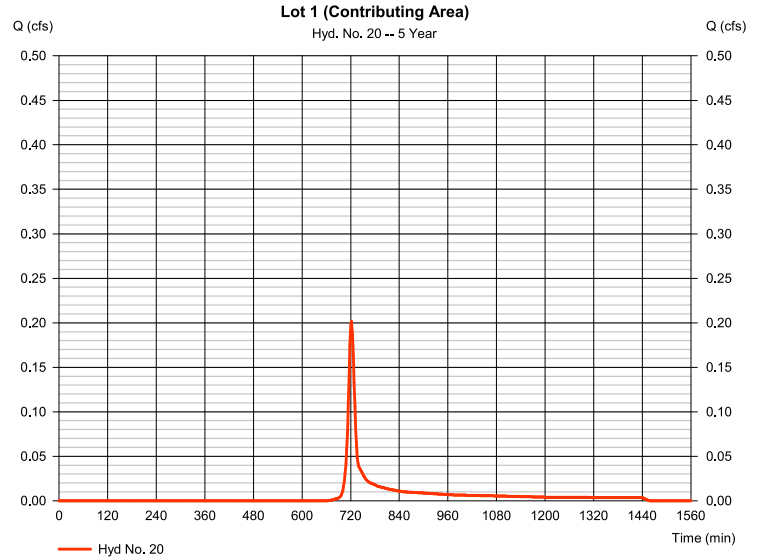
Hyd. No. 20

Lot 1 (Contributing Area)

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 0.240 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 0.202 cfs
Time to peak = 722 min
Hyd. volume = 542 cuft
Curve number = 82*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.030 x 98) + (0.210 x 80)] / 0.240



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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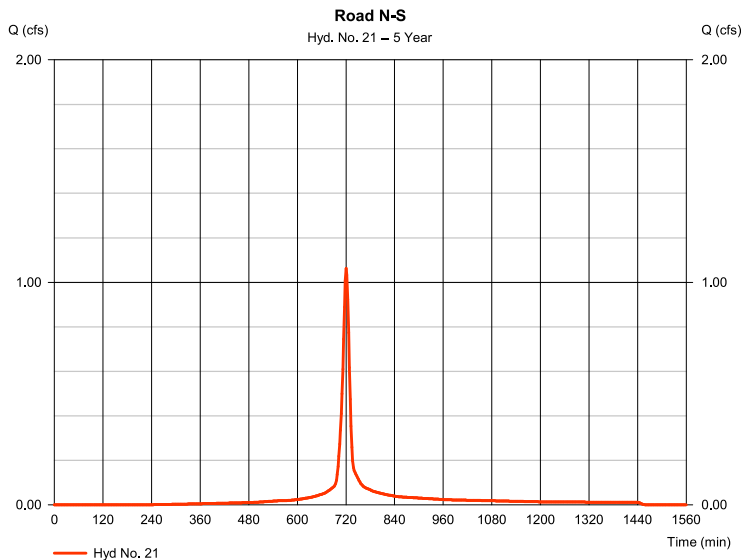
Hyd. No. 21

Road N-S

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 0.510 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

Peak discharge = 1.063 cfs
Time to peak = 720 min
Hyd. volume = 2,877 cuft
Curve number = 96*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.060 x 80) + (0.450 x 98)] / 0.510



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

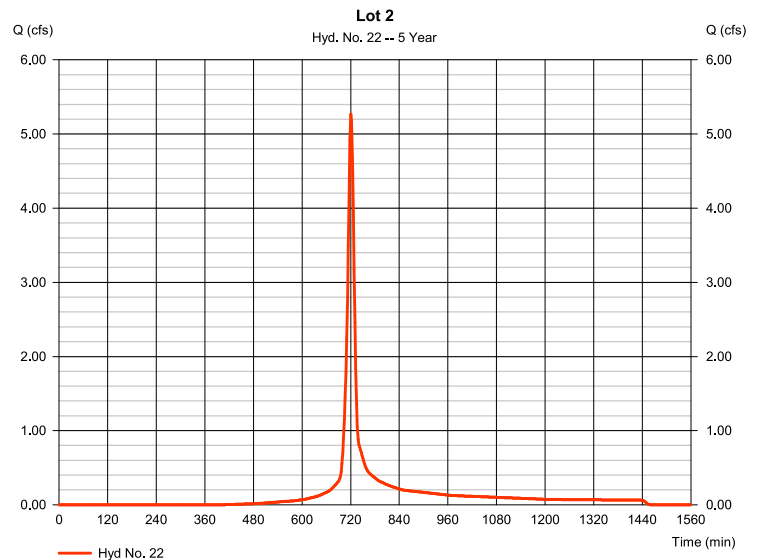
Monday, 09 / 11 / 2023

Hyd. No. 22

Lot 2

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs.
Time interval = 2 min
Drainage area = 3.120 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.93 in
Storm duration = 24 hrs

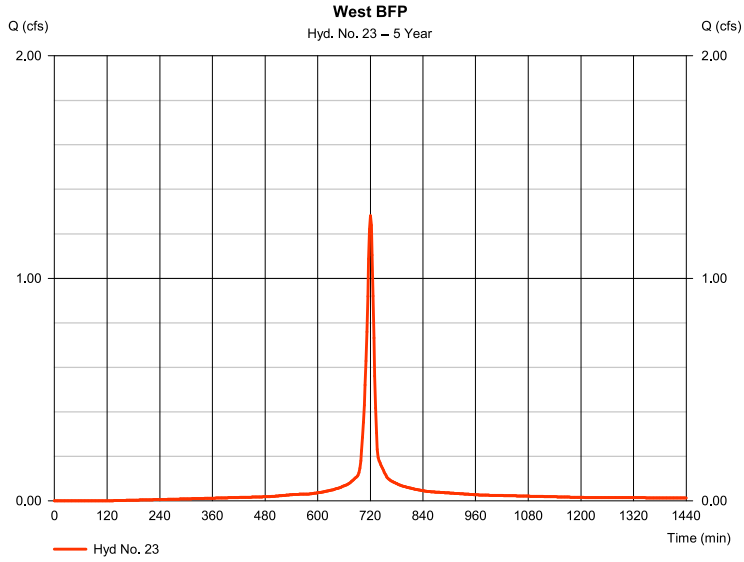
Peak discharge = 5.270 cfs
Time to peak = 720 min
Hyd. volume = 13,718 cuft
Curve number = 92
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484



Hyd. No. 23

West BFP

Hydrograph type	= SCS Runoff	Peak discharge	= 1.281 cfs
Storm frequency	= 5 yrs.	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3,638 cuft
Drainage area	= 0.570 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.93 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hyd. No. 3

Offsite A

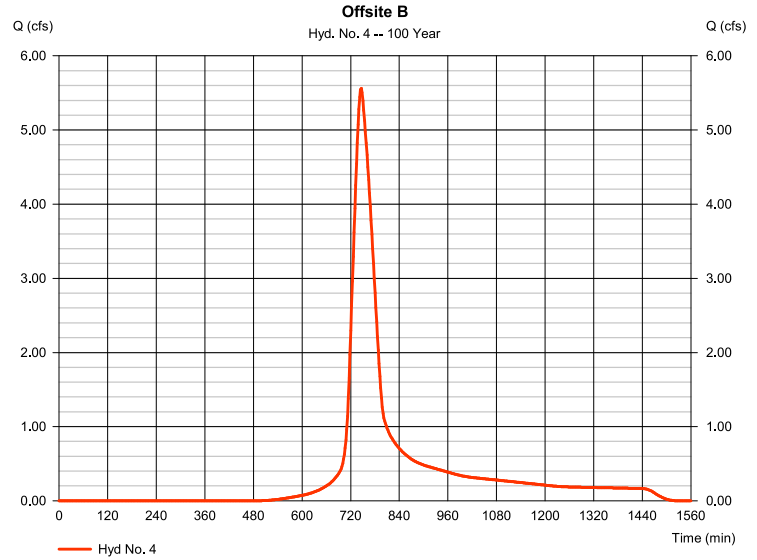
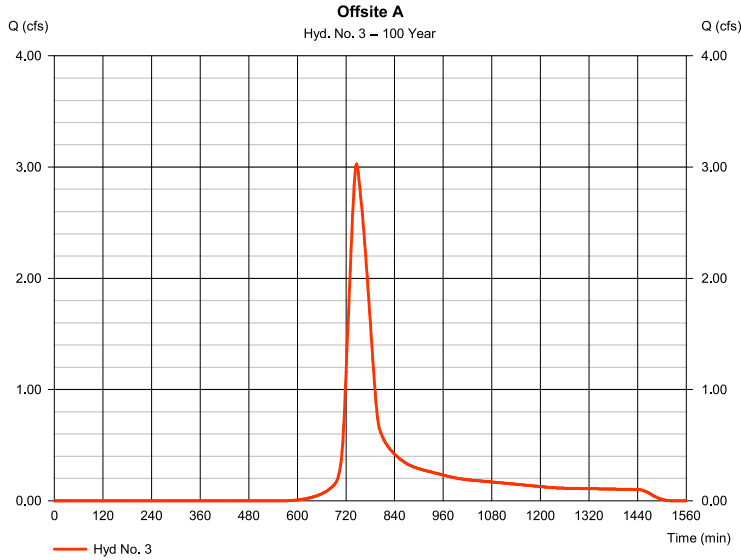
Hydrograph type	= SCS Runoff	Peak discharge	= 3.027 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 18,444 cuft
Drainage area	= 3.500 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 51.40 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hyd. No. 4

Offsite B

Hydrograph type	= SCS Runoff	Peak discharge	= 5.564 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 33,307 cuft
Drainage area	= 5.280 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 54.09 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(4,000 x 80) + (1,280 x 98)] / 5,280



Hydrograph Report

Hyd. No. 5

Offsite C

Hydrograph type	= SCS Runoff	Peak discharge	= 10.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 63,843 cuft
Drainage area	= 12.300 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 54.30 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

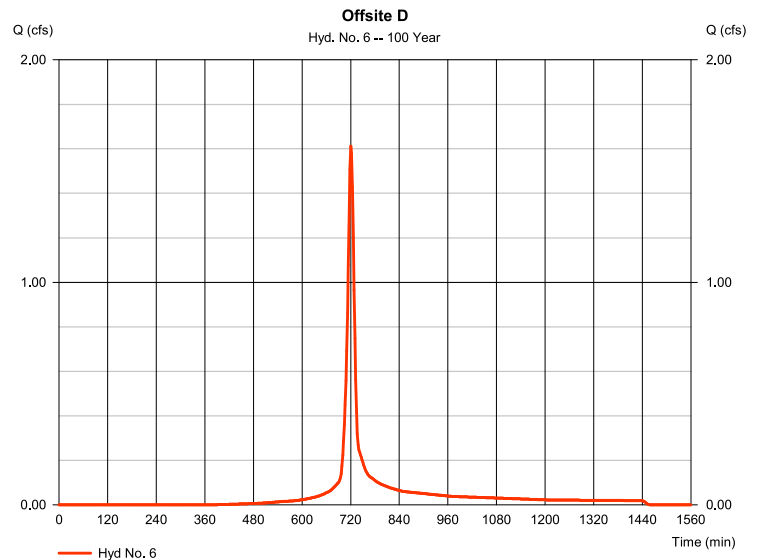
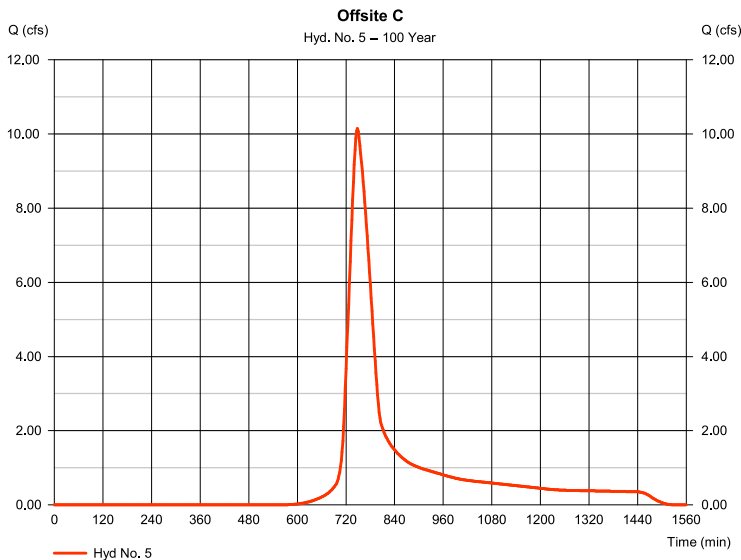
Hydrograph Report

Hyd. No. 6

Offsite D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.611 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 4,204 cuft
Drainage area	= 0.550 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,300 x 80) + (0,250 x 98)] / 0,550



Hydrograph Report

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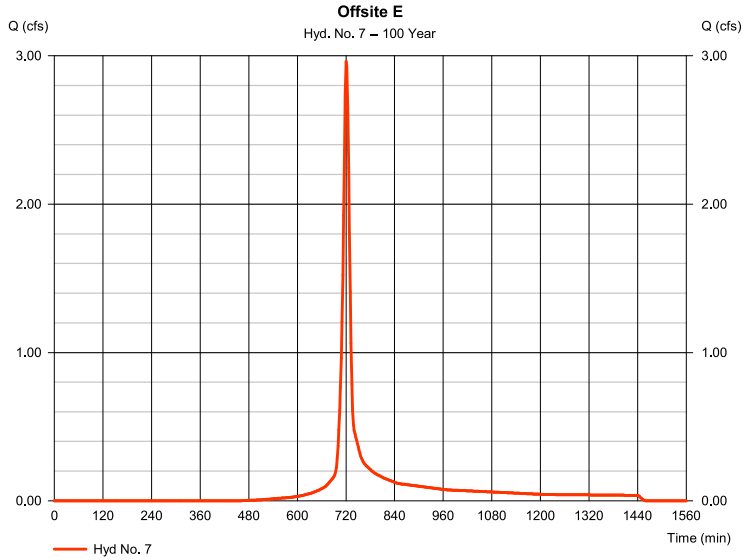
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Hyd. No. 7

Offsite E

Hydrograph type	= SCS Runoff	Peak discharge	= 2,983 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 7,683 cuft
Drainage area	= 1.140 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,310 x 98) + (0,830 x 80)] / 1,140



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

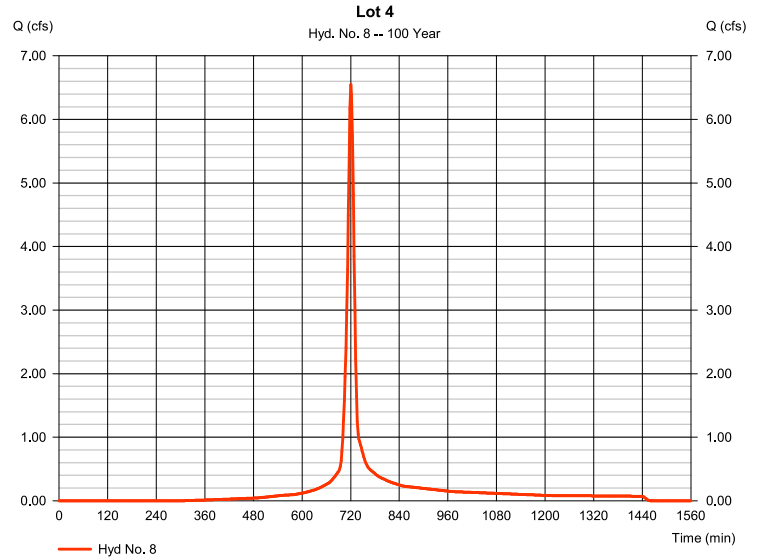
Monday, 09 / 11 / 2023

Hyd. No. 8

Lot 4

Hydrograph type	= SCS Runoff	Peak discharge	= 6,548 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 17,345 cuft
Drainage area	= 2.010 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,600 x 80) + (1,410 x 95)] / 2,010



Hydrograph Report

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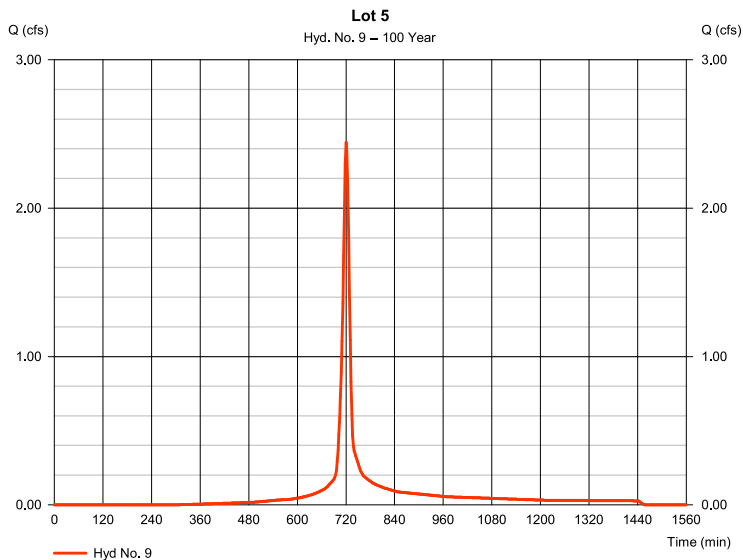
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Hyd. No. 9

Lot 5

Hydrograph type	= SCS Runoff	Peak discharge	= 2,443 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 6,472 cuft
Drainage area	= 0.750 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,180 x 80) + (0,570 x 95)] / 0,750



Hydrograph Report

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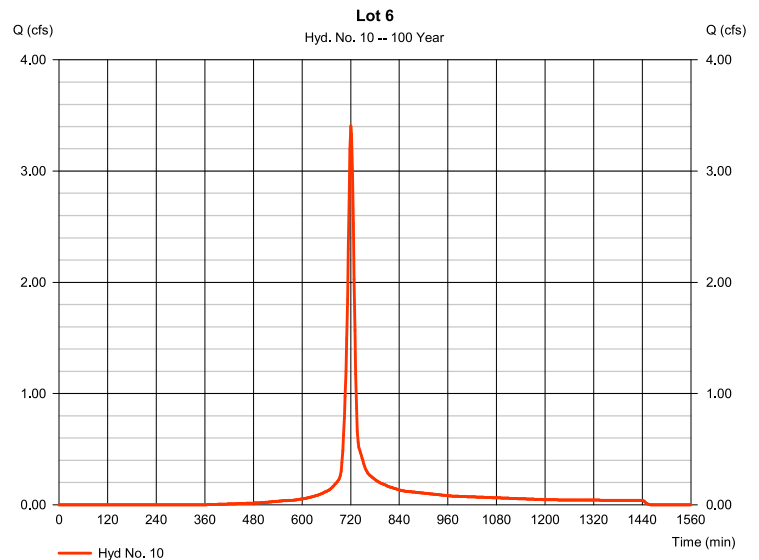
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Hyd. No. 10

Lot 6

Hydrograph type	= SCS Runoff	Peak discharge	= 3,405 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 8,919 cuft
Drainage area	= 1.120 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0,430 x 80) + (0,690 x 95)] / 1,120



Hydrograph Report

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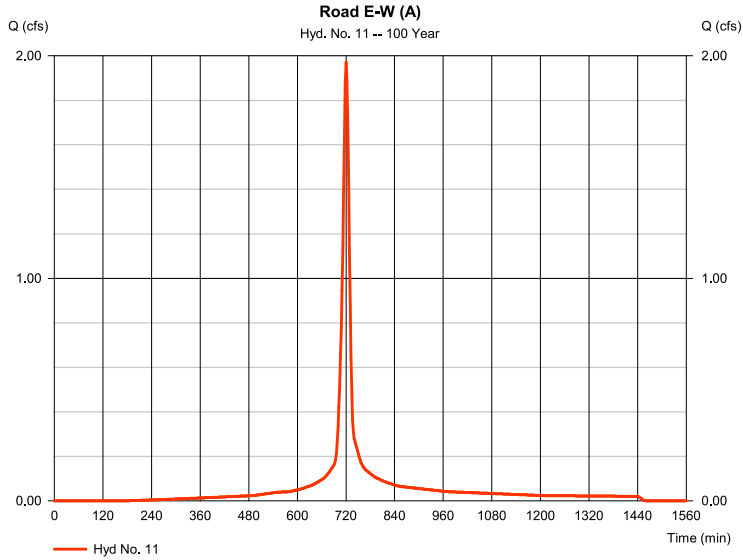
Hyd. No. 11

Road E-W (A)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.540 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.25 in
Storm duration = 24 hrs

Peak discharge = 1.972 cfs
Time to peak = 720 min
Hyd. volume = 5,446 cuft
Curve number = 95*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.080 x 80) + (0.460 x 98)] / 0.540



Hydrograph Report

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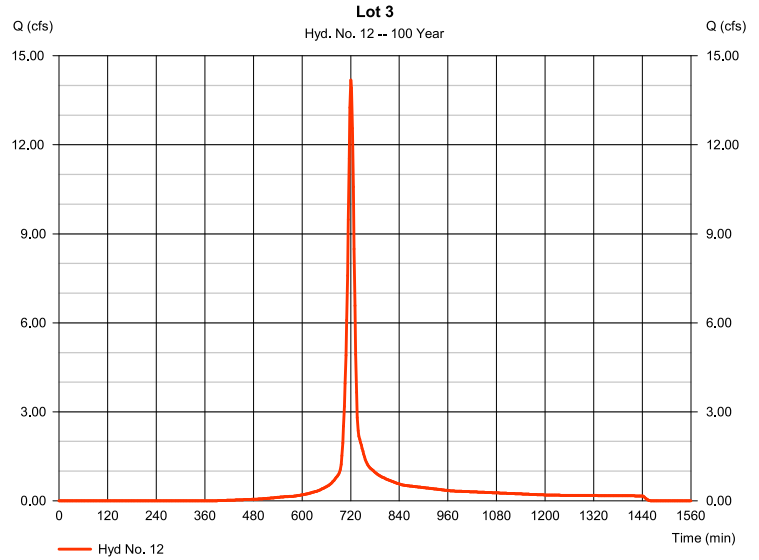
Hyd. No. 12

Lot 3

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 4.840 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.25 in
Storm duration = 24 hrs

Peak discharge = 14.18 cfs
Time to peak = 720 min
Hyd. volume = 36,998 cuft
Curve number = 88*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(3.080 x 92) + (1.760 x 80)] / 4.840



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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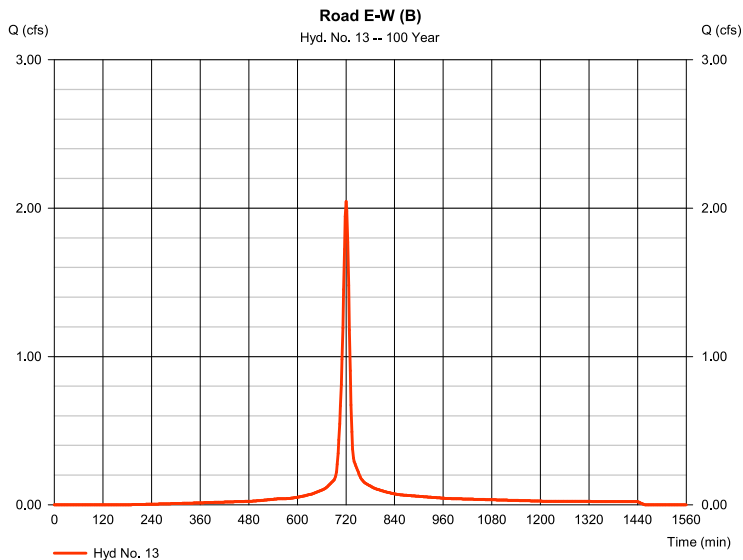
Hyd. No. 13

Road E-W (B)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.560 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.25 in
Storm duration = 24 hrs

Peak discharge = 2.045 cfs
Time to peak = 720 min
Hyd. volume = 5,647 cuft
Curve number = 95*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.480 x 98) + (0.080 x 80)] / 0.560



