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LANDSCAPE ARCHITECTURE

DRAINAGE PLAN
CASTLEGATE ADDITION

MARCH 2014

REPORT CONTENTS

EXISTING CONDITIONS

The property is approximately 25 acres and is located along the north side of Central Avenue approximately ½ mile west of 119th Street West. This property is bounded on the east by Country Meadows West Addition and to the west by open farmland/pasture. The northern property line is developed as a Buckhead Addition.

This property is currently farmland/pasture which drains to the south and into the Central Avenue storm water sewer system. Based on site topography, this is generally sheet flow and shallow concentrated flow to the south before entering the box structure under Central Avenue.

The drainage patterns can be viewed on the Aerial and Lidar Exhibit (Exhibit 1).

PROPOSED CONDITIONS

The proposed property is being platted as a residential subdivision that will feature 83 patio home lots with associated streets, utilities, detention pond, and community amenities. We expect the structures to be a mix of slab on grade homes and homes with full basements. Storm water will be conveyed to the pond via storm water sewer located throughout the subdivision. The pond will ultimately discharge to the Central RCBC via storm water sewer after detention and water quality requirements have been met.

For a half-scale copy of the Plat, see Exhibit 2.

OFFSITE CONDITIONS

A new RCBC – constructed with the Central Avenue roadway straightening project – was installed at the southwest corner of this property. This box conveys runoff to the south from this site as well as approximately 31 acres from the west farmed property. The offsite runoff from the west currently sheet flows onto the western part of this property and then south to the RCBC. This area appears much larger on the Hydrogeodatabase, however, the northern portion of that basin drains to the east and into the storm water sewer which serves the rear yards in Buckhead Addition. The Offsite Drainage Exhibit can be seen as Exhibit 6.

There does not appear to be any runoff encroaching this property from the north or east as those developed subdivisions as those areas have on site storm water sewer and rear yard grading along their respective property lines.

The overall site location can be seen as Exhibit 3.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events
  - 2-yr Rainfall Intensity = 3.83 in
  - 10-yr Rainfall Intensity = 5.22 in
  - 100-yr Rainfall Intensity = 7.37 in

- FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - SCS Curve Number Method (CN = 80)
  - Time of Concentration: Lag Method (minimum 15 min)

SITE CHARACTERISTICS

The site is currently open space pasture that drains to the south and into the RCBC located at the southwest corner of the property under Central Avenue. This property does not appear to pond – but is relatively flat when draining to the south. The offsite property from the west sheet flows to the midpoint of this property and then south to the box structure.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

This property was analyzed based on existing conditions for peak runoff values for the entire storm series. Conditions on the site are farmed pasture in Type C soils (a composite of Types B, C, & D soils, based on NRCS Soil Survey). Time of concentration was calculated for the site and offsite flow per the Lag Method. A minimum Time of Concentration of 15 minutes was used, where applicable. The SCS Curve Number method was used for peak flow rates with a Curve Number of 80 (Undisturbed/ Pre-developed).

DOWNSTREAM DRAINAGE CAPACITY

This basin drains to the recently constructed 8x3 RCBC under Central Avenue. This box, based on a quick and simple calculation based on the assumption of a velocity (5 ft/s), will convey approximately 120 cfs. Based on existing conditions, we estimate approximately 140 cfs of peak flow to this structure in the 100-year storm event (based on a basin slope of 0.3% and a drainage area of 63 acres). The new box structure appears to be sized adequately to convey the basins runoff up to the 100-year event without overtopping the roadway.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Calculated
  - Rational Formula Method used for peak runoff
  - CN = 90 (Composite of Developed and Impervious Areas)
  - Rational 'C' Factor = 0.64 (10-year event)
  - Time of Concentration; Lag Method, minimum Tc = 15min
  - Storm Sewer sized for 10-year event (HGL underground = no surcharge)

- GRADING CONSTRAINTS TO BE OBSERVED AT SITE PLAN
  - One foot freeboard between 100-yr WSE and adjacent lot corner
  - Match all existing perimeter grades
  - On-site SWS system to be sized and located based on site plan

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

The site is being platted into 82 residential lots and 1 commercial frontage lot. The site was analyzed for runoff values based on approximately 50% impervious cover on the subdivision in Type C soils. A minimum Time of Concentration of 15 minutes was used. The site was divided into smaller sub-basins due to storm water sewer being used for conveyance to the pond. These areas were modeled using the Rational Method for storm water sewer sizing. The Curve Number method was used for the entire contributing basin to the pond for pond sizing.

DETENTION FACILITY

There is one proposed detention facility located in this subdivision. The detention pond will be surface water and will detain the developed runoff before discharging into the RCBC located under Central Avenue. The pond is described in more detail below.

Reserve G The pond in Reserve G is approximately 1.8 acres in surface area at its static elevation of 1338.0. This facility will accept runoff from approximately 22 acres of the developed subdivision. The lake will be 'wet' and is expected to be around 8-10' in total depth under its static elevation. The pond will have a 100-year water surface at elevation 1341.1 while discharging 14 cfs in that storm event. The pond will discharge to the south via a 24" SWS which is included in the southern SWS system that eventually ties into the Central RCBC. This pipe system, although designed for the 10-year storm event, incorporates this 100-year peak flow rate into that 10-year design. There will be an emergency overflow into the Thornton street ROW in case of the SWS plugging. This will also be apparent and incorporated into the grading of the surrounding lots and structures.

DISCHARGE POINTS SUMMARY

The site currently drains to the new RCBC constructed with the Central Avenue widening and CIP project. This box appears to be sized adequately for the existing conditions. Upon development of this project, we expect a much lower peak runoff flow rate to this point which should reduce ponding on this property as well as downstream properties. With the addition of the pond, we expect to reduce the 100-year peak flow from 140 cfs in current conditions to under 35 cfs in proposed conditions.

WATER QUALITY

Water quality will be obtained in this subdivision by using the pond volume under static for settling and treatment of the required water quality volume. The pond is expected to have approximately 8-10' of depth under the static surface which will provide approximately 15.8 ac-ft of storage. In comparison, the required water quality volume on the site is around 1.3 ac-ft of treatment. The pond is large enough to treat the water quality volume as well as not creating a short circuit scenario for the suspended solids.

DOWNSTREAM CHANNEL PROTECTION

Downstream channel protection will be provided on the site by using an orifice and riser structure as the primary outfall of the pond. The orifice will be a 4" diameter hole at static with a soil saver/ wall structure as the primary outfall to the 24" RCP at a 1' higher elevation. This configuration will give the 1 year event an extended detention of just over 24 hours. The larger storm events will utilize the full 24" outfall through the riser/wall structure.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

Due to the size of the detention pond while providing water quality and downstream channel protection, we do not expect any negative impacts downstream. The offsite runoff from the west adjacent property is expected to be ditched and directed south to the RCBC on the offsite property.

SOURCE OF FLOODPLAIN INFORMATION

This site lies within a FEMA Zone X per FEMA FIRM Panel 328 of 700 for Wichita, Sedgwick County, Kansas; effective May 2, 2012.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time. The areas of discharge do not account for more than 640 acres.

FEMA

No FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There is no KDOT ROW adjacent or near this property which would require a permit at this time.

SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

EXHIBIT 1: Aerial Photo Exhibit with Lidar Topography

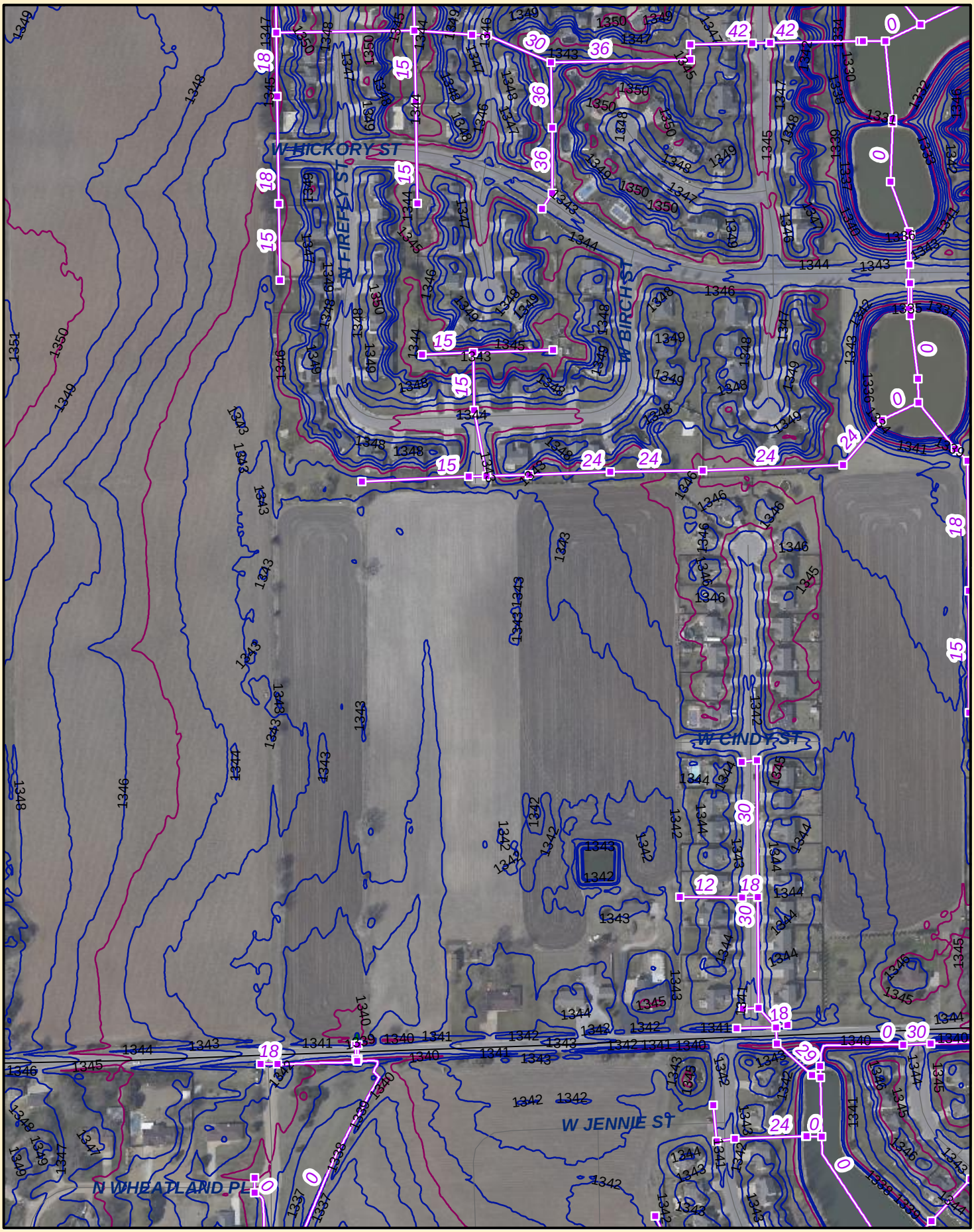
EXHIBIT 2: Plat – Half Scale

EXHIBIT 3: Site Location Map - Hydrogeodatabase

EXHIBIT 4: Drainage Plan – Half Scale

EXHIBIT 5: Floodplain Location (FIRM)

EXHIBIT 6: Offsite Drainage Basin Map



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AERIAL & LIDAR EXHIBIT

0 75 150 300 Feet

Baughman
ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

CASTLEGATE ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS

State of Kansas)
Sedgwick County) SS

We, Baughman Company, P.A., Surveyors in aforesaid county and state do hereby certify that we have surveyed and platted "CASTLEGATE ADDITION", Wichita, Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as Lot 1, Block A, Dan Blasi Addition, Sedgwick County, Kansas, EXCEPT that part of said Lot 1 described as follows: Beginning at the southeast corner of said Lot 1; thence northerly along the east line of said Lot 1, 279.00 feet; thence westerly parallel with the east segment and the west segment of the south line of said Lot 1, 160.00 feet; thence southerly parallel with the east line of said Lot 1, 111.20 feet to a point on the west segment of the south line of said Lot 1; thence easterly along the west segment of the south line of said Lot 1, 18.79 feet to a deflection corner in said south line; thence southerly along the middle segment of the south line of said Lot 1, 167.80 feet to a deflection corner in said south line; thence easterly along the east segment of the south line of said Lot 1, 141.21 feet to the point of beginning, TOGETHER with, Beginning at a point 2200.00 feet westerly of the southeast corner of the Southeast Quarter of Section 13, Township 27 South, Range 2 West of the Sixth Principal Meridian, Sedgwick County, Kansas; thence westerly, 200.00 feet; thence northerly parallel with the east line of said Southeast Quarter, 1320.00 feet; thence easterly, 367.97 feet; thence southerly, 1102.20 feet; thence westerly, 167.97 feet; thence southerly, 217.80 feet to the point of beginning, EXCEPT that part of the above described tract described as follows: Beginning at a point 2200.00 feet westerly of the southeast corner of said Southeast Quarter; thence westerly, 20.00 feet; thence northerly, 217.80 feet; thence easterly, 20.00 feet; thence southerly, 217.80 feet to the point of beginning, all being subject to road rights-of-way over the south 50.00 feet, TOGETHER with, a tract of land described as the south 1297 feet of the Southeast Quarter of Section 13, Township 27 South, Range 2 West of the 6th Principle Meridian, Sedgwick County, Kansas.

Existing public easements and dedications being vacated by virtue of K.S.A. 12-512b, as amended.

Baughman Company, P.A.

_____, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, Blocks, Streets, and Reserves to be known as "CASTLEGATE ADDITION", Wichita, Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The drainage and utility easements are hereby granted as indicated for drainage purposes and for the construction and maintenance of all public utilities. The drainage easements are hereby granted as indicated for drainage purposes. The street, drainage, and utility easements are hereby granted as indicated for street purposes, including sidewalks, for drainage purposes, and for the construction and maintenance of all public utilities. The parking easements are hereby granted as indicated exclusively for residential parking. The pedestrian access easement is hereby granted as indicated for pedestrian access to or from Azure and no fences or other obstructions shall be constructed or placed on or within this easement. The streets are hereby dedicated to and for the use of the public. Access controls shall be as depicted on the face of the plat and are hereby granted to the City of Wichita, Kansas. The permitted opening locations shall be as determined by the City Engineer of the City of Wichita, Kansas. Reserve "A" is hereby reserved for open space, landscaping, streets, entry monuments, drainage purposes, and utilities. Reserves "B" and "C" are hereby reserved for open space, landscaping, entry monuments, berms, sidewalks, drainage purposes, and utilities. Reserve "D" and "E" are hereby reserved for open space, landscaping, drainage purposes, berms, HOA maintenance and storage facilities, utilities as confined to easements, and streets as confined to easements. Reserve "F" is hereby reserved for open space, landscaping, berms, lakes, gazebos, fences, sidewalks, playgrounds, parking, a clubhouse and related appurtenances, and swimming pools and related appurtenances, drainage purposes, utilities as confined to easements, parking, and streets as confined to easements. There shall be no building setback requirements in said Reserve "F" along any public rights-of way. The parking easements within said Reserve "F" shall be used for residential parking exclusively. No obstructions shall be constructed or placed on or within the parking easements in said Reserve "F". The Minimum Building Pad Elevations for the lowest opening to the structures shall be as indicated on the face of the plat.

Green Vision Developer, LLC

_____, Member
Randy Ketzner

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this_____day of_____, 2014, by Randy Ketzner, Member of the Green Vision Developer, LLC, on behalf of the limited liability company.

_____ Notary Public

My App't. Exp. _____

This plat of "CASTLEGATE ADDITION", Wichita, Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this _____ day of _____, 2014.
Wichita-Sedgwick County Metropolitan Area Planning Commission

_____, Chair
Don Klausmeyer

_____, Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this_____ day of _____, 2014.

_____, Mayor
Carl Brewer

_____, City Clerk
Karen Sublett

Reviewed in accordance with K.S.A. 58-2005 on this_____day of _____, 2014.

_____
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

Entered on transfer record this_____day of _____ , 2014.

_____, County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County) SS

This is to certify that this plat has been filed for record in the office of the Register of Deeds, this_____day of_____, 2014 at_____o'clock __M; and is duly recorded.

_____, Register of Deeds
Bill Meek

_____, Deputy
Tonya Buckingham

CASTLEGATE ADDITION

10 MARCH 2014

Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

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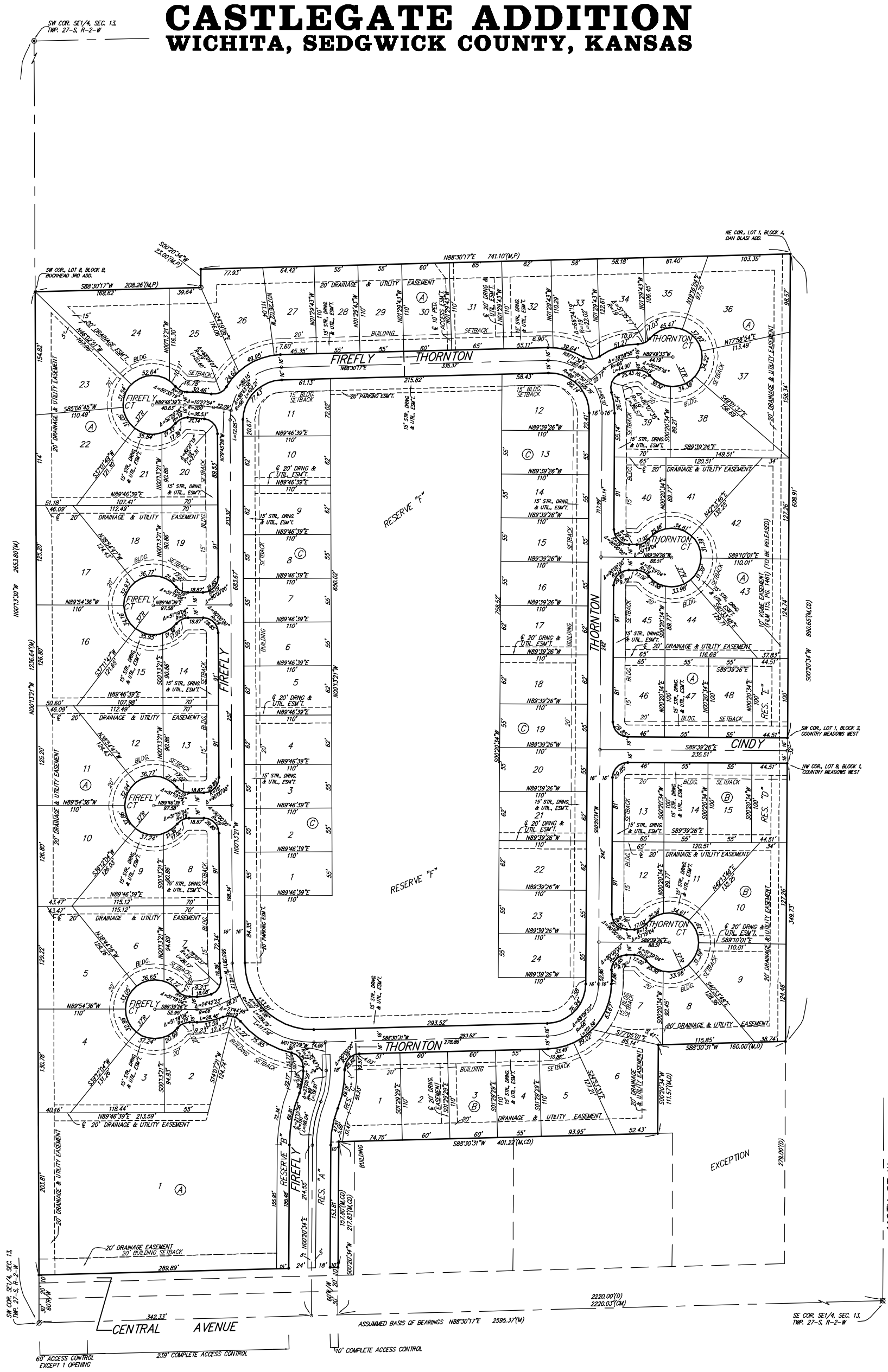
CASTLEGATE ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS



- ⊙ = ½" REBAR (FOUND)
- • = ½" REBAR W/ "BAUGHMAN" CAP (SET)
- ⁎ = ½" REBAR W/ "BAUGHMAN" CAP (FOUND)
- ⊠ = 1" IRON IN THIMBLE (FOUND)
- Ø = 3/4" IRON (FOUND)
- ○ = 1/2" IRON (FOUND)

(M) = MEASURED
(D) = DESCRIBED
(P) = PLATTED
(C) = CALCULATED
(CP) = CALCULATED PER PLATTED INFO.
(CD) = CALCULATED PER DESCRIBED
(CM) = CALCULATED PER MEASURED

NOTE:
ALL LOTS WITHIN CASTLEGATE ADDITION SHALL HAVE A 5 FOOT INTERIOR SIDEYARD SETBACK.

0' 60' 120'

DATE OF PREPARATION: 10 FEBRUARY 2014

BENCHMARK:
"X" CUT ON TOP OF CURB INLET NORTH SIDE OF CENTRAL 30' EAST OF THE INTERSECTION OF CENTRAL AND FIREFLY.
ELEVATION = 1341.99 (NGVD88)

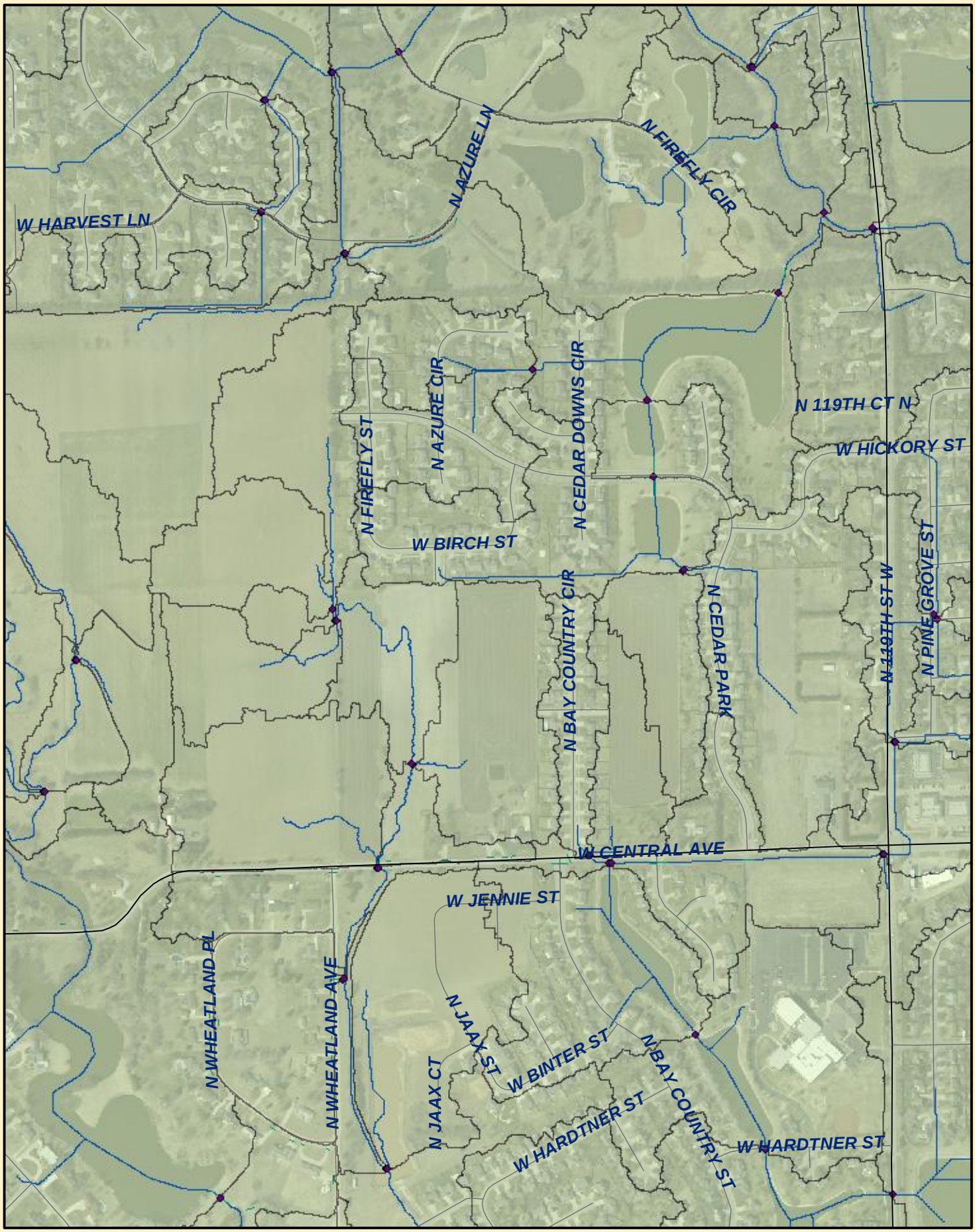
MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION NAVD88
1–24	C	1340.0

NOTE:
A master grading plan for drainage has been developed for this subdivision and is on file with the City of Wichita, Kansas. All drainage easements, right-of-ways, or reserves shall remain at established grades or as modified with the approval of the City Engineer of the City of Wichita, Kansas. No obstructions which impede the flow of this drainage system shall be allowed.

CASTLEGATE ADDITION

10 MARCH 2014

Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE



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Site Location
Hydrogeodatabse

0 150 300 600
Feet

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LANDSCAPE ARCHITECTURE

DRAINAGE PLAN

CASTLEGATE ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

Offsite from North 3x4 RCBC
Area = 31.1 acres
CN = 80
Tc = 43 min
Q_2 = 36 cfs
Q_5 = 54 cfs
Q_{10} = 68 cfs
Q_{25} = 86 cfs
Q_{100} = 120 cfs

Offsite runoff to be conveyed to the south via ditch section (as shown) on adjacent property.

LESLIE & VENESSA ALBERT
14601 W CENTRAL
WICHITA, KS 67235

JOHN E. THEIS
12610 W CENTRAL
WICHITA, KS 67235
ZONED "SF-5"

0' 60' 120'

DATE OF PREPARATION: 10 FEBRUARY 2014
DATE OF TOPOGRAPHY: 31 JANUARY 2014
CONTOUR INTERVALS = 1 FOOT

DETENTION POND/BASIN (Static = 1338.0)

STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	67 cfs	7.6 cfs	1339.2
10 yr	108 cfs	12 cfs	1340.0
100 yr	171 cfs	14 cfs	1341.1

NORTH WEST BASIN

ELEVATION	TOTAL STORAGE (ac ft)
1337	0.0
1338	1.9
1339	4.1
1340	6.4
1341	9.0

Developed	2yr	10yr	100yr
Intensity	3.8	5.19	7.36
Rational C	0.55	0.64	0.73

Basin ID	Area	Developed Flowrates		
		2-yr	10-yr	100-yr
	acres	cfs	cfs	cfs
1	0.5	1.0	1.7	2.7
2	0.7	1.4	2.2	3.5
3	1.5	3.1	5.0	8.1
4	0.3	0.6	1.0	1.6
5	0.1	0.3	0.4	0.6
6	0.2	0.4	0.7	1.1
7	0.4	0.8	1.3	2.1
8	0.9	1.9	3.0	4.8
9	1.7	3.6	5.6	9.1
10	1.4	2.9	4.7	7.5
11	0.6	1.3	2.0	3.2
12	0.3	0.5	0.8	1.3
13	0.6	1.3	2.1	3.3
14	0.6	1.3	2.0	3.2
15	0.4	0.8	1.3	2.1
16	1.8	3.8	6.0	10
17	0.4	0.8	1.2	2.0
18	0.2	0.5	0.8	1.2
19	0.7	1.4	2.2	3.5
20	1.3	2.7	4.3	7.0
21	0.4	0.9	1.4	2.3
22	0.7	1.4	2.2	3.6
23	1.4	2.9	4.7	7.5
24	0.7	1.4	2.2	3.5
25	1.1	2.3	3.7	5.9
26	6.0	13	20	32
TOTAL	24.8	51.7	82.2	133.0

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group A	B	C	D	Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed	0.02	0.03	0.04	**0.05**	Undisturbed	55	71	80	**84**
Turf or Disturbed Soils	0.15	0.20	0.22	**0.25**	Turf or Disturbed Soils	71	80	84	**88**
Impervious Cover	0.95	0.95	0.95	**0.95**	Impervious Cover	98	98	98	**98**

Basin #	Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*) Undist. ft^2	Dist. ft^2	Red. Imp. ft^2	New Imp. ft^2	Totol Area ft^2	U %	D %	Redev. I %	I %	R_v %	WQ_v ft^3 eq. 4-25*
Total Site	*0*	*468,270*	*0*	*468,270*	936,540	0.000	0.125	0.000	0.475	**0.6000**	**56,192**
CN		*42*	*0*	*49*	**91**						

Pond Volume Below Static Pool

Basin	Static Sq.Ft.	Static Acre	Pond Bottom Area Sq. Ft.	Pond Bottom Area Acre	Depth Feet	Volume Acre-Ft.
Pond	80000	1.8	58000	1.3	10	15.8
Totals:		1.8		1.3		15.8

Pond Volume > WQv		
Pond	WQv	Check
15.8	1.3	Yes

The proposed pond is approximately 3.5 acres in surface area and is not included in the total basin area.

CP = Cable TV Pedestal
DI = Drop Inlet
EB = Electric Box
LP = Light Pole
Sign = Sign
SI = Tornado Siren
SSMH
ATTVT = ATT Vault
ATT Ped = ATT Pedestal
SWSMH = Stormwater Sewer Manhole
TR = Tree
Well = Cased Well
WV = Water Valve

LEGEND
- Proposed SWS
- Drainage Basin Boundary
- Proposed Flow Direction
- Proposed Ditch Section

WATER LINE
SOUTHWESTERN BELL
GAS LINE
CABLE TV
FENCE
OVERHEAD ELECTRIC LINE
UNDERGROUND ELECTRIC LINE
PIPELINE

VICINITY MAP
SEC. 13, T27S, R2W

TYPICAL DETAIL (4A) PROPOSED CHANNEL
4:1 SS
Manning's 'n' = 0.030
Slope = 1.0%
4'
Capacity:
@ 1' = 30 cfs
@ 2' = 130 cfs
NOT TO SCALE

DRAINAGE PLAN CASTLEGATE ADDITION

10 MAR 2014

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315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

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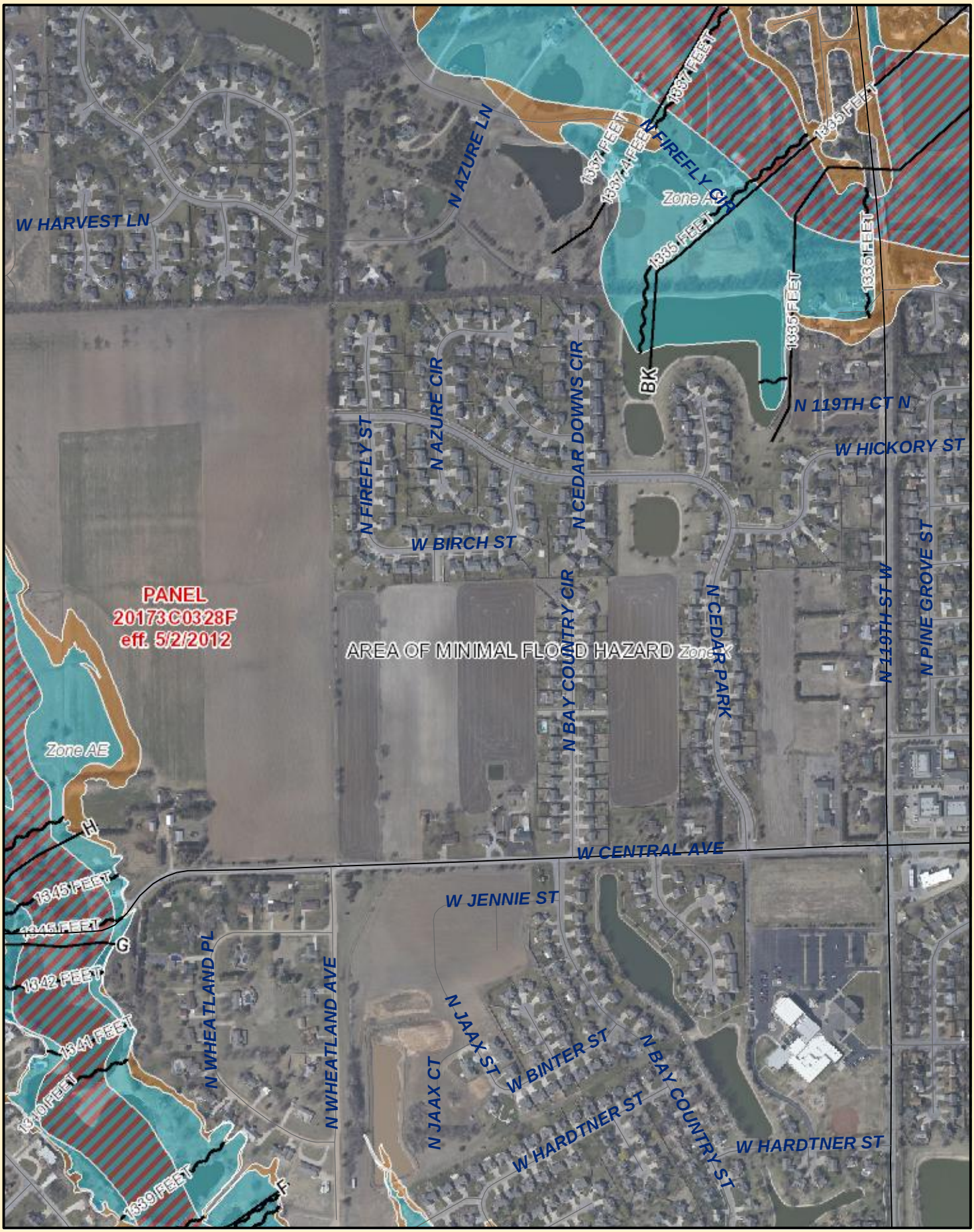

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FEMA FIRM EXHIBIT

0 150 300 600 Feet

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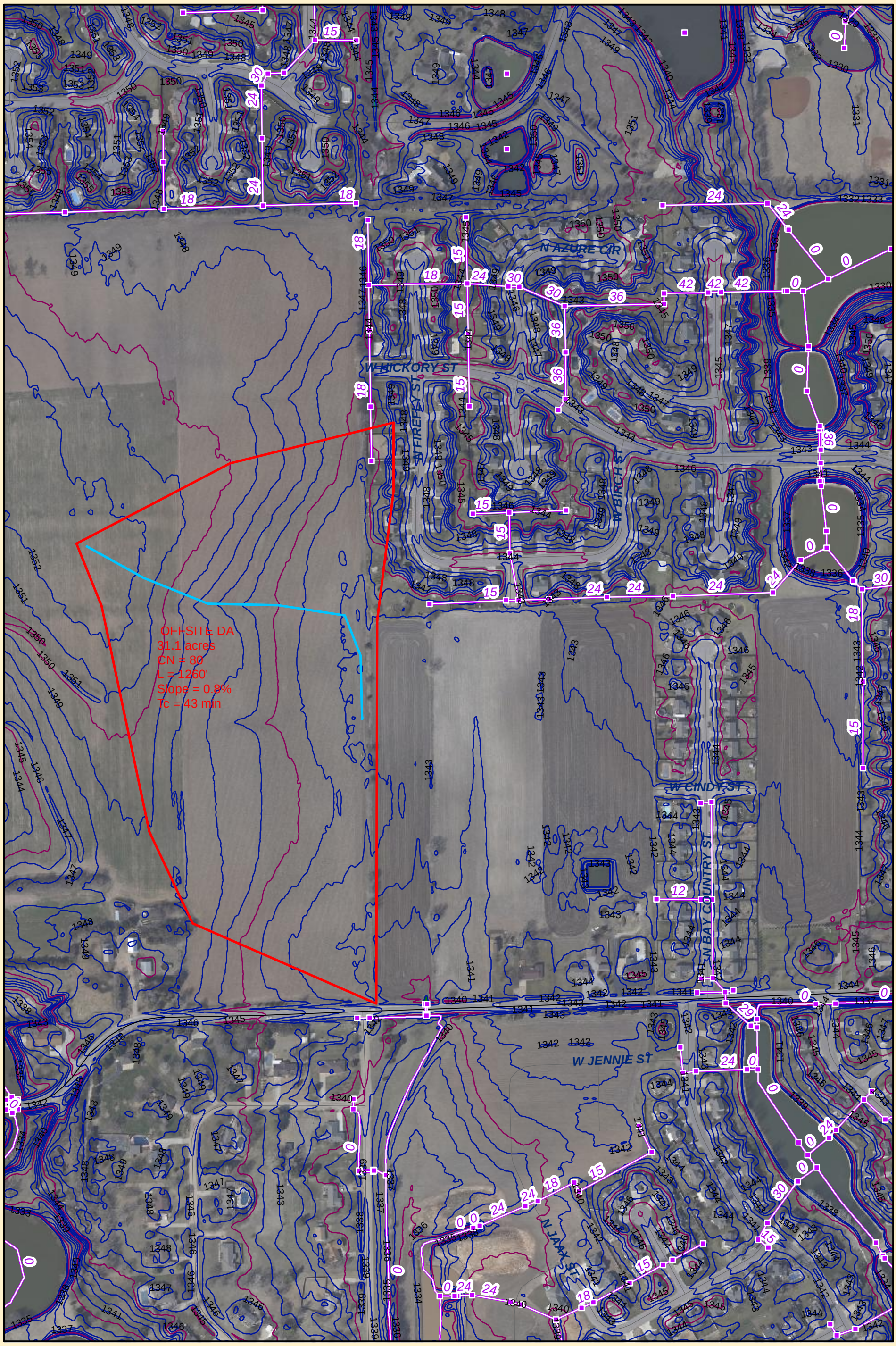
LANDSCAPE ARCHITECTURE



CASTLEGATE
Offsite DA

0 150 300 600 Feet

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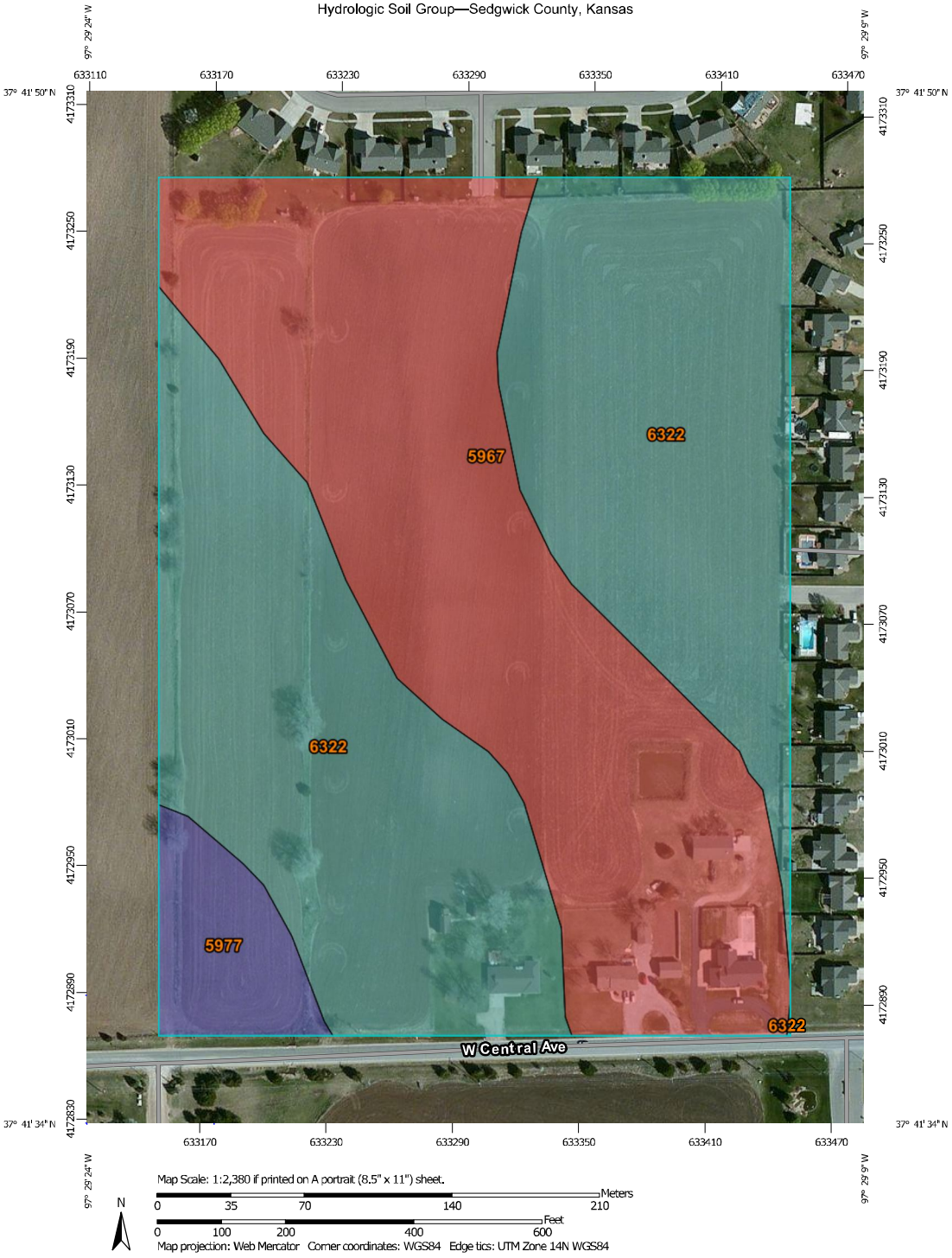
LANDSCAPE ARCHITECTURE

APPENDIX A: USGS Soils Survey

APPENDIX B: HydraFlow Hydrographs
Pond Routing and Site Flow

APPENDIX C: HydraFlow SWS
Proposed Onsite SWS – 10-year Event

USGS Soils Survey



Map Scale: 1:2,380 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 9, Dec 10, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 18, 2010—Sep 27, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sedgwick County, Kansas (KS173)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	12.4	41.2%
5977	Vanoss silt loam, 1 to 3 percent slopes	B	1.5	4.8%
6322	Blanket silt loam, 0 to 1 percent slopes	C	16.3	54.0%
Totals for Area of Interest			**30.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

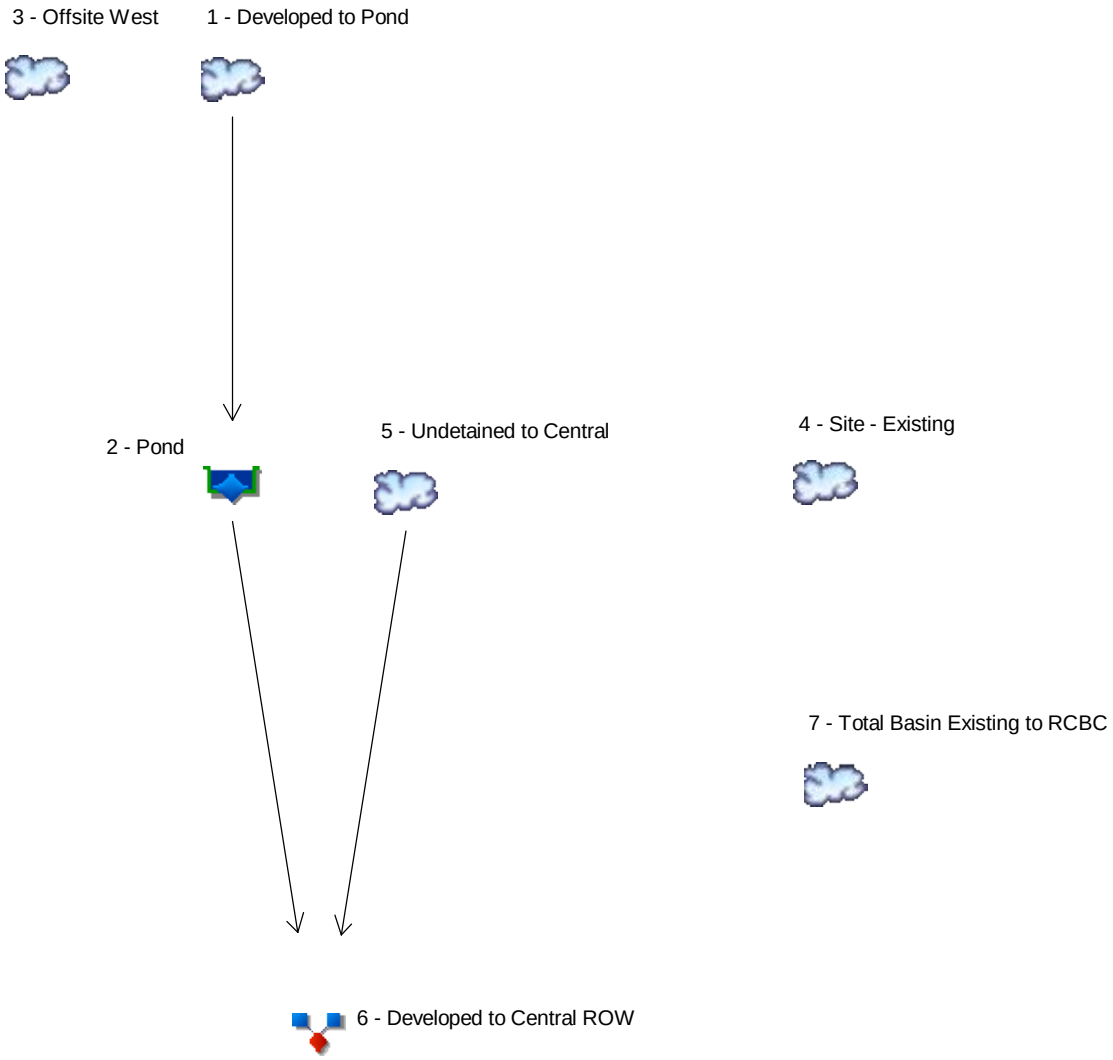
Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

HydraFlow Hydrographs

Pond Routing & Site Flow

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Developed to Pond
2	Reservoir	Pond
3	SCS Runoff	Offsite West
4	SCS Runoff	Site - Existing
5	SCS Runoff	Undetained to Central
6	Combine	Developed to Central ROW
7	SCS Runoff	Total Basin Existing to RCBC

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	49.67	66.81	12.42	91.33	108.43	130.31	149.66	171.34	Developed to Pond
2	Reservoir	1	1.641	4.734	0.176	11.98	13.05	14.23	15.11	15.95	Pond
3	SCS Runoff	------	23.48	35.68	2.000	54.28	67.77	85.54	101.53	119.62	Offsite West
4	SCS Runoff	------	15.48	23.58	1.336	35.94	44.91	56.66	67.29	79.31	Site - Existing
5	SCS Runoff	------	6.209	8.524	1.354	11.86	14.21	17.21	19.87	22.84	Undetained to Central
6	Combine	2, 5	6.476	8.866	1.386	16.58	24.17	29.19	32.82	36.67	Developed to Central ROW
7	SCS Runoff	------	26.82	41.01	2.436	62.77	78.60	99.38	118.09	139.28	Total Basin Existing to RCBC

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

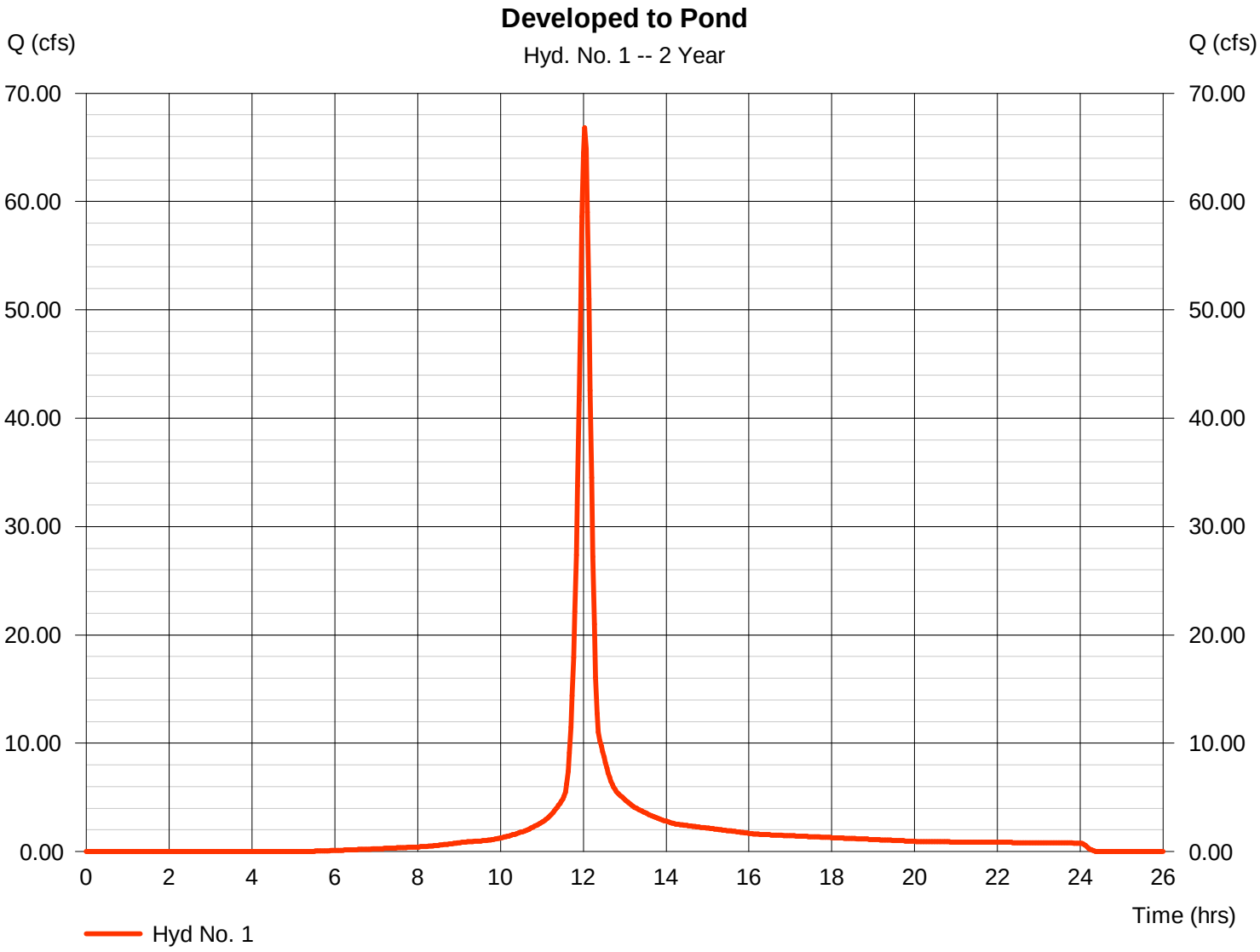
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	66.81	2	722	4.376	------	------	------	Developed to Pond
2	Reservoir	4.734	2	782	3.882	1	1339.36	2.69	Pond
3	SCS Runoff	35.68	2	740	4.282	------	------	------	Offsite West
4	SCS Runoff	23.58	2	748	3.384	------	------	------	Site - Existing
5	SCS Runoff	8.524	2	722	0.553	------	------	------	Undetained to Central
6	Combine	8.866	2	722	4.435	2, 5	------	------	Developed to Central ROW
7	SCS Runoff	41.01	2	770	8.629	------	------	------	Total Basin Existing to RCBC

Hydrograph Report

Hyd. No. 1

Developed to Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 66.81 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.376 acft
Drainage area	= 22.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



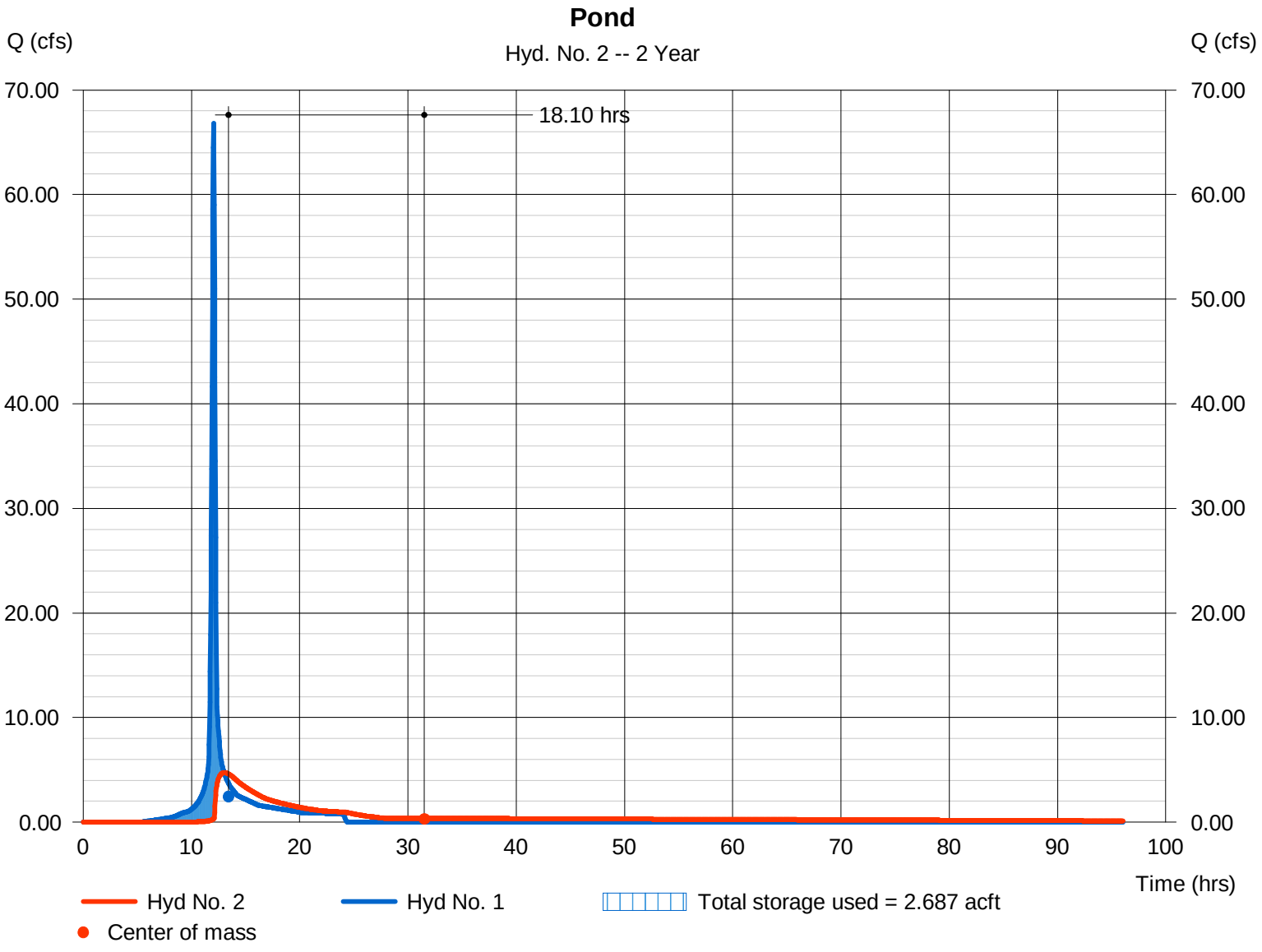
Hydrograph Report

Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 4.734 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.03 hrs
Time interval	= 2 min	Hyd. volume	= 3.882 acft
Inflow hyd. No.	= 1 - Developed to Pond	Max. Elevation	= 1339.36 ft
Reservoir name	= Proposed Pond	Max. Storage	= 2.687 acft

Storage Indication method used.



Pond No. 1 - Proposed Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1338.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1338.00	79,500	0.000	0.000
1.00	1339.00	88,400	1.926	1.926
2.00	1340.00	97,600	2.134	4.060
3.00	1341.00	107,100	2.349	6.409
4.00	1342.00	116,800	2.569	8.978
5.00	1343.00	126,700	2.794	11.771

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	4.00	0.00	0.00
Span (in)	= 24.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1337.25	1338.00	0.00	0.00
Length (ft)	= 700.00	0.00	0.00	0.00
Slope (%)	= 0.30	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	Yes	No	No

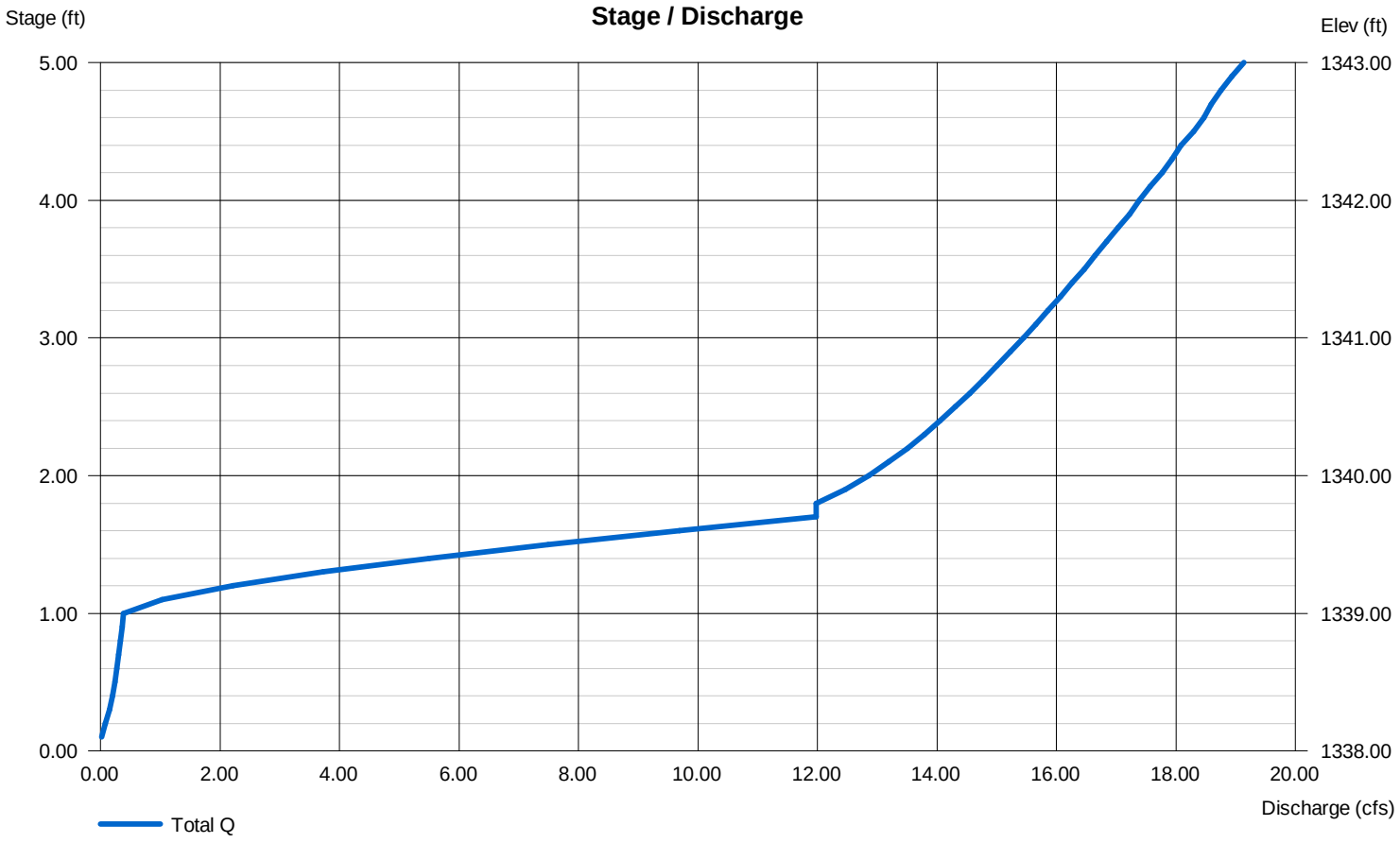
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 1339.00	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 Contour)

TW Elev. (ft) = 0.00

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

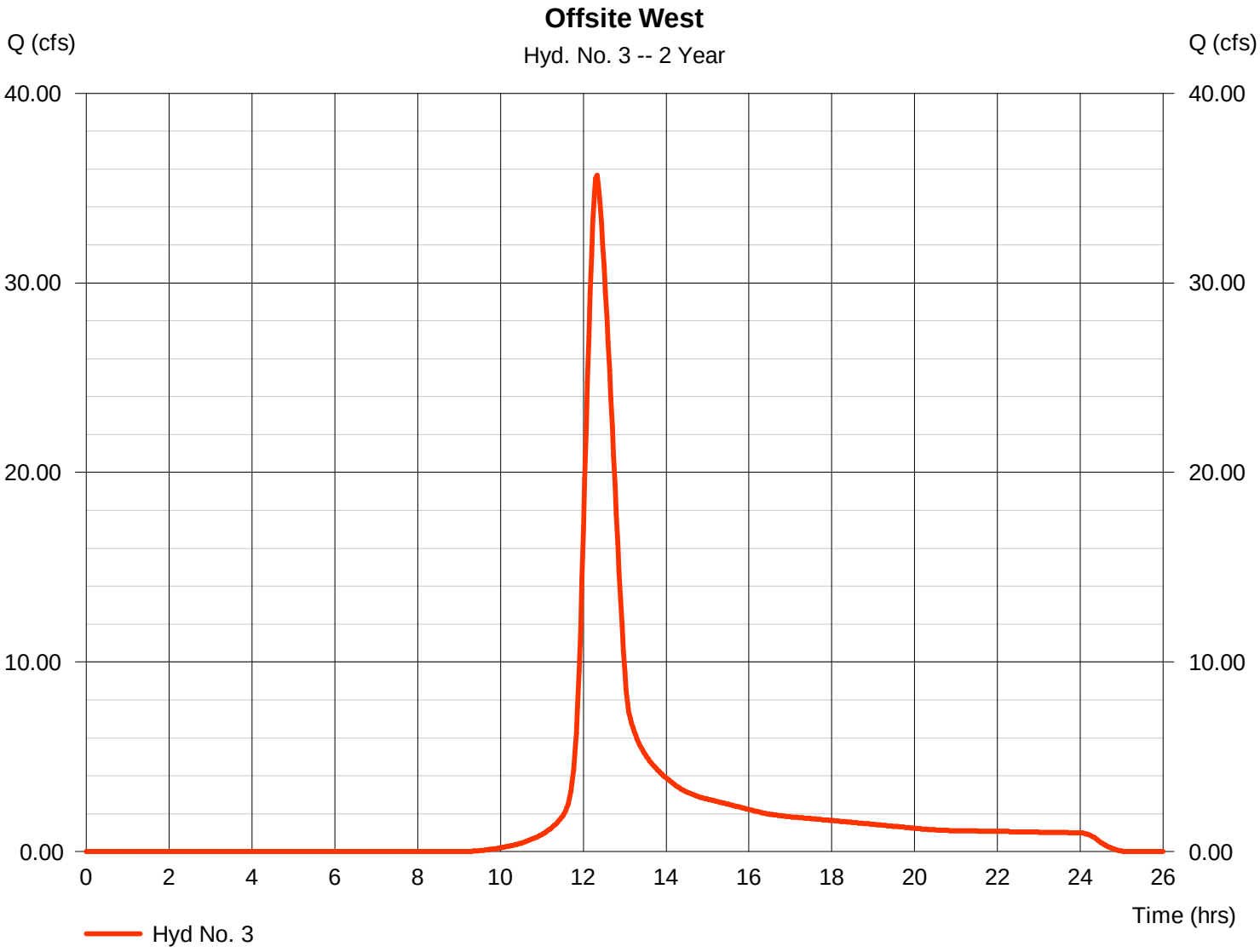


Hydrograph Report

Hyd. No. 3

Offsite West

Hydrograph type	= SCS Runoff	Peak discharge	= 35.68 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 4.282 acft
Drainage area	= 31.100 ac	Curve number	= 80
Basin Slope	= 0.8 %	Hydraulic length	= 1260 ft
Tc method	= LAG	Time of conc. (Tc)	= 42.80 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