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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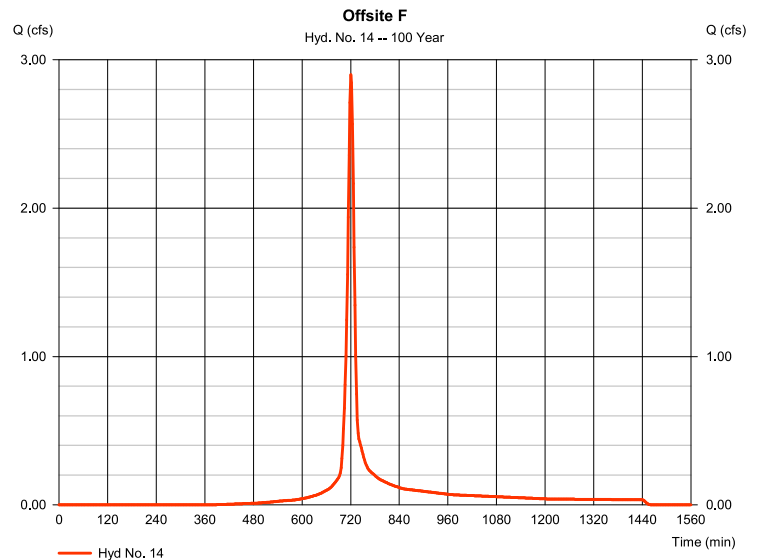
Hyd. No. 14

Offsite F

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.990 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 3.25 in
Storm duration = 24 hrs

Peak discharge = 2.901 cfs
Time to peak = 720 min
Hyd. volume = 7,568 cuft
Curve number = 88*
Hydraulic length = 0 ft
Time of conc. (Tc) = 10.00 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = [(0.570 x 80) + (0.420 x 98)] / 0.990



Hydrograph Report

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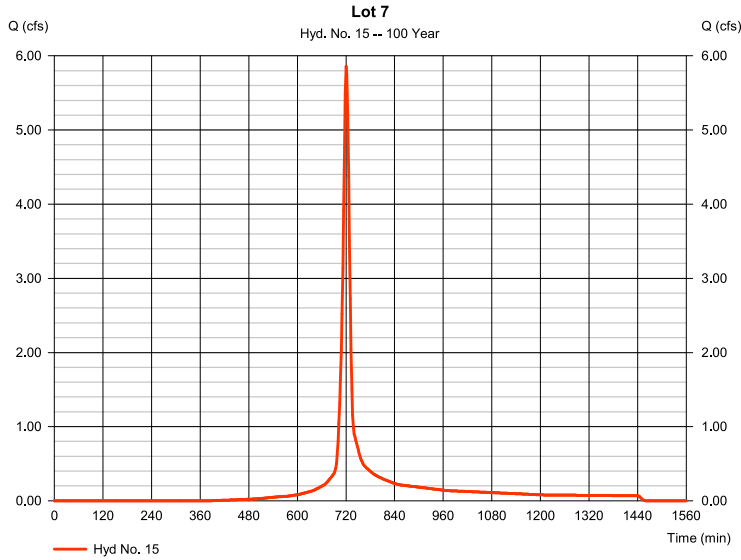
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Hyd. No. 15

Lot 7

Hydrograph type	= SCS Runoff	Peak discharge	= 5.860 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 15,288 cuft
Drainage area	= 2.000 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.880 x 80) + (1.120 x 95)] / 2.000



Hydrograph Report

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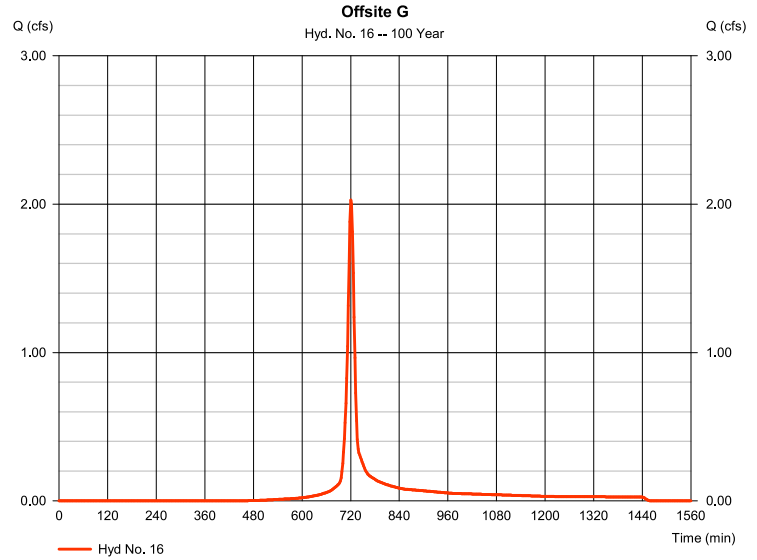
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Hyd. No. 16

Offsite G

Hydrograph type	= SCS Runoff	Peak discharge	= 2.027 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,257 cuft
Drainage area	= 0.780 ac	Curve number	= 85*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.200 x 98) + (0.580 x 80)] / 0.780



Hydrograph Report

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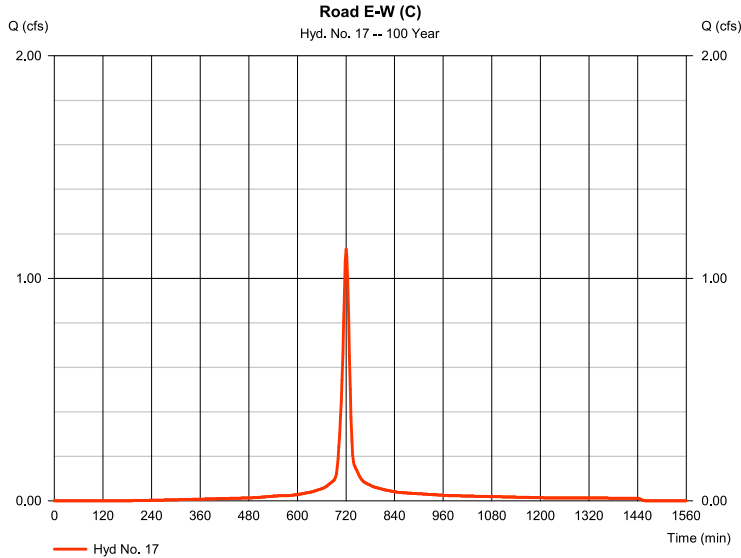
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Hyd. No. 17

Road E-W (C)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.132 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3,126 cuft
Drainage area	= 0.310 ac	Curve number	= 95
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

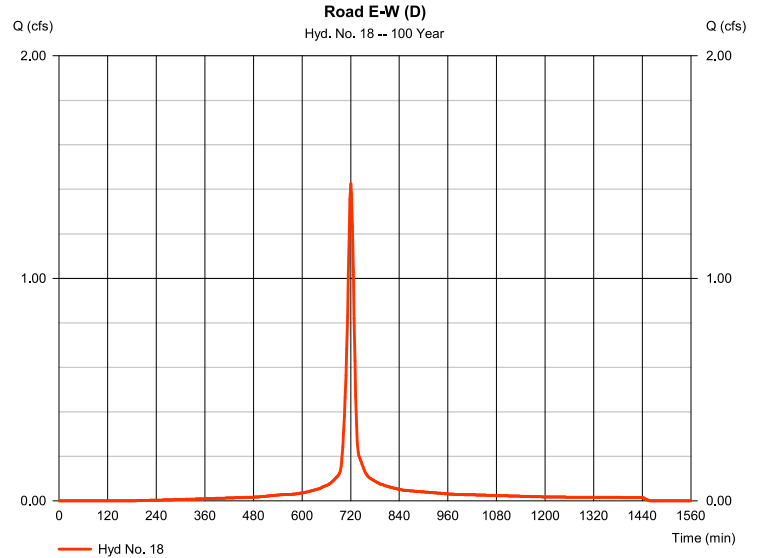
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Hyd. No. 18

Road E-W (D)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.424 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 3,933 cuft
Drainage area	= 0.390 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.670 x 98) + (0.110 x 80)] / 0.390



Hydrograph Report

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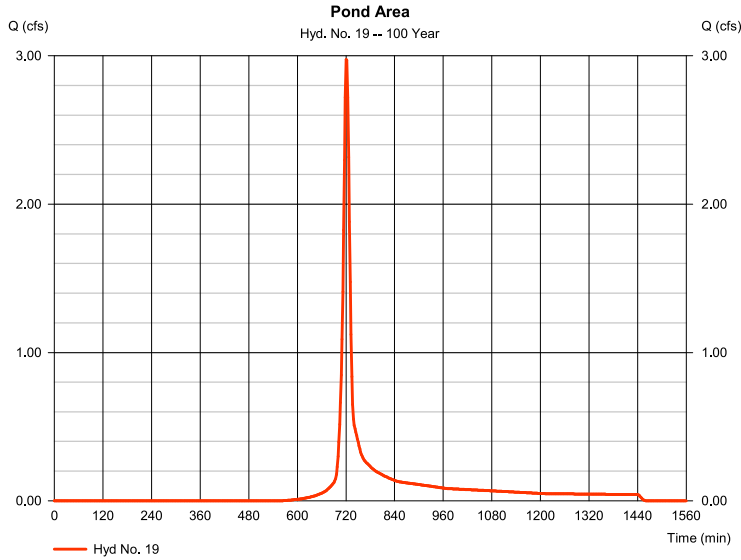
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Hyd. No. 19

Pond Area

Hydrograph type	= SCS Runoff	Peak discharge	= 2.975 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 7,765 cuft
Drainage area	= 1.440 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

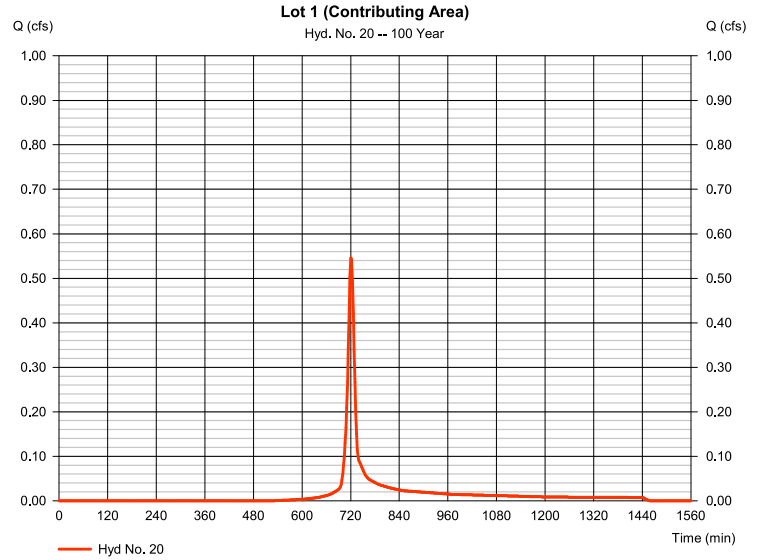
Monday, 09 / 11 / 2023

Hyd. No. 20

Lot 1 (Contributing Area)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.546 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 1,418 cuft
Drainage area	= 0.240 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.030 x 98) + (0.210 x 80)] / 0.240



Hydrograph Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

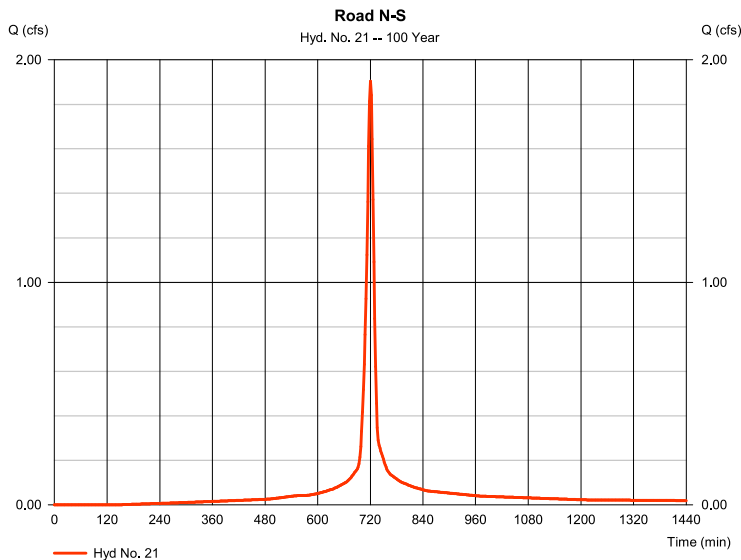
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Hyd. No. 21

Road N-S

Hydrograph type	= SCS Runoff	Peak discharge	= 1.904 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,343 cuft
Drainage area	= 0.510 ac	Curve number	= 96*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.060 x 80) + (0.450 x 98)] / 0.510



Hydrograph Report

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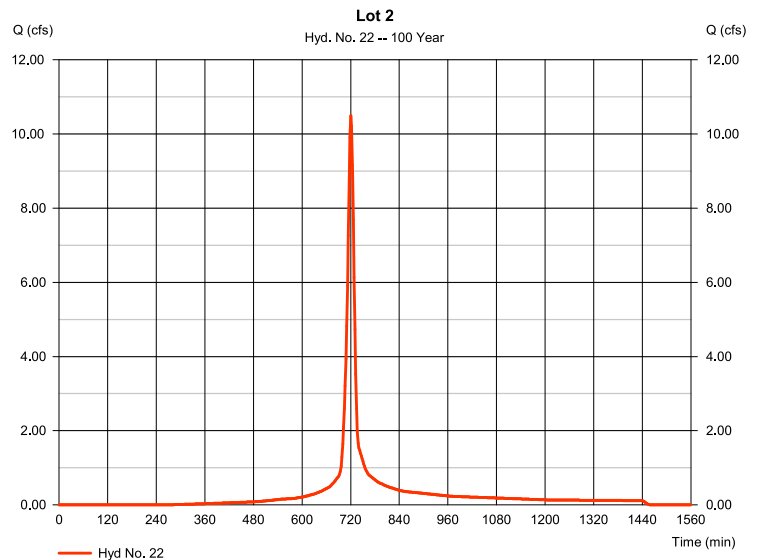
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Hyd. No. 22

Lot 2

Hydrograph type	= SCS Runoff	Peak discharge	= 10.49 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 28,009 cuft
Drainage area	= 3.120 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

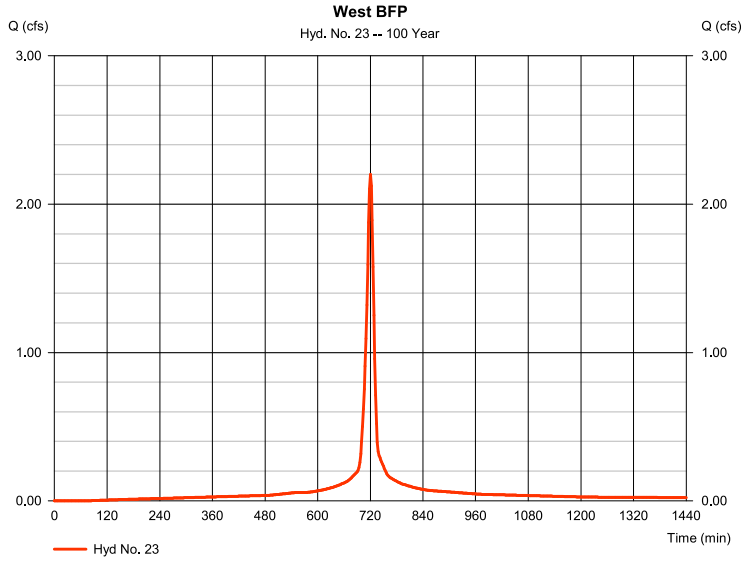


Hydrograph Report

Hyd. No. 23

West BFP

Hydrograph type	= SCS Runoff	Peak discharge	= 2.201 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 6,438 cuft
Drainage area	= 0.570 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hyd. No. 3

Offsite A

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 1.55	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	= 49.38	+ 0.00	+ 0.00	= 49.38
Shallow Concentrated Flow				
Flow length (ft)	= 300.00	0.00	0.00	
Watercourse slope (%)	= 2.00	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	=2.67	0.00	0.00	
Travel Time (min)	= 1.74	+ 0.00	+ 0.00	= 1.74
Channel Flow				
X sectional flow area (sqft)	= 6.00	0.00	0.00	
Wetted perimeter (ft)	= 3.00	0.00	0.00	
Channel slope (%)	= 2.00	0.00	0.00	
Manning's n-value	= 0.025	0.015	0.015	
Velocity (ft/s)	=13.41	0.00	0.00	
Flow length (ft)	((0))200.0	0.0	0.0	
Travel Time (min)	= 0.25	+ 0.00	+ 0.00	= 0.25
Total Travel Time, Tc				51.40 min

Hyd. No. 4

Offsite B

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 1.55	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	= 49.38	+ 0.00	+ 0.00	= 49.38
Shallow Concentrated Flow				
Flow length (ft)	= 300.00	0.00	0.00	
Watercourse slope (%)	= 2.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.28	0.00	0.00	
Travel Time (min)	= 2.19	+ 0.00	+ 0.00	= 2.19
Channel Flow				
X sectional flow area (sqft)	= 3.00	0.00	0.00	
Wetted perimeter (ft)	= 6.00	0.00	0.00	
Channel slope (%)	= 0.50	0.00	0.00	
Manning's n-value	= 0.200	0.015	0.015	
Velocity (ft/s)	=0.33	0.00	0.00	
Flow length (ft)	((0))50.0	0.0	0.0	
Travel Time (min)	= 2.52	+ 0.00	+ 0.00	= 2.52
Total Travel Time, Tc				54.09 min

TR55 Tc Worksheet

Hyd. No. 5

Offsite C

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 1.55	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
Travel Time (min)	= 49.38	+ 0.00	+ 0.00	= 49.38
Shallow Concentrated Flow				
Flow length (ft)	= 500.00	0.00	0.00	
Watercourse slope (%)	= 2.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.28	0.00	0.00	
Travel Time (min)	= 3.65	+ 0.00	+ 0.00	= 3.65
Channel Flow				
X sectional flow area (sqft)	= 3.00	0.00	0.00	
Wetted perimeter (ft)	= 6.00	0.00	0.00	
Channel slope (%)	= 2.00	0.00	0.00	
Manning's n-value	= 0.025	0.015	0.015	
Velocity (ft/s)	=5.30	0.00	0.00	
Flow length (ft)	((0))400.0	0.0	0.0	
Travel Time (min)	= 1.26	+ 0.00	+ 0.00	= 1.26
Total Travel Time, Tc				54.30 min

Hyd. No. 24

Lot 4 Pond Inflow

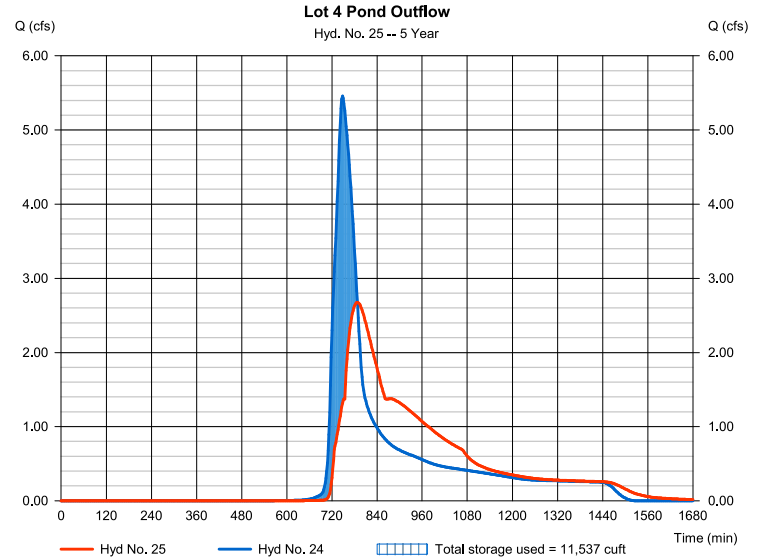
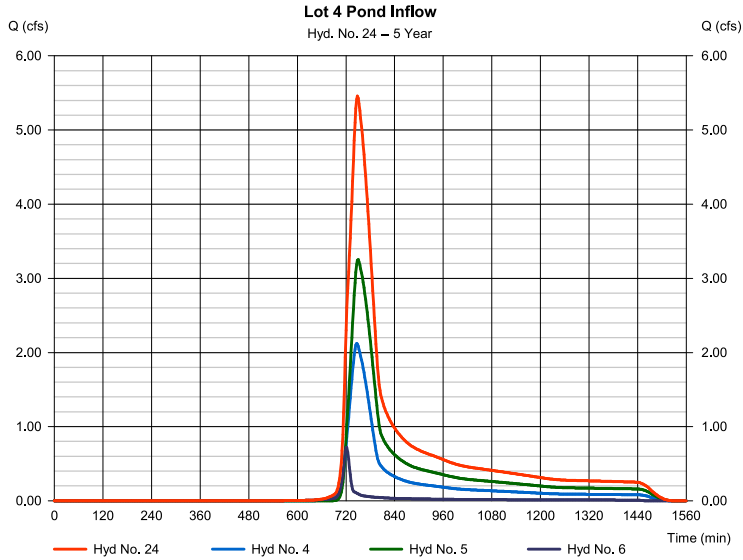
Hydrograph type	= Combine	Peak discharge	= 5.457 cfs
Storm frequency	= 5 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 38,353 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 18.130 ac

Hyd. No. 25

Lot 4 Pond Outflow

Hydrograph type	= Reservoir	Peak discharge	= 2.676 cfs
Storm frequency	= 5 yrs	Time to peak	= 788 min
Time interval	= 2 min	Hyd. volume	= 38,336 cuft
Inflow hyd. No.	= 24 - Lot 4 Pond Inflow	Max. Elevation	= 6996.28 ft
Reservoir name	= Lot 4 Pond	Max. Storage	= 11,537 cuft

Storage Indication method used.