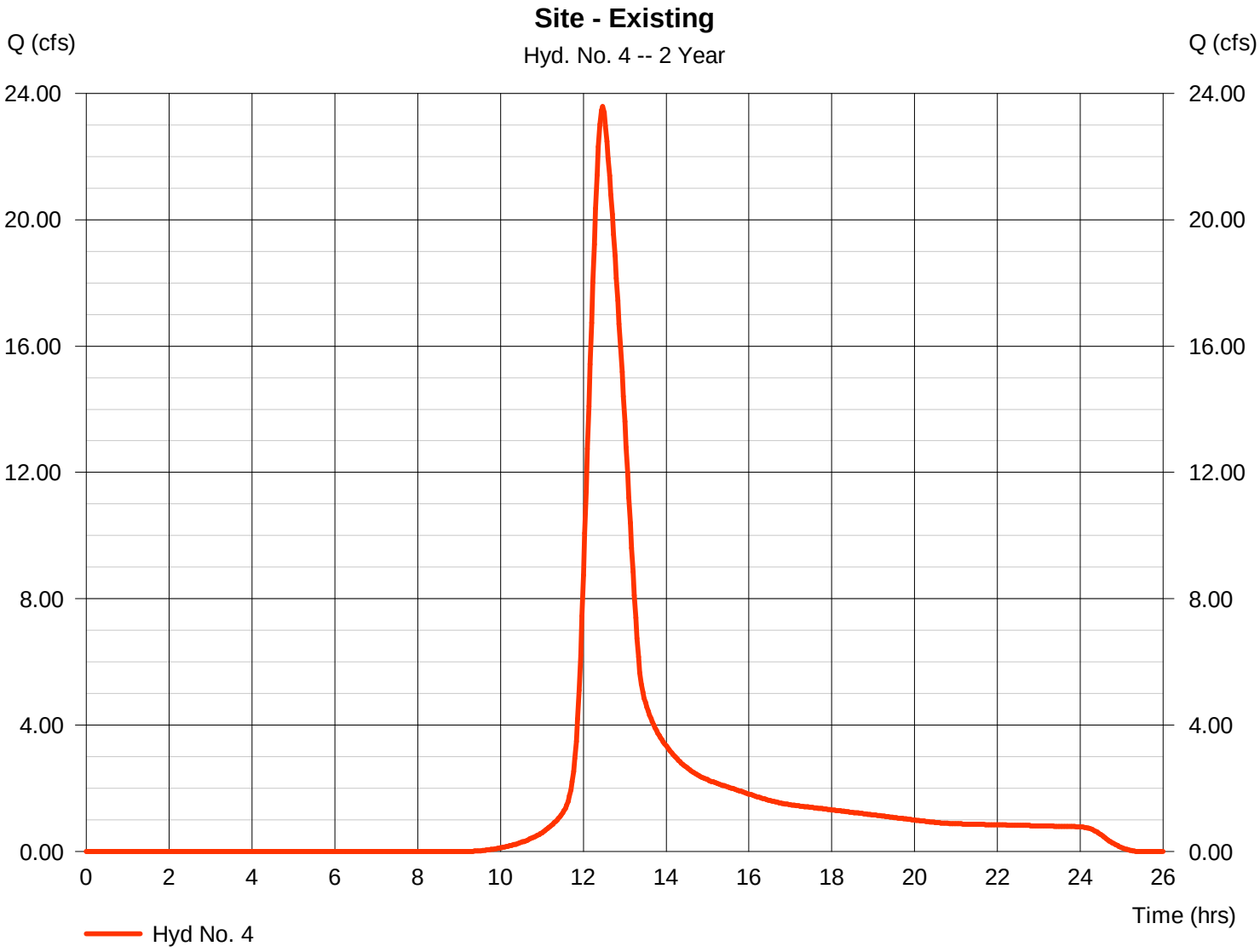


Hydrograph Report

Hyd. No. 4

Site - Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 23.58 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 3.384 acft
Drainage area	= 25.000 ac	Curve number	= 80
Basin Slope	= 0.5 %	Hydraulic length	= 1300 ft
Tc method	= LAG	Time of conc. (Tc)	= 55.50 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

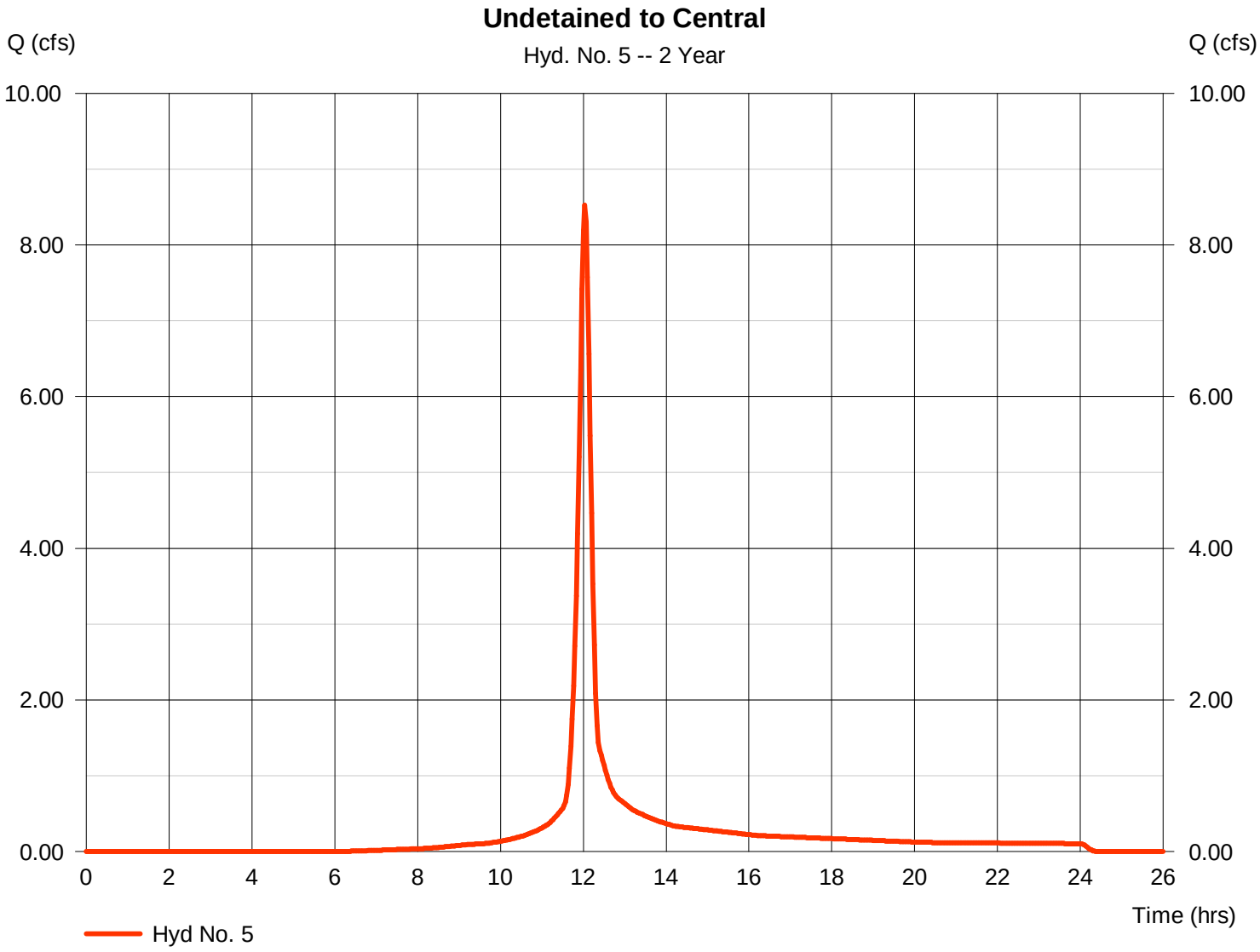


Hydrograph Report

Hyd. No. 5

Undetained to Central

Hydrograph type	= SCS Runoff	Peak discharge	= 8.524 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 0.553 acft
Drainage area	= 3.000 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

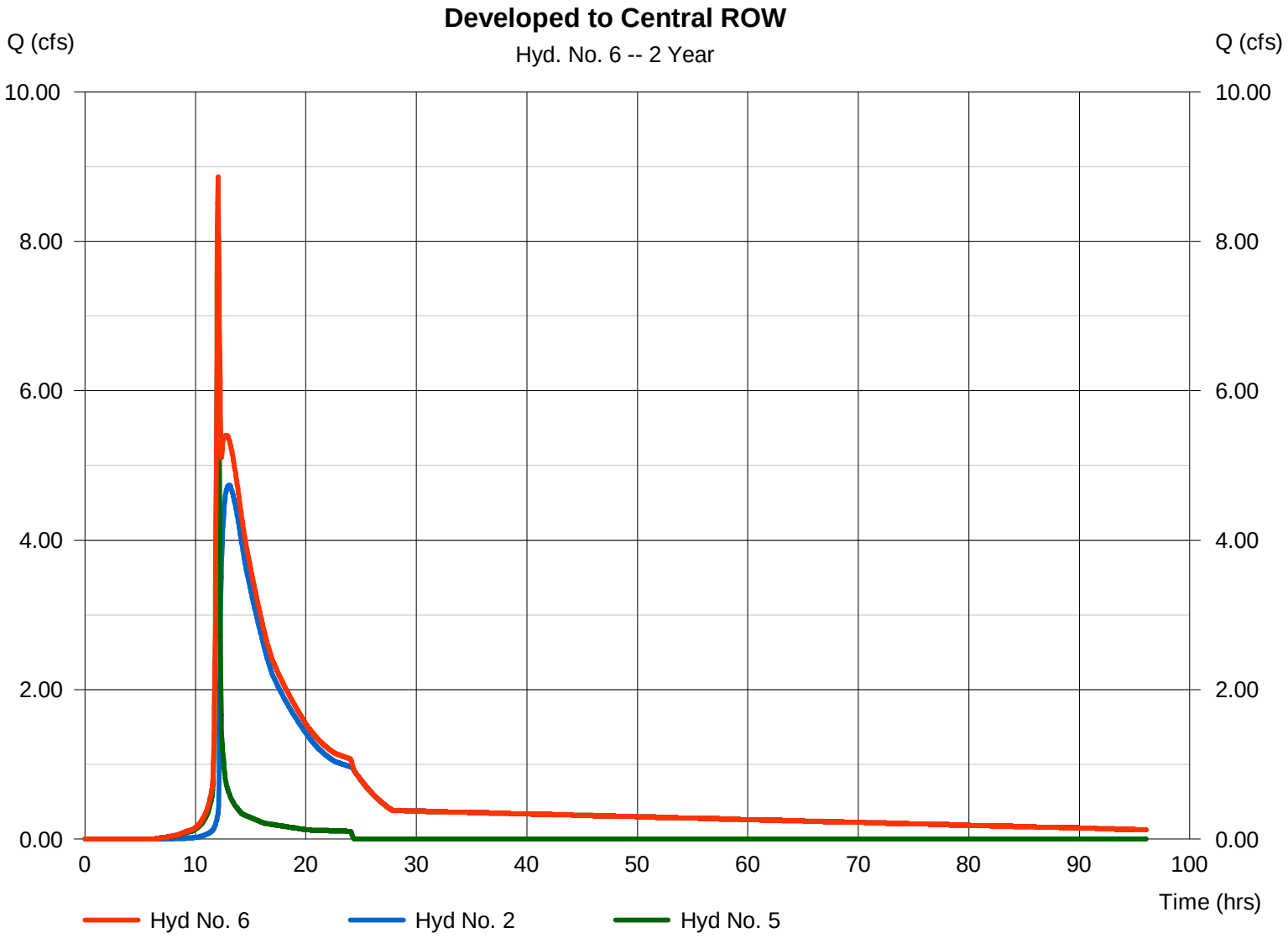


Hydrograph Report

Hyd. No. 6

Developed to Central ROW

Hydrograph type	= Combine	Peak discharge	= 8.866 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.435 acft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 3.000 ac

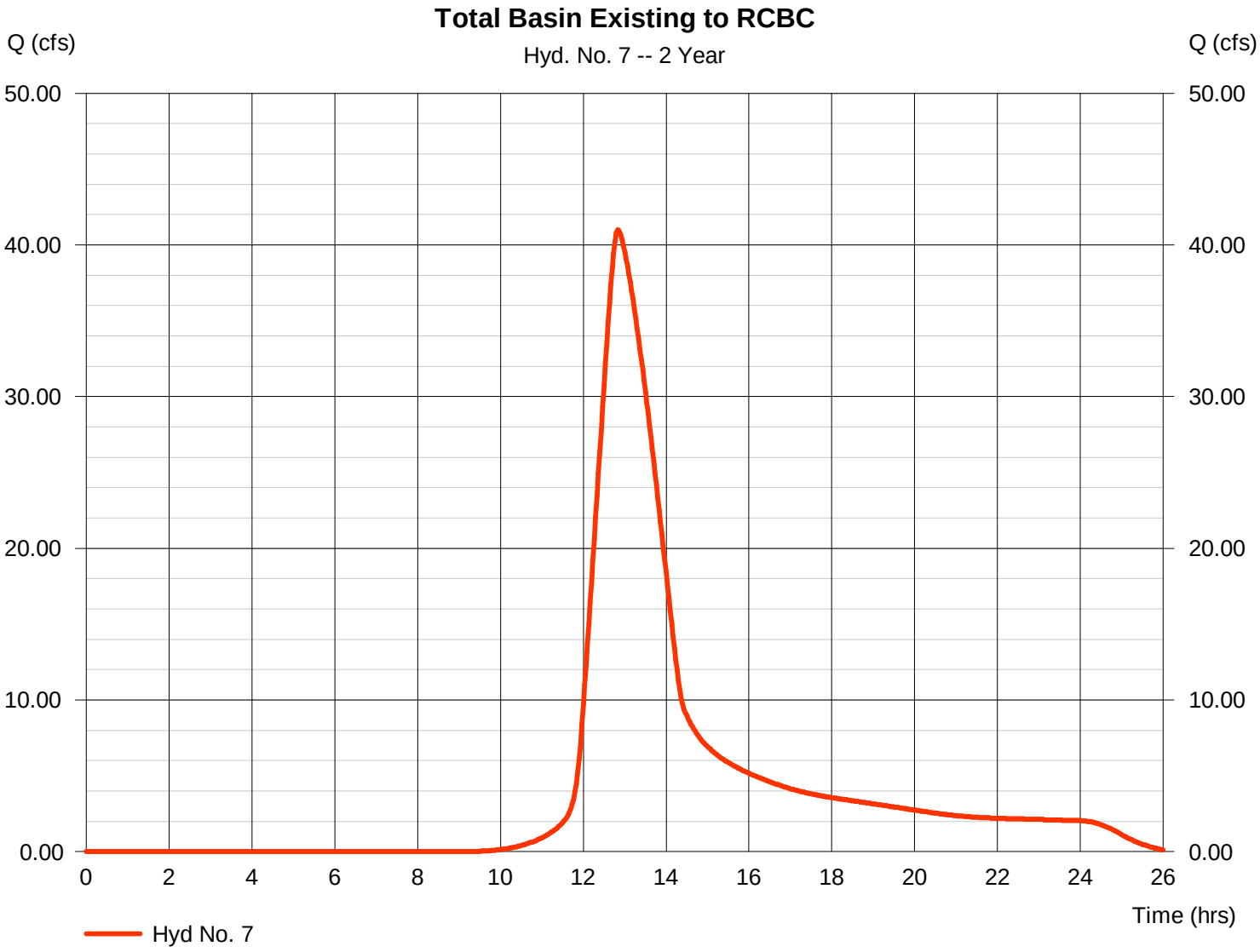


Hydrograph Report

Hyd. No. 7

Total Basin Existing to RCBC

Hydrograph type	= SCS Runoff	Peak discharge	= 41.01 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.83 hrs
Time interval	= 2 min	Hyd. volume	= 8.629 acft
Drainage area	= 63.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 93.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

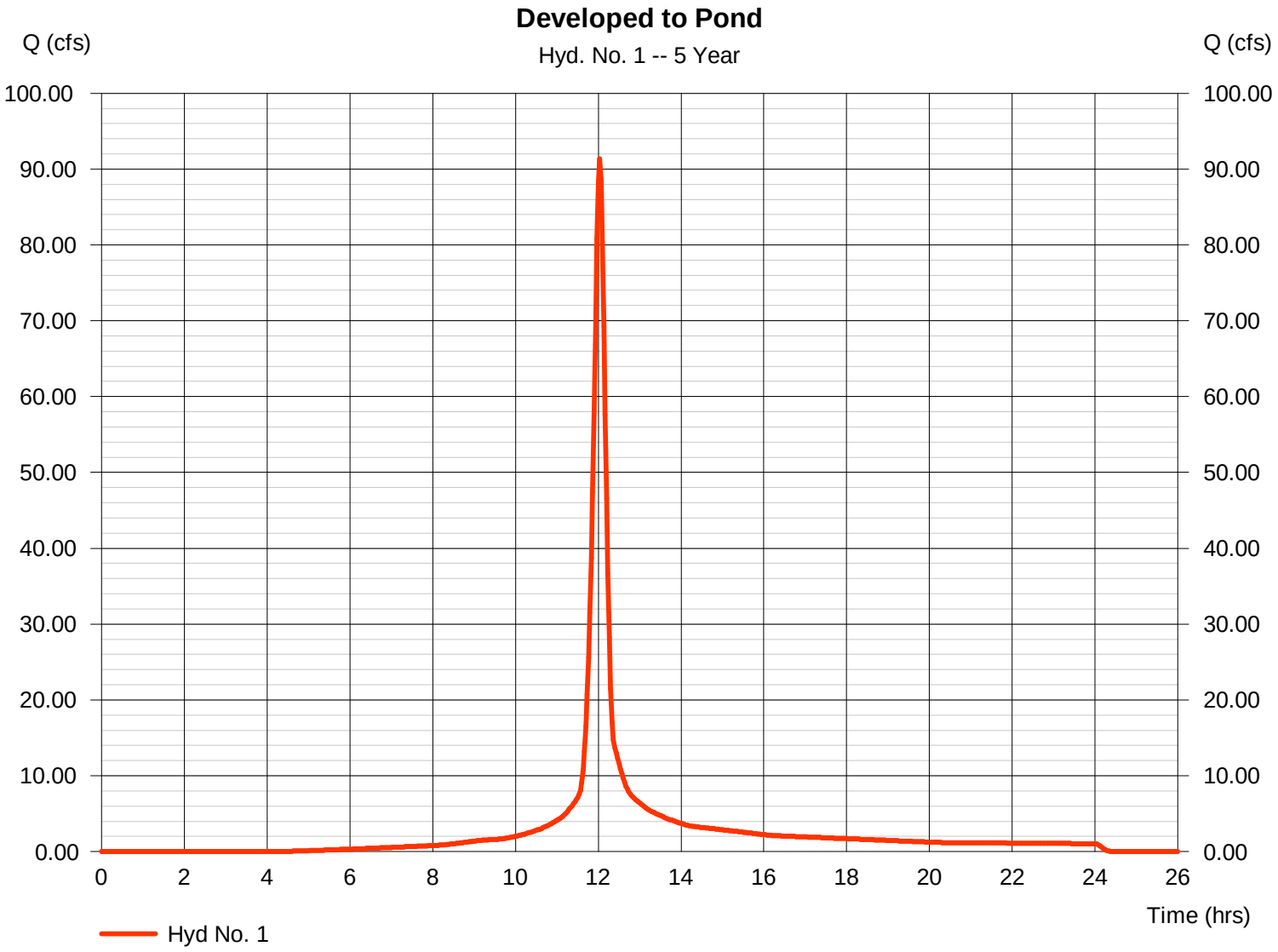
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	91.33	2	722	6.070	------	------	------	Developed to Pond
2	Reservoir	11.98	2	766	5.570	1	1339.73	3.48	Pond
3	SCS Runoff	54.28	2	740	6.441	------	------	------	Offsite West
4	SCS Runoff	35.94	2	748	5.090	------	------	------	Site - Existing
5	SCS Runoff	11.86	2	722	0.779	------	------	------	Undetained to Central
6	Combine	16.58	2	730	6.349	2, 5	------	------	Developed to Central ROW
7	SCS Runoff	62.77	2	770	12.981	------	------	------	Total Basin Existing to RCBC

Hydrograph Report

Hyd. No. 1

Developed to Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	91.33 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.070 acft
Drainage area	=	22.000 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



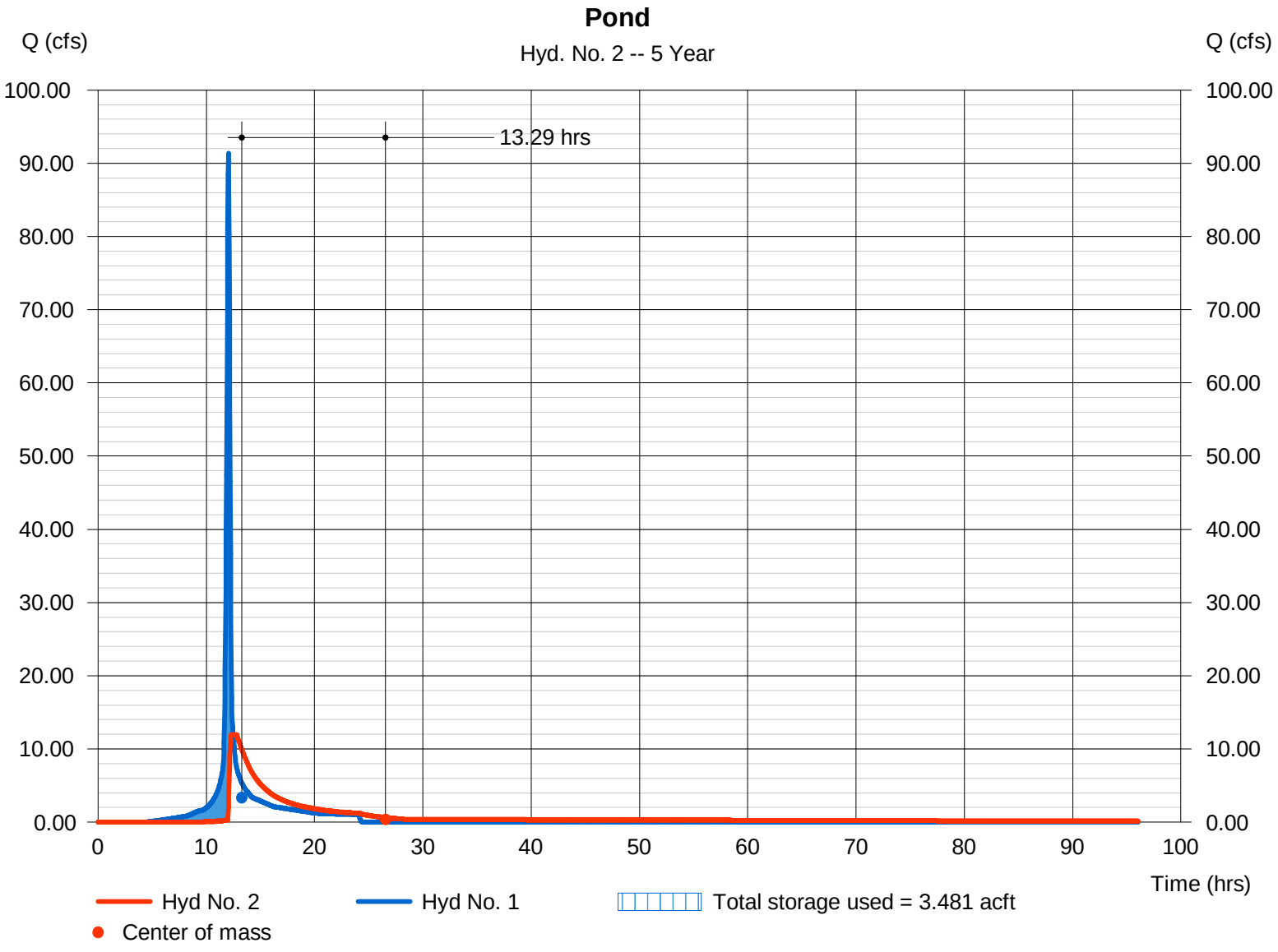
Hydrograph Report

Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 11.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.77 hrs
Time interval	= 2 min	Hyd. volume	= 5.570 acft
Inflow hyd. No.	= 1 - Developed to Pond	Max. Elevation	= 1339.73 ft
Reservoir name	= Proposed Pond	Max. Storage	= 3.481 acft

Storage Indication method used.

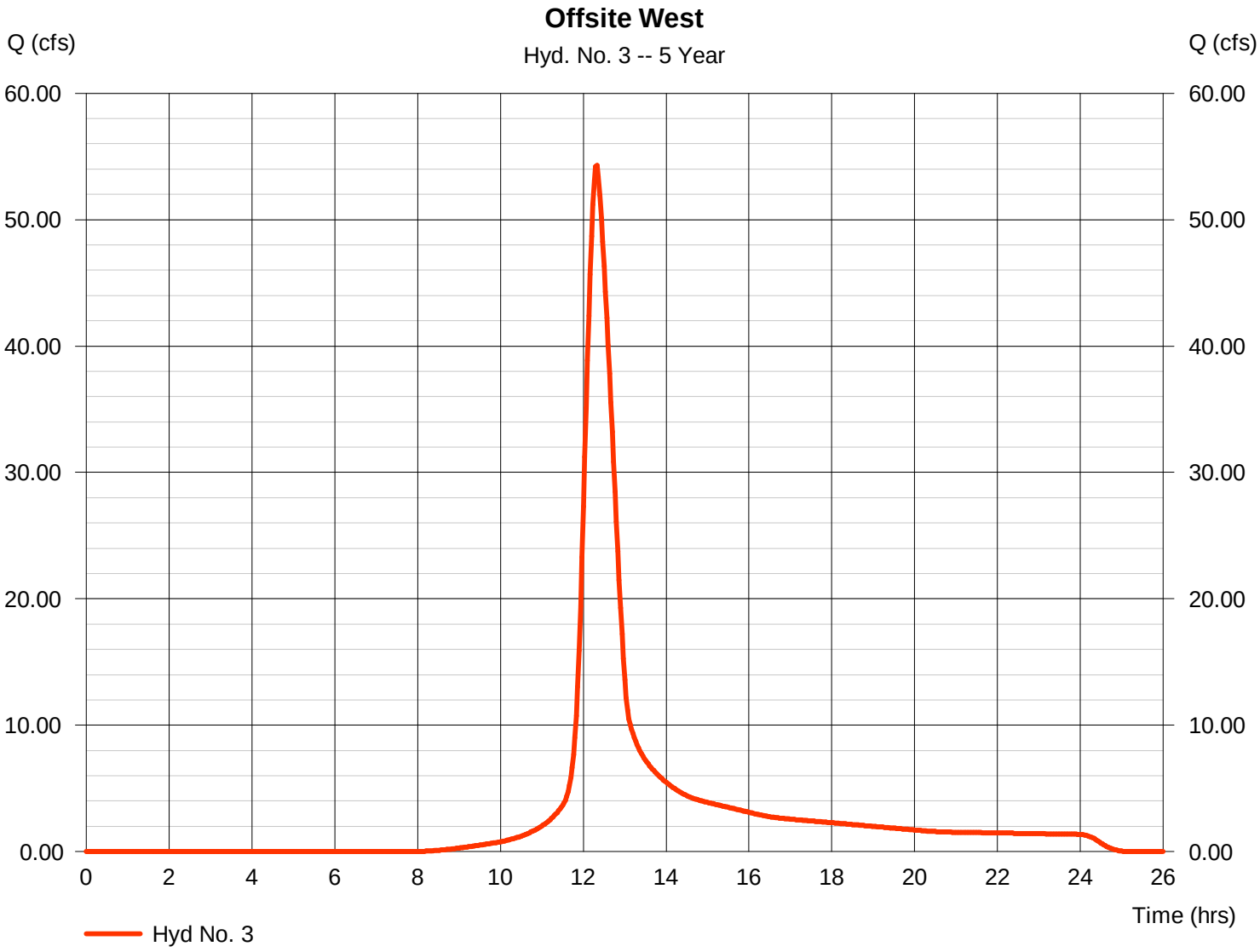


Hydrograph Report

Hyd. No. 3

Offsite West

Hydrograph type	= SCS Runoff	Peak discharge	= 54.28 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 6.441 acft
Drainage area	= 31.100 ac	Curve number	= 80
Basin Slope	= 0.8 %	Hydraulic length	= 1260 ft
Tc method	= LAG	Time of conc. (Tc)	= 42.80 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

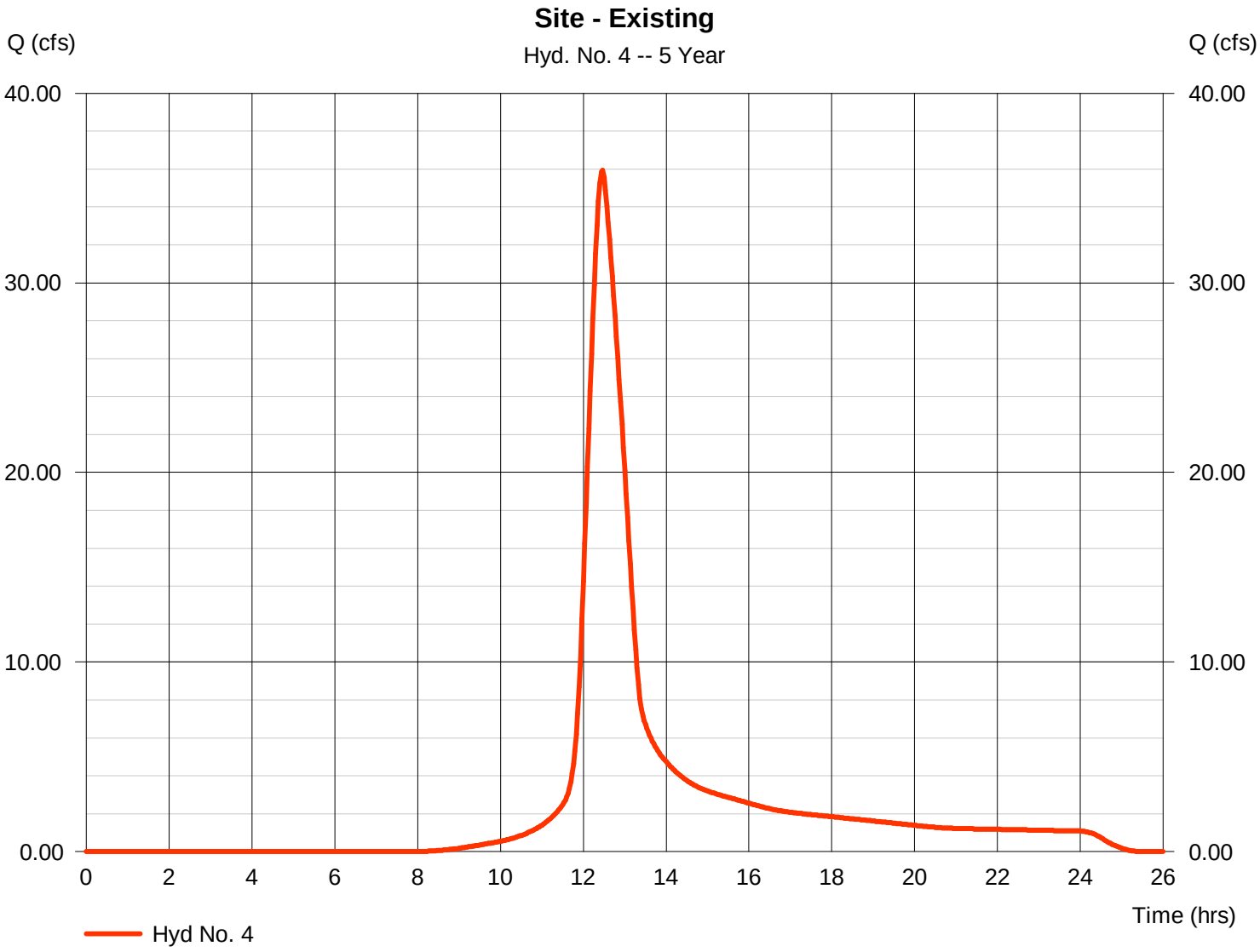


Hydrograph Report

Hyd. No. 4

Site - Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 35.94 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 5.090 acft
Drainage area	= 25.000 ac	Curve number	= 80
Basin Slope	= 0.5 %	Hydraulic length	= 1300 ft
Tc method	= LAG	Time of conc. (Tc)	= 55.50 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

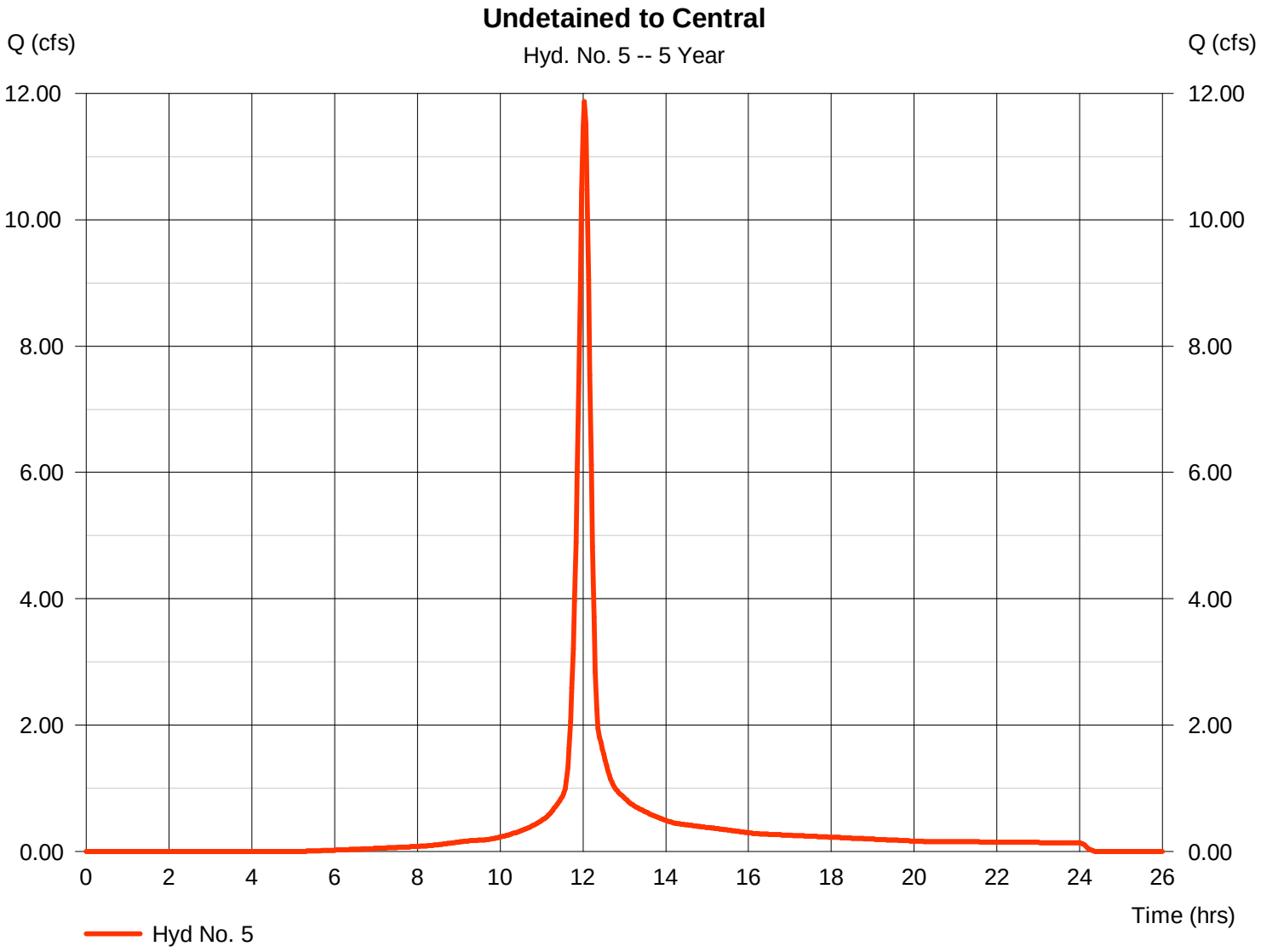


Hydrograph Report

Hyd. No. 5

Undetained to Central

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.86 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	0.779 acft
Drainage area	=	3.000 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

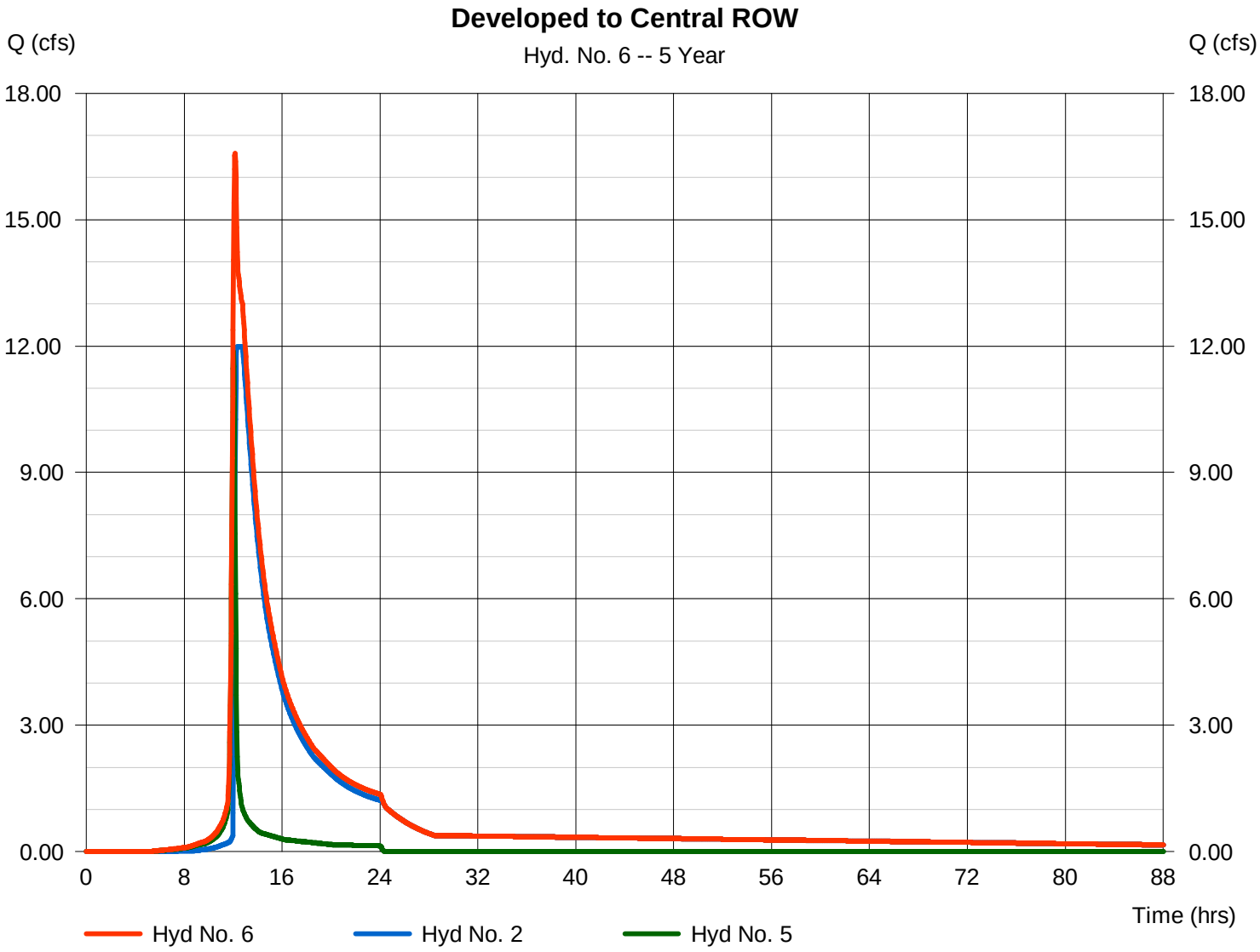


Hydrograph Report

Hyd. No. 6

Developed to Central ROW

Hydrograph type	= Combine	Peak discharge	= 16.58 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 6.349 acft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 3.000 ac

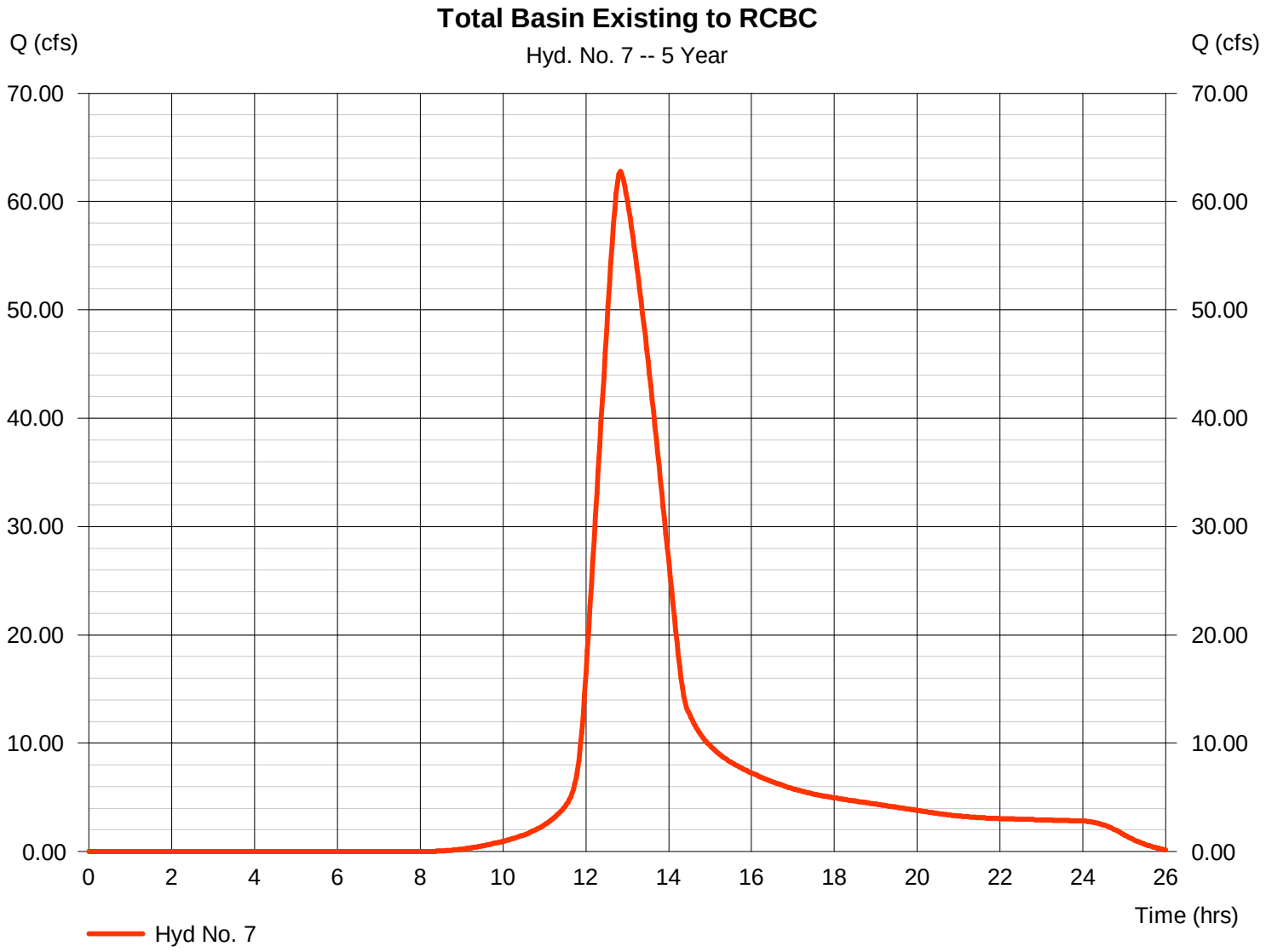


Hydrograph Report

Hyd. No. 7

Total Basin Existing to RCBC

Hydrograph type	= SCS Runoff	Peak discharge	= 62.77 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.83 hrs
Time interval	= 2 min	Hyd. volume	= 12.981 acft
Drainage area	= 63.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 93.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

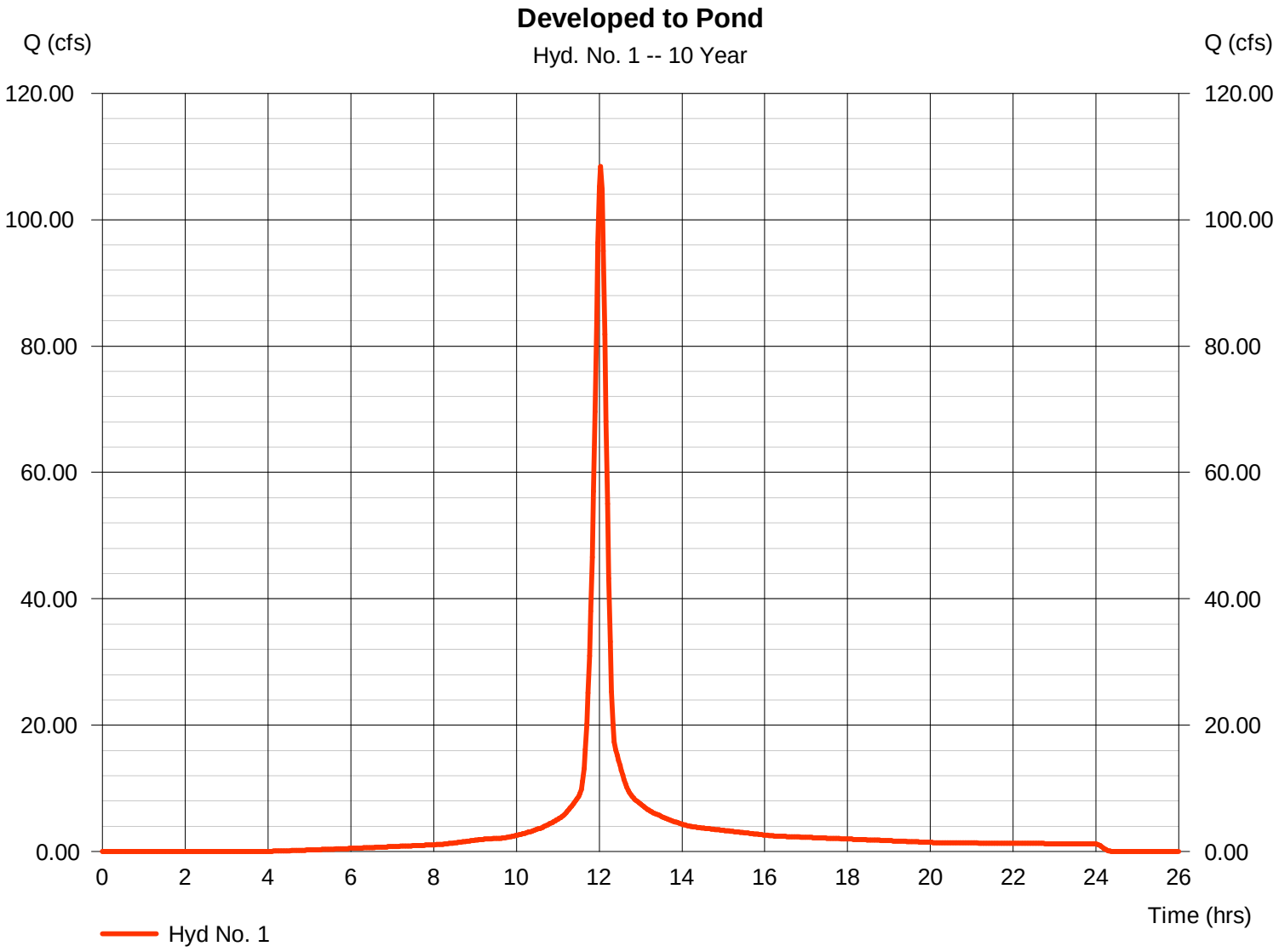
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	108.43	2	722	7.274	------	------	------	Developed to Pond
2	Reservoir	13.05	2	752	6.771	1	1340.06	4.19	Pond
3	SCS Runoff	67.77	2	740	8.028	------	------	------	Offsite West
4	SCS Runoff	44.91	2	748	6.345	------	------	------	Site - Existing
5	SCS Runoff	14.21	2	722	0.941	------	------	------	Undetained to Central
6	Combine	24.17	2	726	7.711	2, 5	------	------	Developed to Central ROW
7	SCS Runoff	78.60	2	770	16.179	------	------	------	Total Basin Existing to RCBC

Hydrograph Report

Hyd. No. 1

Developed to Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	108.43 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	7.274 acft
Drainage area	=	22.000 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



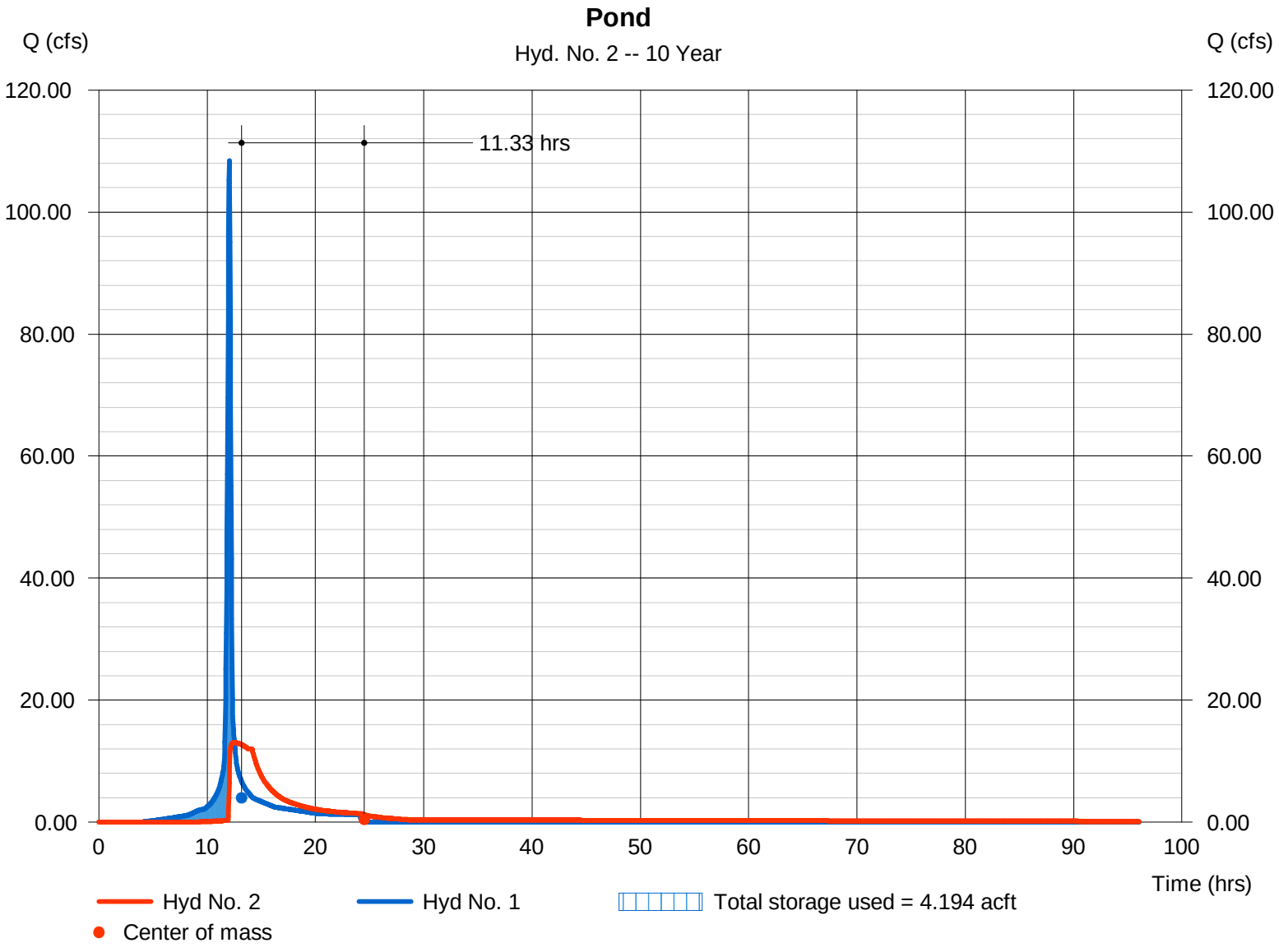
Hydrograph Report

Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 13.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 6.771 acft
Inflow hyd. No.	= 1 - Developed to Pond	Max. Elevation	= 1340.06 ft
Reservoir name	= Proposed Pond	Max. Storage	= 4.194 acft

Storage Indication method used.

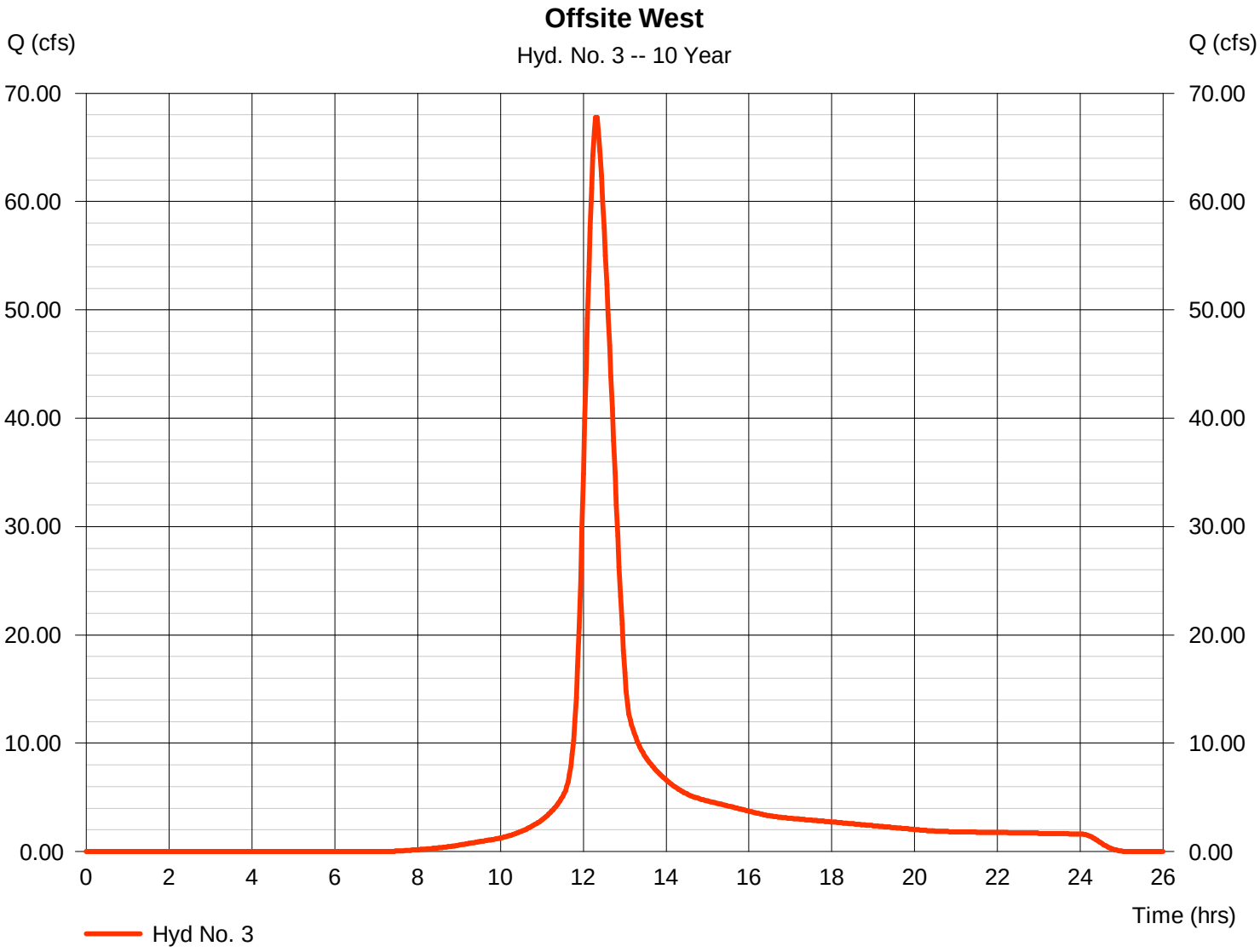


Hydrograph Report

Hyd. No. 3

Offsite West

Hydrograph type	=	SCS Runoff	Peak discharge	=	67.77 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	8.028 acft
Drainage area	=	31.100 ac	Curve number	=	80
Basin Slope	=	0.8 %	Hydraulic length	=	1260 ft
Tc method	=	LAG	Time of conc. (Tc)	=	42.80 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

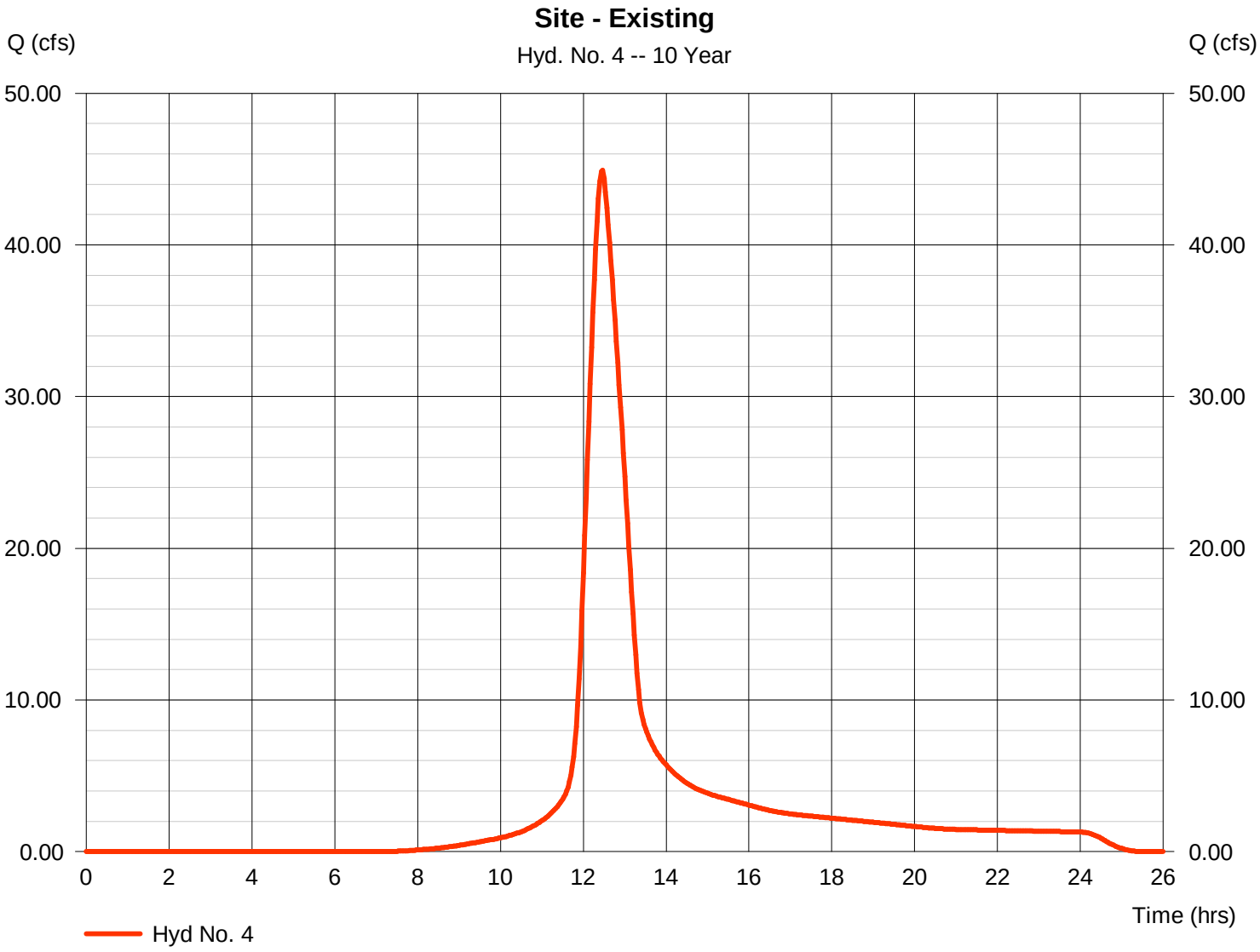


Hydrograph Report

Hyd. No. 4

Site - Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 44.91 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 6.345 acft
Drainage area	= 25.000 ac	Curve number	= 80
Basin Slope	= 0.5 %	Hydraulic length	= 1300 ft
Tc method	= LAG	Time of conc. (Tc)	= 55.50 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

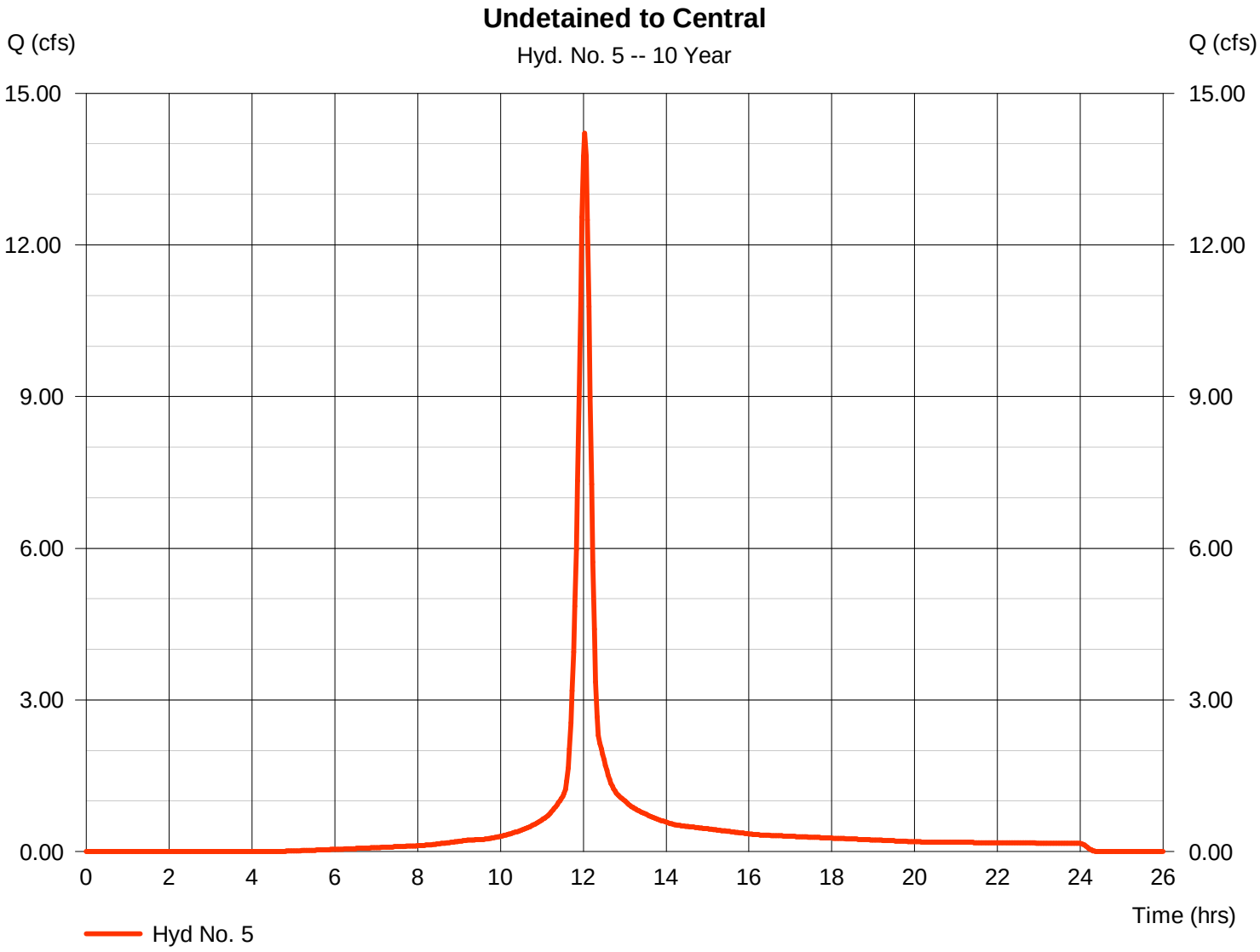


Hydrograph Report

Hyd. No. 5

Undetained to Central

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.21 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	0.941 acft
Drainage area	=	3.000 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