Hydrograph Report

3

Hyd. No. 27

Offsite Basin Ditch 1

Hydrograph type	= Combine	Peak discharge	= 3.321 cfs
Storm frequency	= 5 yrs	Time to peak	= 778 min
Time interval	= 2 min	Hyd. volume	= 48,174 cuft
Inflow hyds.	= 3, 7, 25	Contrib. drain. area	= 4.640 ac

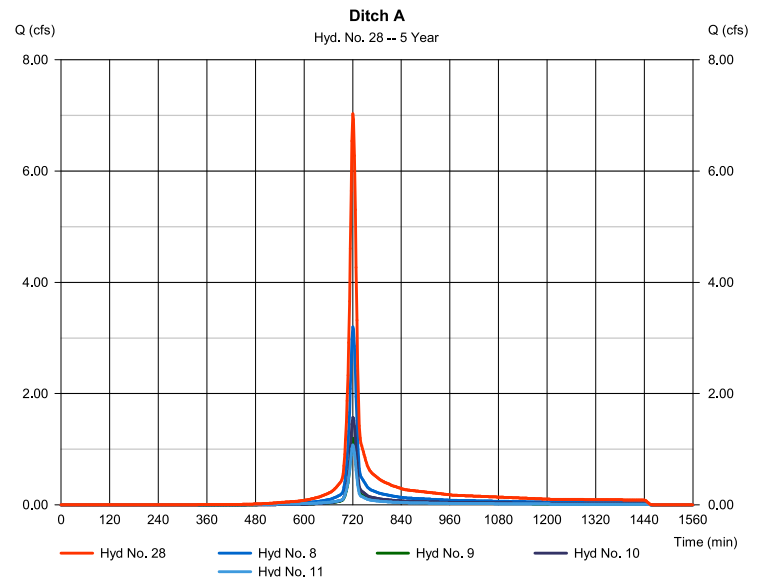
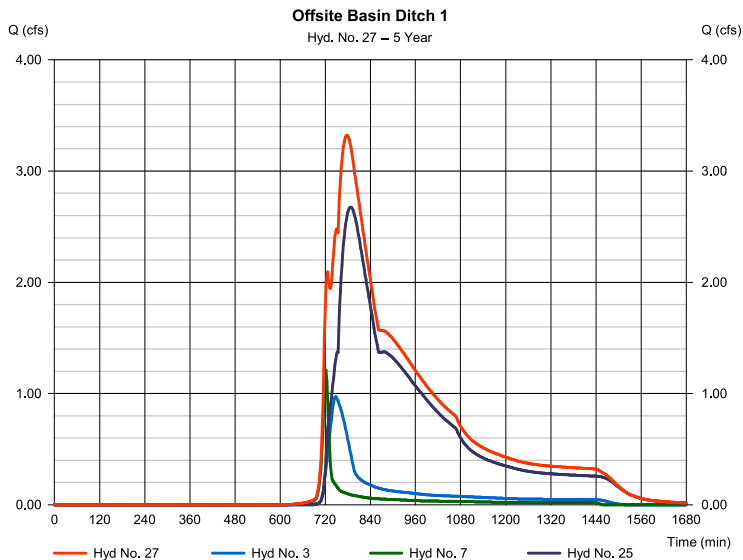
Hydrograph Report

4

Hyd. No. 28

Ditch A

Hydrograph type	= Combine	Peak discharge	= 7.032 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 18,323 cuft
Inflow hyds.	= 8, 9, 10, 11	Contrib. drain. area	= 4.420 ac



Hydrograph Report

5

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

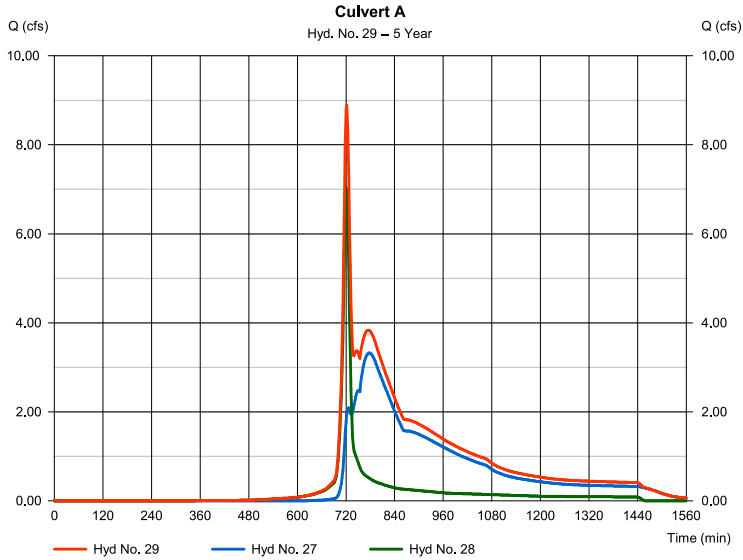
Monday, 09 / 11 / 2023

Hyd. No. 29

Culvert A

Hydrograph type = Combine
Storm frequency = 5 yrs.
Time interval = 2 min
Inflow hyds. = 27, 28

Peak discharge = 8.888 cfs
Time to peak = 722 min
Hyd. volume = 66,497 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

6

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

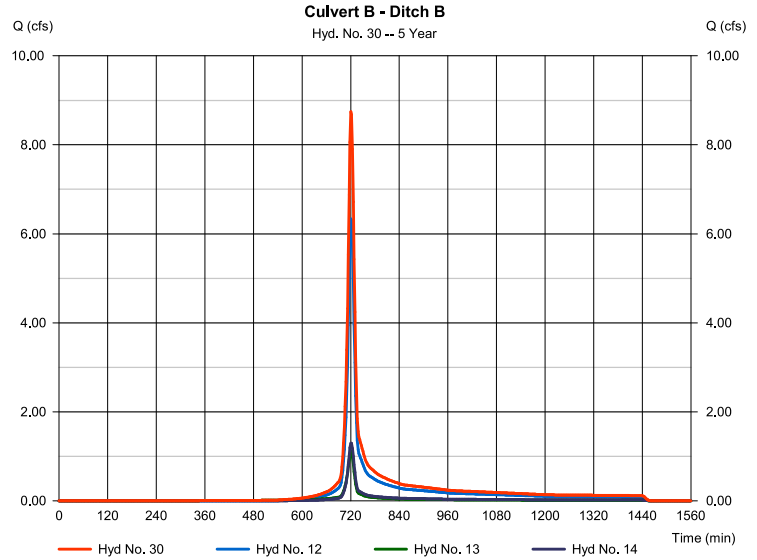
Monday, 09 / 11 / 2023

Hyd. No. 30

Culvert B - Ditch B

Hydrograph type = Combine
Storm frequency = 5 yrs.
Time interval = 2 min
Inflow hyds. = 12, 13, 14

Peak discharge = 8.744 cfs
Time to peak = 720 min
Hyd. volume = 22,811 cuft
Contrib. drain. area = 6.390 ac



Hydrograph Report

7

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

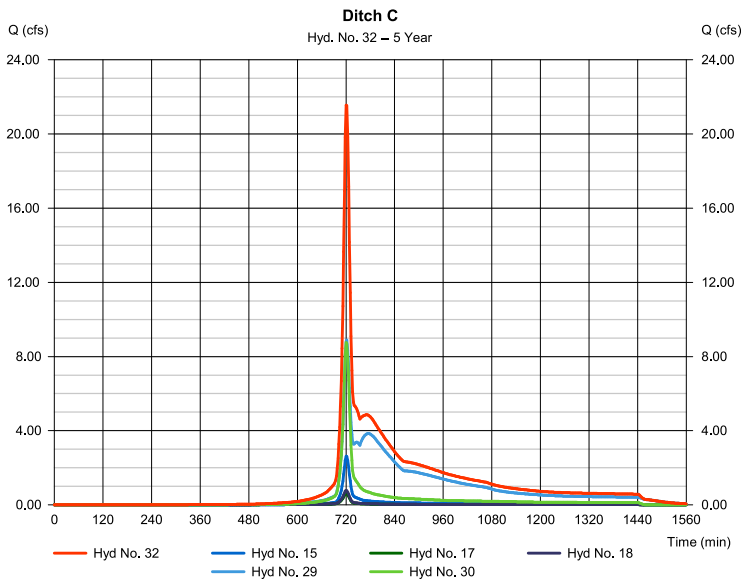
Monday, 09 / 11 / 2023

Hyd. No. 32

Ditch C

Hydrograph type = Combine
Storm frequency = 5 yrs.
Time interval = 2 min
Inflow hyds. = 15, 17, 18, 29, 30

Peak discharge = 21.57 cfs
Time to peak = 720 min
Hyd. volume = 99,826 cuft
Contrib. drain. area = 2.700 ac



Hydrograph Report

8

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

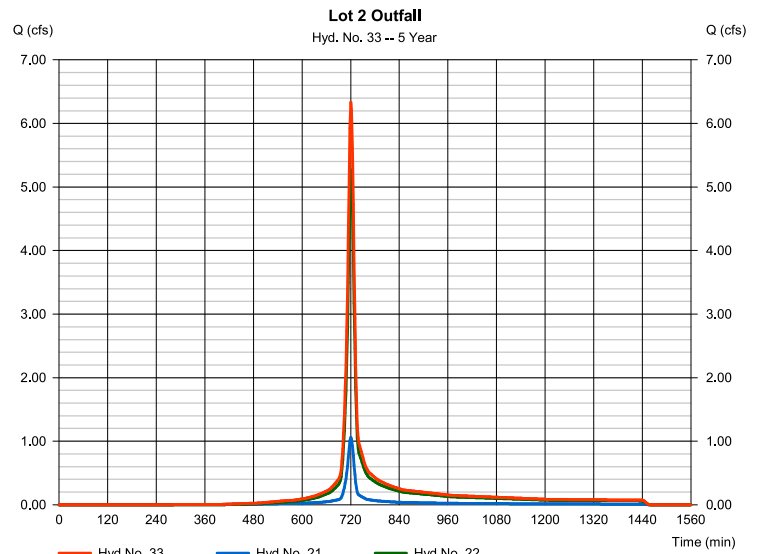
Monday, 09 / 11 / 2023

Hyd. No. 33

Lot 2 Outfall

Hydrograph type = Combine
Storm frequency = 5 yrs.
Time interval = 2 min
Inflow hyds. = 21, 22

Peak discharge = 6.333 cfs
Time to peak = 720 min
Hyd. volume = 16,594 cuft
Contrib. drain. area = 3.630 ac



Hydrograph Report

9

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

Hyd. No. 34

Main Pond Inflow

Hydrograph type	= Combine.	Peak discharge	= 29.91 cfs
Storm frequency	= 5 yrs.	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 121,940 cuft
Inflow hyds.	= 16, 19, 20, 32, 33	Contrib. drain. area	= 2.460 ac

Hydrograph Report

10

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

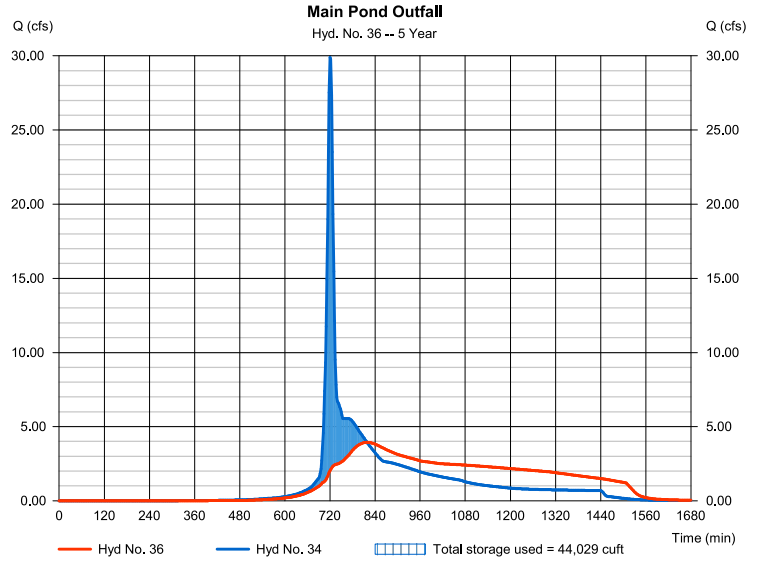
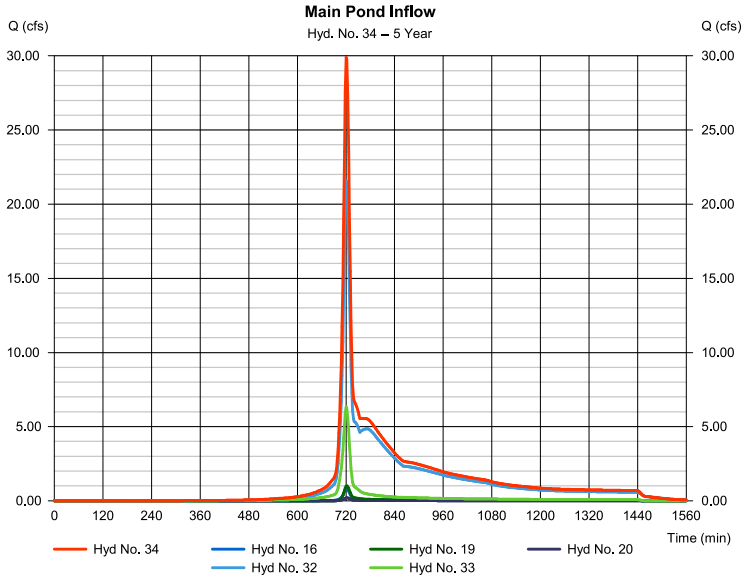
Monday, 09 / 11 / 2023

Hyd. No. 36

Main Pond Outfall

Hydrograph type	= Reservoir	Peak discharge	= 3.935 cfs
Storm frequency	= 5 yrs.	Time to peak	= 818 min
Time interval	= 2 min	Hyd. volume	= 121,932 cuft
Inflow hyd. No.	= 34 - Main Pond Inflow	Max. Elevation	= 6970.34 ft
Reservoir name	= HAGA Pond	Max. Storage	= 44,029 cuft

Storage Indication method used.



Hyd. No. 24

Lot 4 Pond Inflow

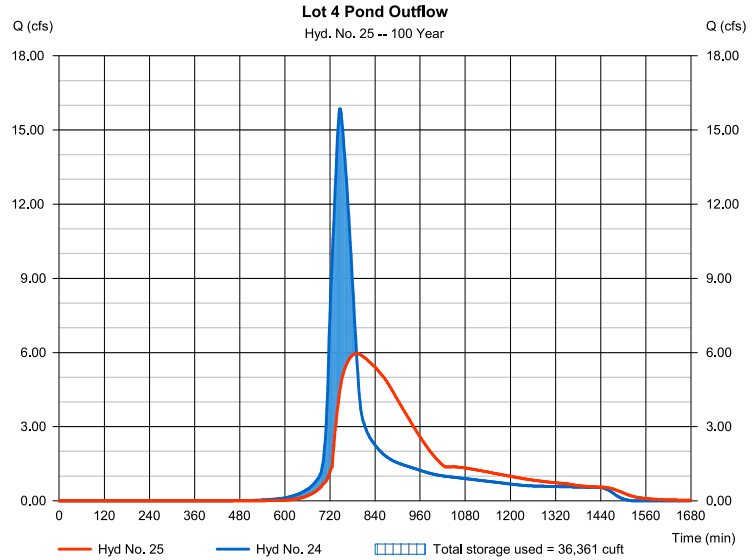
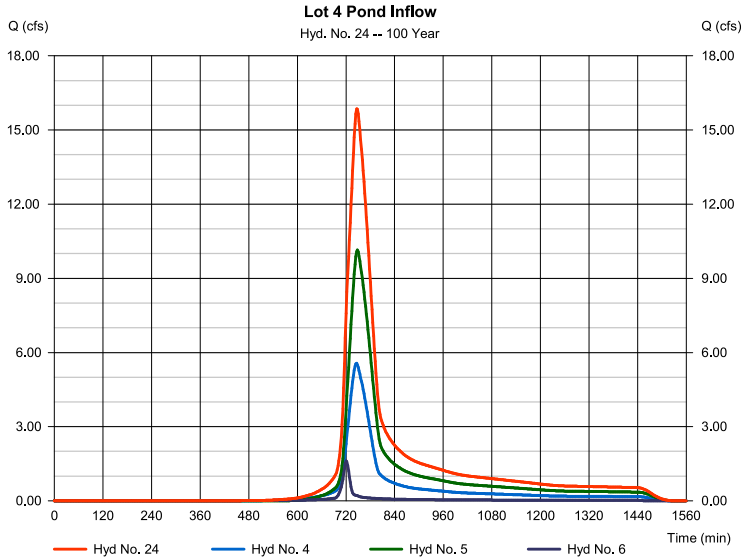
Hydrograph type	= Combine	Peak discharge	= 15.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 101,354 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 18.130 ac

Hyd. No. 25

Lot 4 Pond Outflow

Hydrograph type	= Reservoir	Peak discharge	= 5.966 cfs
Storm frequency	= 100 yrs	Time to peak	= 790 min
Time interval	= 2 min	Hyd. volume	= 101,336 cuft
Inflow hyd. No.	= 24 - Lot 4 Pond Inflow	Max. Elevation	= 6997.99 ft
Reservoir name	= Lot 4 Pond	Max. Storage	= 36,361 cuft

Storage Indication method used.



Hydrograph Report

3

Hyd. No. 27

Offsite Basin Ditch 1

Hydrograph type	= Combine	Peak discharge	= 8.229 cfs
Storm frequency	= 100 yrs	Time to peak	= 758 min
Time interval	= 2 min	Hyd. volume	= 127,464 cuft
Inflow hyds.	= 3, 7, 25	Contrib. drain. area	= 4.640 ac

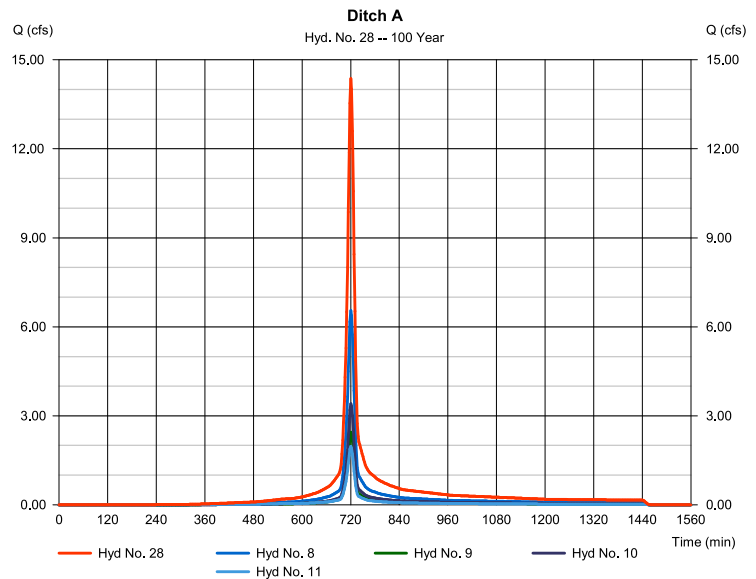
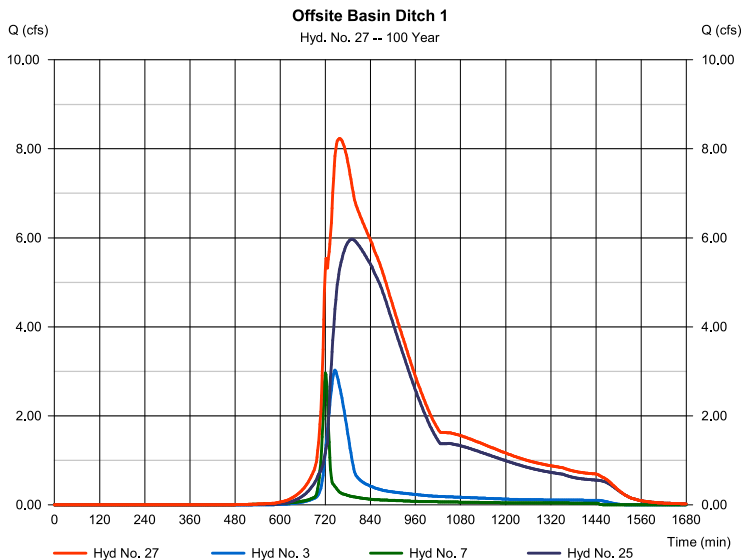
Hydrograph Report

4

Hyd. No. 28

Ditch A

Hydrograph type	= Combine	Peak discharge	= 14.37 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 38,182 cuft
Inflow hyds.	= 8, 9, 10, 11	Contrib. drain. area	= 4.420 ac



Hydrograph Report

5

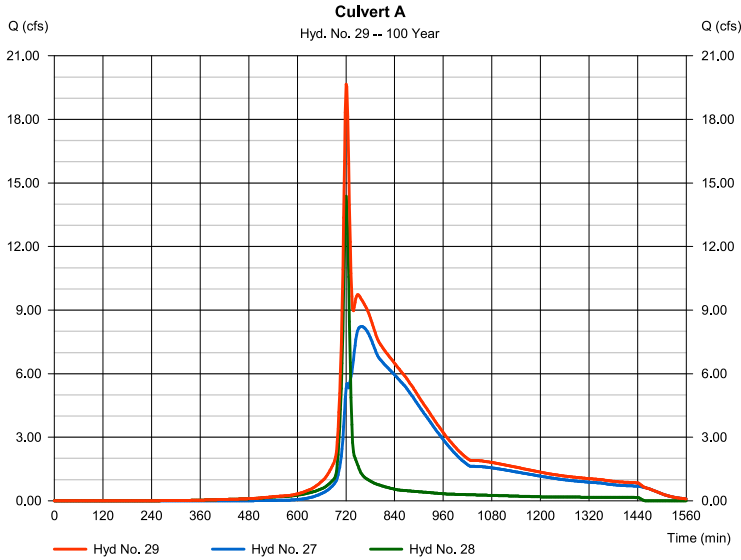
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

Hyd. No. 29

Culvert A

Hydrograph type	= Combine	Peak discharge	= 19.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 165.645 cuft
Inflow hyds.	= 27, 28	Contrib. drain. area	= 0.000 ac



Hydrograph Report

6

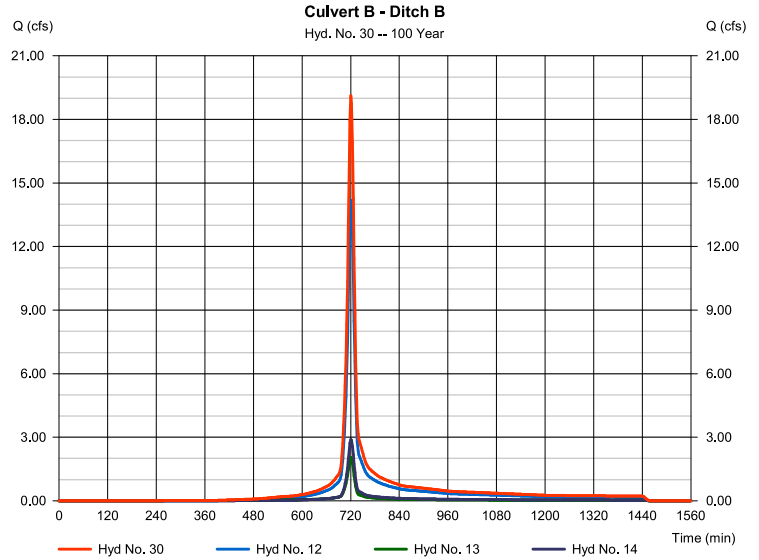
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

Hyd. No. 30

Culvert B - Ditch B

Hydrograph type	= Combine	Peak discharge	= 19.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 50.212 cuft
Inflow hyds.	= 12, 13, 14	Contrib. drain. area	= 6.390 ac



Hydrograph Report

7

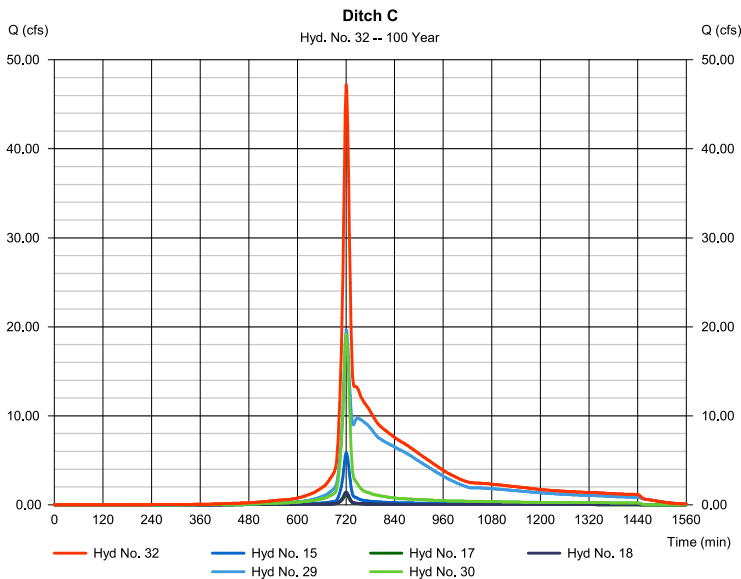
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

Hyd. No. 32

Ditch C

Hydrograph type	= Combine	Peak discharge	= 47.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 238.205 cuft
Inflow hyds.	= 15, 17, 18, 29, 30	Contrib. drain. area	= 2.700 ac



Hydrograph Report

8

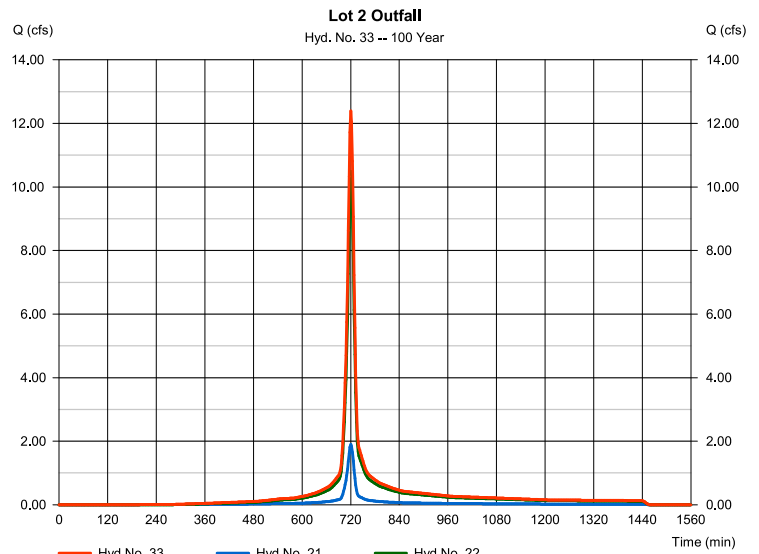
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Monday, 09 / 11 / 2023

Hyd. No. 33

Lot 2 Outfall

Hydrograph type	= Combine	Peak discharge	= 12.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 33.352 cuft
Inflow hyds.	= 21, 22	Contrib. drain. area	= 3.630 ac



Hydrograph Report

Hyd. No. 34

Main Pond Inflow

Hydrograph type	= Combine	Peak discharge	= 65.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 285,997 cuft
Inflow hyd.	= 16, 19, 20, 32, 33	Contrib. drain. area	= 2.460 ac

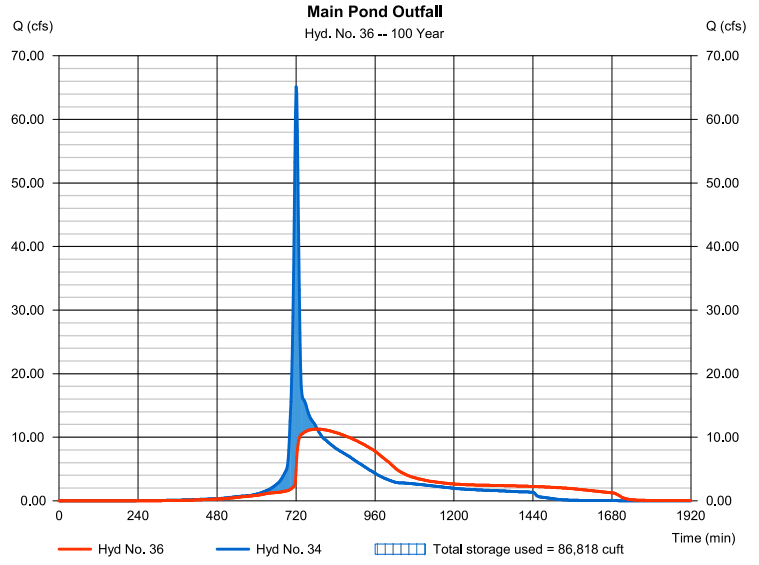
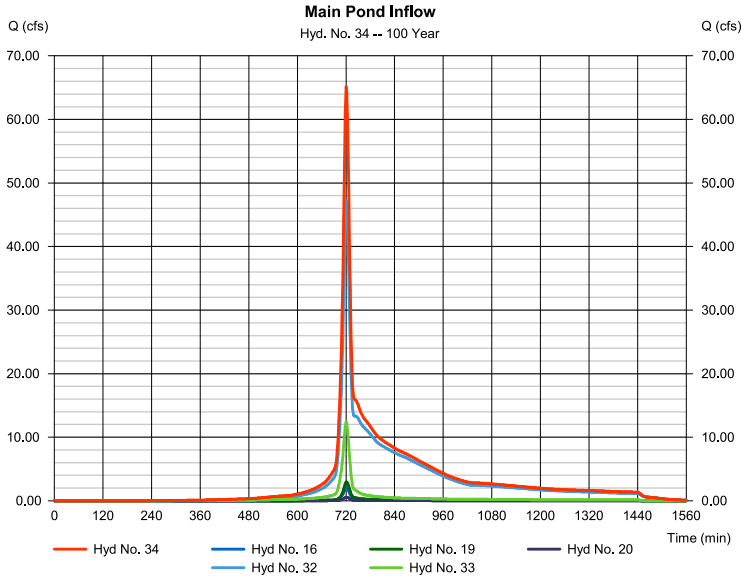
Hydrograph Report

Hyd. No. 36

Main Pond Outfall

Hydrograph type	= Reservoir	Peak discharge	= 11.28 cfs
Storm frequency	= 100 yrs	Time to peak	= 784 min
Time interval	= 2 min	Hyd. volume	= 285,989 cuft
Inflow hyd. No.	= 34 - Main Pond Inflow	Max. Elevation	= 6971.98 ft
Reservoir name	= HAGA Pond	Max. Storage	= 86,818 cuft

Storage Indication method used.