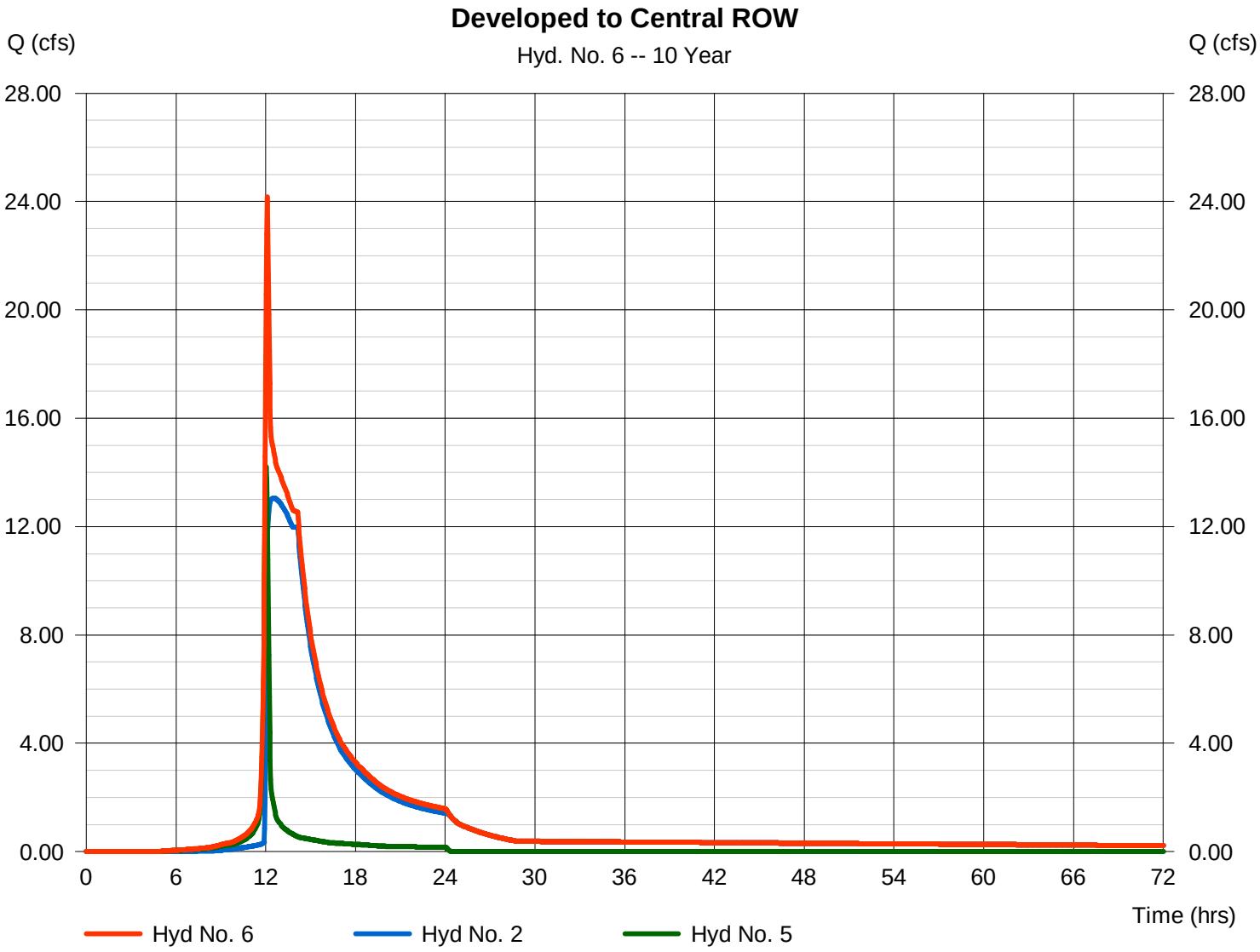


Hydrograph Report

Hyd. No. 6

Developed to Central ROW

Hydrograph type	=	Combine	Peak discharge	=	24.17 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	7.711 acft
Inflow hyds.	=	2, 5	Contrib. drain. area	=	3.000 ac

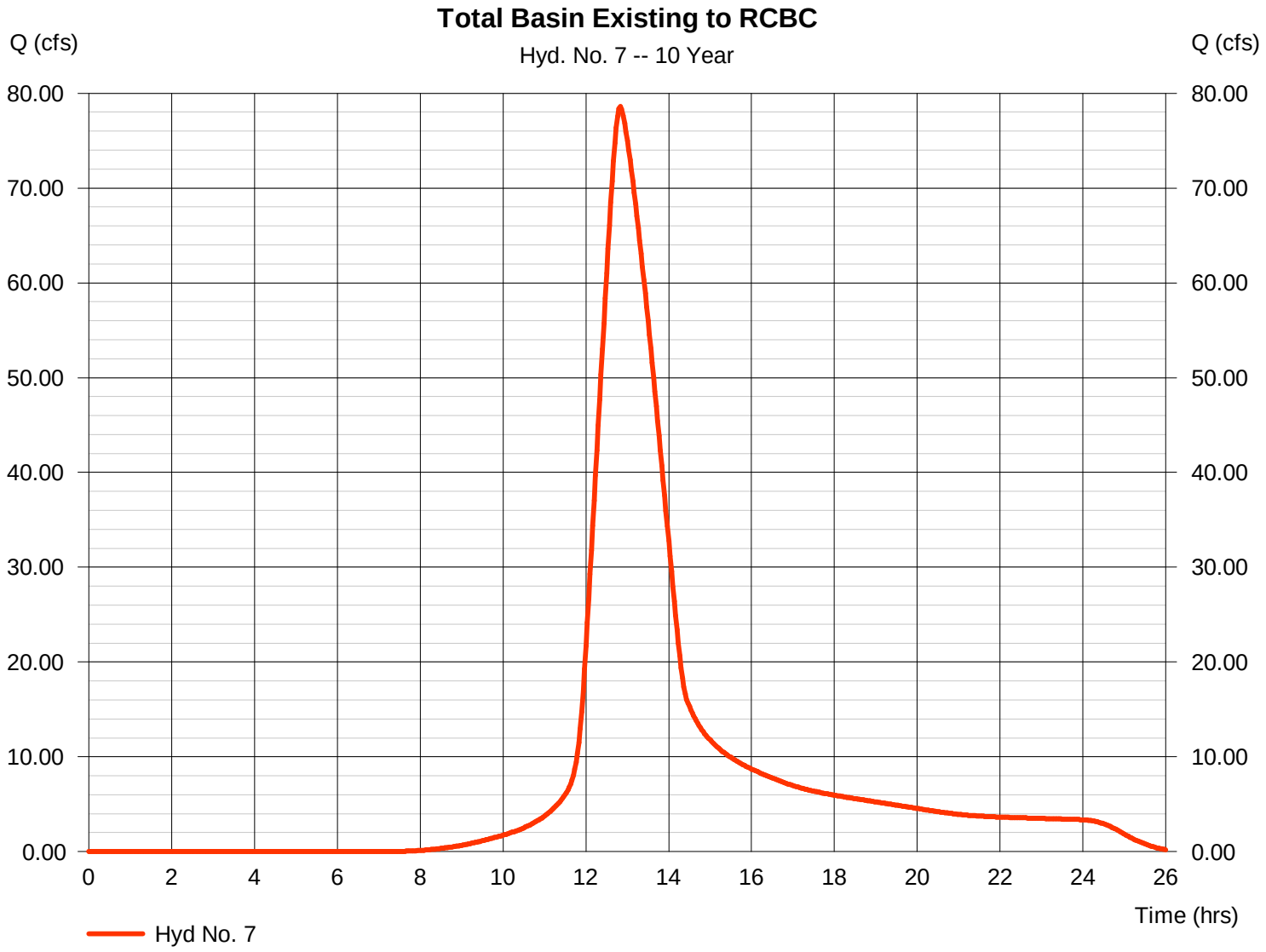


Hydrograph Report

Hyd. No. 7

Total Basin Existing to RCBC

Hydrograph type	= SCS Runoff	Peak discharge	= 78.60 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.83 hrs
Time interval	= 2 min	Hyd. volume	= 16.179 acft
Drainage area	= 63.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 93.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

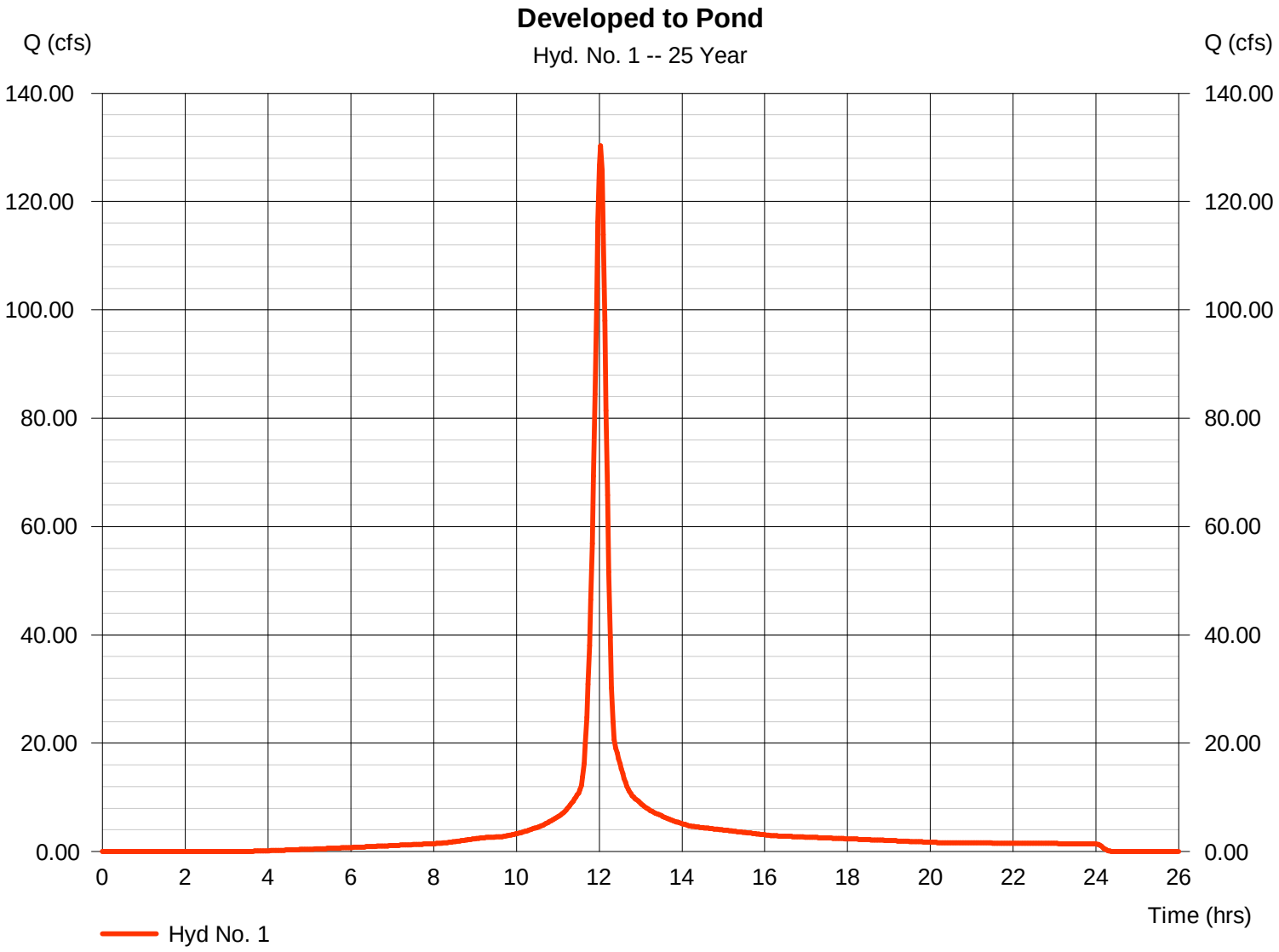
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	130.31	2	722	8.836	------	------	------	Developed to Pond
2	Reservoir	14.23	2	754	8.329	1	1340.47	5.16	Pond
3	SCS Runoff	85.54	2	738	10.130	------	------	------	Offsite West
4	SCS Runoff	56.66	2	746	8.007	------	------	------	Site - Existing
5	SCS Runoff	17.21	2	722	1.151	------	------	------	Undetained to Central
6	Combine	29.19	2	722	9.480	2, 5	------	------	Developed to Central ROW
7	SCS Runoff	99.38	2	770	20.417	------	------	------	Total Basin Existing to RCBC

Hydrograph Report

Hyd. No. 1

Developed to Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	130.31 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	8.836 acft
Drainage area	=	22.000 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



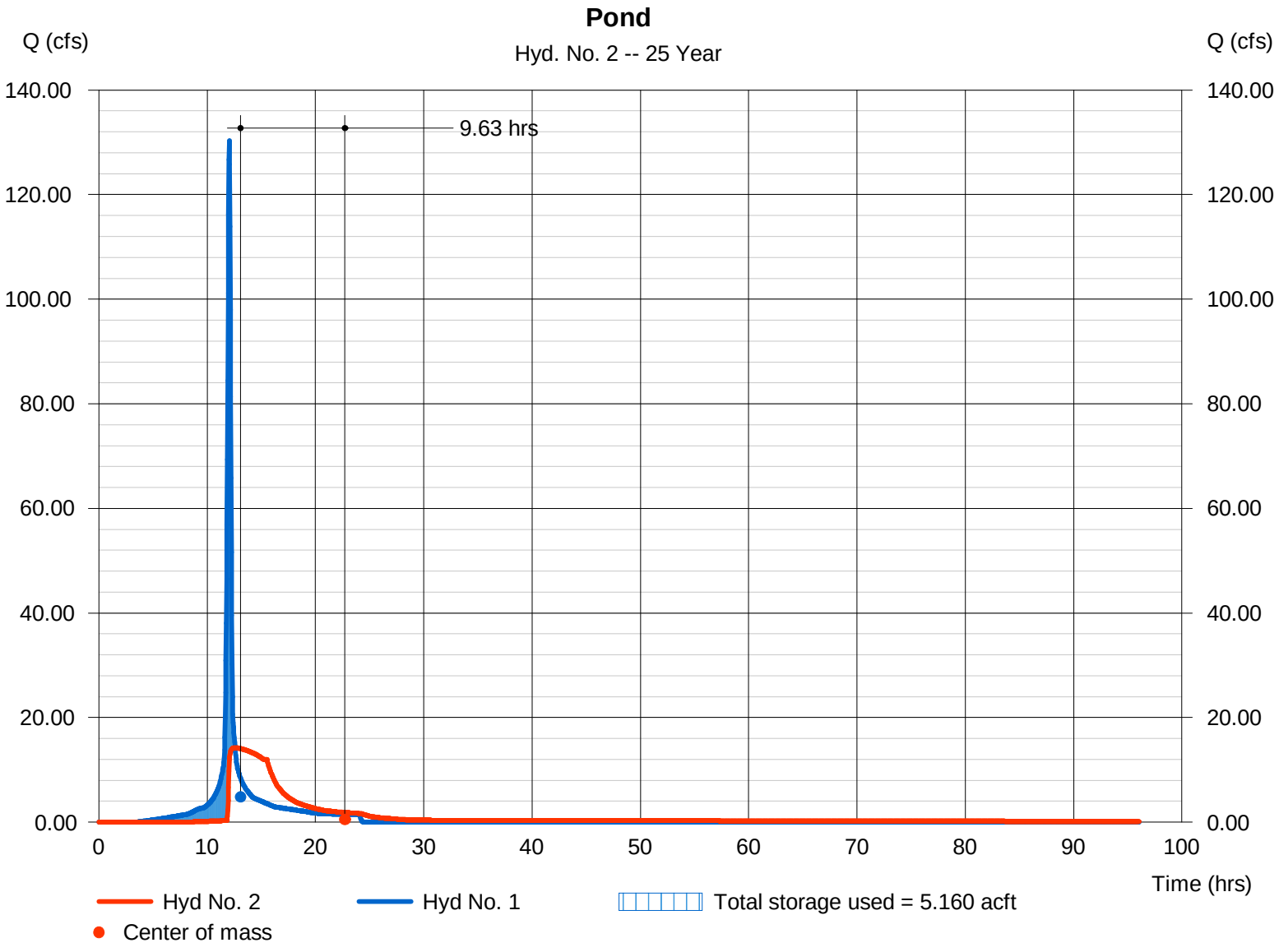
Hydrograph Report

Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 14.23 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.57 hrs
Time interval	= 2 min	Hyd. volume	= 8.329 acft
Inflow hyd. No.	= 1 - Developed to Pond	Max. Elevation	= 1340.47 ft
Reservoir name	= Proposed Pond	Max. Storage	= 5.160 acft

Storage Indication method used.

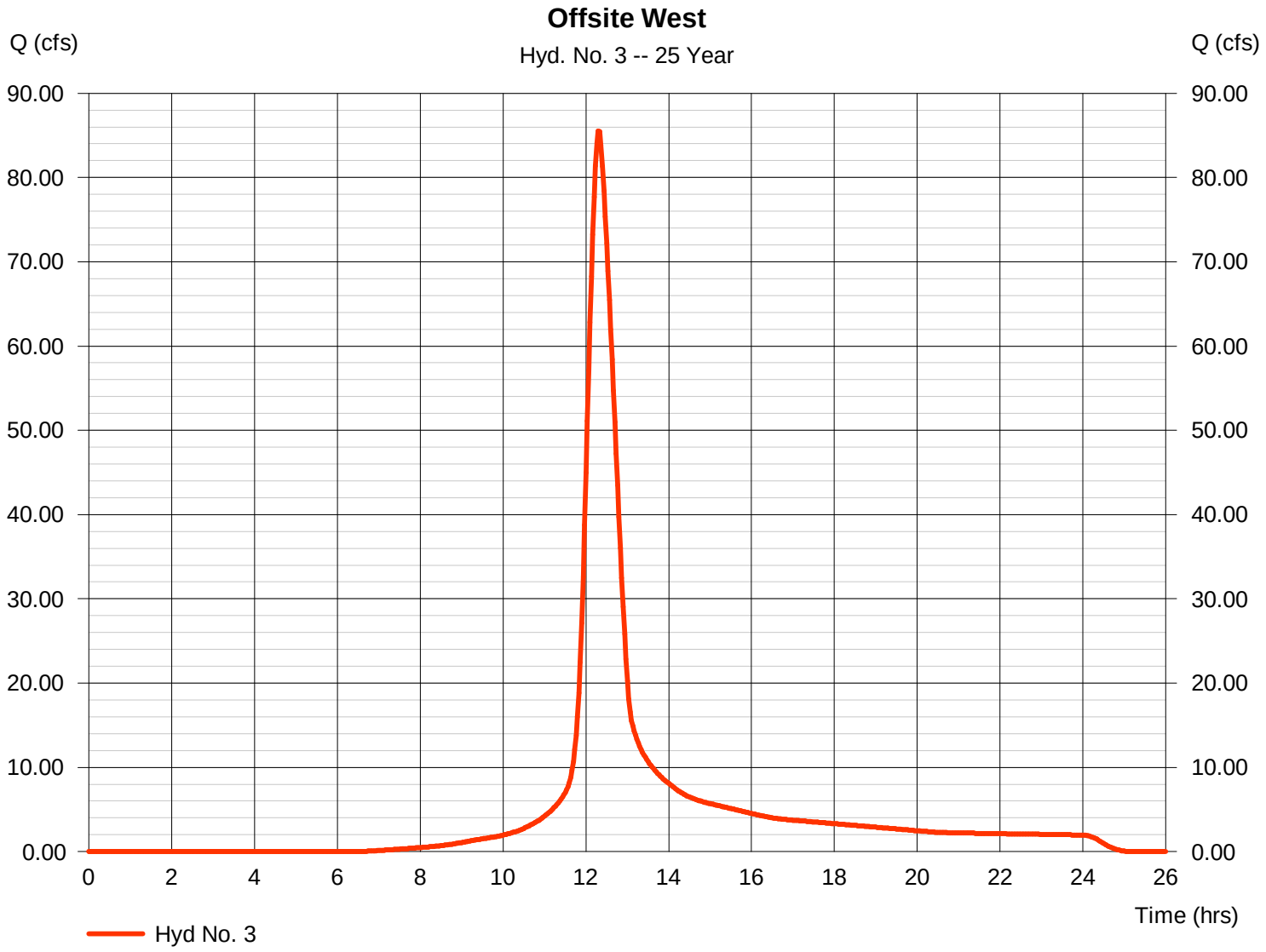


Hydrograph Report

Hyd. No. 3

Offsite West

Hydrograph type	=	SCS Runoff	Peak discharge	=	85.54 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.30 hrs
Time interval	=	2 min	Hyd. volume	=	10.130 acft
Drainage area	=	31.100 ac	Curve number	=	80
Basin Slope	=	0.8 %	Hydraulic length	=	1260 ft
Tc method	=	LAG	Time of conc. (Tc)	=	42.80 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

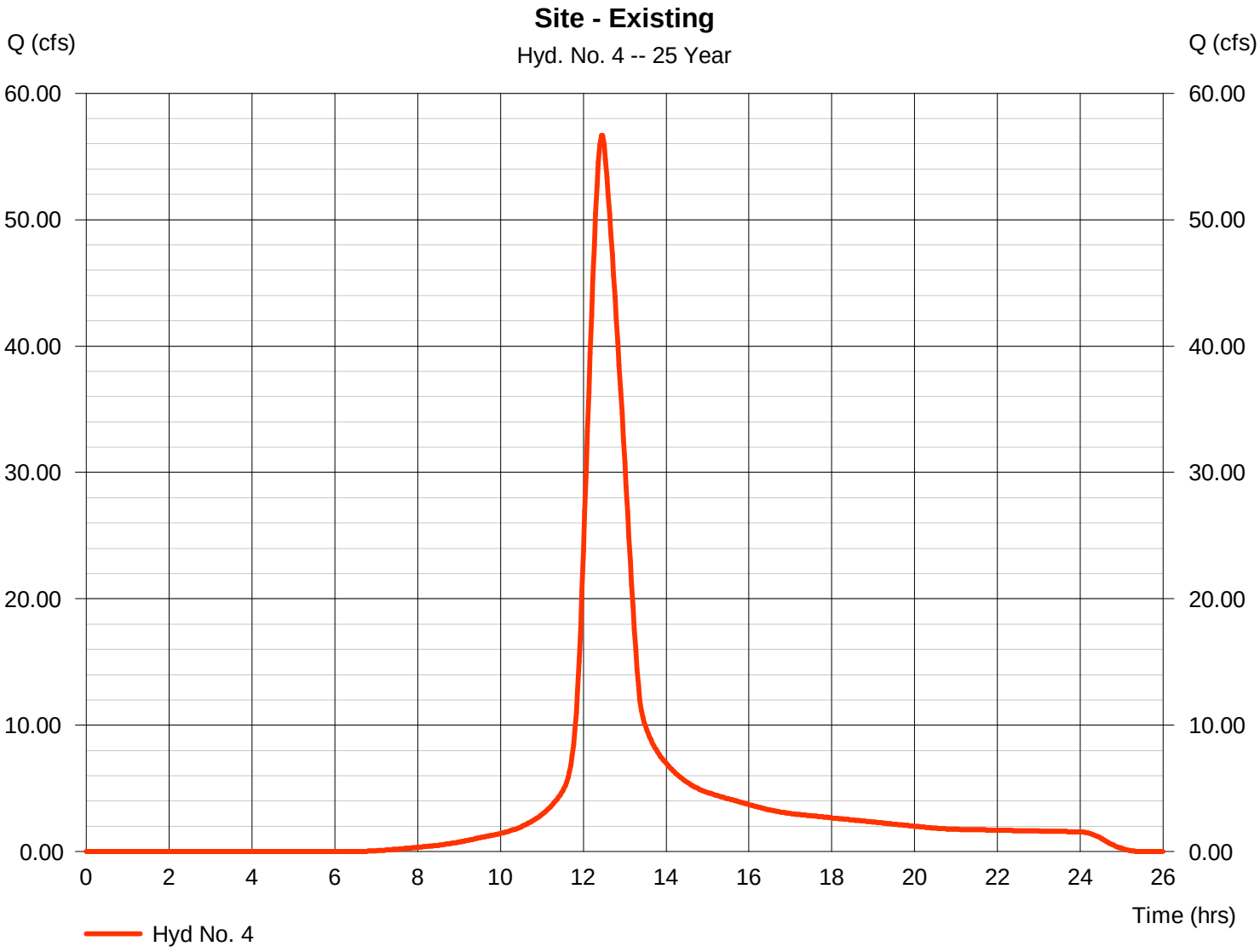


Hydrograph Report

Hyd. No. 4

Site - Existing

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.66 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.43 hrs
Time interval	=	2 min	Hyd. volume	=	8.007 acft
Drainage area	=	25.000 ac	Curve number	=	80
Basin Slope	=	0.5 %	Hydraulic length	=	1300 ft
Tc method	=	LAG	Time of conc. (Tc)	=	55.50 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

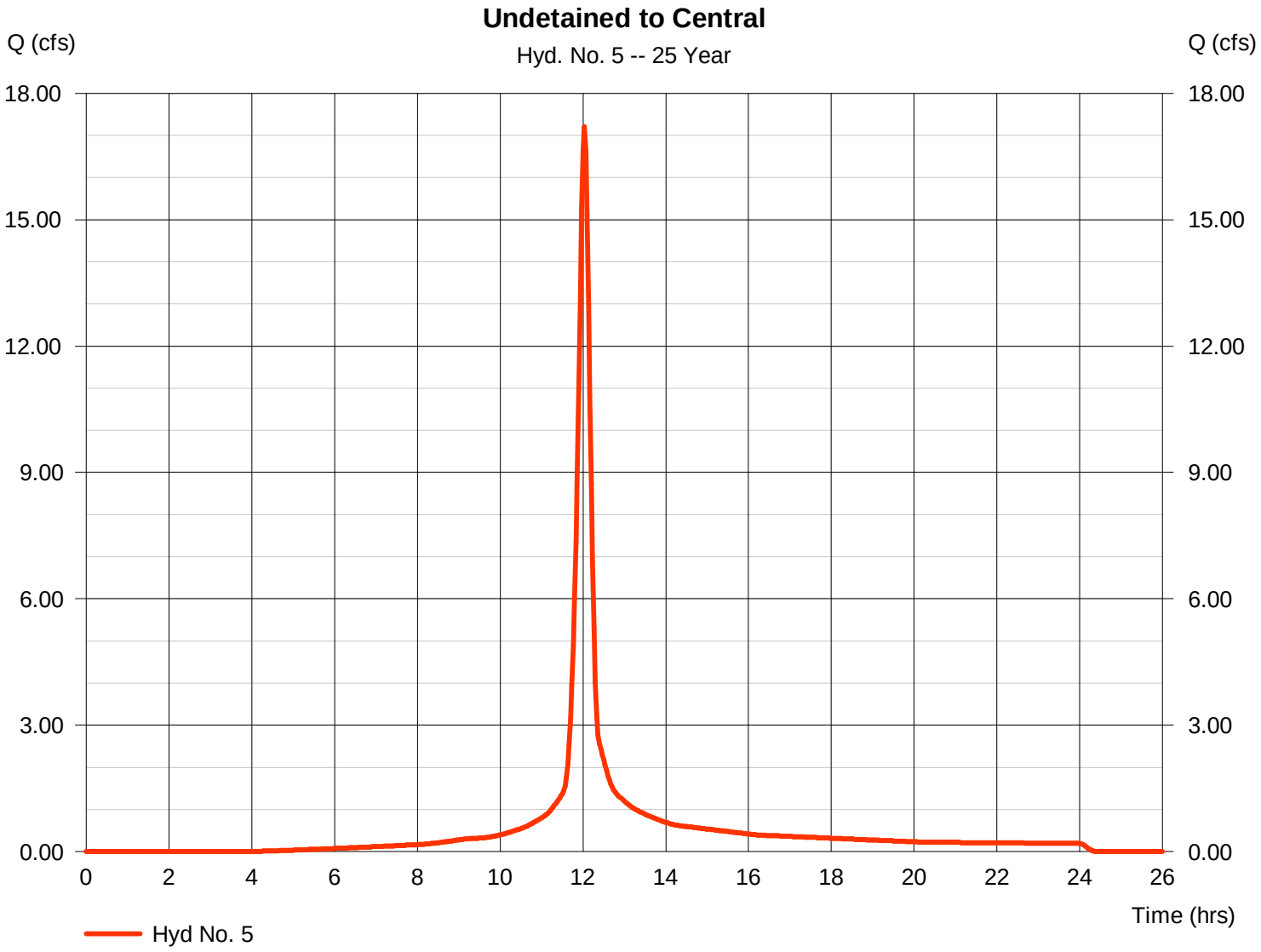


Hydrograph Report

Hyd. No. 5

Undetained to Central

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.21 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.151 acft
Drainage area	=	3.000 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

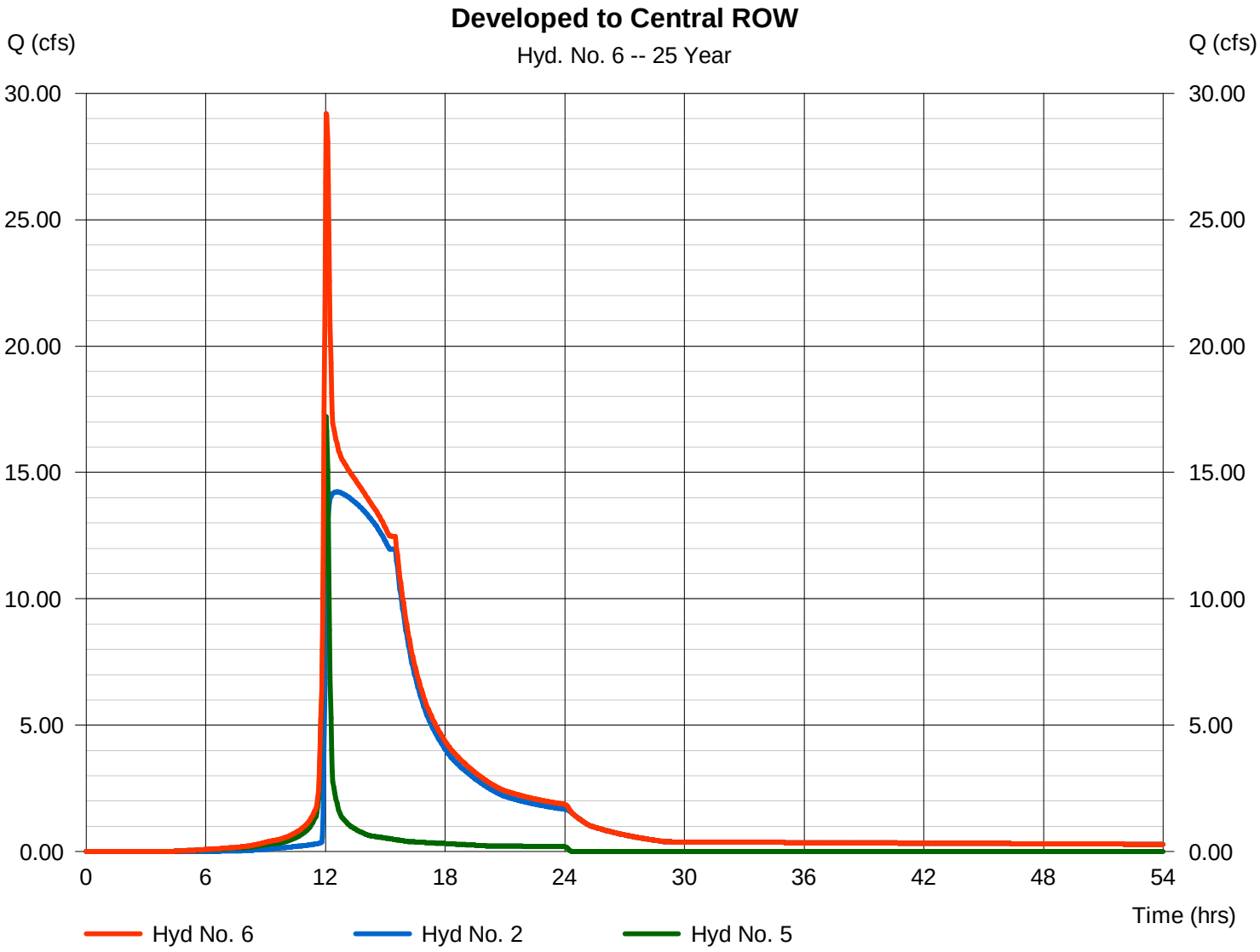


Hydrograph Report

Hyd. No. 6

Developed to Central ROW

Hydrograph type	=	Combine	Peak discharge	=	29.19 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	9.480 acft
Inflow hyds.	=	2, 5	Contrib. drain. area	=	3.000 ac

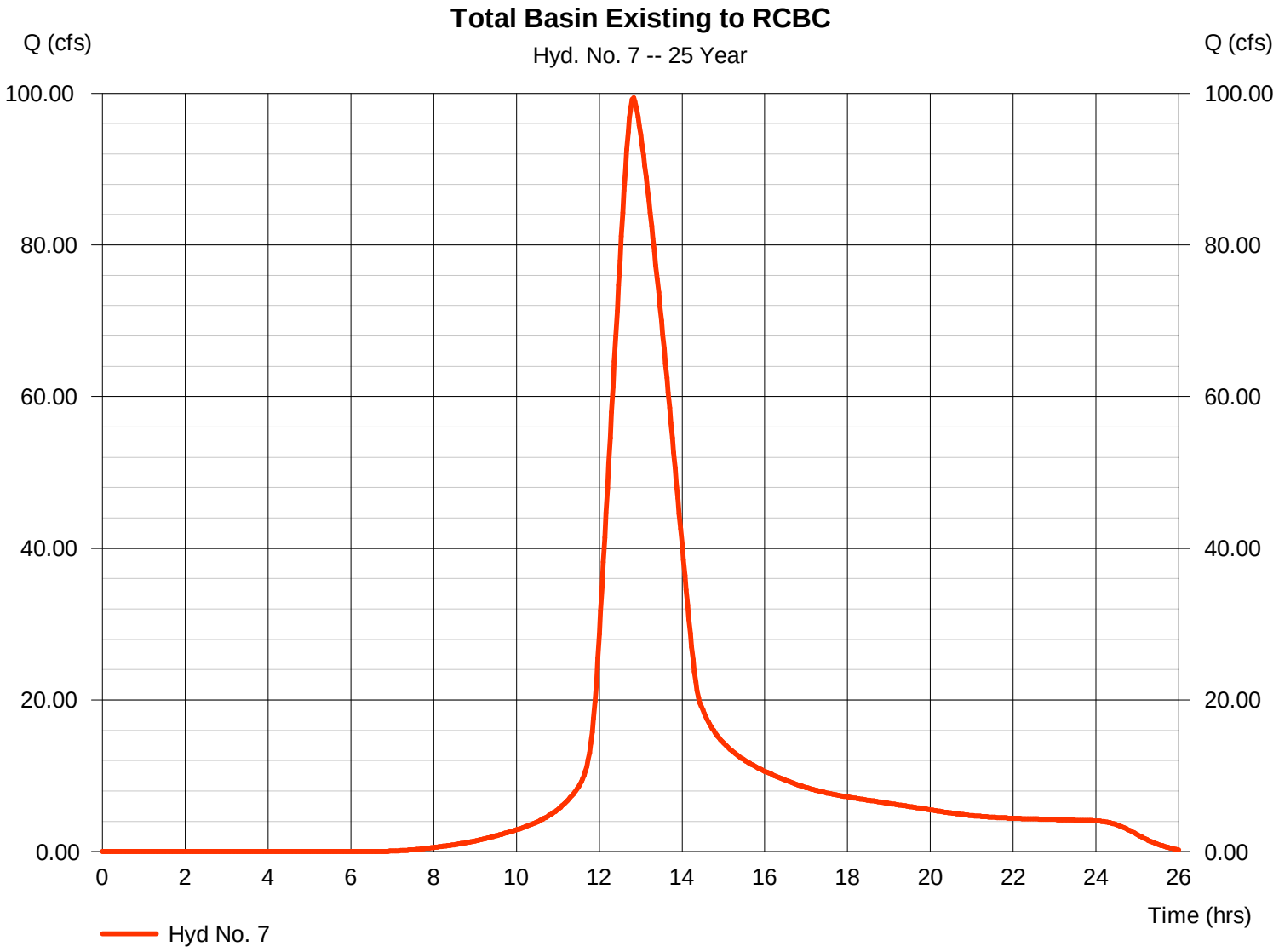


Hydrograph Report

Hyd. No. 7

Total Basin Existing to RCBC

Hydrograph type	= SCS Runoff	Peak discharge	= 99.38 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.83 hrs
Time interval	= 2 min	Hyd. volume	= 20.417 acft
Drainage area	= 63.000 ac	Curve number	= 80
Basin Slope	= 0.3 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 93.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

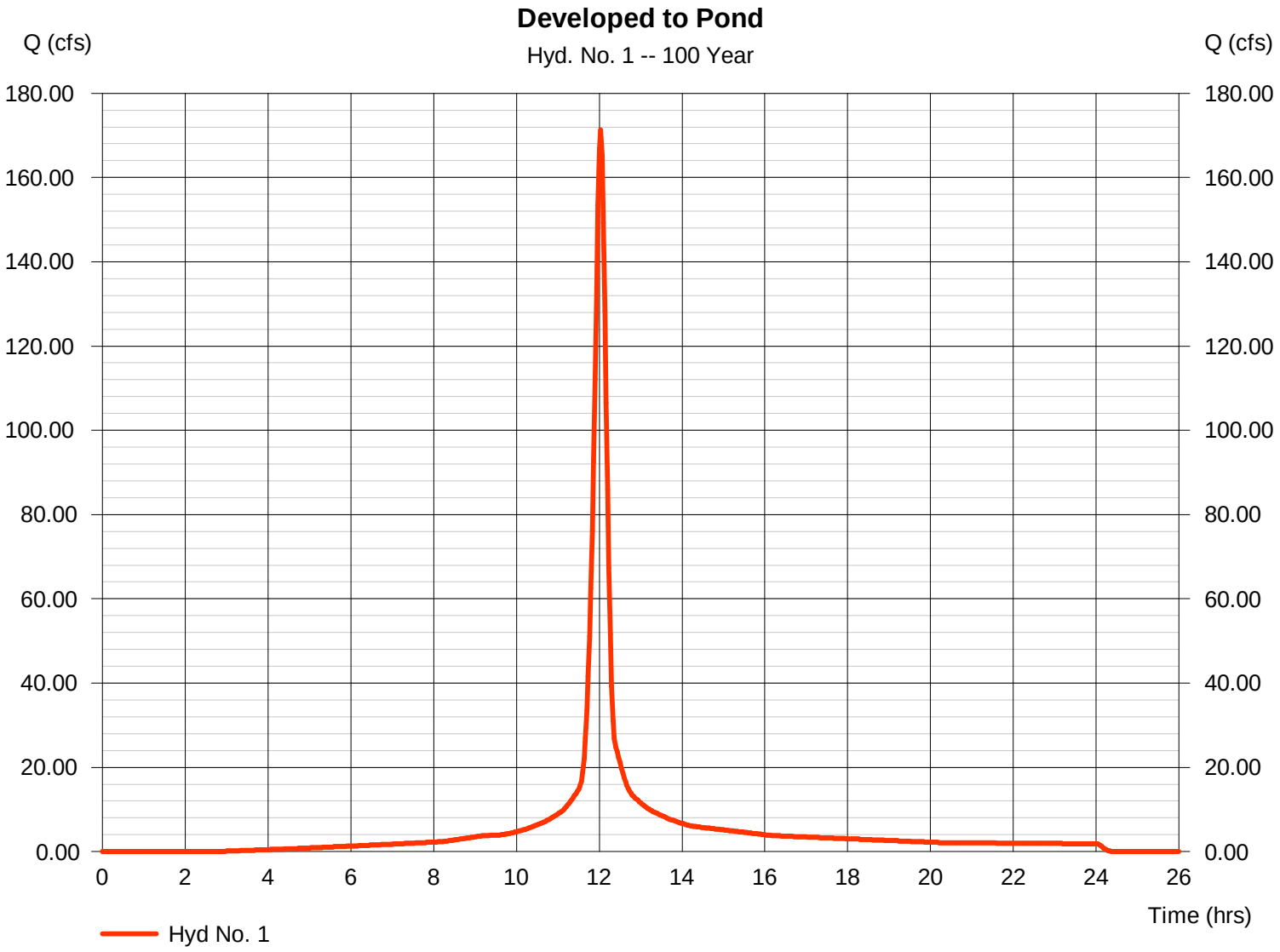
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	171.34	2	722	11.813	------	------	------	Developed to Pond
2	Reservoir	15.95	2	760	11.300	1	1341.24	7.04	Pond
3	SCS Runoff	119.62	2	738	14.228	------	------	------	Offsite West
4	SCS Runoff	79.31	2	746	11.245	------	------	------	Site - Existing
5	SCS Runoff	22.84	2	722	1.553	------	------	------	Undetained to Central
6	Combine	36.67	2	722	12.853	2, 5	------	------	Developed to Central ROW
7	SCS Runoff	139.28	2	770	28.676	------	------	------	Total Basin Existing to RCBC

Hydrograph Report

Hyd. No. 1

Developed to Pond

Hydrograph type	=	SCS Runoff	Peak discharge	=	171.34 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	11.813 acft
Drainage area	=	22.000 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



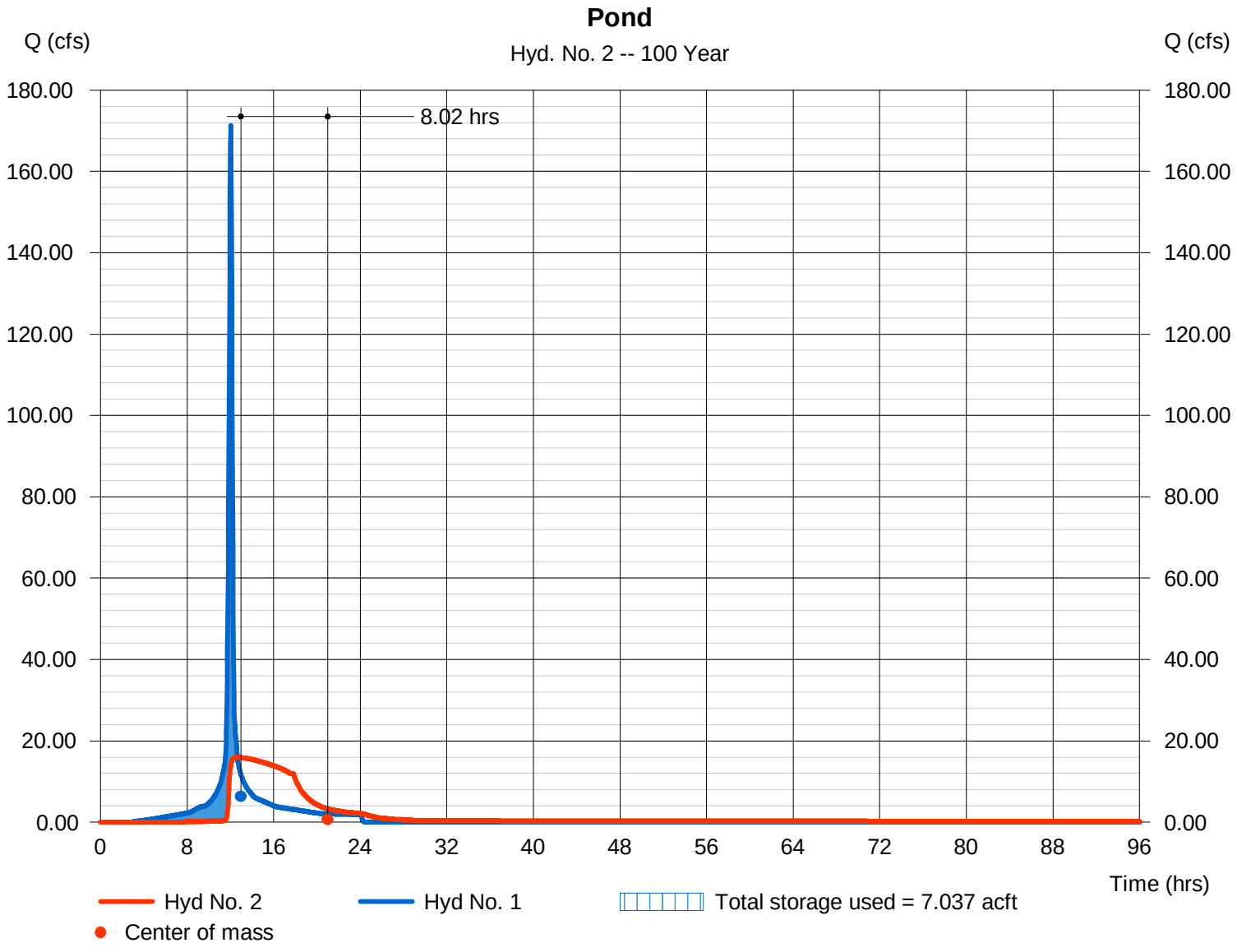
Hydrograph Report

Hyd. No. 2

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	15.95 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.67 hrs
Time interval	=	2 min	Hyd. volume	=	11.300 acft
Inflow hyd. No.	=	1 - Developed to Pond	Max. Elevation	=	1341.24 ft
Reservoir name	=	Proposed Pond	Max. Storage	=	7.037 acft

Storage Indication method used.

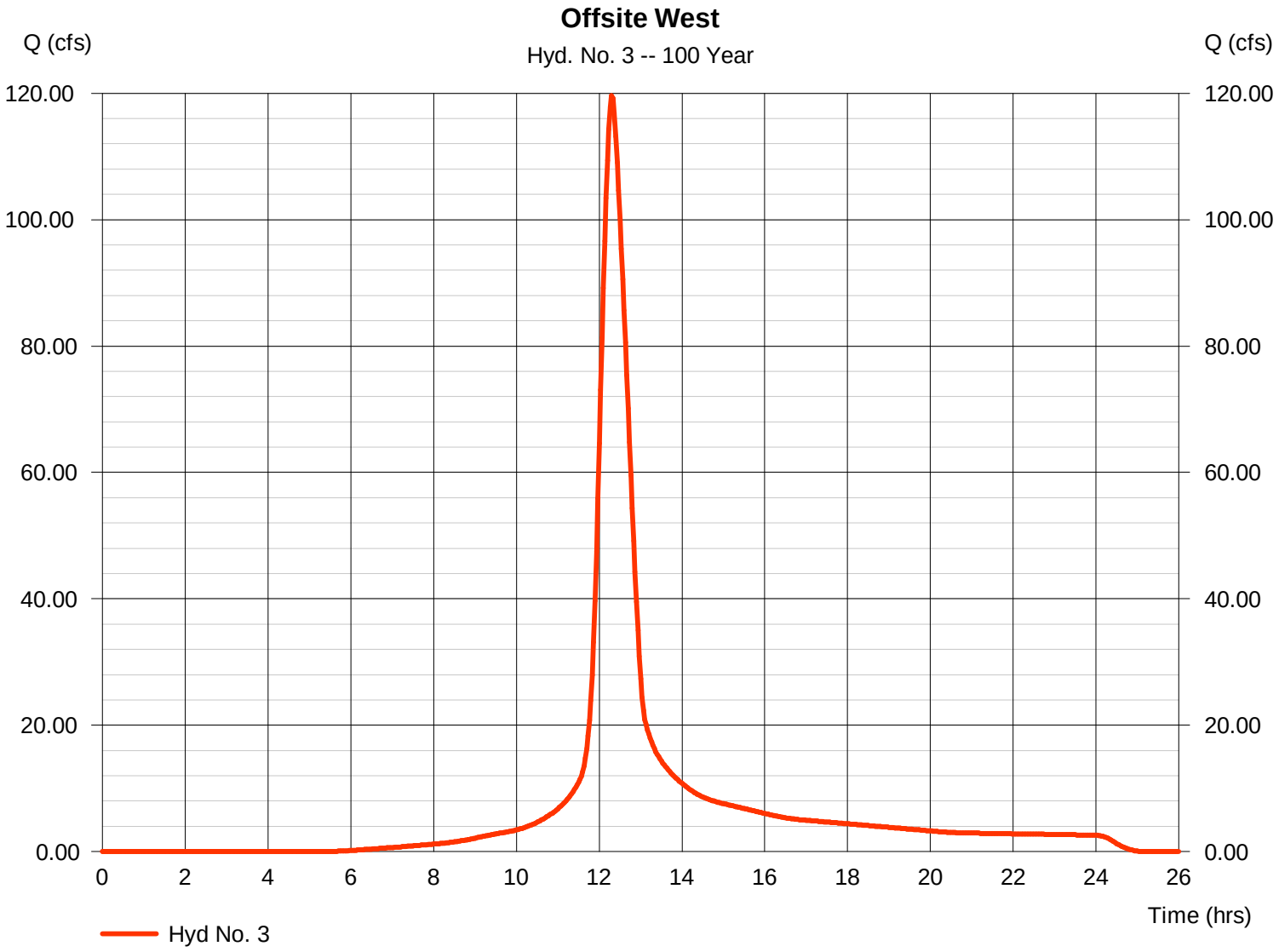


Hydrograph Report

Hyd. No. 3

Offsite West

Hydrograph type	=	SCS Runoff	Peak discharge	=	119.62 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.30 hrs
Time interval	=	2 min	Hyd. volume	=	14.228 acft
Drainage area	=	31.100 ac	Curve number	=	80
Basin Slope	=	0.8 %	Hydraulic length	=	1260 ft
Tc method	=	LAG	Time of conc. (Tc)	=	42.80 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

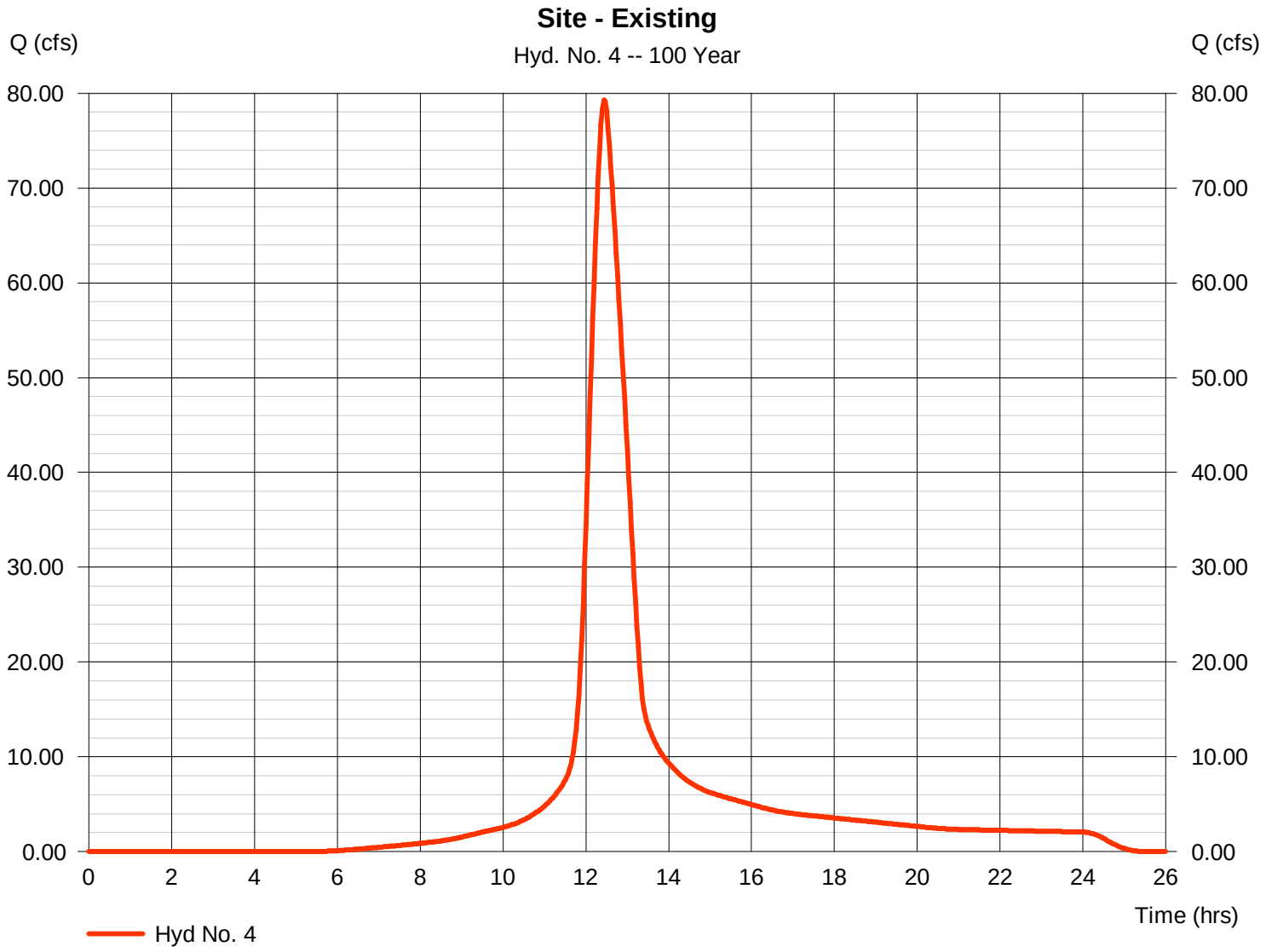


Hydrograph Report

Hyd. No. 4

Site - Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 79.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 11.245 acft
Drainage area	= 25.000 ac	Curve number	= 80
Basin Slope	= 0.5 %	Hydraulic length	= 1300 ft
Tc method	= LAG	Time of conc. (Tc)	= 55.50 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

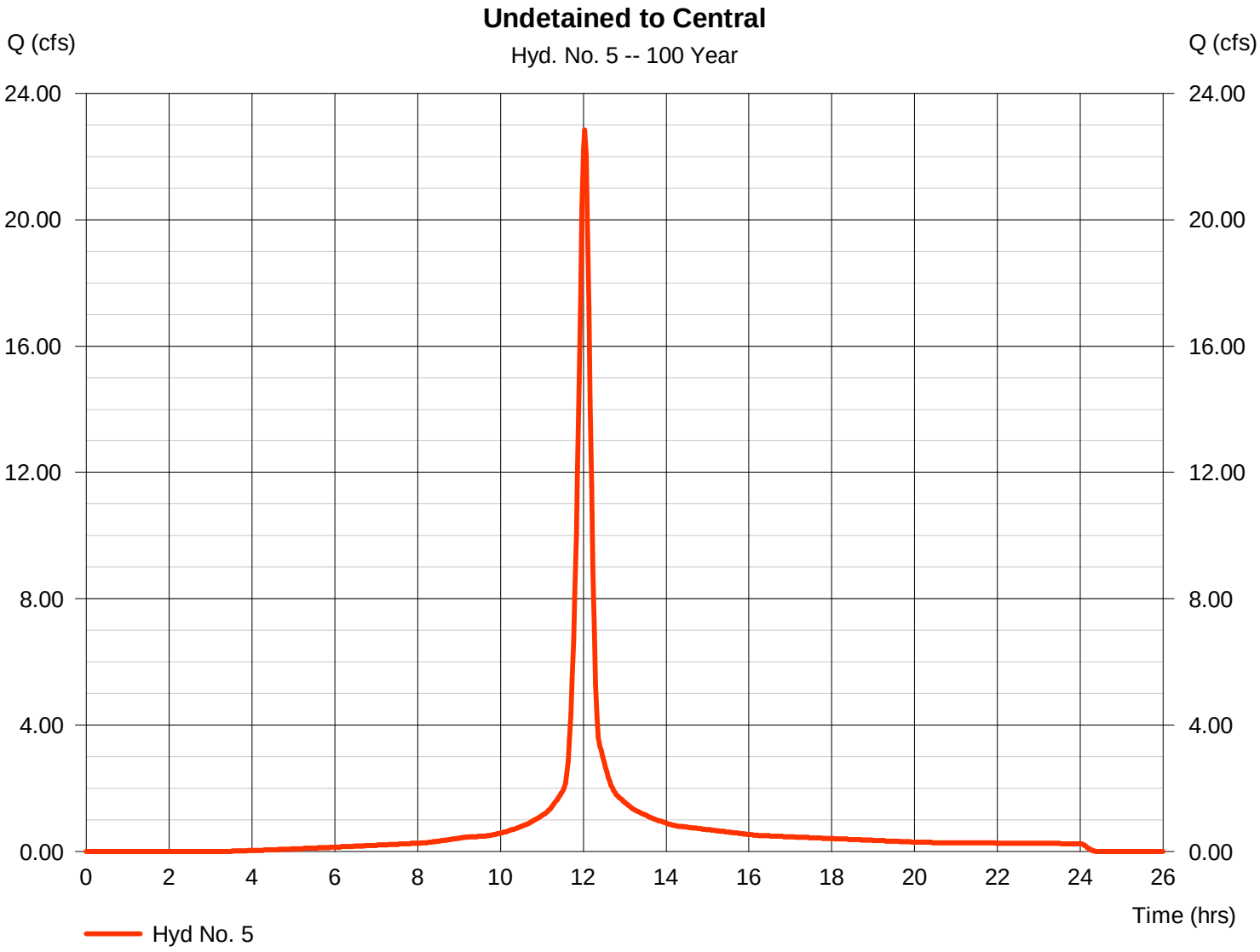


Hydrograph Report

Hyd. No. 5

Undetained to Central

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.553 acft
Drainage area	=	3.000 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

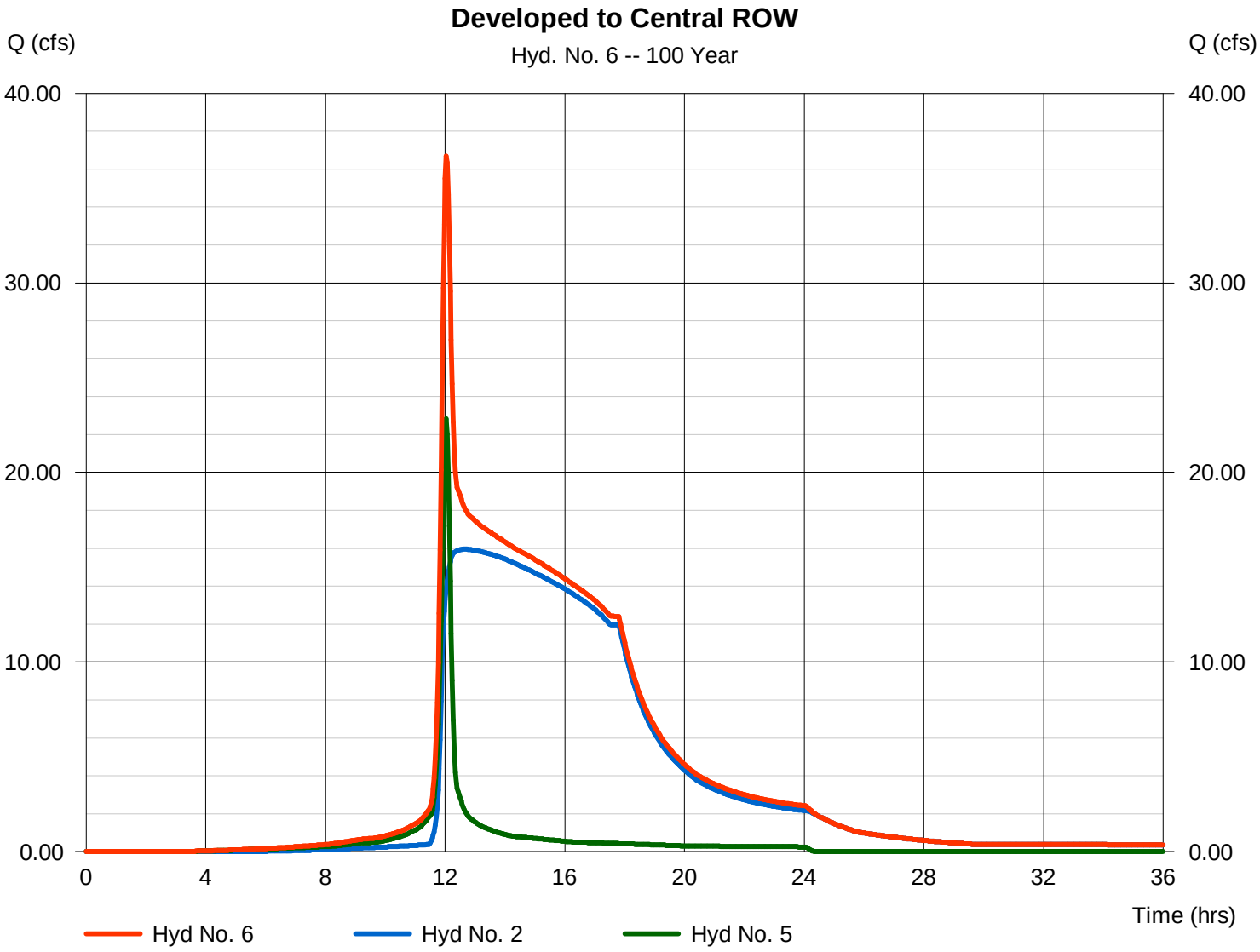


Hydrograph Report

Hyd. No. 6

Developed to Central ROW

Hydrograph type	=	Combine	Peak discharge	=	36.67 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	12.853 acft
Inflow hyds.	=	2, 5	Contrib. drain. area	=	3.000 ac