Pond No. 1 - Lot 4 Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 6995.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	6995.00	00	0	0
0.50	6995.50	11,684	1,947	1,947
1.00	6996.00	12,328	6,002	7,949
1.50	6996.50	12,987	6,327	14,276
2.00	6997.00	13,662	6,661	20,937
2.50	6997.50	15,409	7,263	28,200
3.00	6998.00	17,975	8,337	36,537

FLOW RESTRICTED BY 12-IN CULVERT

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 6995.00	0.00	0.00	0.00
Length (ft)	= 20.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	0.00	0.00	0.00
Crest El. (ft)	= 6997.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ie) and submergence (e).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	6995.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.50	1,947	6995.50	0.69 oc	---	---	---	0.00	---	---	---	---	---	0.686
1.00	7,949	6996.00	1.37 oc	---	---	---	0.00	---	---	---	---	---	1.369
1.50	14,276	6996.50	3.35 oc	---	---	---	0.00	---	---	---	---	---	3.353
2.00	20,937	6997.00	4.54 oc	---	---	---	0.00	---	---	---	---	---	4.540
2.50	28,200	6997.50	5.35 ic	---	---	---	0.00	---	---	---	---	---	5.347
3.00	36,537	6998.00	5.98 ic	---	---	---	0.00	---	---	---	---	---	5.979

APPENDIX H: HAGA MAIN POND OVERFLOW ANALYSIS

POND OVERFLOW

Trapezoidal

Bottom Width (ft) = 8.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 0.75
Invert Elev (ft) = 6975.25
Slope (%) = 10.00
N-Value = 0.040

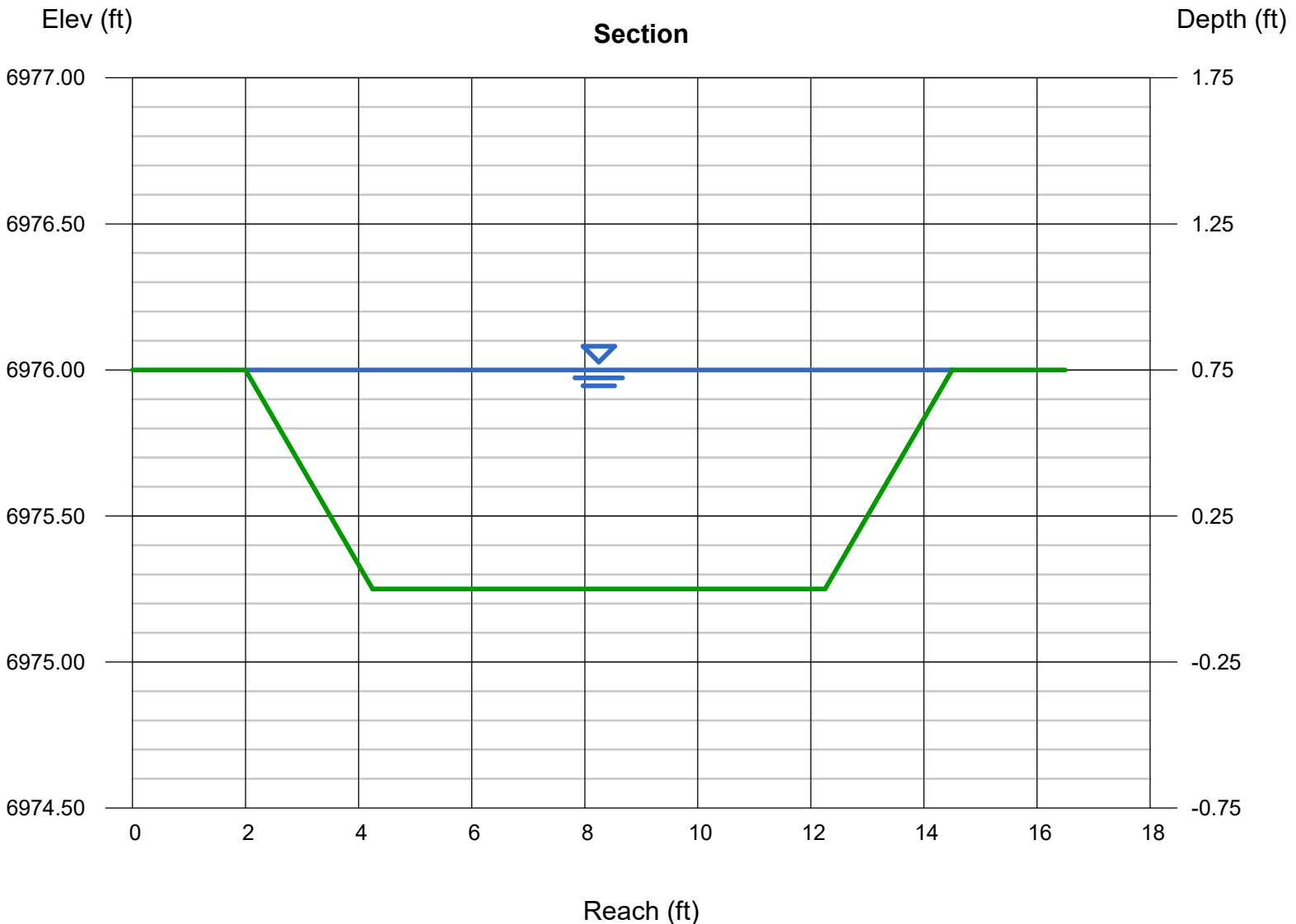
Calculations

Compute by: Known Depth
Known Depth (ft) = 0.75

Highlighted

Depth (ft) = 0.75
Q (cfs) = 64.47
Area (sqft) = 7.69
Velocity (ft/s) = 8.39
Wetted Perim (ft) = 12.74
Crit Depth, Yc (ft) = 0.75
Top Width (ft) = 12.50
EGL (ft) = 1.84

> DEVELOPED Q100 = 64.40 CFS



Ditch A

Trapezoidal

Bottom Width (ft) = 7.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 6981.00
Slope (%) = 0.75
N-Value = 0.026

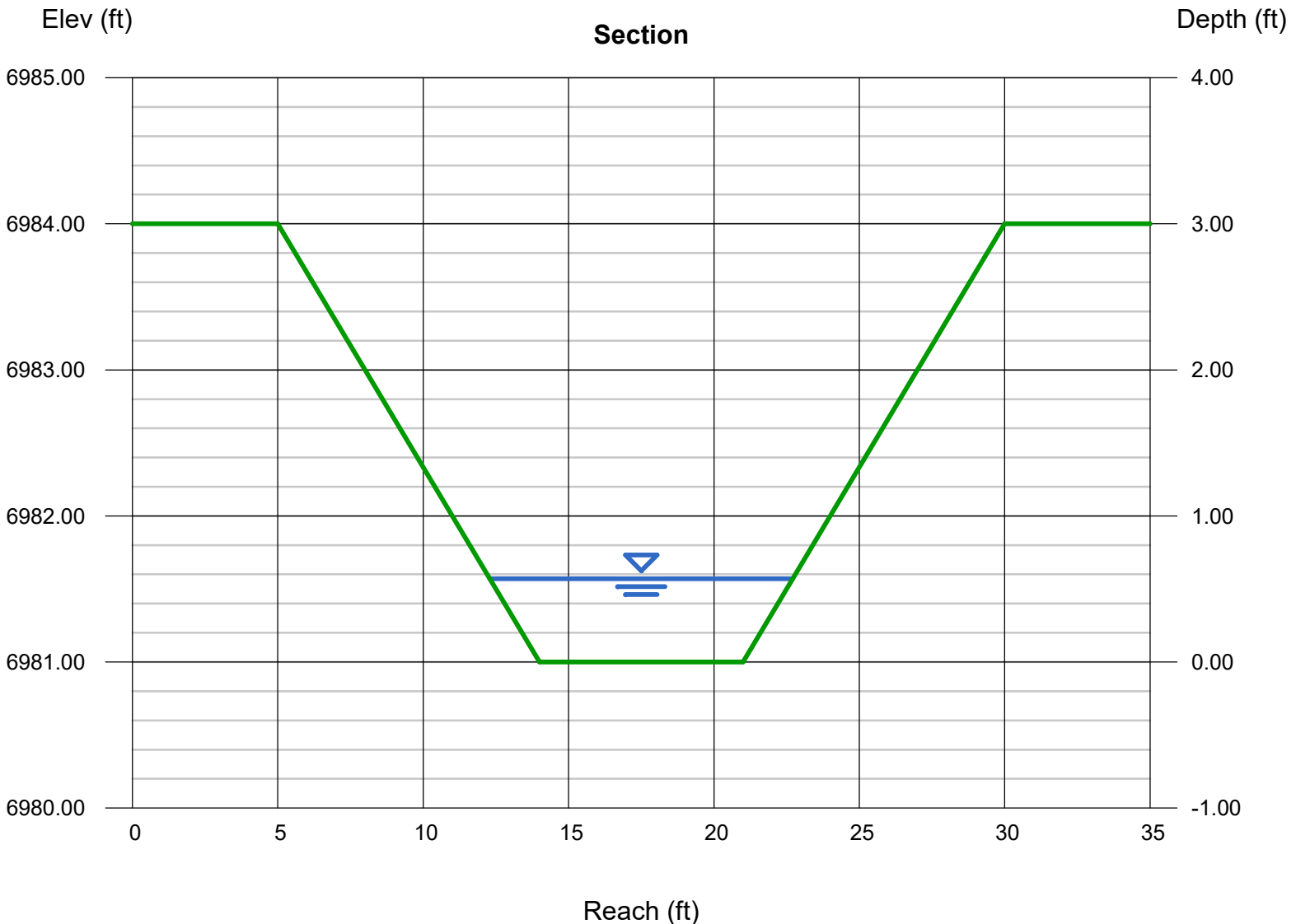
Highlighted

Depth (ft) = 0.57
Q (cfs) = 14.40
Area (sqft) = 4.96
Velocity (ft/s) = 2.90
Wetted Perim (ft) = 10.60
Crit Depth, Yc (ft) = 0.48
Top Width (ft) = 10.42
EGL (ft) = 0.70

Calculations

Compute by: Known Q
Known Q (cfs) = 14.40

100-YR FLOW FROM ROUTED HYDROGRAPH
"DITCH A" (HYD NO. 28)



Ditch B

Trapezoidal

Bottom Width (ft) = 7.00
 Side Slopes (z:1) = 3.00, 3.00
 Total Depth (ft) = 3.00
 Invert Elev (ft) = 6981.00
 Slope (%) = 1.00
 N-Value = 0.026

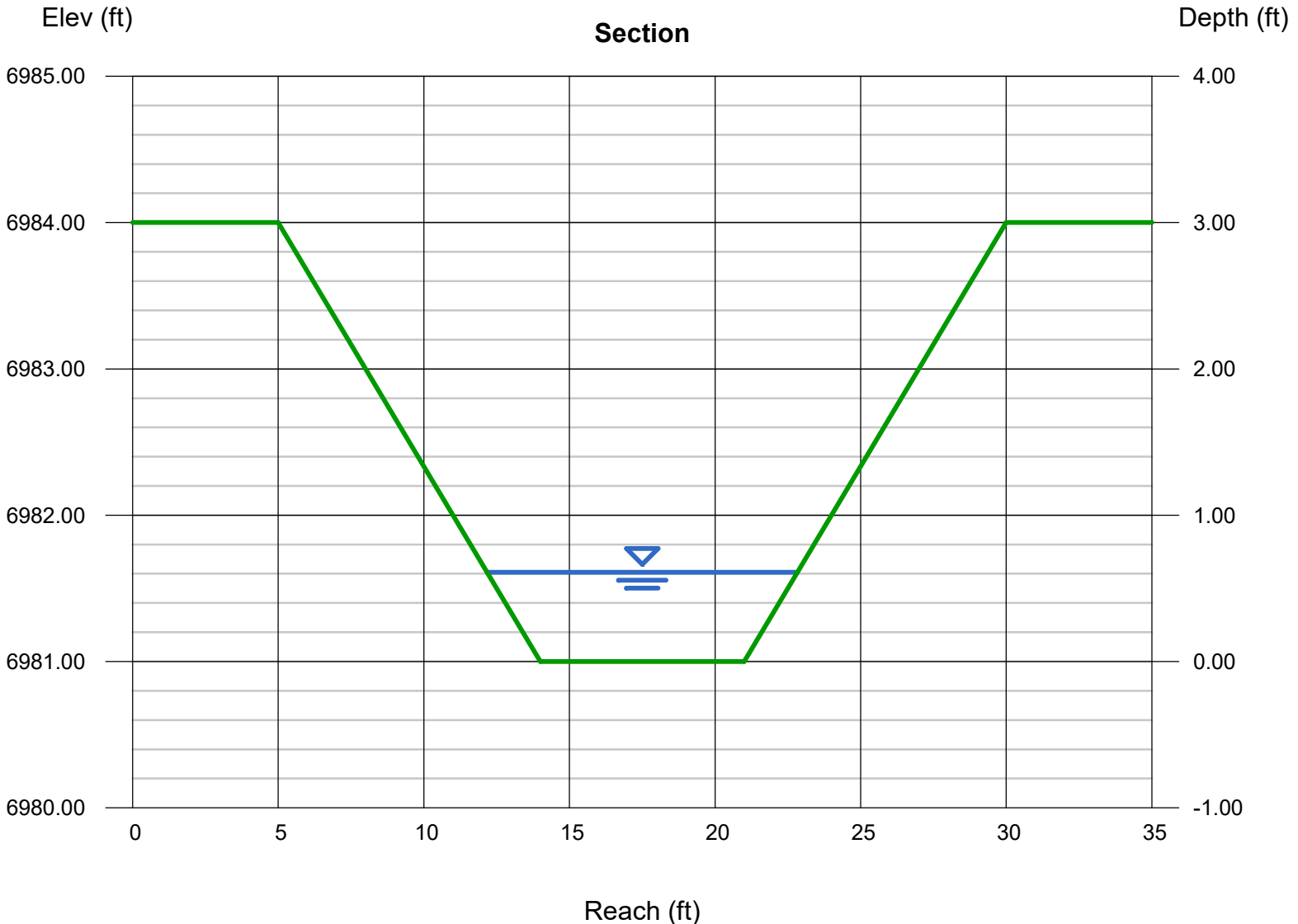
Highlighted

Depth (ft) = 0.61
 Q (cfs) = 19.13
 Area (sqft) = 5.39
 Velocity (ft/s) = 3.55
 Wetted Perim (ft) = 10.86
 Crit Depth, Yc (ft) = 0.57
 Top Width (ft) = 10.66
 EGL (ft) = 0.81

Calculations

Compute by: Known Q
 Known Q (cfs) = 19.13

100-YR FLOW FROM ROUTED HYDROGRAPH
 "DITCH B - CULVERT B" (HYD NO. 30)



Ditch C

Trapezoidal

Bottom Width (ft) = 7.00
 Side Slopes (z:1) = 3.00, 3.00
 Total Depth (ft) = 3.00
 Invert Elev (ft) = 6973.00
 Slope (%) = 1.00
 N-Value = 0.026

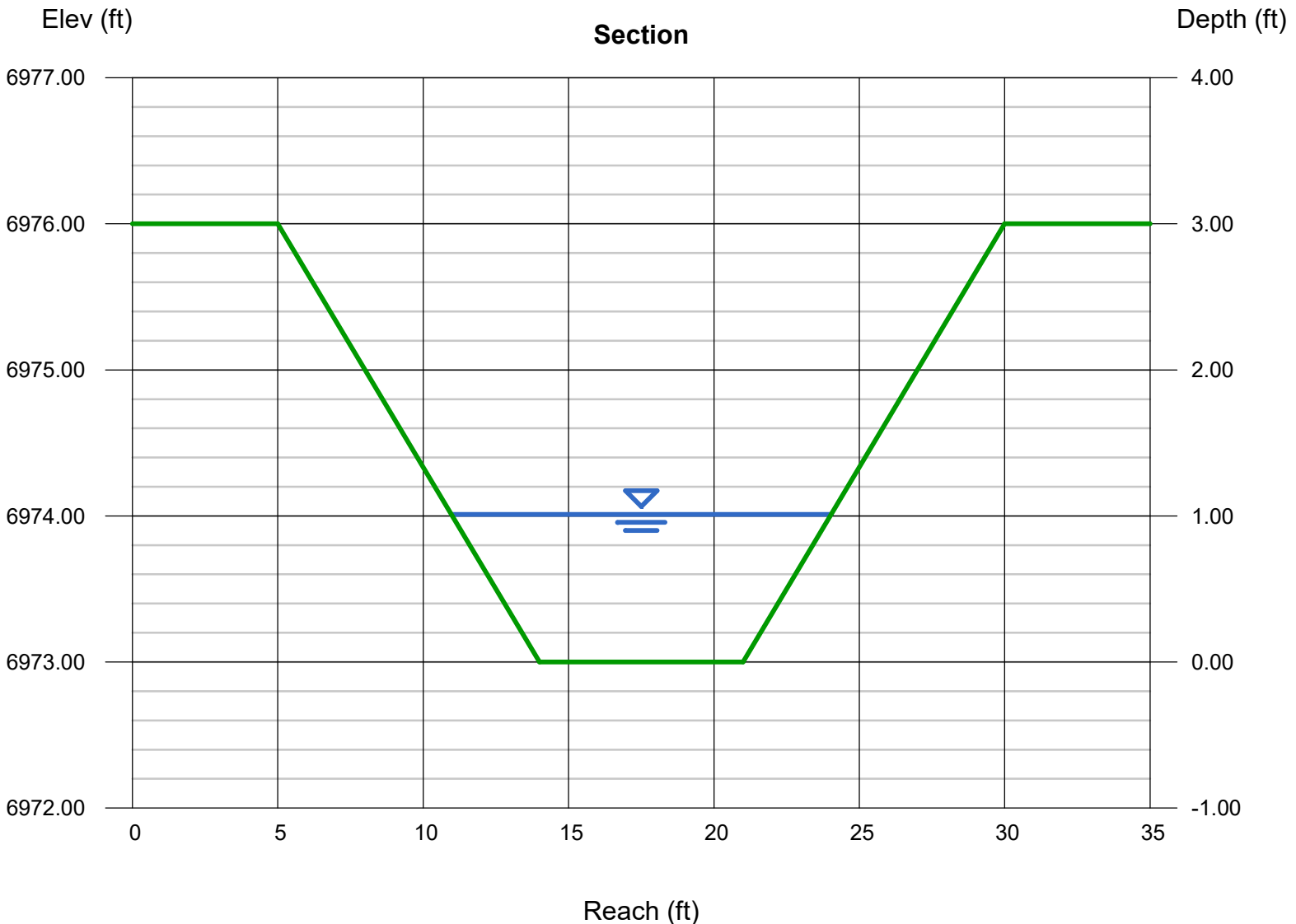
Highlighted

Depth (ft) = 1.01
 Q (cfs) = 47.20
 Area (sqft) = 10.13
 Velocity (ft/s) = 4.66
 Wetted Perim (ft) = 13.39
 Crit Depth, Yc (ft) = 0.97
 Top Width (ft) = 13.06
 EGL (ft) = 1.35

Calculations

Compute by: Known Q
 Known Q (cfs) = 47.20

100-YR FLOW FROM ROUTED HYDROGRAPH
 "DITCH C" (HYD NO. 32)



Offsite Ditch 1

Triangular

Side Slopes (z:1) = 2.50, 2.50
 Total Depth (ft) = 2.00

Invert Elev (ft) = 1.00
 Slope (%) = 0.50
 N-Value = 0.026

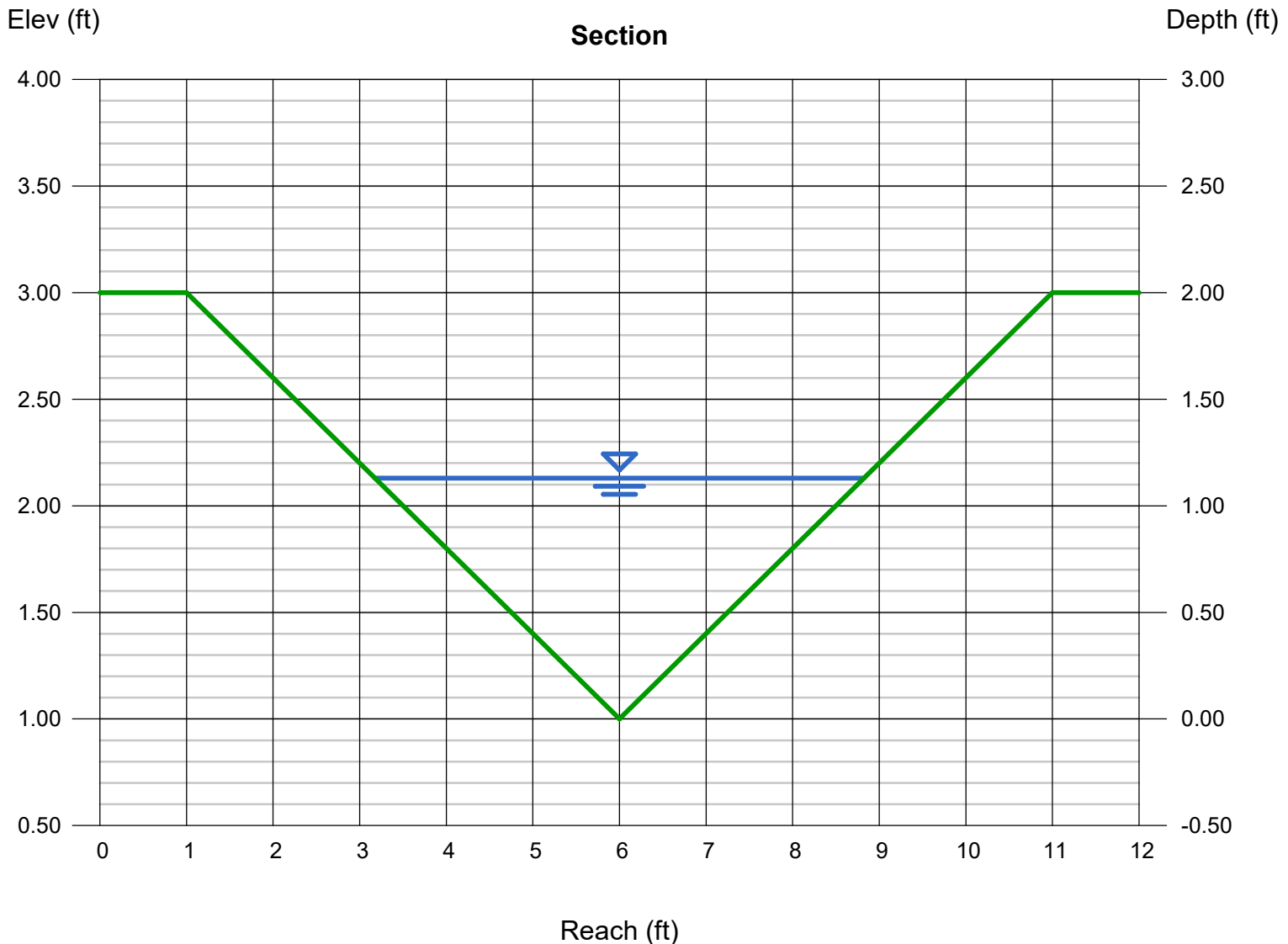
Calculations

Compute by:
 Known Q (cfs) = **8.22**

Highlighted

Depth (ft) = 1.13
 Q (cfs) = 8.220
 Area (sqft) = 3.19
 Velocity (ft/s) = 2.57
 Wetted Perim (ft) = 6.09
 Crit Depth, Yc (ft) = 0.93
 Top Width (ft) = 5.65
 EGL (ft) = 1.23