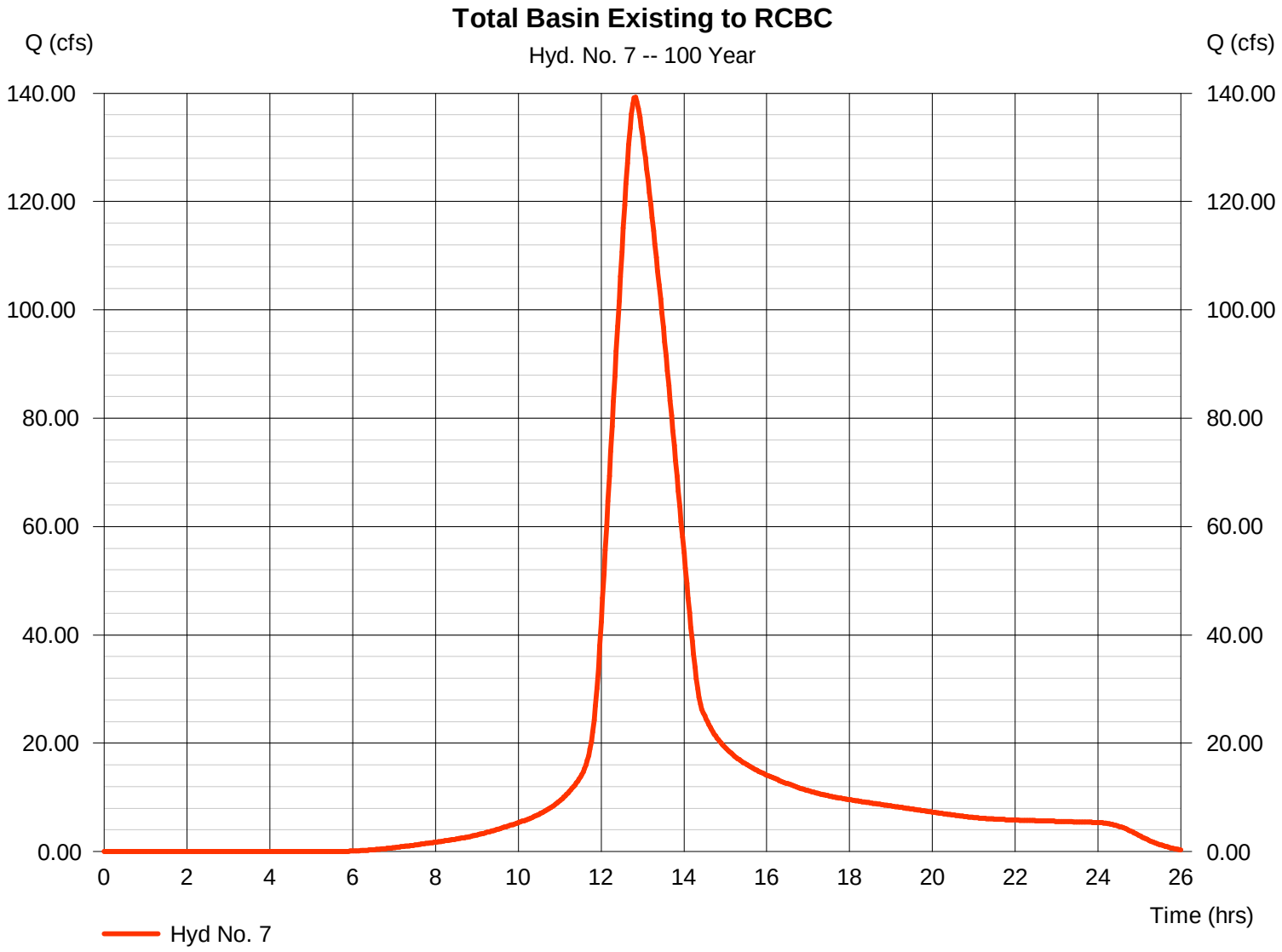


Hydrograph Report

Hyd. No. 7

Total Basin Existing to RCBC

Hydrograph type	=	SCS Runoff	Peak discharge	=	139.28 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.83 hrs
Time interval	=	2 min	Hyd. volume	=	28.676 acft
Drainage area	=	63.000 ac	Curve number	=	80
Basin Slope	=	0.3 %	Hydraulic length	=	1800 ft
Tc method	=	LAG	Time of conc. (Tc)	=	93.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	27.8967	9.8000	0.7047	--------
2	76.3137	14.3000	0.8844	--------
3	1.2000	0.1000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: wich_IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.18	3.40	2.90	2.55	2.29	2.08	1.91	1.78	1.66	1.56	1.48	1.40
2	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
3	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
5	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: wich_24hr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.80	3.50	1.20	4.50	5.20	6.10	6.90	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydraflow Table of Contents

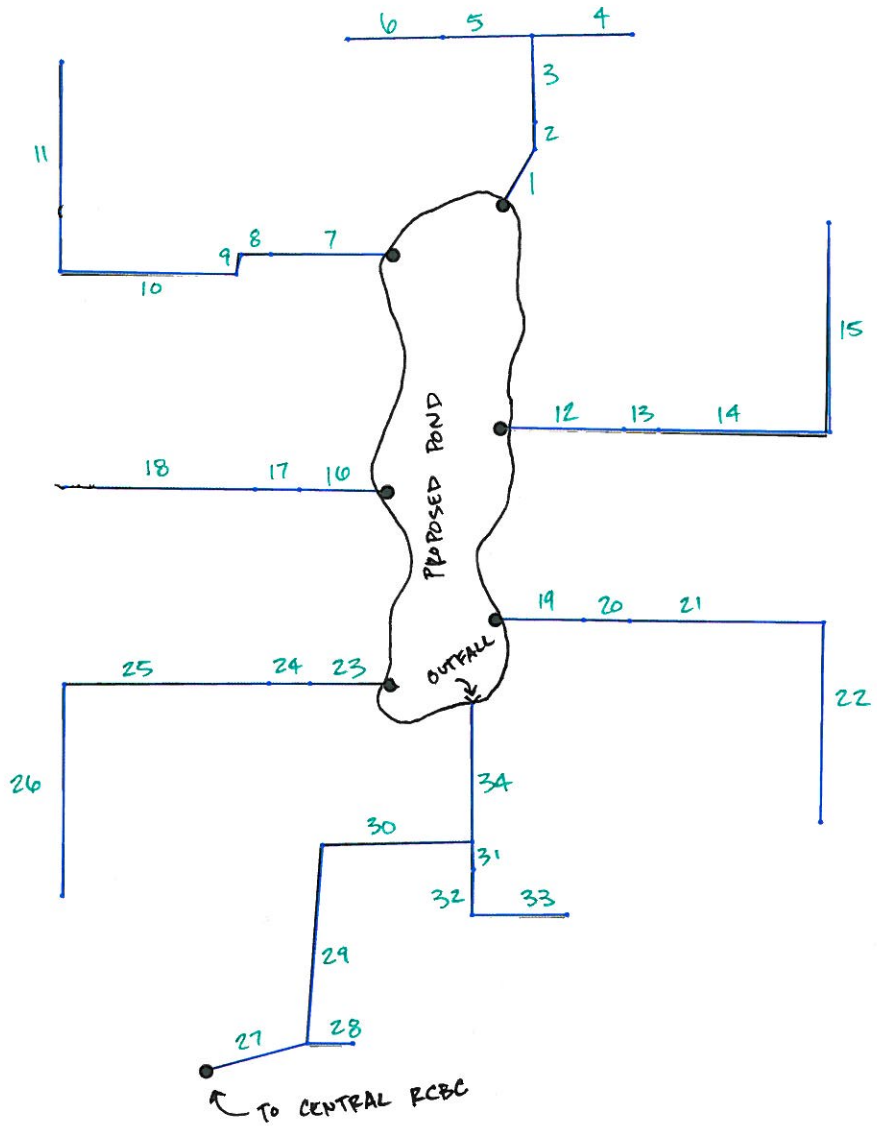
100 - Year

HydraFlow SWS

Onsite SWS Systems

10-Year Event

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: Castlegate - sws.stm	Number of lines: 34	Date: 3/11/2014

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
34	30	169.696	-88.687	Hdwl	14.00	0.00	0.00	0.0	1337.30	0.20	1337.64	24	Cir	0.013	1.00	1337.00	
33	32	114.821	-91.303	DrGrt	0.00	0.40	0.64	15.0	1338.40	0.44	1338.91	15	Cir	0.013	1.00	1341.40	
32	31	54.882	3.744	DrGrt	0.00	0.20	0.64	15.0	1338.16	0.44	1338.40	15	Cir	0.013	1.50	1341.20	
31	30	33.812	88.736	Curb	0.00	1.00	0.64	15.0	1338.05	0.32	1338.16	15	Cir	0.013	0.50	1341.20	
30	29	181.584	84.614	Curb	0.00	0.80	0.64	15.0	1336.44	0.20	1336.80	30	Cir	0.013	1.50	1341.20	
29	27	242.829	-70.790	MH	0.00	0.00	0.64	15.0	1335.95	0.20	1336.44	30	Cir	0.013	1.00	1342.30	
28	27	54.876	15.422	Curb	0.00	0.35	0.64	15.0	1337.20	0.44	1337.44	15	Cir	0.013	1.00	0.00	
27	End	126.989	-15.422	Curb	0.00	0.35	0.64	15.0	1335.20	0.20	1335.45	36	Cir	0.013	1.43	1340.90	
26	25	258.178	-89.286	DrGrt	0.00	0.40	0.64	15.0	1338.96	0.44	1340.09	15	Cir	0.013	1.00	1341.80	
25	24	248.048	-0.541	DrGrt	0.00	0.70	0.64	15.0	1337.88	0.44	1338.96	15	Cir	0.013	1.50	1341.80	
24	23	49.920	0.000	Curb	0.00	1.00	0.64	15.0	1337.75	0.25	1337.88	15	Cir	0.013	0.50	1342.70	
23	End	97.499	180.000	Curb	0.00	0.40	0.64	15.0	1333.25	4.62	1337.75	15	Cir	0.013	0.50	1342.70	
22	21	245.708	90.356	DrGrt	0.00	0.40	0.64	15.0	1338.78	0.44	1339.85	15	Cir	0.013	1.00	1341.50	
21	20	235.559	-0.606	DrGrt	0.00	0.60	0.64	15.0	1337.75	0.44	1338.78	15	Cir	0.013	1.50	1341.30	
20	19	56.165	0.378	Curb	0.00	0.30	0.64	15.0	1337.50	0.44	1337.75	15	Cir	0.013	0.50	1342.50	
19	End	106.862	0.418	Curb	0.00	0.30	0.64	15.0	1333.00	4.21	1337.50	15	Cir	0.013	0.50	1342.50	
18	17	229.319	0.195	DrGrt	0.00	0.70	0.64	15.0	1337.68	0.44	1338.68	15	Cir	0.013	1.00	1340.00	
17	16	53.819	-0.836	Curb	0.00	0.60	0.64	15.0	1337.50	0.33	1337.68	15	Cir	0.013	0.50	1342.70	
16	End	106.871	-179.164	Curb	0.00	0.50	0.64	15.0	1333.00	4.21	1337.50	15	Cir	0.013	0.50	1342.70	
15	14	256.618	-90.978	DrGrt	0.00	0.90	0.64	15.0	1338.53	0.44	1339.66	15	Cir	0.013	1.00	1342.60	
14	13	208.000	-0.091	DrGrt	0.00	0.60	0.64	15.0	1337.86	0.33	1338.53	15	Cir	0.013	1.50	1342.00	
13	12	42.000	-0.179	Curb	0.00	1.00	0.64	15.0	1337.75	0.25	1337.86	15	Cir	0.013	0.50	1342.70	
12	End	150.000	0.653	Curb	0.00	0.40	0.64	15.0	1333.25	3.00	1337.75	15	Cir	0.013	0.50	1342.70	

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
11	10	258.182	89.445	DrGrt	0.00	0.50	0.64	15.0	1338.89	0.44	1340.02	15	Cir	0.013	1.00	1342.00	
10	9	213.719	77.000	DrGrt	0.00	0.70	0.64	15.0	1337.95	0.44	1338.89	15	Cir	0.013	1.50	1342.00	
9	8	24.628	-75.000	MH	0.00	0.00	0.64	15.0	1337.84	0.44	1337.95	15	Cir	0.013	0.98	0.00	
8	7	35.888	-0.943	Curb	0.00	0.80	0.64	15.0	1337.75	0.25	1337.84	15	Cir	0.013	1.46	1342.70	
7	End	148.200	179.698	Curb	0.00	0.70	0.64	15.0	1333.25	3.04	1337.75	15	Cir	0.013	0.50	1342.70	
6	5	114.680	0.000	DrGrt	0.00	0.30	0.64	15.0	1338.80	0.44	1339.30	15	Cir	0.013	1.00	1342.00	(2)
5	3	108.464	-89.296	DrGrt	0.00	0.10	0.64	15.0	1338.32	0.44	1338.80	15	Cir	0.013	0.50	1342.00	
4	3	121.701	91.004	DrGrt	0.00	0.40	0.64	15.0	1338.32	0.44	1338.86	15	Cir	0.013	1.00	1342.00	
3	2	106.151	-2.106	DrGrt	0.00	0.20	0.64	15.0	1337.86	0.44	1338.32	15	Cir	0.013	2.25	1342.00	
2	1	33.540	-28.836	Curb	0.00	0.80	0.64	15.0	1337.75	0.33	1337.86	15	Cir	0.013	0.50	1342.60	
1	End	79.245	-61.164	Curb	0.00	0.90	0.64	15.0	1333.25	5.68	1337.75	15	Cir	0.013	0.81	1342.60	

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
34		OpenHeadwall	1337.00	n/a	n/a	n/a	24	Cir	1337.64			
33		DropGrate	1341.40	Cir	4.00	4.00	15	Cir	1338.91			
32		DropGrate	1341.20	Cir	4.00	4.00	15	Cir	1338.40	15	Cir	1338.40
31		Curb-	1341.20	Cir	4.00	4.00	15	Cir	1338.16	15	Cir	1338.16
30		Curb-	1341.20	Cir	4.00	4.00	30	Cir	1336.80	15 24	Cir Cir	1338.05 1337.30
29		Manhole	1342.30	Cir	4.00	4.00	30	Cir	1336.44	30	Cir	1336.44
28		Curb-	0.00	Cir	4.00	4.00	15	Cir	1337.44			
27		Curb-	1340.90	Cir	4.00	4.00	36	Cir	1335.45	15 30	Cir Cir	1337.20 1335.95
26		DropGrate	1341.80	Cir	4.00	4.00	15	Cir	1340.09			
25		DropGrate	1341.80	Cir	4.00	4.00	15	Cir	1338.96	15	Cir	1338.96
24		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.88	15	Cir	1337.88
23		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.75	15	Cir	1337.75
22		DropGrate	1341.50	Cir	4.00	4.00	15	Cir	1339.85			
21		DropGrate	1341.30	Cir	4.00	4.00	15	Cir	1338.78	15	Cir	1338.78
20		Curb-	1342.50	Cir	4.00	4.00	15	Cir	1337.75	15	Cir	1337.75
19		Curb-	1342.50	Cir	4.00	4.00	15	Cir	1337.50	15	Cir	1337.50
18		DropGrate	1340.00	Cir	4.00	4.00	15	Cir	1338.68			
17		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.68	15	Cir	1337.68
16		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.50	15	Cir	1337.50
15		DropGrate	1342.60	Cir	4.00	4.00	15	Cir	1339.66			
14		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1338.53	15	Cir	1338.53
13		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.86	15	Cir	1337.86

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
12		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.75	15	Cir	1337.75
11		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1340.02			
10		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1338.89	15	Cir	1338.89
9		Manhole	0.00	Cir	4.00	4.00	15	Cir	1337.95	15	Cir	1337.95
8		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.84	15	Cir	1337.84
7		Curb-	1342.70	Cir	4.00	4.00	15	Cir	1337.75	15	Cir	1337.75
6		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1339.30			
5	New	DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1338.80	15	Cir	1338.80
4		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1338.86			
3		DropGrate	1342.00	Cir	4.00	4.00	15	Cir	1338.32	15 15	Cir Cir	1338.32 1338.32
2		Curb-	1342.60	Cir	4.00	4.00	15	Cir	1337.86	15	Cir	1337.86
1		Curb-	1342.60	Cir	4.00	4.00	15	Cir	1337.75	15	Cir	1337.75

Storm Sewer Summary 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
34		14.00	24	Cir	169.696	1337.30	1337.64	0.200	1340.22*	1340.87*	0.31	1341.18	30	OpenHeadwall
33		1.21	15	Cir	114.821	1338.40	1338.91	0.438	1340.58*	1340.62*	0.02	1340.63	32	DropGrate
32		1.72	15	Cir	54.882	1338.16	1338.40	0.438	1340.49*	1340.53*	0.05	1340.58	31	DropGrate
31		4.51	15	Cir	33.812	1338.05	1338.16	0.325	1340.22*	1340.39*	0.10	1340.49	30	Curb-
30		20.74	30	Cir	181.584	1336.44	1336.80	0.200	1339.34*	1339.81*	0.42	1340.22	29	Curb-
29		20.62	30	Cir	242.829	1335.95	1336.44	0.200	1338.45*	1339.07*	0.27	1339.34	27	Manhole
28		1.06	15	Cir	54.876	1337.20	1337.44	0.438	1337.87	1337.92	0.10	1338.01	27	Curb-
27		22.36	36	Cir	126.989	1335.20	1335.45	0.200	1336.71	1337.40	0.47	1337.87	End	Curb-
26		1.21	15	Cir	258.178	1338.96	1340.09	0.438	1340.48	1340.69	0.07	1340.76	25	DropGrate
25		2.97	15	Cir	248.048	1337.88	1338.96	0.438	1339.82*	1340.34*	0.14	1340.48	24	DropGrate
24		5.46	15	Cir	49.920	1337.75	1337.88	0.255	1339.31*	1339.67*	0.15	1339.82	23	Curb-
23		6.47	15	Cir	97.499	1333.25	1337.75	4.615	1334.27	1338.35	n/a	1339.31	End	Curb-
22		1.21	15	Cir	245.708	1338.78	1339.85	0.438	1339.82	1340.30	n/a	1340.45 j	21	DropGrate
21		2.71	15	Cir	235.559	1337.75	1338.78	0.438	1338.88	1339.48	0.34	1339.82	20	DropGrate
20		3.39	15	Cir	56.165	1337.50	1337.75	0.438	1338.69	1338.81	0.07	1338.88	19	Curb-
19		4.14	15	Cir	106.862	1333.00	1337.50	4.211	1333.82	1337.98	n/a	1338.69	End	Curb-
18		2.11	15	Cir	229.319	1337.68	1338.68	0.438	1339.07	1339.41	0.12	1339.53	17	DropGrate
17		3.70	15	Cir	53.819	1337.50	1337.68	0.325	1338.83*	1339.00*	0.07	1339.07	16	Curb-
16		5.08	15	Cir	106.871	1333.00	1337.50	4.211	1333.90	1338.04	n/a	1338.83	End	Curb-
15		2.71	15	Cir	256.618	1338.53	1339.66	0.438	1341.25*	1341.71*	0.08	1341.78	14	DropGrate
14		4.30	15	Cir	208.000	1337.86	1338.53	0.325	1340.05*	1340.97*	0.29	1341.25	13	DropGrate
13		6.98	15	Cir	42.000	1337.75	1337.86	0.255	1339.30*	1339.79*	0.25	1340.05	12	Curb-
12		8.08	15	Cir	150.000	1333.25	1337.75	3.000	1334.37	1338.54	n/a	1339.30	End	Curb-
11		1.51	15	Cir	258.182	1338.89	1340.02	0.438	1340.77	1340.92	0.04	1340.96	10	DropGrate

Project File: Castlegate - sws.stm | Number of lines: 34 | Run Date: 3/11/2014

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary 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
10		3.30	15	Cir	213.719	1337.95	1338.89	0.438	1340.05*	1340.61*	0.17	1340.77	9	DropGrate
9		3.21	15	Cir	24.628	1337.84	1337.95	0.438	1339.88*	1339.94*	0.10	1340.05	8	Manhole
8		5.33	15	Cir	35.888	1337.75	1337.84	0.255	1339.21*	1339.45*	0.43	1339.88	7	Curb-
7		7.17	15	Cir	148.200	1333.25	1337.75	3.036	1334.32	1338.48	n/a	1339.21	End	Curb-
6	(2)	0.90	15	Cir	114.680	1338.80	1339.30	0.438	1340.94*	1340.96*	0.01	1340.97	5	DropGrate
5		1.13	15	Cir	108.464	1338.32	1338.80	0.438	1340.90*	1340.93*	0.01	1340.94	3	DropGrate
4		1.21	15	Cir	121.701	1338.32	1338.86	0.438	1340.90*	1340.94*	0.02	1340.96	3	DropGrate
3		2.69	15	Cir	106.151	1337.86	1338.32	0.438	1340.55*	1340.73*	0.17	1340.90	2	DropGrate
2		4.76	15	Cir	33.540	1337.75	1337.86	0.325	1340.25*	1340.43*	0.12	1340.55	1	Curb-
1		7.12	15	Cir	79.245	1333.25	1337.75	5.679	1334.32	1338.35	n/a	1340.25	End	Curb-

Project File: Castlegate - sws.stm | Number of lines: 34 | Run Date: 3/11/2014

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
34	24	14.00	1337.30	1340.22	2.00	3.14	4.46	0.31	1340.53	0.383	169.696	1337.64	1340.87	2.00	3.14	4.46	0.31	1341.18	0.383	0.383	0.650	1.00	0.31
33	15	1.21	1338.40	1340.58	1.25	1.23	0.98	0.02	1340.59	0.035	114.821	1338.91	1340.62	1.25	1.23	0.98	0.02	1340.63	0.035	0.035	0.040	1.00	0.02
32	15	1.72	1338.16	1340.49	1.25	1.23	1.40	0.03	1340.52	0.071	54.882	1338.40	1340.53	1.25	1.23	1.40	0.03	1340.56	0.071	0.071	0.039	1.50	0.05
31	15	4.51	1338.05	1340.22	1.25	1.23	3.67	0.21	1340.43	0.487	33.812	1338.16	1340.39	1.25	1.23	3.67	0.21	1340.60	0.487	0.487	0.165	0.50	0.10
30	30	20.74	1336.44	1339.34	2.50	4.91	4.23	0.28	1339.62	0.256	181.584	1336.80	1339.81	2.50	4.91	4.22	0.28	1340.08	0.256	0.256	0.464	1.50	0.42
29	30	20.62	1335.95	1338.45	2.50*	4.91	4.20	0.27	1338.73	0.253	242.829	1336.44	1339.07	2.50	4.91	4.20	0.27	1339.34	0.253	0.253	0.614	1.00	0.27
28	15	1.06	1337.20	1337.87	0.67	0.67	1.59	0.04	1337.91	0.086	54.876	1337.44	1337.92	0.47	0.43	2.47	0.10	1338.01	0.287	0.186	0.102	1.00	0.10
27	36	22.36	1335.20	1336.71	1.51	3.56	6.27	0.61	1337.32	0.440	126.989	1335.45	1337.40	1.94	4.84	4.62	0.33	1337.73	0.198	0.319	0.405	1.43	0.47
26	15	1.21	1338.96	1340.48	1.25	1.23	0.98	0.02	1340.50	0.035	258.178	1340.09	1340.69	0.59	0.57	2.10	0.07	1340.76	0.167	0.101	0.261	1.00	0.07
25	15	2.97	1337.88	1339.82	1.25	1.23	2.42	0.09	1339.91	0.211	248.048	1338.96	1340.34	1.25	1.23	2.42	0.09	1340.44	0.211	0.211	0.524	1.50	0.14
24	15	5.46	1337.75	1339.31	1.25	1.23	4.45	0.31	1339.62	0.715	49.920	1337.88	1339.67	1.25	1.23	4.45	0.31	1339.97	0.715	0.715	0.357	0.50	0.15
23	15	6.47	1333.25	1334.27	1.02*	0.58	0.00	1.92	1336.19	0.000	97.499	1337.75	1338.35	0.60	0.58	11.11	1.92	1340.27	0.000	0.000	0.000	0.50	n/a
22	15	1.21	1338.78	1339.82	1.04	1.09	1.10	0.02	1339.84	0.034	245.708	1339.85	1340.30 j	0.45**	0.40	3.05	0.14	1340.45	0.460	0.247	0.606	1.00	0.14
21	15	2.71	1337.75	1338.88	1.13	1.17	2.32	0.08	1338.96	0.154	235.559	1338.78	1339.48	0.70	0.71	3.82	0.23	1339.71	0.479	0.317	0.746	1.50	0.34
20	15	3.39	1337.50	1338.69	1.19	1.20	2.81	0.12	1338.81	0.239	56.165	1337.75	1338.81	1.06	1.11	3.06	0.15	1338.95	0.261	0.250	0.140	0.50	0.07
19	15	4.14	1333.00	1333.82	0.81*	0.43	0.00	1.42	1335.23	0.000	106.862	1337.50	1337.98	0.48	0.43	9.54	1.42	1339.40	0.000	0.000	0.000	0.50	n/a
18	15	2.11	1337.68	1339.07	1.25	1.23	1.72	0.05	1339.12	0.107	229.319	1338.68	1339.41	0.73	0.75	2.83	0.12	1339.53	0.256	0.182	0.416	1.00	0.12
17	15	3.70	1337.50	1338.83	1.25	1.23	3.01	0.14	1338.97	0.328	53.819	1337.68	1339.00	1.25	1.23	3.01	0.14	1339.14	0.328	0.328	0.176	0.50	0.07
16	15	5.08	1333.00	1333.90	0.90*	0.50	0.00	1.58	1335.48	0.000	106.871	1337.50	1338.04	0.54	0.50	10.08	1.58	1339.62	0.000	0.000	0.000	0.50	n/a
15	15	2.71	1338.53	1341.25	1.25	1.23	2.21	0.08	1341.33	0.177	256.618	1339.66	1341.71	1.25	1.23	2.21	0.08	1341.78	0.177	0.177	0.453	1.00	0.08
14	15	4.30	1337.86	1340.05	1.25	1.23	3.50	0.19	1340.24	0.443	208.000	1338.53	1340.97	1.25	1.23	3.50	0.19	1341.16	0.443	0.443	0.921	1.50	0.29
13	15	6.98	1337.75	1339.30	1.25	1.23	5.69	0.50	1339.81	1.171	42.000	1337.86	1339.79	1.25	1.23	5.69	0.50	1340.30	1.170	1.170	0.492	0.50	0.25

Project File: Castlegate - sws.stm | Number of lines: 34 | Run Date: 3/11/2014

Notes: * depth assumed.; ** Critical depth.; j-Line contains hyd. jump. ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

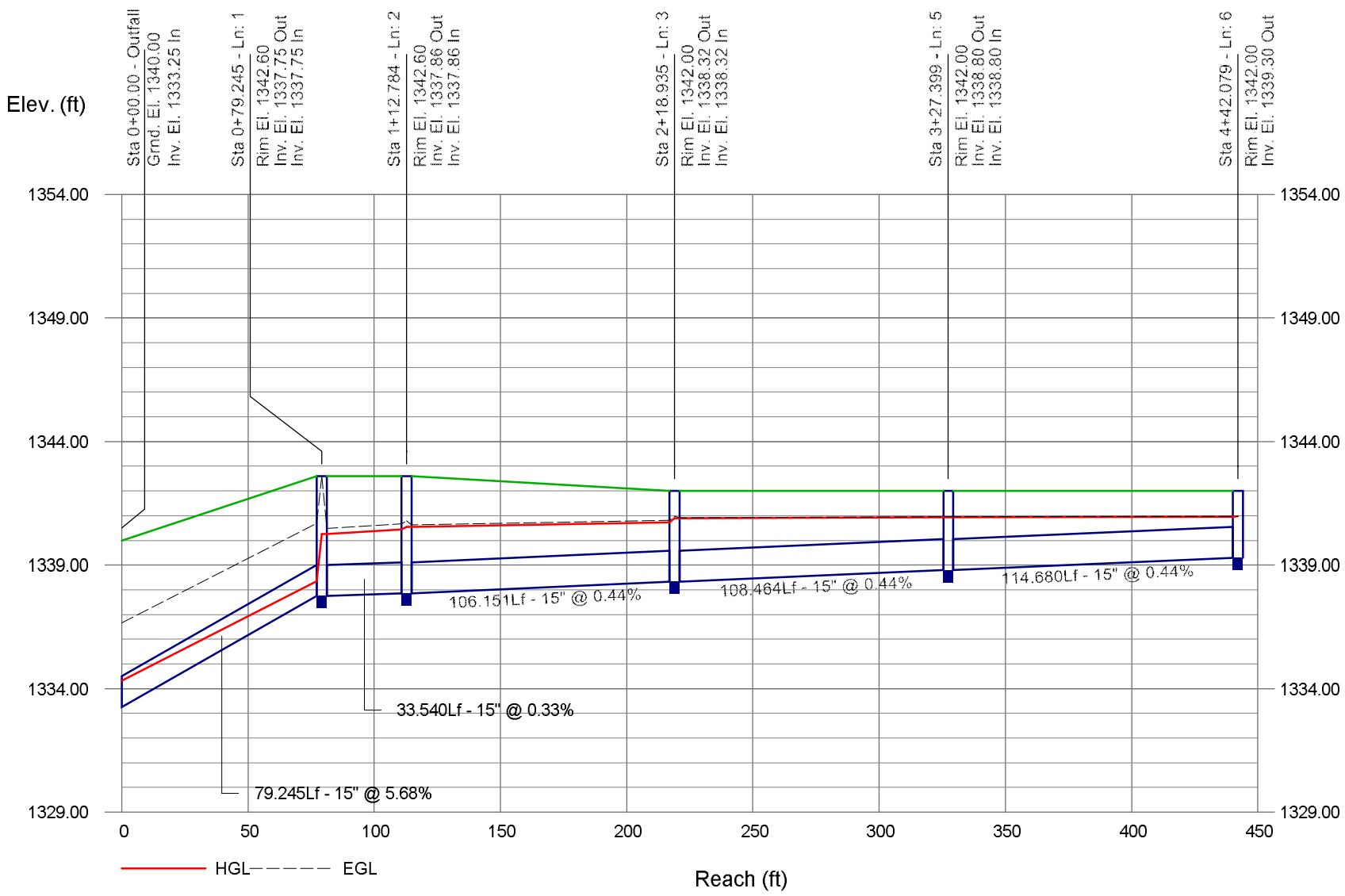
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
12	15	8.08	1333.25	1334.37	1.12*	0.81	0.00	1.53	1335.90	0.000	150.000	1337.75	1338.54	0.79	0.81	9.92	1.53	1340.07	0.000	0.000	0.000	0.50	n/a
11	15	1.51	1338.89	1340.77	1.25	1.23	1.23	0.02	1340.80	0.055	258.182	1340.02	1340.92	0.91	0.95	1.58	0.04	1340.96	0.071	0.063	0.163	1.00	0.04
10	15	3.30	1337.95	1340.05	1.25	1.23	2.69	0.11	1340.16	0.262	213.719	1338.89	1340.61	1.25	1.23	2.69	0.11	1340.72	0.262	0.262	0.560	1.50	0.17
9	15	3.21	1337.84	1339.88	1.25	1.23	2.61	0.11	1339.99	0.247	24.628	1337.95	1339.94	1.25	1.23	2.61	0.11	1340.05	0.247	0.247	0.061	0.98	0.10
8	15	5.33	1337.75	1339.21	1.25	1.23	4.34	0.29	1339.50	0.681	35.888	1337.84	1339.45	1.25	1.23	4.34	0.29	1339.75	0.680	0.681	0.244	1.46	0.43
7	15	7.17	1333.25	1334.32	1.07*	0.74	0.00	1.47	1335.79	0.000	148.200	1337.75	1338.48	0.72	0.74	9.71	1.47	1339.94	0.000	0.000	0.000	0.50	n/a
6	15	0.90	1338.80	1340.94	1.25	1.23	0.74	0.01	1340.95	0.020	114.680	1339.30	1340.96	1.25	1.23	0.74	0.01	1340.97	0.020	0.020	0.023	1.00	0.01
5	15	1.13	1338.32	1340.90	1.25	1.23	0.92	0.01	1340.92	0.030	108.464	1338.80	1340.93	1.25	1.23	0.92	0.01	1340.95	0.030	0.030	0.033	0.50	0.01
4	15	1.21	1338.32	1340.90	1.25	1.23	0.98	0.02	1340.92	0.035	121.701	1338.86	1340.94	1.25	1.23	0.98	0.02	1340.96	0.035	0.035	0.042	1.00	0.02
3	15	2.69	1337.86	1340.55	1.25	1.23	2.19	0.07	1340.62	0.174	106.151	1338.32	1340.73	1.25	1.23	2.19	0.07	1340.81	0.174	0.174	0.184	2.25	0.17
2	15	4.76	1337.75	1340.25	1.25	1.23	3.88	0.23	1340.48	0.544	33.540	1337.86	1340.43	1.25	1.23	3.88	0.23	1340.67	0.544	0.544	0.182	0.50	0.12
1	15	7.12	1333.25	1334.32	1.07	0.58	0.00	2.35	1336.67	0.000	79.245	1337.75	1338.35	0.60	0.58	12.29	2.35	1340.70	0.000	0.000	0.000	0.81	n/a

Project File: Castlegate - sws.stm | Number of lines: 34 | Run Date: 3/11/2014

Notes: * depth assumed.; ** Critical depth.; j-Line contains hyd. jump. ; c = cir e = ellip b = box