100-YR FLOW FROM ROUTED HYDROGRAPH
 "OFFSITE DITCH 1" (HYD NO. 27)



Offsite Ditch 2

Triangular

Side Slopes (z:1) = 2.50, 2.50

Total Depth (ft) = 2.00

Invert Elev (ft) = 1.00

Slope (%) = 1.00

N-Value = 0.026

Calculations

Compute by:

Known Q (cfs)

Known Q

= 2.02

Highlighted

Depth (ft) = 0.59

Q (cfs) = 2.020

Area (sqft) = 0.87

Velocity (ft/s) = 2.32

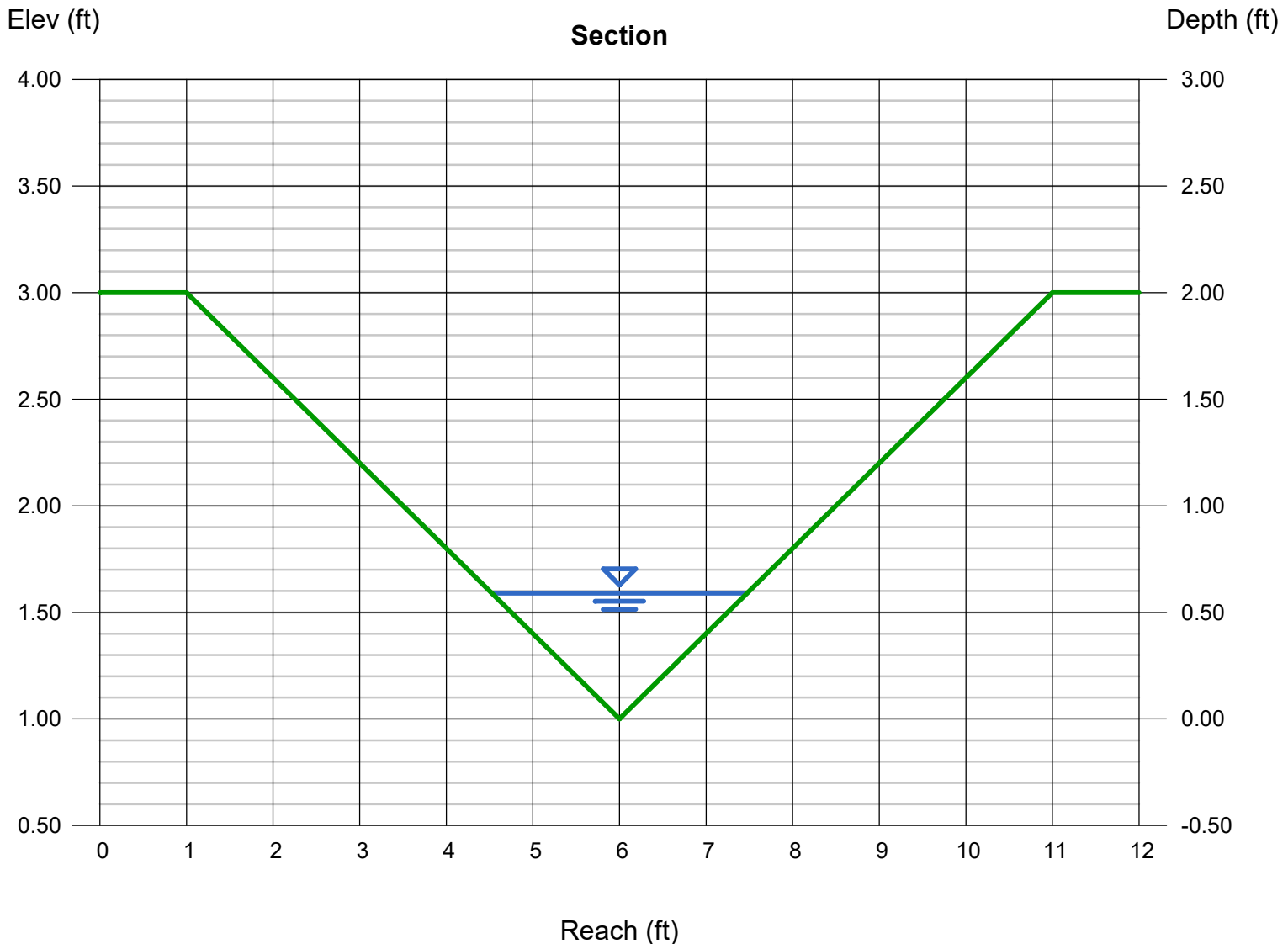
Wetted Perim (ft) = 3.18

Crit Depth, Yc (ft) = 0.53

Top Width (ft) = 2.95

EGL (ft) = 0.67

100-YR FLOW FROM OFFSITE
BASIN G (HYD NO. 16)



Culvert Report

APPENDIX J-1: CULVERT A ANALYSIS

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

Thursday, Jan 26 2023

Q100 FROM ROUTED
HYDROGRAPH "CULVERT A"
(HYD NO. 29)

CULVERT A

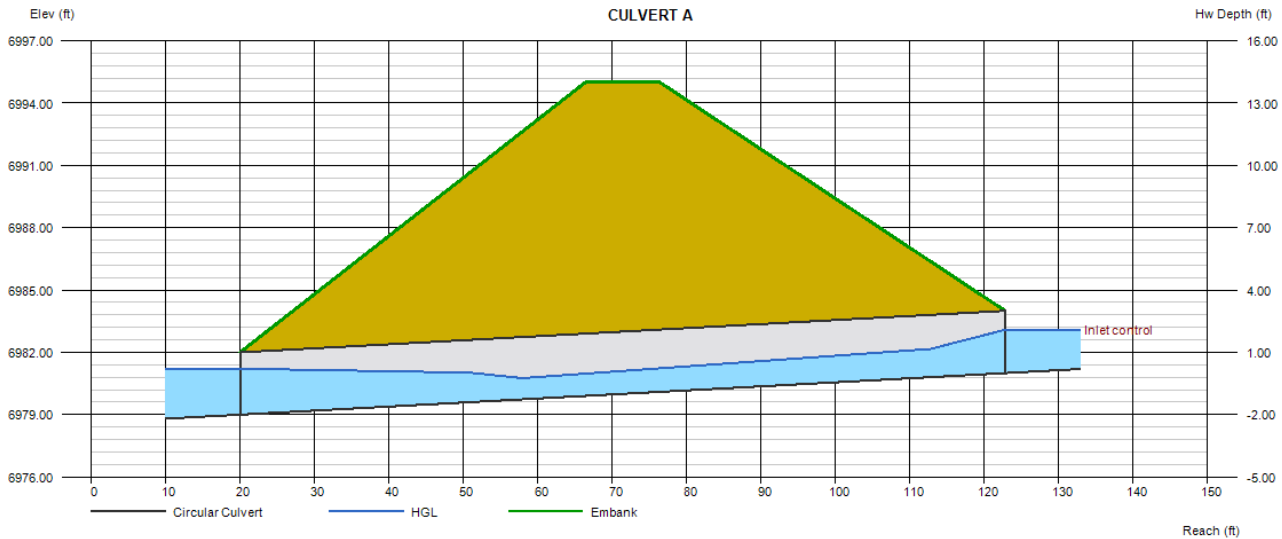
Invert Elev Dn (ft) = 6979.00
 Pipe Length (ft) = 102.80
 Slope (%) = 1.95
 Invert Elev Up (ft) = 6981.00
 Rise (in) = 36.0
 Shape = Circular
 Span (in) = 36.0
 No. Barrels = 1
 n-Value = 0.011
 Culvert Type = Circular Culvert
 Culvert Entrance = Smooth tapered inlet throat
 Coeff. K,M,c,Y,k = 0.534, 0.555, 0.0196, 0.9, 0.2

Embankment
 Top Elevation (ft) = 6995.00
 Top Width (ft) = 10.00
 Crest Width (ft) = 100.00

Calculations
 Qmin (cfs) = 19.70
 Qmax (cfs) = 19.70
 Tailwater Elev (ft) = (dc+D)/2

Highlighted
 Qtotal (cfs) = 19.70
 Qpipe (cfs) = 19.70
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 3.53
 Veloc Up (ft/s) = 5.97
 HGL Dn (ft) = 6981.21
 HGL Up (ft) = 6982.42
 Hw Elev (ft) = 6983.09
 Hw/D (ft) = 0.70
 Flow Regime = Inlet Control

TOP OF ADJACENT DITCH
 ELEV = 6984.00
 (0.91-FT OF FREEBOARD)



Culvert Report

APPENDIX J-2: CULVERT B ANALYSIS

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

Thursday, Mar 2 2023

CULVERT B

Invert Elev Dn (ft)	=	6979.00
Pipe Length (ft)	=	200.00
Slope (%)	=	1.00
Invert Elev Up (ft)	=	6981.00
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	1
n-Value	=	0.011
Culvert Type	=	Circular Culvert
Culvert Entrance	=	Smooth tapered inlet throat
Coeff. K,M,c,Y,k	=	0.534, 0.555, 0.0196, 0.9, 0.2

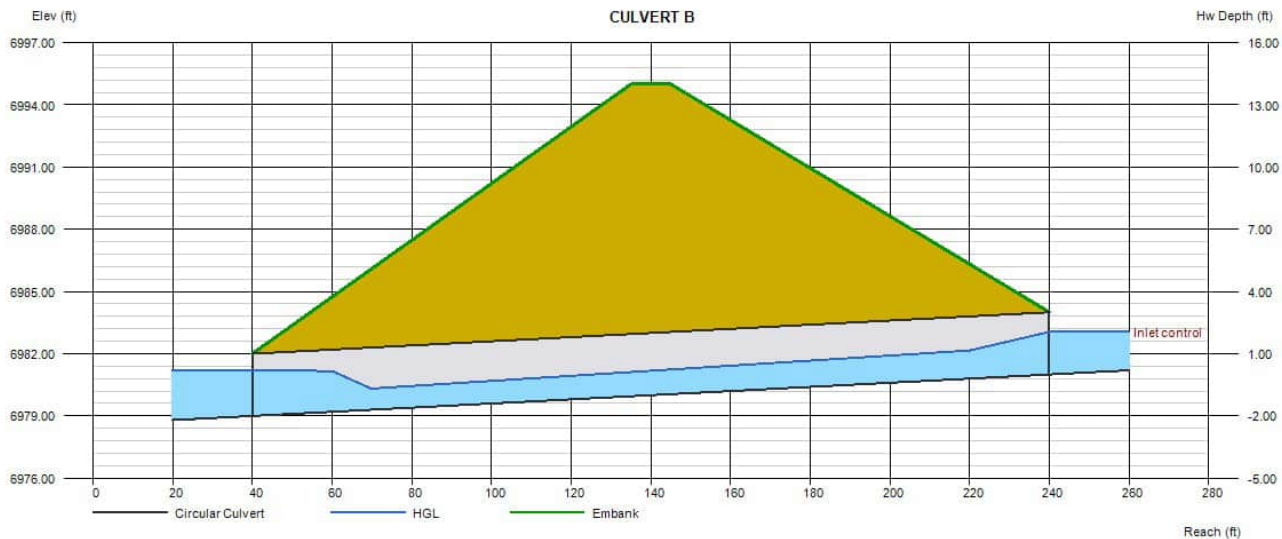
Embankment	
Top Elevation (ft)	= 6995.00
Top Width (ft)	= 10.00
Crest Width (ft)	= 100.00

Q100 FROM ROUTED
HYDROGRAPH "CULVERT B-
DITCH B"
(HYD NO. 30)

Calculations	
Qmin (cfs)	= 19.13
Qmax (cfs)	= 19.13
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 19.13
Qpipe (cfs)	= 19.13
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.44
Veloc Up (ft/s)	= 5.91
HGL Dn (ft)	= 6981.20
HGL Up (ft)	= 6982.40
Hw Elev (ft)	= 6983.05
Hw/D (ft)	= 0.68
Flow Regime	= Inlet Control

TOP OF ADJACENT DITCH
ELEV = 6984.00
(0.95-FT FREEBOARD)



INLET X1

Combination Inlet

Location	=	Sag
Curb Length (ft)	=	3.00
Throat Height (in)	=	6.00
Grate Area (sqft)	=	0.80
Grate Width (ft)	=	1.50
Grate Length (ft)	=	3.00

Gutter

Slope, Sw (ft/ft)	=	0.040
Slope, Sx (ft/ft)	=	0.020
Local Depr (in)	=	2.00
Gutter Width (ft)	=	1.50
Gutter Slope (%)	=	-0-
Gutter n-value	=	-0-

Q100 FOR BASIN "ROAD E-W (B)"
HYD NO. 11

Calculations

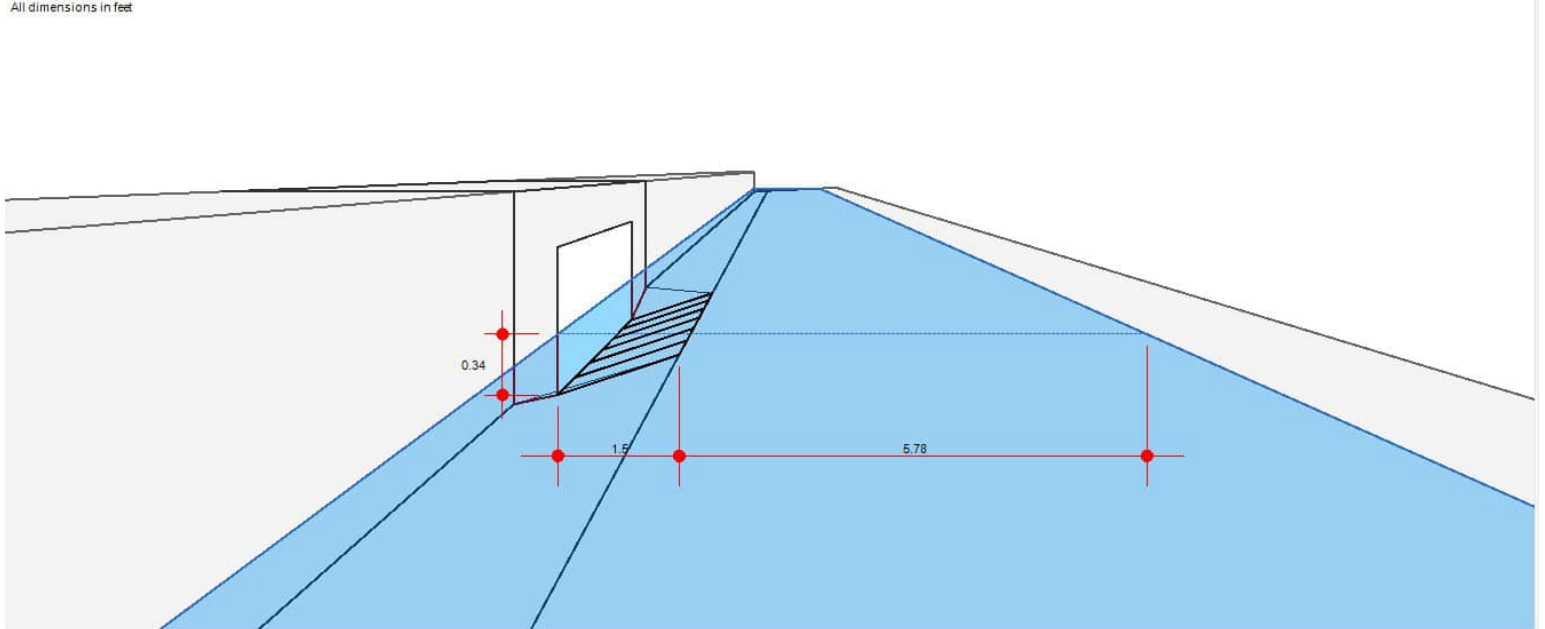
Compute by: Known Q
Q (cfs) = 1.97

Highlighted

Q Total (cfs)	=	1.97
Q Capt (cfs)	=	1.97
Q Bypass (cfs)	=	-0-
Depth at Inlet (in)	=	4.11
Efficiency (%)	=	100
Gutter Spread (ft)	=	7.28
Gutter Vel (ft/s)	=	-0-
Bypass Spread (ft)	=	-0-
Bypass Depth (in)	=	-0-

ACTUAL GRATE AREA = 1.6 SQFT
50% CLOGGING FACTOR APPLIED

All dimensions in feet



WEST END CURB CUT

Rectangular

Bottom Width (ft) = 1.00

Total Depth (ft) = 0.50

Invert Elev (ft) = 1.00

Slope (%) = 1.00

N-Value = 0.011

Calculations

Compute by:

Known Q (cfs)

Known Q

= 1.42

Highlighted

Depth (ft) = 0.32

Q (cfs) = 1.420

Area (sqft) = 0.32

Velocity (ft/s) = 4.44

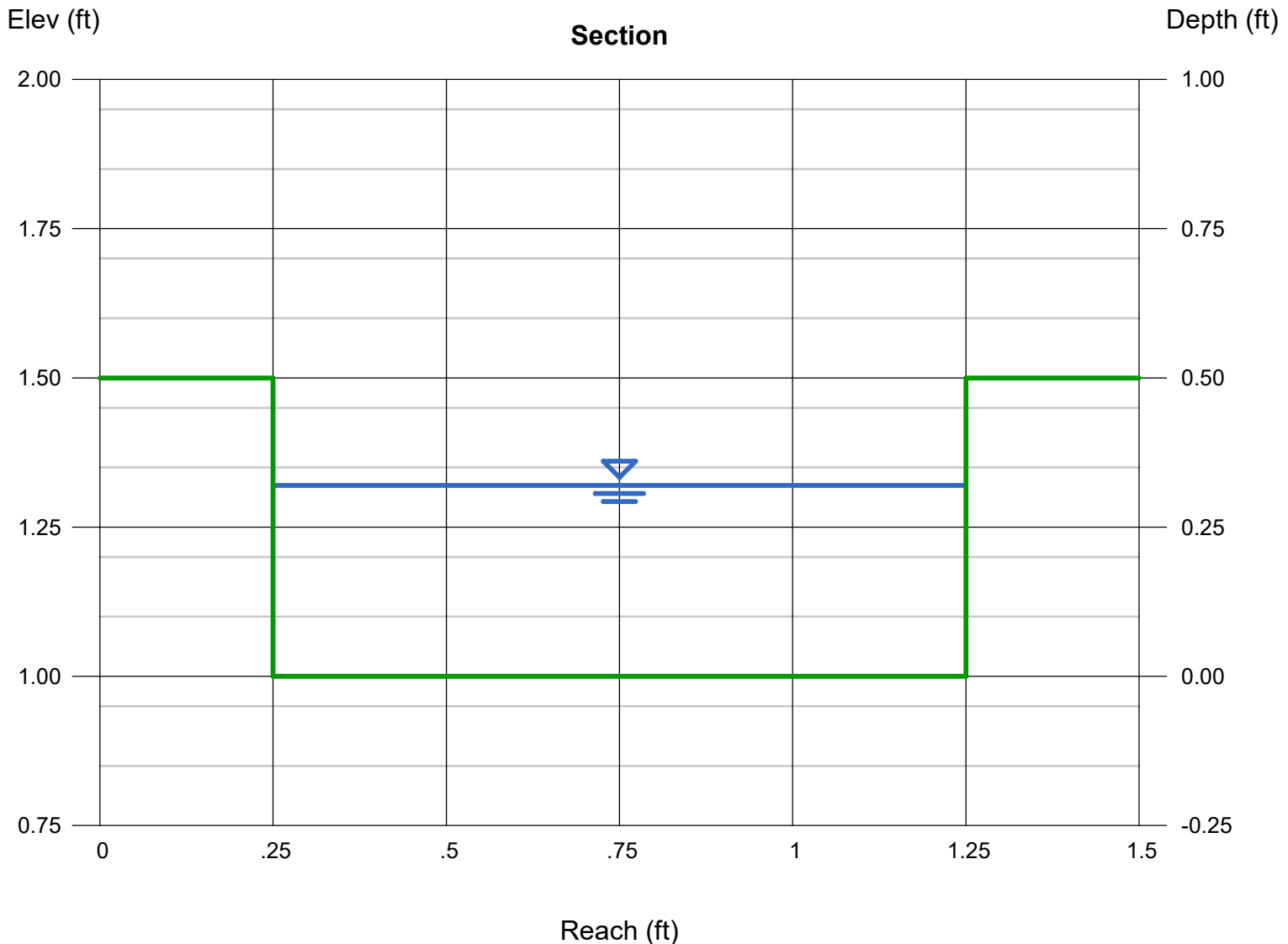
Wetted Perim (ft) = 1.64

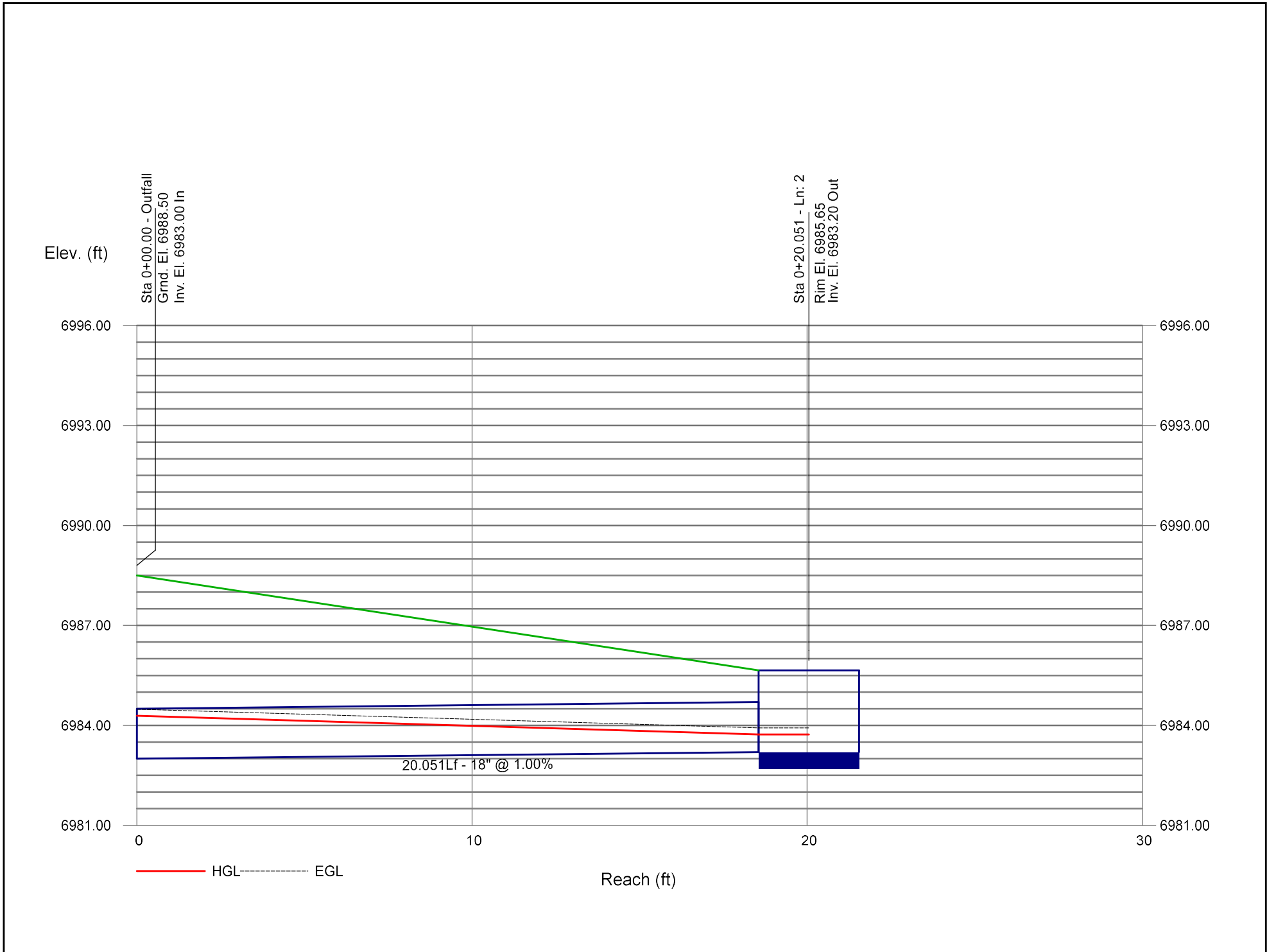
Crit Depth, Yc (ft) = 0.40

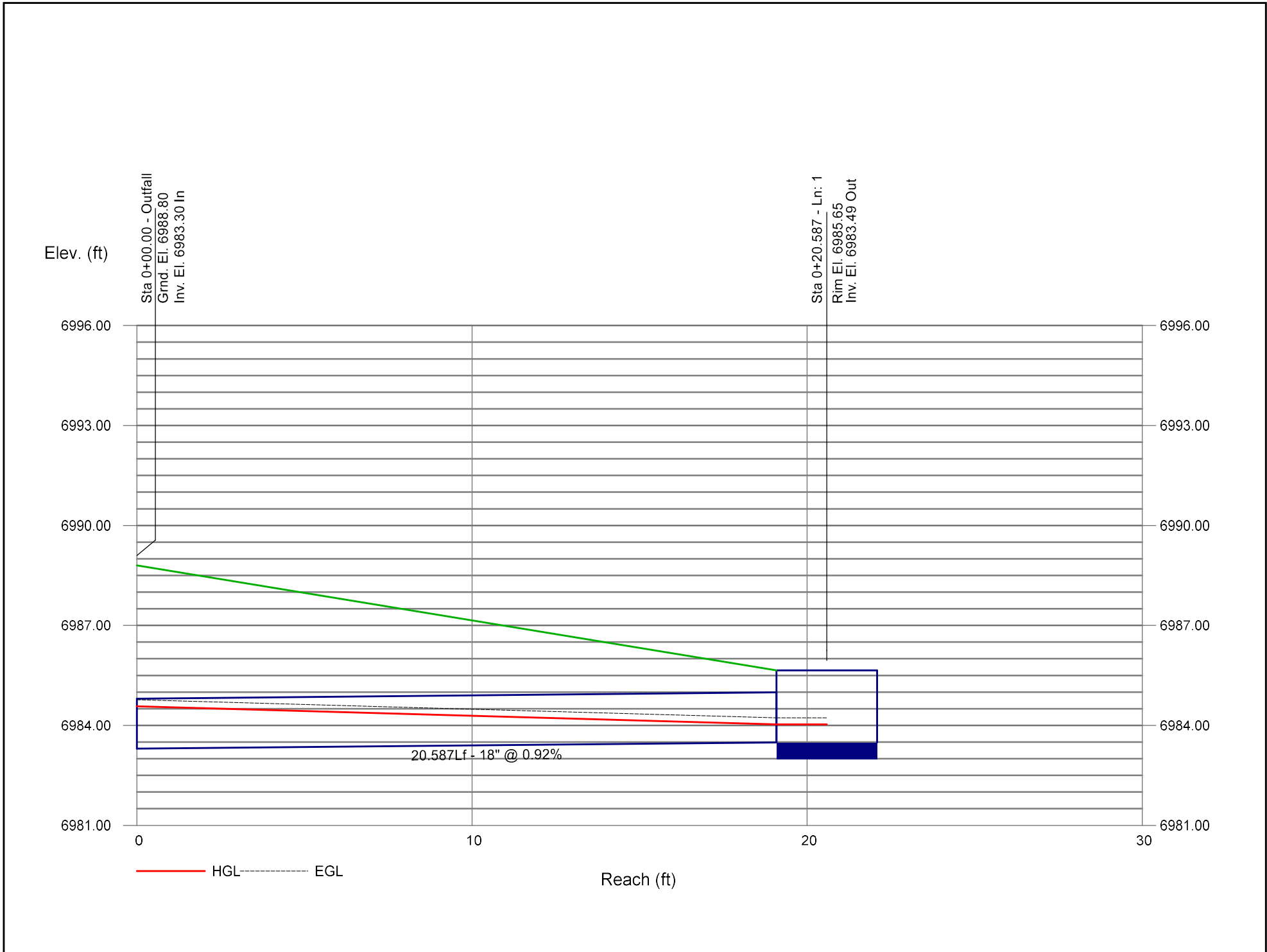
Top Width (ft) = 1.00

EGL (ft) = 0.63

Q100 FOR BASIN "ROAD E-W (D)"
HYD NO. 18







Storm Sewer Summary Report

APPENDIX L-3: STORM SEWER REPORT

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE X2	2.05	18	Cir	20.587	6983.30	6983.49	0.925	6984.57	6984.03	n/a	6984.03	End	Curb-
2	PIPE X1	1.97	18	Cir	20.051	6983.00	6983.20	0.998	6984.29	6983.73	n/a	6983.73	End	Curb-

Project File: Storm X.stm	Number of lines: 2	Run Date: 1/26/2023
---------------------------	--------------------	---------------------

NOTES: Known Qs only

West BFP Curb & Gutter Spread

Q100 FOR BASIN "WEST BFP"
HYD. NO 23

Gutter

Cross Sl, Sx (ft/ft) = 0.020
 Cross Sl, Sw (ft/ft) = 0.045
 Gutter Width (ft) = 1.50
 Invert Elev (ft) = 1.00
 Slope (%) = 2.30
 N-Value = 0.011

Calculations

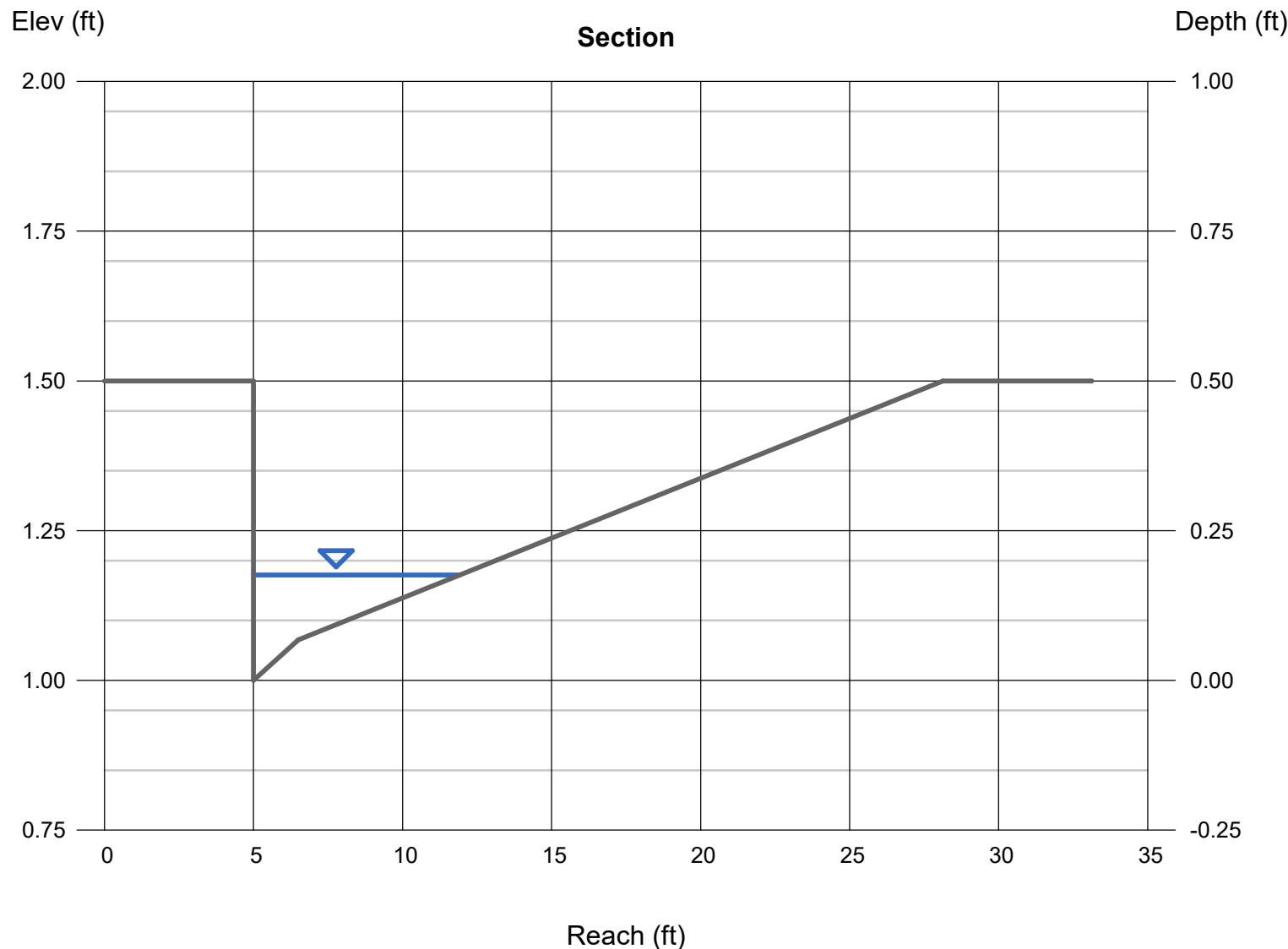
Compute by: Known Q
 Known Q (cfs) = 2.20

Highlighted

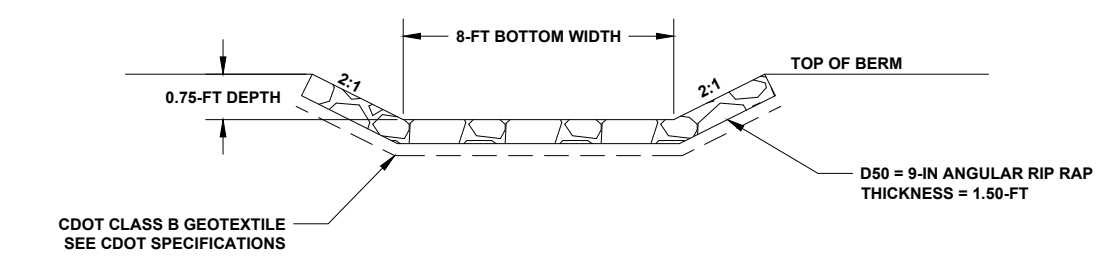
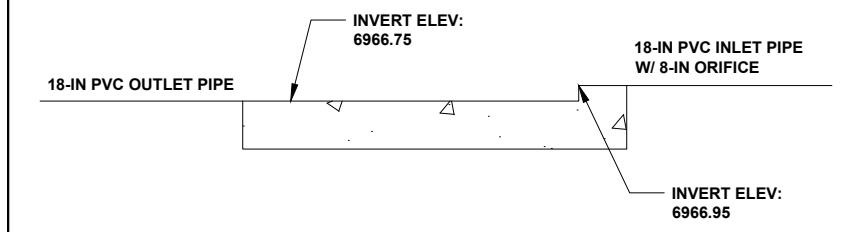
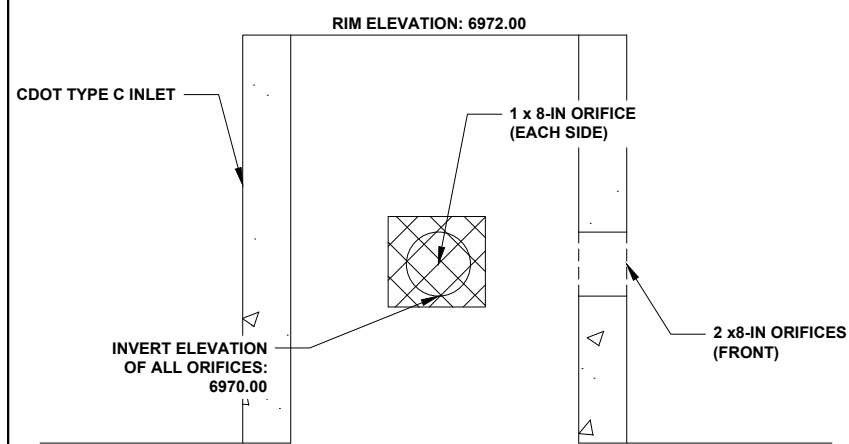
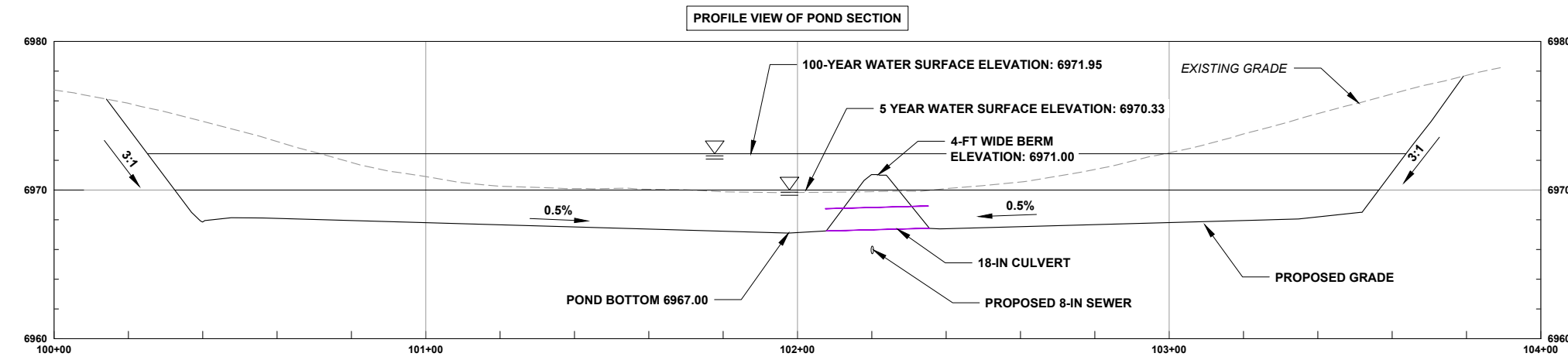
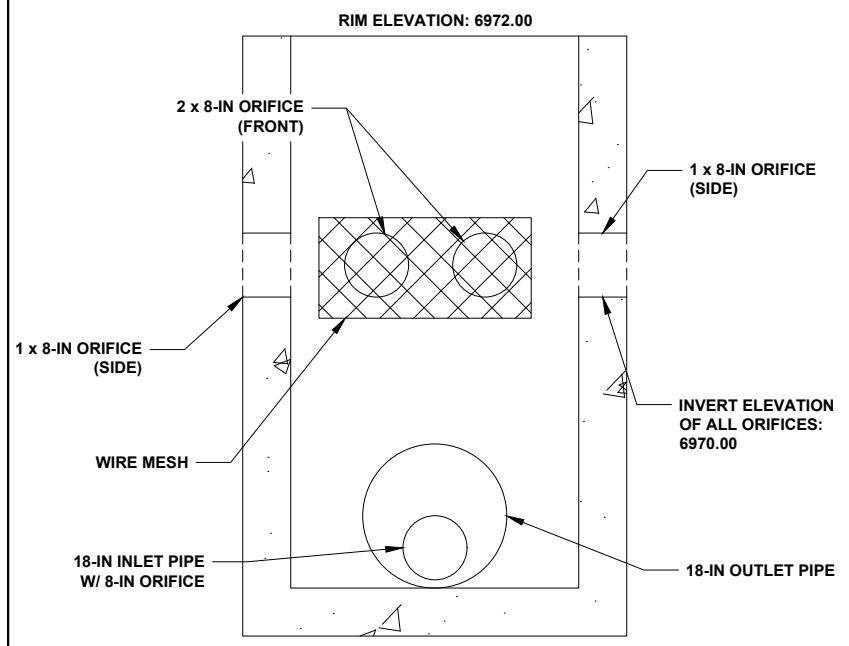
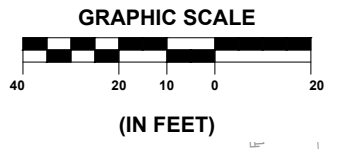
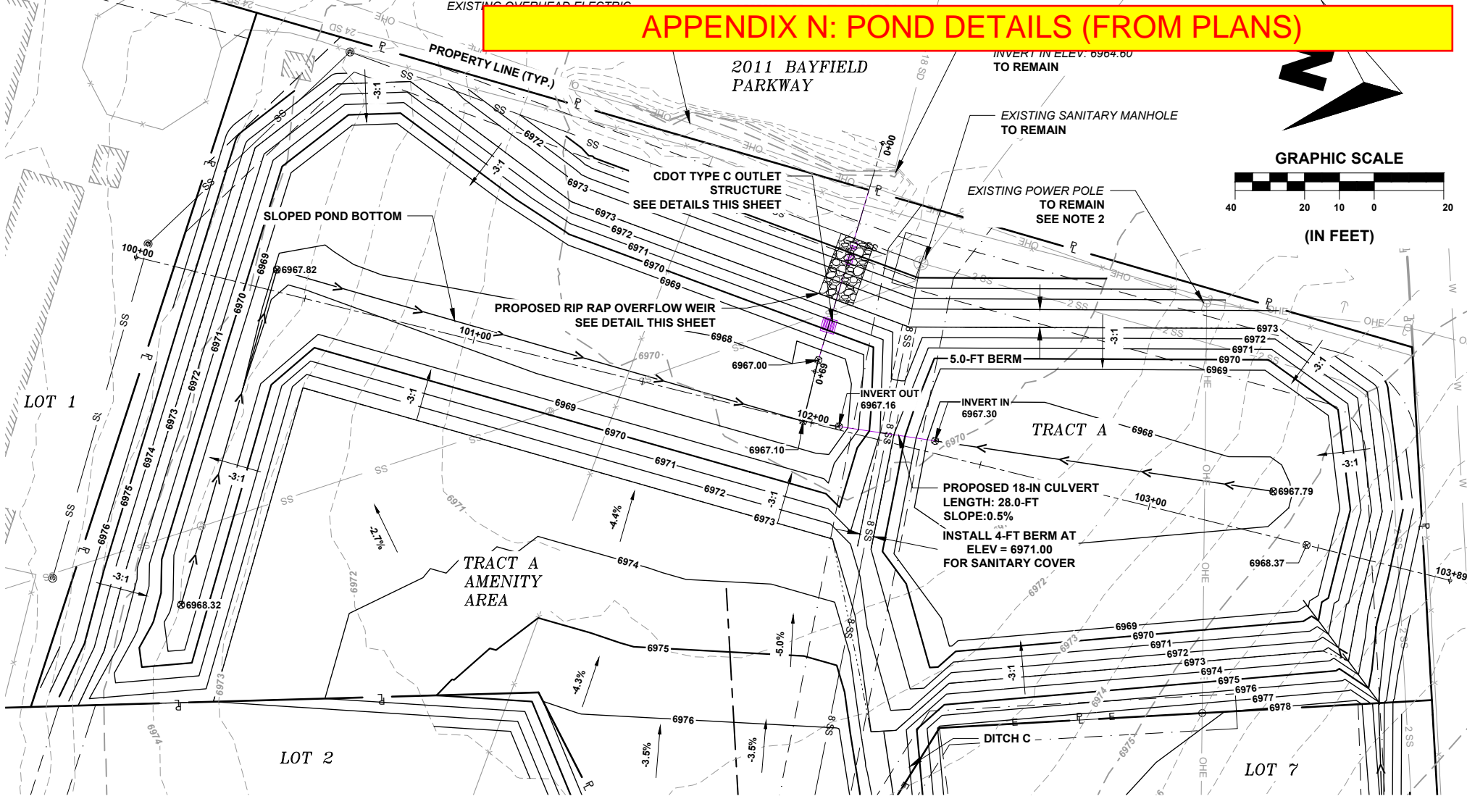
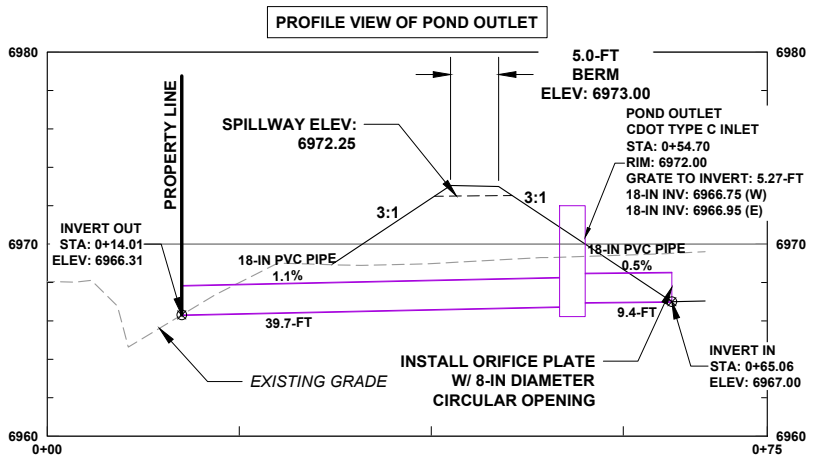
Depth (ft) = **0.18**
 Q (cfs) = **2.200**
 Area (sqft) = 0.51
 Velocity (ft/s) = 4.33
 Wetted Perim (ft) = 7.10
 Crit Depth, Yc (ft) = 0.26
Spread Width (ft) = 6.93
 EGL (ft) = 0.47

0.43-FT ENCROACHMENT
INTO TRAVEL LANE

BIKE LANE + GUTTER WIDTH
= 6.5-FT



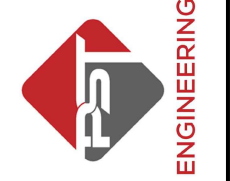
APPENDIX N: POND DETAILS (FROM PLANS)



- NOTES:**
1. POND OUTLET STRUCTURE BOX TO BE COLORADO DEPARTMENT OF TRANSPORTATION INLET, TYPE C WITH CLOSE MESH INLET GRATE.
 2. CONTRACTOR MUST COORDINATE WITH LPEA TO DETERMINE IF POLES NEED TEMPORARY SUPPORT DURING GRADING OPERATIONS.

SHEET
30 OF **49**

PST ENGINEERING, LLC
 2615 MAIN AVE. SUITE 209
 DURANGO, CO 81301
 970-403-5492



**HAGA PROPERTY
 MASTER PLAN
 2107 BAYFIELD PARKWAY
 BAYFIELD, CO 81122
 POND GRADING & DETAILS**

REVISIONS:

#	DATE	DESCRIPTION	SHEET

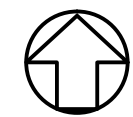
DATE: 09/06/2023
 DRAWN BY: HR
 CHECKED BY: SP



APPENDIX Q: RELEVANT PAGES FROM "MASTER DRAINAGE PLAN FOR THE TOWN OF BAYFIELD, COLORADO" PREPARED BY SOUDER MILLER & ASSOCIATES IN SEPTEMBER 2014

MATCHLINE - FIGURE 8-1

MATCHLINE - FIGURE 8-3



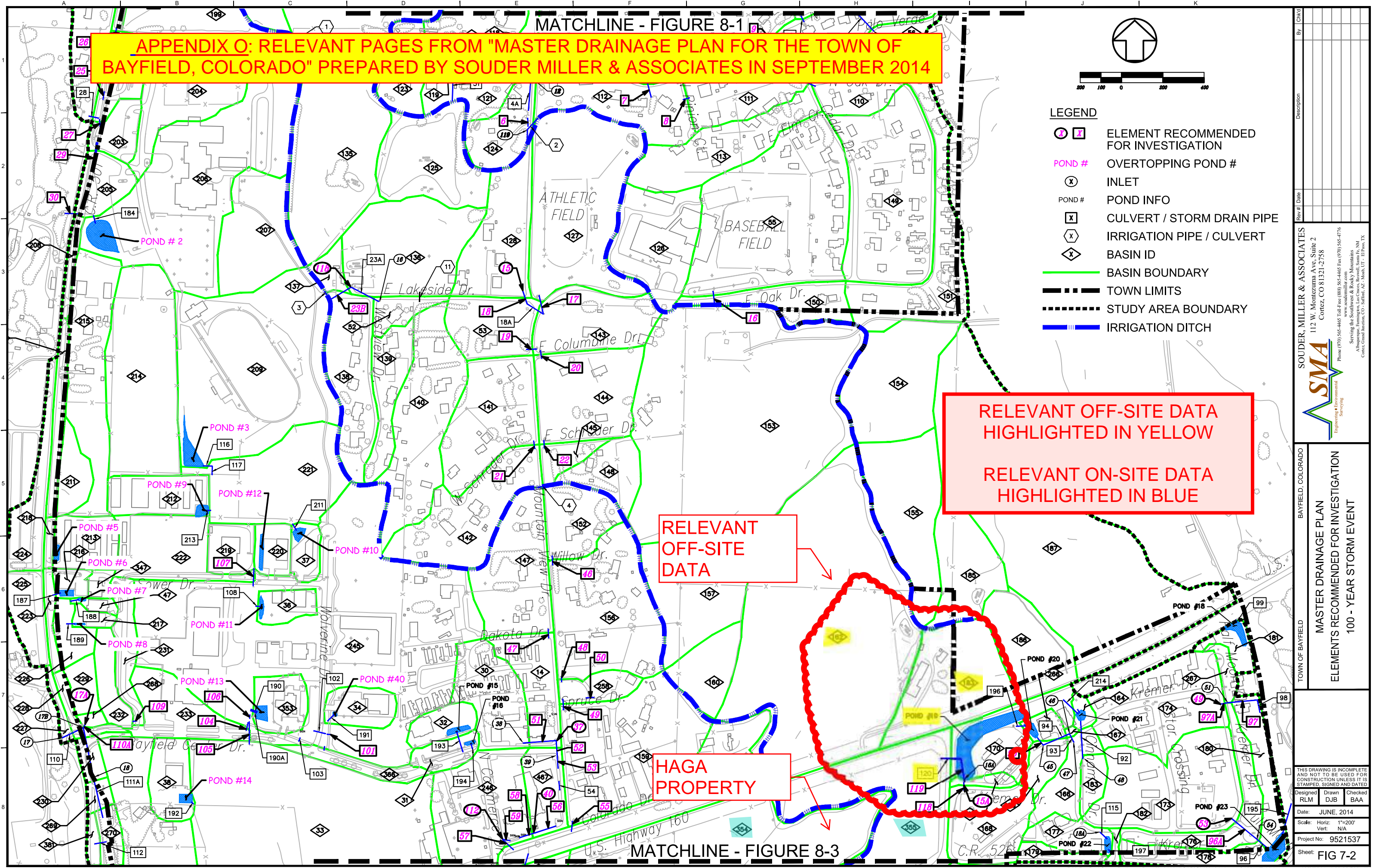
- LEGEND**
- 7 ELEMENT RECOMMENDED FOR INVESTIGATION
 - POND # OVERTOPPING POND #
 - (X) INLET
 - POND # POND INFO
 - [X] CULVERT / STORM DRAIN PIPE
 - (X) IRRIGATION PIPE / CULVERT
 - (X) BASIN ID
 - BASIN BOUNDARY
 - - - TOWN LIMITS
 - - - STUDY AREA BOUNDARY
 - IRRIGATION DITCH

RELEVANT OFF-SITE DATA HIGHLIGHTED IN YELLOW

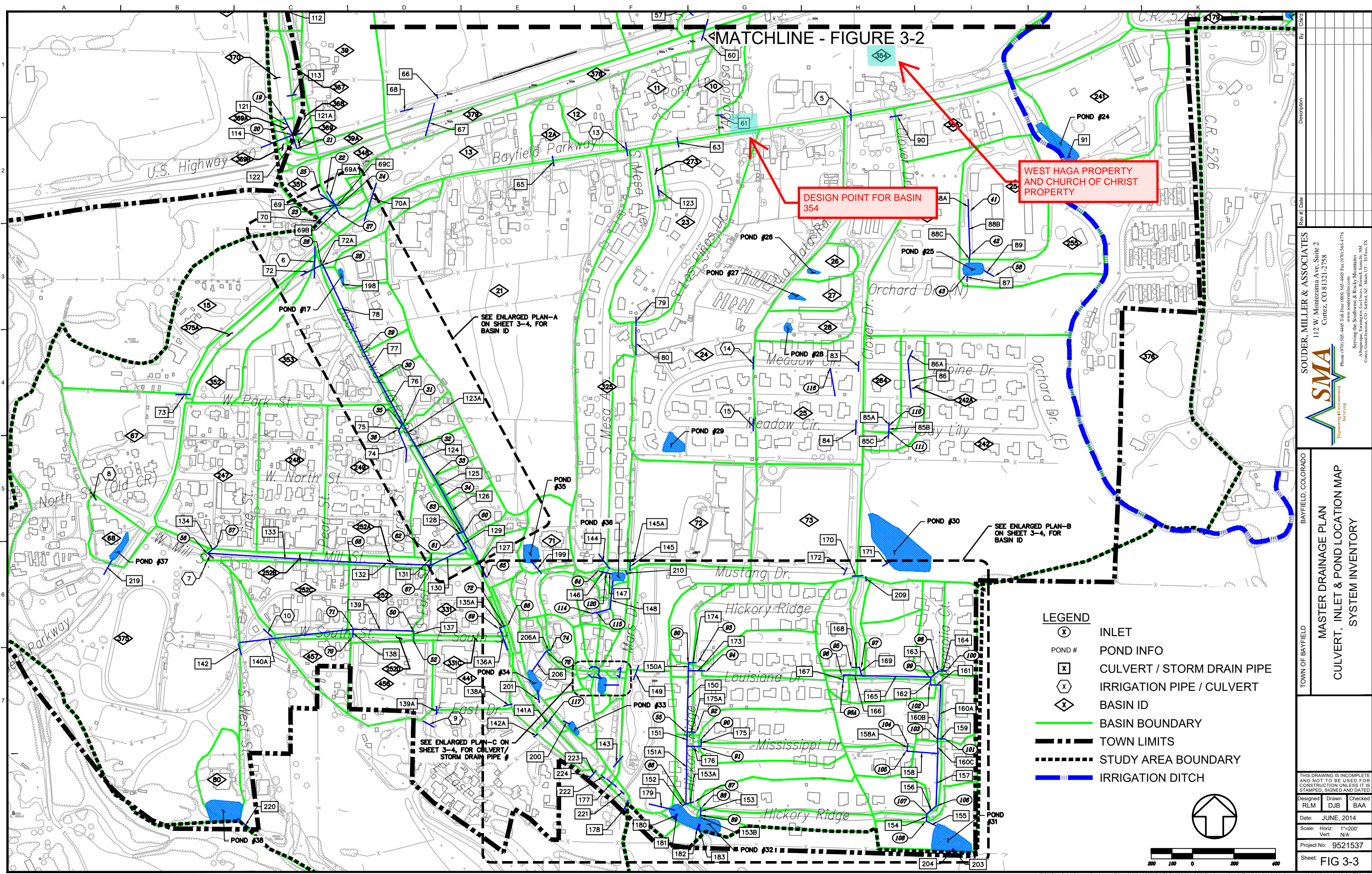
RELEVANT ON-SITE DATA HIGHLIGHTED IN BLUE

RELEVANT OFF-SITE DATA

HAGA PROPERTY



By	CHK'd	
Rev #	Date	
<p>SOUDER MILLER & ASSOCIATES 112 W. Montezuma Ave., Suite 2 Cortez, CO 81321-2758 Phone (970) 865-4466 Toll Free (888) 965-4466 Fax (970) 566-4776 www.soudermiller.com Serving the Southwest & Rocky Mountains Albuquerque, Farmington, Las Cruces, Roswell, Santa Fe, NM Cortez, Grand Junction, CO - Salt Lake City, Utah, UT - El Paso, TX</p>		
<p>SMA Engineering & Environmental Surveying</p>		
<p>TOWN OF BAYFIELD MASTER DRAINAGE PLAN ELEMENTS RECOMMENDED FOR INVESTIGATION 100 - YEAR STORM EVENT</p>		
<p>THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED</p>		
Designed	Drawn	Checked
RLM	DJB	BAA
Date:	JUNE, 2014	
Scale:	Horiz: 1"=200'	
	Vert: N/A	
Project No:	9521537	
Sheet:	FIG 7-2	



MATCHLINE - FIGURE 3-2

DESIGN POINT FOR BASIN 354

WEST HAGA PROPERTY AND CHURCH OF CHRIST PROPERTY

SEE ENLARGED PLAN-A ON SHEET 3-4, FOR BASIN ID

SEE ENLARGED PLAN-B ON SHEET 3-4, FOR BASIN ID

SEE ENLARGED PLAN-C ON SHEET 3-4, FOR CULVERT/STORM DRAIN PIPE #

- LEGEND**
- (X) INLET
 - POND # POND INFO
 - (X) CULVERT / STORM DRAIN PIPE
 - (X) IRRIGATION PIPE / CULVERT
 - (X) BASIN ID
 - BASIN BOUNDARY
 - - - TOWN LIMITS
 - STUDY AREA BOUNDARY
 - IRRIGATION DITCH



By: CHKD

Rev # Date

Description

SMA
Engineering & Environmental Surveying

SOUDER, MILLER & ASSOCIATES
112 W. Montezuma Ave., Suite 2
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TOWN OF BAYFIELD

MASTER DRAINAGE PLAN
CULVERT, INLET & POND LOCATION MAP
SYSTEM INVENTORY

THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

Designed	Drawn	Checked
RLM	DJB	BAA

Date: JUNE, 2014
Scale: Horiz: 1"=200'
Vert: N/A
Project No: 9521537
Sheet: **FIG 3-3**

**Table 4
Existing Stormwater Pond Inventory**

Pond #	Runoff Source	Outlet Structure	Pond Bottom Elevation (ft)	Overflow Elevation (ft)	Estimated Pond Volume (Ac-Ft)	Outlet Pipe Number	Comments
1	Dove Ranch Subdivision to north and east	8" PVC pipe	7008.00	7010.00	0.207	185	Discharge pipe near top of berm; intended to be sedimentation pond, only
2	Bayfield High School building and parking lots	4' dia vert pipe w/4" holes at about 6" center w/screen on top, connected to outlet drainage w/24" CMP pipe, discharge from pond into a drainage channel,	6972.00	6974.00	0.678	184	Water from CR and Pond #2 discharges into a drainage "pond" that then drains thru a 24" CMP under CR to River, this area also collects school water and discharges all water under CR to river
3	Bayfield HS athletic facilities	4' dia vert pipe w/4" holes at about 6" center w/screen on top, drainage discharged thru 12" HDPE	6966.10	6967.50	0.246	116	Discharge into drainage channel thru Bayfield Center
5	Adjacent storage units	Concrete overflow weir	6963.08	6965.12	0.054	N/A	No outlet pipe visible
6	UPRFPD Administration Building	8"PVC, pipe capped w/3" hole in the end	6961.65	6962.78	0.040	187	
7	Adjacent office building	8"PVC, pipe capped w/3" hole in the end	6964.58	6965.82	0.008	188	
8	Adjacent office building parking lot	8"PVC, 8" tee, open top pipe, end capped w/3" hole in end	6963.63	6965.09	0.007	189	
9	Adjacent storage units	None visible	6963.7	6965.51	0.100	N/A	
10	Adjacent carwash	Known outlet pipes appear to be covered with silt	6970.66	6971.08	0.023	N/A	Pond is silted nearly full; outlet pipes not visible. Modeled without outlet pipe.
11	Adjacent office building and parking lot	6"X6" opening on side of concrete box, open top 16" X 18", 12" PVC discharge pipe	6958.82	6960.92	0.044	108	
12	Adjacent body shop and parking lot	Known outlet pipe not visible (submerged by high ground water or silt/vegetation)	6960.7	6963.75	0.101	N/A	Modeled without outlet pipe
13	Pine River Valley Bank facilities	Two 6"PVC pipes	6955.91	6956.81	0.067	190	
14	Dollar General store	8" PVC pipe	6955.79	6956.26	0.025	192	
15	Bayfield Library	3' X 5' concrete box w/6" square opening on the side, three 6" PVC discharge pipes	6973.84	6975.65	0.080	193	
16	Bayfield Library parking lot and overflow from Pond #15	4' X 4' outlet box w/3" diameter opening on the side, two 6" PVC discharge pipes	6973.5	6974.69	0.015	194	
17	Baptist Church facilities	8" PVC pipe	6929.88	6931.06	0.020	198	
18	Sunrise Estates Subdivision	12" CMP pipe	6990.3	6992.91	0.203	99	
19	Adjacent convenience store and car wash, adjacent streets, Hwy 160, Ponds #20 and #21	20" X 30" concrete box, 8" diameter opening on side, 18" CMP discharge pipe	7000.36	7009.16	3.729	120	
20	Cinnamon Heights townhomes	6" PVC pipe	7009.14	7014.02	0.161	196	
21	Cinnamon Drive and adjacent properties	None visible	7011.97	7016.17	0.092	N/A	Pond design and function is not clear; appears to have irrigation component. Modeled without outlet pipe.
22	Street and adjacent properties	6"PVC pipe	7011.29	7014.84	0.089	197	
23	Sunrise Estates Subdivision	12" CMP pipe	6981.18	6988.85	0.761	195	
24	Adjacent property to east	2'8" X 2'8" concrete box w/two 12" diameter openings on side, open top, 15" CMP discharge pipe	6989.64	6992.53	0.582	91	Low point on berm allows overtopping before reaching top of concrete box; berm needs to be leveled
25	Joint Maintenance Facility	12" CMP pipe	6964.76	6969.74	0.403	87	
26	Adjacent building and property	None visible	6963.49	6964.76	0.020	N/A	
27	Adjacent building and property	None visible	6959.59	6961.36	0.045	N/A	

"GAS STATION POND"

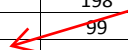


Table 5
Existing Stormwater Pond Outlet Pipe Inventory

Pipe No.	Pond No.	Pipe Material	Outlet Pipe Diameter (in)	Pipe Length (ft)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Pipe Slope (%)	Comments
87	25	CMP	12	22.86	6966.11	6964.53	6.91%	
91	24	CMP	15	17	6990.22	6990	1.29%	
99	18	CMP	12	19	6992.36	6991.61	3.95%	
108	11	PVC	12	19.5	6958.82	6958.40	2.15%	
116	3	HDPE	12	45	6966.08	6965.11	2.46%	
120	19	CMP	18	89.87	7000.36	6995.47	5.44%	
171	30	CMP	18	48	6941.89	6941.48	0.85%	
179	32	PVC	10	128	6909.58	6909.04	0.42%	
180		PVC	12	27	6911.16	6909.56	5.93%	
181		PVC	6	31	6909.54	6908.26	4.13%	
182		PVC	6	33	6909.66	6907.58	6.30%	
183		PVC	12	28	6911.09	6909.62	5.25%	
184	2	PVC	12	40	6974.7	6971.09	9.02%	
185	1	PVC	8	52	7009.13	7008.42	1.37%	
187	6	PVC	8	40	6961.55	6960.00	3.88%	Pipe information estimated
188	7	PVC	8	80	6964.58	6963.00	1.97%	Pipe information estimated
189	8	PVC	8	80	6963.63	6962.00	2.04%	Pipe information estimated
190	13	PVC	6"	20	6955.57	6954.96	3.05%	
190-A		PVC	6"	19	6955.25	6955.17	0.42%	
191-A	40	PVC	4	10	6967.04	6966.28	7.60%	
191-B		PVC	4	10	6967.44	6966.68	7.60%	
192	14	PVC	8	14	6955.92	6955.60	2.29%	
193	15	PVC	Three - 6"	100	6973.95	6973.90	0.05%	Downstream invert estimated
194	16	PVC	Two - 6"	23	6973.45	6969.46	17.35%	Downstream invert estimated
195	23	CMP	12	139	6981.00	6975.00	4.32%	Pipe information estimated
196	20	PVC	6	60	7009.50	7009.45	0.08%	
197	22	PVC	6	30	7011.46	7010.96	1.67%	
198	17	PVC	8	13	6929.88	6929.59	2.23%	
199	35	PVC	6	32	6924.17	6923.1	3.34%	Inverts estimated
200	33	PVC	12	15	6912.64	6911.94	4.67%	
201	34	PVC	12	48	6907.84	6907.45	0.81%	
203	31	PVC	12	13.3	6925.56	6925.34	1.65%	
204		PVC	12	13.3	6925.55	6925.31	1.80%	
207	41	PVC	12	18	6912.22	6910.58	9.11%	
219	37	HDPE	18	94	6874.08	6873.56	0.55%	
220	38	HDPE	12	30	6857.00	6856.00	3.33%	

"CULVERT C" IN APPENDIX A-2

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm		100-Year Storm	
						Peak Runoff (cfs)	Time Of Concentration (D H:M:S)	Peak Runoff (cfs)	Time Of Concentration (D H:M:S)
154	5.46	87.00	2.0300	496.69	37.00	5.99	0 01:05:47	13.52	0 00:53:40
155	5.32	87.00	1.7400	1735.57	37.00	7.64	0 00:32:01	16.59	0 00:26:07
156	7.22	87.00	1.9600	1124.00	85.00	15.57	0 00:20:21	27.66	0 00:16:36
157	5.53	84.00	2.3500	936.00	37.00	6.39	0 00:43:22	15.00	0 00:35:23
159	8.22	95.00	2.1000	1143.00	85.00	18.48	0 00:21:20	32.22	0 00:17:24
160	2.14	84.00	2.5100	636.00	37.00	2.78	0 00:30:19	6.39	0 00:24:44
161	5.30	95.00	2.1700	1567.00	50.00	11.21	0 00:27:40	20.06	0 00:22:34
162	22.97	84.00	1.5600	2311.00	37.00	23.24	0 01:06:59	53.11	0 00:54:39
163	0.70	87.00	0.7100	179.00	37.00	0.86	0 00:48:23	1.94	0 00:39:28
164	0.27	87.00	2.2900	219.00	50.00	0.53	0 00:14:53	0.98	0 00:12:08
165	1.42	87.00	0.5300	379.00	37.00	1.71	0 00:51:37	3.86	0 00:42:07
166	1.62	87.00	0.7600	281.00	37.00	1.84	0 01:00:01	4.17	0 00:48:58
167	0.17	87.00	0.5300	337.77	37.00	0.30	0 00:15:25	0.59	0 00:12:34
168	3.22	85.50	1.8900	374.00	37.00	3.54	0 00:58:00	8.12	0 00:47:19
169	0.35	87.00	1.6800	210.56	37.00	0.56	0 00:22:13	1.15	0 00:18:07
170	3.25	87.00	2.1100	711.00	37.00	4.36	0 00:38:25	9.69	0 00:31:20
173	6.54	87.00	1.1700	566.00	37.00	6.65	0 01:19:55	14.88	0 01:05:12
174	5.26	87.00	2.5200	848.00	37.00	6.71	0 00:43:43	15.08	0 00:35:39
176	2.21	87.00	0.6400	480.00	37.00	2.58	0 00:55:06	5.85	0 00:44:57
177	1.29	87.00	1.8600	277.00	37.00	1.70	0 00:40:20	3.79	0 00:32:54
178	1.70	87.00	2.6500	500.00	37.00	2.50	0 00:30:01	5.37	0 00:24:29
179	0.64	85.00	0.4900	200.00	37.00	0.74	0 00:48:10	1.72	0 00:39:18
180	1.89	87.00	0.6600	828.00	37.00	2.60	0 00:35:50	5.72	0 00:29:14
181	0.78	87.00	0.3600	121.00	50.00	0.99	0 01:09:42	2.08	0 00:56:52
182	0.17	87.00	0.8300	361.00	37.00	0.32	0 00:13:05	0.60	0 00:10:40
183	5.38	84.00	0.4900	499.00	37.00	4.77	0 01:39:35	10.44	0 01:21:15
185	3.44	87.00	0.5200	530.01	37.00	3.64	0 01:12:04	8.18	0 00:58:48
186	3.46	87.00	0.2400	827.00	37.00	3.71	0 01:09:53	8.35	0 00:57:01
187	20.35	87.00	2.2000	1582.00	37.00	21.72	0 01:10:32	48.92	0 00:57:33
188	0.89	87.00	1.2300	405.00	37.00	1.33	0 00:29:08	2.84	0 00:23:46
189	0.41	87.00	1.2800	235.00	37.00	0.65	0 00:25:08	1.35	0 00:20:30
190	1.88	87.00	0.2200	2122.00	37.00	2.83	0 00:28:16	6.02	0 00:23:04
191	6.15	75.00	"OFF-SITE BASIN B"	0	37.00	5.76	0 00:48:29	13.45	0 00:39:33
192	4.82	70.00	1.4200	1743.42	0.00	0.51	0 00:42:10	5.64	0 00:34:24
193	3.58	70.00	1.3500	1260.00	37.00	3.30	0 00:32:58	8.01	0 00:26:54
194	48.39	70.00	3.5000	965.00	0.00	1.47	0 03:03:11	10.54	0 02:29:27
195	8.36	87.00	0.5900	377.00	37.00	6.58	0 02:25:11	14.06	0 01:58:26
196	0.35	87.00	1.4800	620.00	50.00	0.70	0 00:10:35	1.28	0 00:08:38
197	0.93	87.00	0.5200	1773.86	50.00	1.83	0 00:13:54	3.39	0 00:11:20
198	3.77	84.00	0.7400	441.00	37.00	3.66	0 01:16:32	8.24	0 01:02:26
199	3.44	84.00	0.4000	271.00	10.00	1.03	0 02:24:30	3.28	0 01:57:53
200	1.50	82.00	2.1500	326.00	37.00	1.69	0 00:38:21	4.07	0 00:31:17
201	4.42	87.00	0.3900	887.00	37.00	4.81	0 01:07:07	10.85	0 00:54:46
202	0.24	82.00	0.8200	243.00	50.00	0.40	0 00:17:44	0.81	0 00:14:28
203	0.62	82.00	0.3800	273.00	50.00	0.87	0 00:36:44	1.87	0 00:29:58
204	4.94	82.00	1.7000	556.00	37.00	4.93	0 01:01:03	11.40	0 00:49:48
205	1.50	82.00	1.5400	285.00	50.00	2.06	0 00:39:55	4.43	0 00:32:34
206	13.02	82.00	1.6000	951.00	37.00	12.06	0 01:20:34	26.79	0 01:05:44
207	4.16	82.00	0.5700	398.00	37.00	3.68	0 01:33:20	8.02	0 01:16:08
208	0.50	87.00	0.1300	944.03	50.00	0.91	0 00:21:04	1.75	0 00:17:11
209	13.29	82.00	5.0000	989.00	85.00	26.59	0 00:23:55	48.75	0 00:19:31
210	1.19	87.00	0.1500	829.00	50.00	1.87	0 00:36:48	3.84	0 00:30:01
211	1.21	87.00	1.3300	435.00	37.00	1.72	0 00:32:45	3.76	0 00:26:43
212	2.13	82.00	0.4800	621.00	37.00	2.23	0 00:50:21	5.27	0 00:41:05
213	1.80	95.00	0.2800	260.00	75.00	3.19	0 00:51:54	5.96	0 00:42:20
214	7.58	82.00	0.7400	665.00	37.00	6.76	0 01:30:57	14.79	0 01:14:12
215	4.97	87.00	0.7800	1536.00	37.00	6.43	0 00:42:03	14.41	0 00:34:18
216	1.09	95.00	1.4100	213.00	75.00	2.42	0 00:26:36	4.24	0 00:21:42

Table 6
Basin Characteristics and Estimated Flows

Basin ID	Area (acres)	Weighted Curve Number	Average Slope (%)	Equivalent Width (ft)	Impervious Area (%)	5-Year Storm		100-Year Storm	
						Peak Runoff (cfs)	Time Of Concentration (D H:M:S)	Peak Runoff (cfs)	Time Of Concentration (D H:M:S)
325	3.40	87.00	0.7700	783.00	37.00	4.12	0 00:50:23	9.31	0 00:41:06
325A	2.38	87.00	0.5000	752.00	37.00	2.94	0 00:47:22	6.64	0 00:38:39
331	2.63	92.00	6.5000	346.00	37.00	4.37	0 00:37:11	8.68	0 00:30:20
331A	0.14	75.00	0.5000	121.00	90.00	0.33	0 00:10:27	0.57	0 00:08:31
331B	0.12	75.00	0.5000	407.62	90.00	0.28	0 00:04:30	0.47	0 00:03:40
331C	0.29	75.00	1.5000	421.00	90.00	0.67	0 00:05:22	1.14	0 00:04:23
346	3.92	87.00	0.5000	500.00	37.00	3.96	0 01:21:48	8.84	0 01:06:44
347	0.39	95.00	0.5000	148.00	50.00	0.76	0 00:36:44	1.39	0 00:29:58
348	1.17	95.00	0.5000	388.00	50.00	2.26	0 00:40:07	4.14	0 00:32:44
349	0.33	95.00	0.5000	179.00	50.00	0.68	0 00:29:38	1.22	0 00:24:10
349A	0.15	87.00	0.5000	165.88	37.00	0.24	0 00:21:59	0.49	0 00:17:56
350	0.48	95.00	0.5000	348.00	50.00	1.04	0 00:25:13	1.85	0 00:20:34
351	0.95	95.00	0.5000	265.00	50.00	1.77	0 00:44:24	3.27	0 00:36:13
352	2.15	75.00	0.5000	500.00	37.00	1.98	0 00:56:59	4.44	0 00:46:29
353	5.88	65.00	2.7000	561.00	40.00	5.68	0 00:56:58	11.00	0 00:46:28
354	19.67	84.00	0.5000	1700.00	50.00	21.56	0 01:29:52	45.13	0 01:13:19
355	9.53	84.00	0.5000	370.19	50.00	8.66	0 02:25:16	17.54	0 01:58:30
356	3.07	87.00	0.5000	276.00	37.00	2.85	0 01:40:54	6.26	0 01:22:19
365	4.04	87.00	0.5000	1567.84	40.00	5.52	0 00:40:45	12.07	0 00:33:14
366	0.95	95.00	0.5000	500.00	75.00	2.20	0 00:20:01	3.80	0 00:16:20
367	0.55	95.00	0.5000	100.00	75.00	0.96	0 00:16:20	1.96	0 00:34:29
368	0.37	95.00	0.5000	134.00	75.00	0.44	0 00:16:20	0.44	0 00:22:53
369	0.17	95.00	1.0000	123.00	75.00	0.70	0 00:16:20	0.70	0 00:12:19
369A	0.15	95.00	0.5000	295.40	75.00	0.59	0 00:16:20	0.59	0 00:12:32
369B	0.35	87.00	0.5000	347.35	75.00	0.42	0 00:16:20	0.42	0 00:07:43
370	0.95	95.00	1.0000	878.66	75.00	0.87	0 00:16:20	0.87	0 00:10:35
375	33.54	87.00	0.5000	4170.50	37.00	33.63	0 01:23:00	75.03	0 01:07:43
375A	0.81	75.00	1.6000	588.00	70.00	1.63	0 00:13:01	2.89	0 00:10:37
376	26.01	87.00	0.5000	1909.00	37.00	22.83	0 01:53:53	49.81	0 01:32:55
377	0.53	87.00	1.0000	230.00	60.00	1.01	0 00:24:12	1.90	0 00:19:45
378	1.45	95.00	1.1000	631.00	60.00	3.24	0 00:23:32	5.68	0 00:19:12
379	1.04	95.00	3.0000	440.00	50.00	2.30	0 00:20:11	4.05	0 00:16:28
381	0.33	95.00	1.0000	150.00	70.00	0.77	0 00:19:58	1.33	0 00:16:17
418	0.39	87.00	3.0000	220.00	50.00	0.74	0 00:16:59	1.39	0 00:13:51
419	0.09	87.00	0.5000	80.00	60.00	0.18	0 00:19:24	0.33	0 00:15:49
420	0.25	87.00	0.5000	456.61	50.00	0.48	0 00:14:17	0.89	0 00:11:39
421	0.11	87.00	0.5000	87.00	70.00	0.23	0 00:17:32	0.42	0 00:14:18
424	0.44	87.00	0.5000	304.00	50.00	0.77	0 00:25:49	1.51	0 00:21:03
425	0.52	87.00	0.5000	304.00	40.00	0.77	0 00:31:53	1.65	0 00:26:00
440	0.24	87.00	1.0000	458.95	60.00	0.51	0 00:10:01	0.91	0 00:08:10
441	2.83	65.00	3.0000	375.61	37.00	2.58	0 00:46:36	5.25	0 00:38:01
442	0.08	87.00	0.5000	140.00	90.00	0.19	0 00:06:43	0.32	0 00:05:29
456	1.94	65.00	2.0000	988.96	37.00	1.80	0 00:23:29	4.32	0 00:19:10
457	1.69	65.00	2.0000	940.91	37.00	1.57	0 00:22:17	3.81	0 00:18:11
461	0.25	87.00	0.5000	331.97	37.00	0.43	0 00:20:16	0.86	0 00:16:32
467	1.74	87.00	0.5000	217.00	37.00	1.75	0 01:22:59	3.90	0 01:07:42
468	48.27	87.00	0.5000	5333.14	37.00	47.05	0 01:29:06	104.47	0 01:12:41
472	0.17	80.00	0.5000	67.44	25.00	0.12	0 00:45:09	0.36	0 00:36:50
473	1.19	80.00	0.5000	209.12	25.00	0.80	0 01:15:04	2.02	0 01:01:14

EXISTING HAGA PROPERTY BASINS
354 INCLUDES CHURCH OF BAYFIELD
355 IS HAGA PROPERTY EAST OF SCHRODER DITCH

Table 7
Culvert Analysis Results, 5-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows
54	42.65	1.29%	12	0.024	2.59	2.59	5.53	1.00	1.85	N/A	Investigate
55	51.59	0.29%	12	0.024	15.85	4.38	5.91	1.00	3.66	11.47	Investigate
60	106.96	0.81%	24	0.024	28.32	7.94	3.73	2.00	3.56	20.38	Investigate
61	35.69	0.50%	15	0.024	21.54	8.71	8.82	1.25	4.15	12.83	Investigate
63	46.36	1.42%	24	0.024	20.03	20.03	8.55	2.00	3.31	N/A	Investigate
65	49.9	1.42%	24	0.024	1.49	1.49	3.10	2.00	0.48	N/A	Sufficient
66	21	4.43%	36	0.024	77.18	63.41	10.00	2.00	4.08	13.77	Investigate
67	163.25	0.89%	24	0.024	50.28	21.17	10.00	2.00	6.89	29.11	Investigate
68	59.78	0.72%	18	0.024	7.92	7.92	10.00	2.00	3.78	N/A	Investigate
73	70.13	1.80%	18	0.024	6.53	6.53	6.29	1.50	1.91	N/A	Investigate
79	43.84	0.57%	24	0.024	14.29	14.29	4.55	2.00	2.87	N/A	Investigate
80	135.47	0.95%	24	0.024	13.63	13.63	5.93	2.00	2.44	N/A	Investigate
83	49.98	3.08%	24	0.024	17.74	17.74	9.82	2.00	1.38	N/A	Sufficient
84	70	1.37%	24	0.024	17.18	17.18	7.09	2.00	2.76	N/A	Investigate
86	179.61	1.45%	18	0.015	8.77	8.77	5.01	1.50	1.82	N/A	Investigate
86A	53.07	2.20%	12	0.015	8.97	7.04	8.97	1.00	4.06	1.93	Investigate
90	59	2.76%	18	0.024	5.49	5.49	5.77	1.50	1.48	N/A	Sufficient
100	19.66	1.02%	12	0.024	2.20	2.20	3.43	1.00	1.07	N/A	Investigate
101	19.31	0.16%	12	0.024	2.66	2.66	6.24	1.00	3.84	N/A	Investigate
102	60.19	1.20%	18	0.024	2.58	2.58	5.24	1.50	0.88	N/A	Sufficient
103	19.82	0.81%	12	0.024	0.07	0.07	0.56	1.00	0.17	N/A	Sufficient
104	39.81	0.78%	12	0.024	5.02	3.85	7.89	1.00	4.01	1.17	Investigate
105	110.75	0.65%	36	0.024	96.80	51.07	9.70	3.00	4.83	45.73	Investigate
106	19.52	1.69%	24	0.024	109.60	22.72	8.93	2.00	3.50	86.88	Investigate
107	85.83	0.96%	36	0.024	41.02	41.02	7.51	3.00	3.70	N/A	Investigate
109	19.52	1.54%	12	0.024	2.91	2.91	6.30	1.00	1.97	N/A	Investigate
112	57.72	3.48%	24	0.024	11.39	11.39	6.31	2.00	1.99	N/A	Sufficient
113	44.08	0.93%	24	0.024	1.08	1.08	3.28	2.00	0.43	N/A	Sufficient
123	47.73	2.26%	18	0.024	20.33	11.76	9.79	1.50	4.14	8.57	Investigate
138A	41.95	2.19%	15	0.024	1.76	1.76	2.75	1.25	0.74	N/A	Sufficient

Q5 FOR CULVERT
DOWNSTREAM OF HAGA
DEVELOPMENT AND
CHURCH OF CHRIST

Table 8
Culvert Analysis Results, 100-Year Storm

Pipe No.	Pipe Length (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning Roughness Coefficient	Peak Flow to Pipe (cfs)	Peak Flow Entering Pipe (cfs)	Maximum Flow Velocity (ft/s)	Allowable Headwater Depth (ft)	Max Headwater Depth (ft)	Pipe Bypass Flow (cfs)	Reported Condition Under Design Storm Flows	Investigation Priority
55	51.59	0.29%	12	0.024	44.98	4.43	5.94	2.00	3.82	40.55	Investigate	M
60	106.96	0.81%	24	0.024	80.68	10.01	4.04	3.00	3.83	70.67	Investigate	H
61	35.69	0.50%	15	0.024	45.48	9.24	8.83	2.25	4.28	36.24	Investigate	M
63	46.36	1.42%	24	0.024	54.62	22.43	9.20	3.00	3.89	28.19	Investigate	M
65	49.9	1.42%	24	0.024	3.43	3.43	3.91	3.00	0.82	N/A	Sufficient	N/A
66	21	4.43%	36	0.024	178.18	65.50	9.27	4.00	4.27	112.68	Investigate	H
67	163.25	0.89%	24	0.024	121.55			3.00	7.23	98.59	Investigate	H
68	59.78	0.72%	18	0.024	39.99			2.50	4.26	29.81	Investigate	M
73	70.13	1.80%	18	0.024	20.34			2.50	2.76	11.59	Investigate	M
79	43.84	0.57%	24	0.024	72.29	18.69	5.95	3.00	3.94	53.60	Investigate	H
80	135.47	0.95%	24	0.024	23.91	18.01	7.61	3.00	4.32	5.90	Investigate	L
83	49.98	3.08%	24	0.024	19.40	19.40	7.95	3.00	3.16	N/A	Investigate	H
84	70	1.37%	24	0.024	19.09	19.09	7.74	3.00	3.11	N/A	Investigate	H
86	179.61	1.45%	18	0.015	25.90	13.86	7.84	2.50	4.21	12.04	Investigate	M
86A	53.07	2.20%	12	0.015	48.80	7.41	9.45	2.00	4.37	41.39	Investigate	M
90	59	2.76%	18	0.024	11.86	10.67	8.77	2.50	3.22	1.19	Investigate	L
100	19.66	1.02%	12	0.024	3.79	3.79	5.31	2.00	1.82	N/A	Sufficient	N/A
101	19.31	0.16%	12	0.024	4.85	2.75	6.43	2.00	4.00	2.10	Investigate	L
102	60.19	1.20%	18	0.024	2.75	2.75	5.22	2.50	0.93	N/A	Sufficient	N/A
103	19.82	0.81%	12	0.024	0.07	0.07	0.46	2.00	0.21	N/A	Sufficient	N/A
104	39.81	0.78%	12	0.024	9.08	4.22	8.02	2.00	4.06	4.86	Investigate	L
105	110.75	0.65%	36	0.024	162.21	53.21	9.72	4.00	5.03	109.00	Investigate	H
106	19.52	1.69%	24	0.024	169.59	23.00	8.96	3.00	3.91	146.59	Investigate	H
107	85.83	0.96%	36	0.024	78.18	46.00	8.31	4.00	4.05	32.18	Investigate	M
109	19.52	1.54%	12	0.024	5.29	4.70	9.58	2.00	4.02	0.59	Investigate	L
112	57.72	3.48%	24	0.024	16.26	16.26	7.67	3.00	2.65	N/A	Sufficient	N/A
113	44.08	0.93%	24	0.024	1.96	1.96	3.62	3.00	0.58	N/A	Sufficient	N/A
123	47.73	2.26%	18	0.024	50.76	13.36	9.92	2.50	4.34	37.40	Investigate	M
138A	41.95	2.19%	15	0.024	3.31	3.31	3.15	2.25	1.17	N/A	Sufficient	N/A
139A	39.78	2.61%	18	0.024	11.72	10.85	8.97	2.50	4.00	0.87	Investigate	L
142	55.17	0.69%	24	0.024	14.51	14.51	4.62	3.00	2.73	N/A	Sufficient	N/A

Q100 FOR CULVERT
DOWNSTREAM OF HAGA
DEVELOPMENT AND
CHURCH OF CHRIST

Table 13
Stormwater Pond Analysis Results, 5-Year Storm

Pond No.	Pond Bottom Elevation (ft)	Pond Rim Elevation (ft)	Overflow Depth (ft)	Pond Volume (ac-ft)	Peak Flow to Pond (cfs)	Peak Outflow from Outlet Structure (cfs)	Peak Overflow (cfs)	Total Peak Discharge incl Overflow (cfs)	Maximum Water Depth (ft)	Condition Under Design Storm Flows	Percent Reduction in Flow
1	7008.00	7010.00	2.00	0.207	44.71	0.97	42.86	43.83	> 2.00	OVERTOPS	2%
2	6972.00	6974.00	2.00	0.678	16.98	2.05	0.00	2.05	1.89	detained	88%
3	6966.10	6967.50	1.40	0.246	37.02	4.06	28.77	32.83	> 1.40	OVERTOPS	11%
5	6963.08	6965.12	2.04	0.054	7.16	0.00	2.72	2.72	> 2.04	OVERTOPS	62%
6	6961.65	6962.78	1.13	0.040	2.42	0.24	1.75	1.99	> 1.13	OVERTOPS	18%
7	6964.58	6965.82	1.24	0.008	0.76	0.24	0.43	0.67	> 1.24	OVERTOPS	12%
8	6963.63	6965.09	1.46	0.007	1.57	0.88	0.69	1.57	> 1.46	OVERTOPS	0%
9	6963.70	6965.51	1.81	0.100	2.23	0.00	0.37	0.37	> 1.81	OVERTOPS	83%
10	6970.66	6971.08	0.42	0.023	1.47	0.00	1.29	1.29	> 0.42	OVERTOPS	12%
11	6958.82	6960.92	2.10	0.044	2.28	0.00	0.00	1.20	1.34	detained	46%
12	6960.70	6963.75	3.05	0.101	2.28	0.00	0.08	0.08	> 3.05	OVERTOPS	96%
13	6955.91	6956.81	0.90	0.067	3.46	1.21	0.00	1.21	0.80	detained	65%
14	6955.79	6956.26	0.47	0.025	2.23	0.38	1.82	2.20	> 0.47	OVERTOPS	1%
15	6973.84	6975.65	1.81	0.080	2.04	0.81	0.00	0.81	0.97	detained	60%
16	6973.50	6974.69	1.19	0.015	2.22	2.23	0.00	2.23	1.06	detained	0%
17	6929.88	6931.06	1.18	0.020	2.44	1.01	1.42	2.43	> 1.18	OVERTOPS	0%
18	6990.30	6992.91	2.61	0.203	0.99	0.00	0.00	0.00	1.28	detained	100%
19	7000.36	7009.16	8.80	3.729	8.48	1.62	0.00	1.62	1.33	detained	81%
20	7009.14	7014.02	4.88	0.161	4.41	0.65	0.00	0.65	3.01	detained	85%
21	7011.97	7016.17	4.20	0.092	1.37	0.00	0.00	0.00	1.68	detained	100%
22	7011.29	7014.84	3.55	0.089	2.74	0.82	0.00	0.82	1.27	detained	70%
23	6981.18	6988.85	7.67	0.761	15.69	3.89	0.00	3.89	3.50	detained	75%
24	6989.64	6992.53	2.89	0.700	14.05	2.94	0.00	2.94	2.72	detained	79%
25	6964.76	6969.74	4.98	0.403	12.05	2.45	0.00	2.45	2.83	detained	80%
26	6963.49	6964.76	1.27	0.020	1.95	0.00	1.93	1.93	> 1.27	OVERTOPS	1%
27	6959.59	6961.36	1.77	0.045	4.59	0.00	4.51	4.51	> 1.77	OVERTOPS	2%
28	6955.33	6958.10	2.77	0.055	7.93	0.00	7.84	7.84	> 2.77	OVERTOPS	1%
29	6928.58	6929.49	0.91	0.131	56.05	0.00	45.61	45.61	> 0.91	OVERTOPS	19%
30	6942.30	6946.42	4.12	3.662	39.90	1.35	4.61	5.96	> 4.12	OVERTOPS	85%
31	6919.99	6928.34	8.35	2.224	20.11	0.39	0.00	0.39	5.73	detained	98%
32	6908.76	6914.23	5.47	1.381	17.69	3.37	0.00	3.37	2.84	detained	81%
33	6912.59	6914.18	1.59	0.045	0.55	0.07	0.00	0.07	0.58	detained	87%
34	6907.06	6911.32	4.26	0.204	1.97	0.12	0.00	0.12	2.13	detained	94%
35	6924.17	6925.15	0.98	0.117	2.84	0.60	0.00	0.60	0.56	detained	79%
36	6916.89	6920.08	3.19	0.110	2.21	0.00	0.00	0.00	1.97	detained	100%
37	6874.30	6875.52	1.22	0.088	1.30	0.27	0.00	0.27	0.55	detained	79%
38	6857.42	6858.48	1.06	0.367	1.55	0.01	0.00	0.01	0.33	detained	99%
40	6966.21	6967.76	1.55	0.006	2.69	0.55	2.12	2.67	> 1.55	OVERTOPS	1%
41	6910.20	6914.00	3.80	0.140	2.74	0.09	0.00	0.09	1.54	detained	97%

Q5 OUTFLOW TO HAGA PROPERTY IN "CULVERT C"

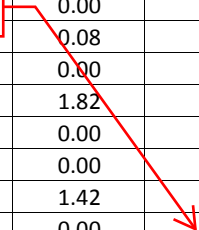


Table 14
Stormwater Pond Analysis Results, 100-Year Storm

Pond No.	Pond Bottom Elevation (ft)	Pond Rim Elevation (ft)	Overflow Depth (ft)	Pond Volume (ac-ft)	Peak Flow to Pond (cfs)	Peak Outflow from Outlet Structure (cfs)	Peak Overflow (cfs)	Total Peak Discharge incl Overflow (cfs)	Maximum Water Depth (ft)	Condition Under Design Storm Flows	Percent Reduction in Flow	Pond Concern Level
1	7008.00	7010.00	2.00	0.207	141.09	0.94	107.80	108.74	> 2.00	OVERTOPS	23%	H
2	6972.00	6974.00	2.00	0.678	77.56	2.66	44.72	47.38	> 2.00	OVERTOPS	39%	H
3	6966.10	6967.50	1.40	0.246	71.54	4.04	43.88	47.92	> 1.40	OVERTOPS	33%	H
5	6963.08	6965.12	2.04	0.054	20.88	0.00	15.01	15.01	> 2.04	OVERTOPS	28%	M
6	6961.65	6962.78	1.13	0.040	4.24	0.25	3.94	4.19	> 1.13	OVERTOPS	1%	L
7	6964.58	6965.82	1.24	0.008	1.39	0.25	1.14	1.39	> 1.24	OVERTOPS	0%	L
8	6963.63	6965.09	1.46	0.007	2.69	0.97	1.73	2.70	> 1.46	OVERTOPS	0%	L
9	6963.70	6965.51	1.81	0.100	5.27	0.00	4.64	4.64	> 1.81	OVERTOPS	12%	L
10	6970.66	6971.08	0.42	0.023	2.90	0.00	2.75	2.75	> 0.42	OVERTOPS	5%	L
11	6958.82	6960.88	2.06	0.044	2.94	1.86	0.08	1.94	> 2.06	OVERTOPS	49%	L
12	6960.70	6963.75	3.05	0.000	0.00	0.00	3.10	3.10	> 3.05	OVERTOPS	22%	L
13	6955.91	6956.81	0.90	0.067	6.09	1.33	3.96	5.29	> 0.90	OVERTOPS	13%	L
14	6955.79	6956.26	0.47	0.025	4.51	0.51	3.90	4.41	> 0.47	OVERTOPS	2%	L
15	6973.84	6975.65	1.81	0.059	3.59	1.02	0.00	1.02	1.56	detained	72%	N/A
16	6973.50	6974.69	1.19	0.010	3.80	3.78	0.00	3.78	1.11	detained	1%	N/A
17	6929.88	6931.06	1.18	0.020	4.24	1.24	2.98	4.22	> 1.18	OVERTOPS	0%	L
18	6990.30	6992.91	2.61	0.203	2.08	0.01	0.00	2.01	2.10	detained	100%	N/A
19	7000.36	7009.16	8.80	3.729	15.50	2.29	0.00	2.29	2.30	detained	85%	N/A
20	7009.14	7014.02	4.88	0.161	9.37	0.87	0.00	0.87	4.70	detained	91%	N/A
21	7011.97	7016.17	4.20	0.092	2.90	0.00	0.00	0.00	2.77	detained	100%	N/A
22	7011.29	7014.84	3.55	0.089	6.10	1.19	0.00	1.19	2.56	detained	80%	N/A
23	6981.18	6988.85	7.67	0.761	25.66	4.55	0.00	4.55	6.60	detained	82%	N/A
24	6989.64	6992.53	2.89	0.700	25.89	5.74	16.34	22.08	> 2.89	OVERTOPS	15%	M
25	6964.76	6969.74	4.98	0.403	16.88	2.90	0.00	2.90	3.66	detained	83%	N/A
26	6963.49	6964.76	1.27	0.020	3.42	0.00	3.39	3.39	> 1.27	OVERTOPS	1%	L
27	6959.59	6961.36	1.77	0.045	8.11	0.00	8.01	8.01	> 1.77	OVERTOPS	1%	L
28	6955.33	6958.10	2.77	0.055	14.02	0.00	13.91	13.91	> 2.77	OVERTOPS	1%	M
29	6928.58	6929.49	0.91	0.131	102.99	0.00	44.19	44.19	> 0.91	OVERTOPS	57%	H
30	6942.30	6946.42	4.12	3.662	82.75	1.40	23.86	25.26	> 4.12	OVERTOPS	69%	H
31	6919.99	6928.34	8.35	2.224	40.85	6.49	0.00	6.49	6.54	detained	84%	N/A
32	6908.76	6914.23	5.47	1.381	88.34	7.73	0.00	7.73	4.41	detained	91%	N/A
33	6912.59	6914.18	1.59	0.045	1.08	0.10	0.00	0.10	1.08	detained	91%	N/A
34	6907.06	6911.32	4.26	0.204	4.05	0.21	0.00	0.21	3.28	detained	95%	N/A
35	6924.17	6925.15	0.98	0.117	5.79	0.68	1.49	2.17	> 0.98	OVERTOPS	63%	L
36	6916.89	6920.08	3.19	0.110	3.71	0.00	0.00	0.00	2.81	detained	100%	N/A
37	6874.30	6875.52	1.22	0.088	3.26	0.43	0.00	0.43	1.19	detained	87%	N/A
38	6857.42	6858.48	1.06	0.367	3.36	0.01	0.00	0.01	0.67	detained	100%	N/A
40	6966.21	6967.76	1.55	0.006	4.87	0.64	4.18	4.82	> 1.55	OVERTOPS	1%	L
41	6910.20	6914.00	3.80	0.140	4.75	0.13	0.00	0.13	2.31	detained	97%	N/A

Q100 OUTFLOW TO HAGA PROPERTY IN "CULVERT C"