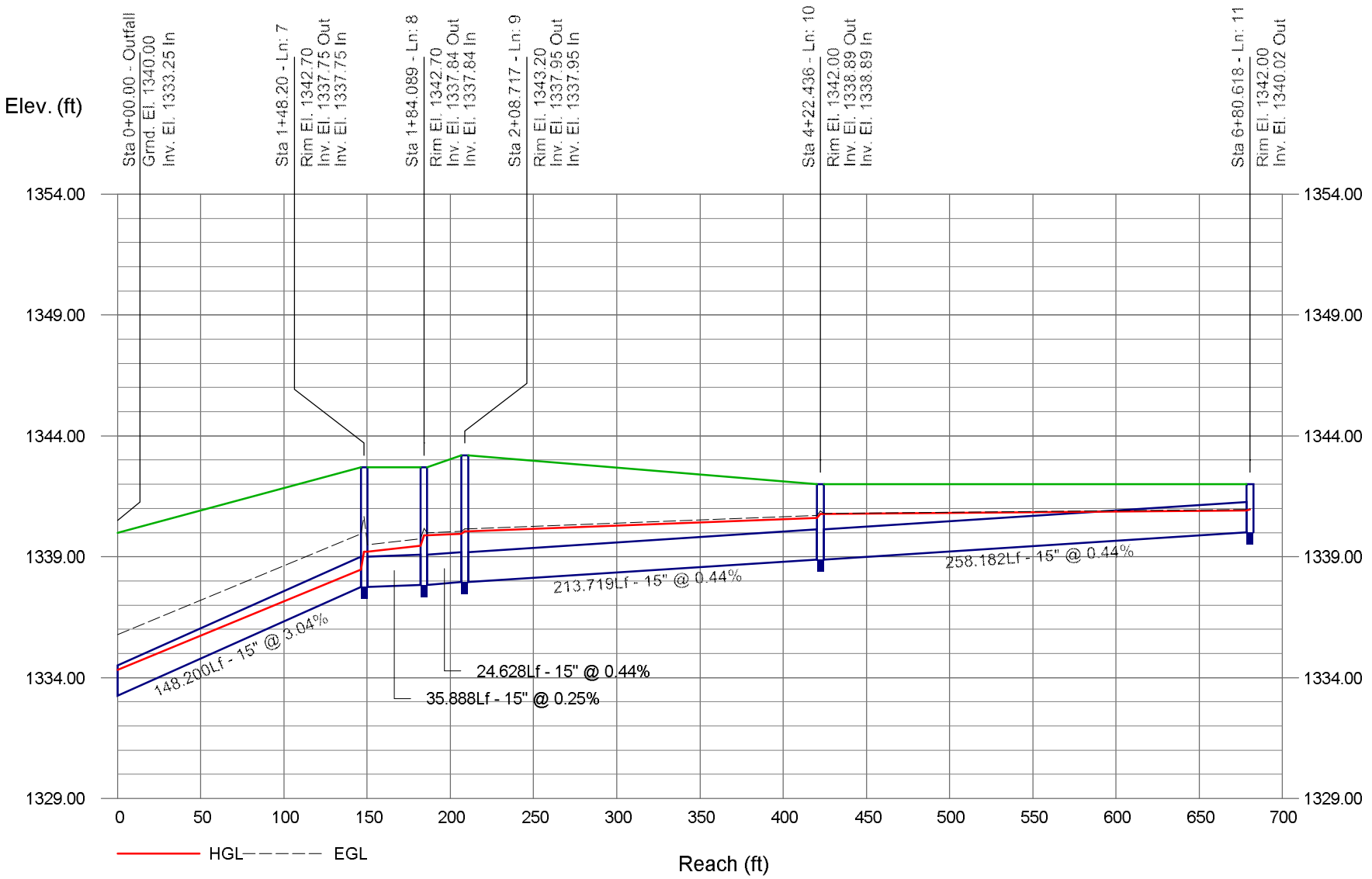
Storm Sewer Profile

Proj. file: Castlegate - sws.stm



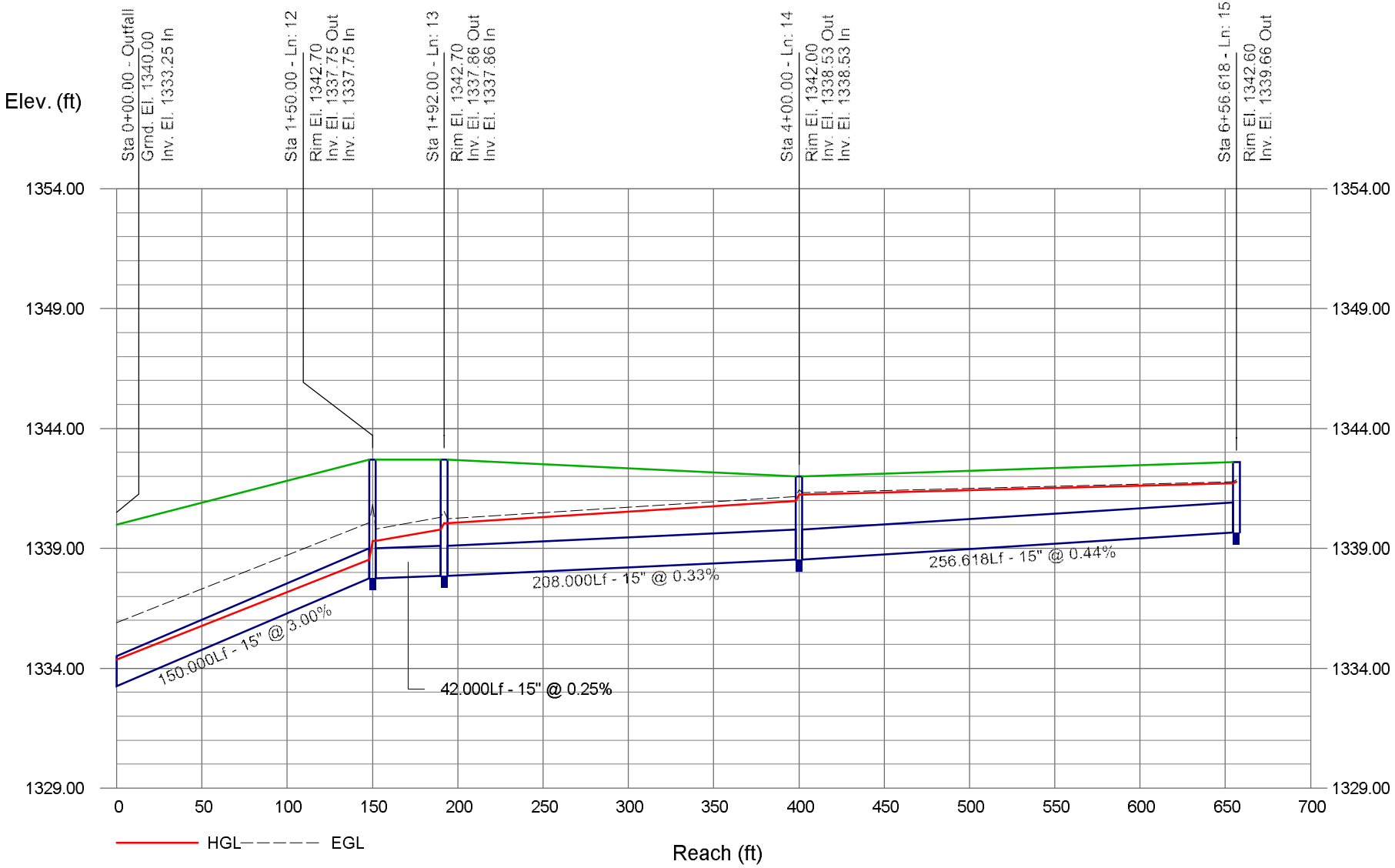
Storm Sewer Profile

Proj. file: Castlegate - sws.stm



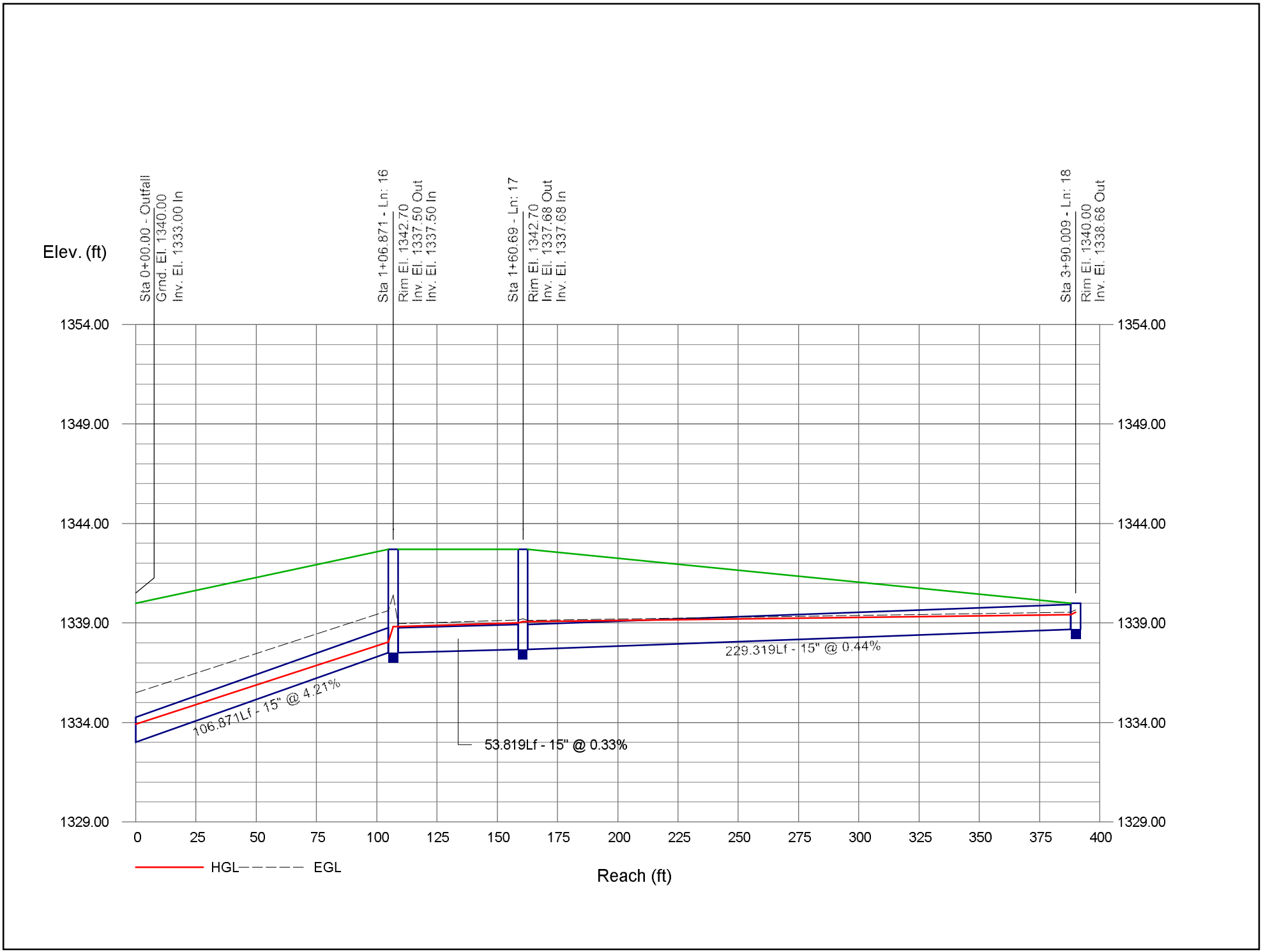
Storm Sewer Profile

Proj. file: Castlegate - sws.stm



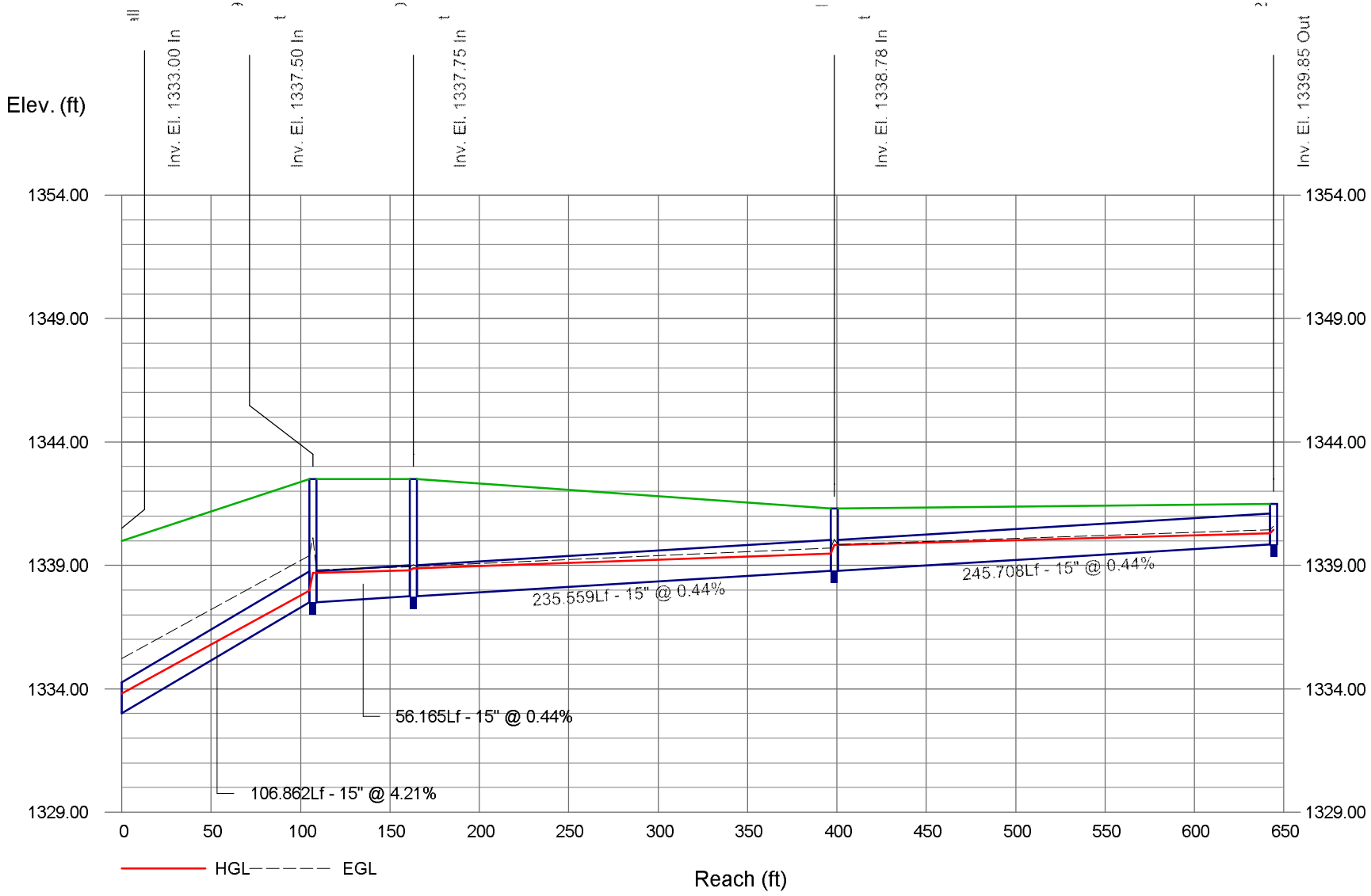
Storm Sewer Profile

Proj. file: Castlegate - sws.stm



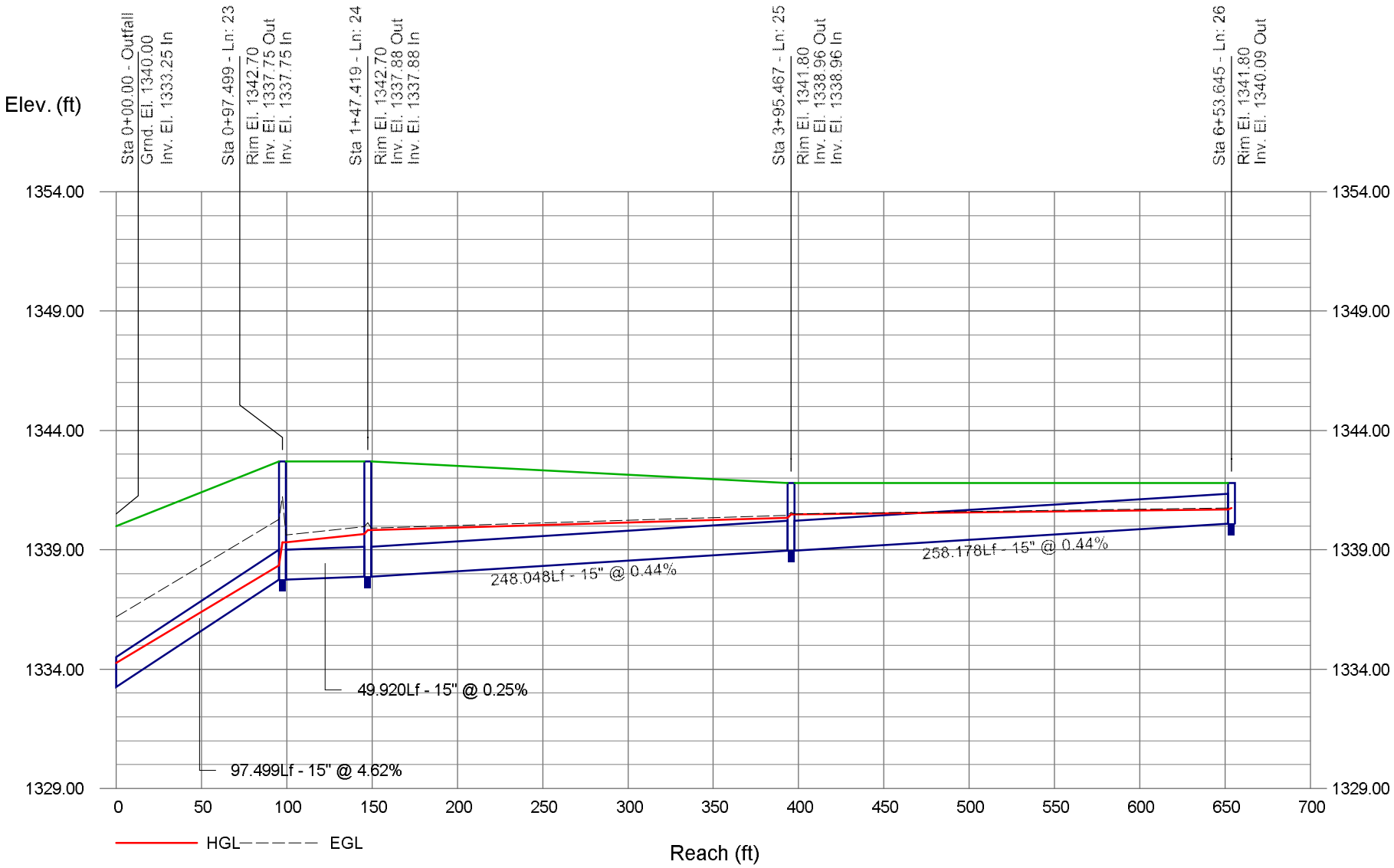
Storm Sewer Profile

Proj. file: Castlegate - sws.stm



Storm Sewer Profile

Proj. file: Castlegate - sws.stm



Storm Sewer Profile

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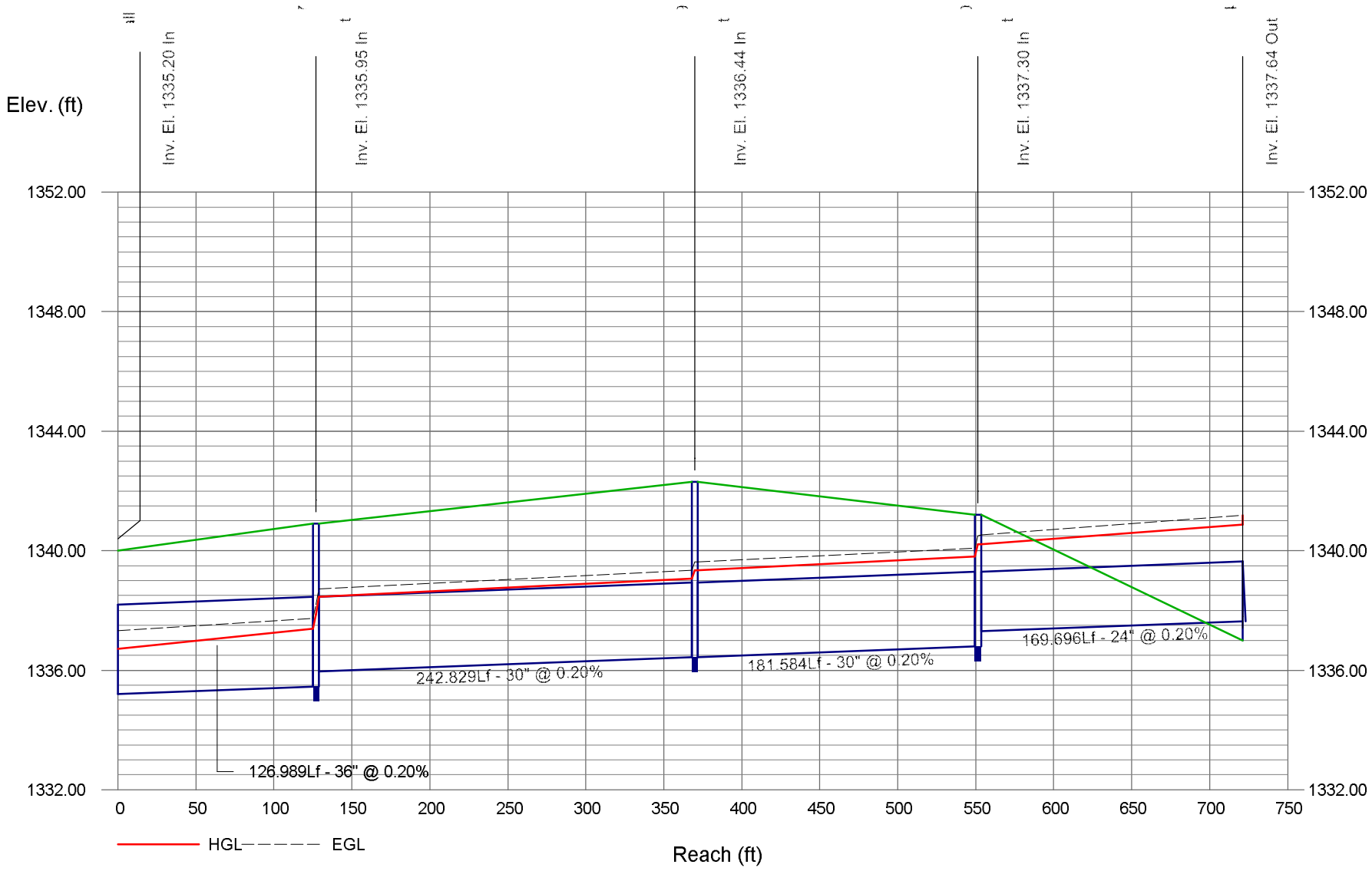
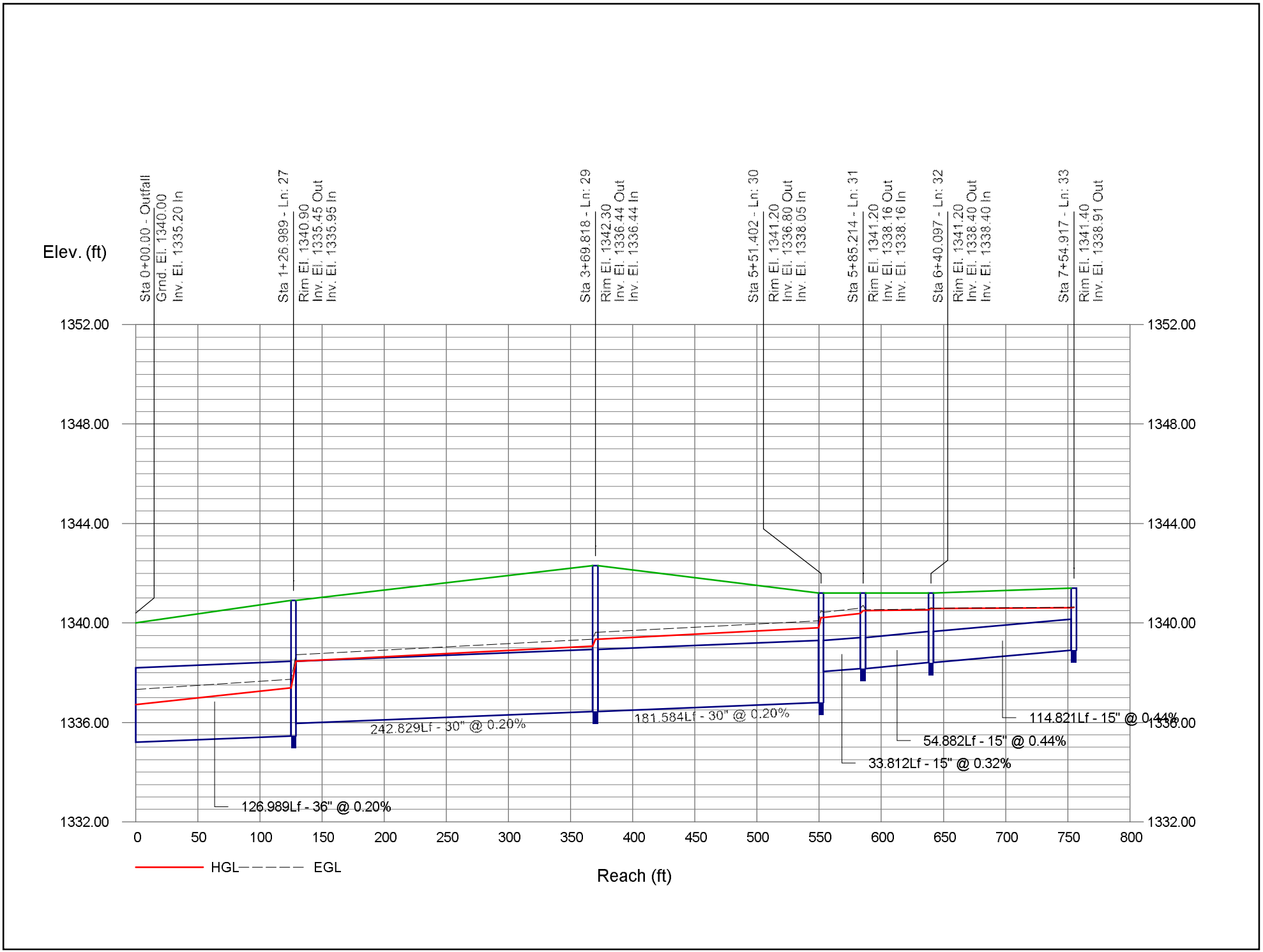


Storm Sewer Profile

Proj. file: Castlegate - sws.stm



Drainage Plan

1:100 Scale

DRAINAGE PLAN

CASTLEGATE ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS

Offsite from North 3x4 RCBC
Area = 31.1 acres
CN = 80
Tc = 43 min
Q_2 = 36 cfs
Q_5 = 54 cfs
Q_{10} = 68 cfs
Q_{25} = 86 cfs
Q_{100} = 120 cfs

Offsite runoff to be conveyed to the south via ditch section (as shown) on adjacent property.

LESLIE & VENESSA ALBERT
14601 W CENTRAL
WICHITA, KS 67235

JOHN E. THEIS
12610 W CENTRAL
WICHITA, KS 67235
ZONED "SF-5"

0' 60' 120'

DATE OF PREPARATION: 10 FEBRUARY 2014
DATE OF TOPOGRAPHY: 31 JANUARY 2014
CONTOUR INTERVALS = 1 FOOT

DETENTION POND/BASIN (Static = 1338.0)

STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	67 cfs	7.6 cfs	1339.2
10 yr	108 cfs	12 cfs	1340.0
100 yr	171 cfs	14 cfs	1341.1

NORTH WEST BASIN

ELEVATION	TOTAL STORAGE (ac ft)
1337	0.0
1338	1.9
1339	4.1
1340	6.4
1341	9.0

Developed	2yr	10yr	100yr
Intensity	3.8	5.19	7.36
Rational C	0.55	0.64	0.73

Basin ID	Area	Developed Flowrates		
		2-yr	10-yr	100-yr
	acres	cfs	cfs	cfs
1	0.5	1.0	1.7	2.7
2	0.7	1.4	2.2	3.5
3	1.5	3.1	5.0	8.1
4	0.3	0.6	1.0	1.6
5	0.1	0.3	0.4	0.6
6	0.2	0.4	0.7	1.1
7	0.4	0.8	1.3	2.1
8	0.9	1.9	3.0	4.8
9	1.7	3.6	5.6	9.1
10	1.4	2.9	4.7	7.5
11	0.6	1.3	2.0	3.2
12	0.3	0.5	0.8	1.3
13	0.6	1.3	2.1	3.3
14	0.6	1.3	2.0	3.2
15	0.4	0.8	1.3	2.1
16	1.8	3.8	6.0	10
17	0.4	0.8	1.2	2.0
18	0.2	0.5	0.8	1.2
19	0.7	1.4	2.2	3.5
20	1.3	2.7	4.3	7.0
21	0.4	0.9	1.4	2.3
22	0.7	1.4	2.2	3.6
23	1.4	2.9	4.7	7.5
24	0.7	1.4	2.2	3.5
25	1.1	2.3	3.7	5.9
26	6.0	13	20	32
TOTAL	24.8	51.7	82.2	133.0

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group A	B	C	D	Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed	0.02	0.03	0.04	**0.05**	Undisturbed	55	71	80	**84**
Turf or Disturbed Soils	0.15	0.20	0.22	**0.25**	Turf or Disturbed Soils	71	80	84	**88**
Impervious Cover	0.95	0.95	0.95	**0.95**	Impervious Cover	98	98	98	**98**

Basin #	Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*) Undist. ft^2	Dist. ft^2	Red. Imp. ft^2	New Imp. ft^2	Totol Area ft^2	U %	D %	Redev. I %	I %	R_v %	WQ_v ft^3 eq. 4-25*
Total Site	*0*	*468,270*	*0*	*468,270*	936,540	0.000	0.125	0.000	0.475	**0.6000**	**56,192**
CN		*42*	*0*	*49*	**91**						

Pond Volume Below Static Pool

Basin	Static Sq.Ft.	Static Acre	Pond Bottom Area Sq. Ft.	Pond Bottom Area Acre	Depth Feet	Volume Acre-Ft.
Pond	80000	1.8	58000	1.3	10	15.8
Totals:		1.8		1.3		15.8

Pond Volume > WQv		
Pond	WQv	Check
15.8	1.3	Yes

The proposed pond is approximately 3.5 acres in surface area and is not included in the total basin area.

CP = Cable TV Pedestal
DI = Drop Inlet
EB = Electric Box
LP = Light Pole
Sign = Sign
SI = Tornado Siren
SSMH
ATTVT = ATT Vault
ATT Ped = ATT Pedestal
SWSMH = Stormwater Sewer Manhole
TR = Tree
Well = Cased Well
WV = Water Valve

LEGEND
- Proposed SWS
- Drainage Basin Boundary
- Proposed Flow Direction
- Proposed Ditch Section

WATER LINE
SOUTHWESTERN BELL
GAS LINE
CABLE TV
FENCE
OVERHEAD ELECTRIC LINE
UNDERGROUND ELECTRIC LINE
PIPELINE

VICINITY MAP
SEC. 13, T27S, R2W

TYPICAL DETAIL (4A) PROPOSED CHANNEL
4:1 SS
Manning's 'n' = 0.030
Slope = 1.0%
4'
Capacity:
@ 1' = 30 cfs
@ 2' = 130 cfs
NOT TO SCALE

DRAINAGE PLAN CASTLEGATE ADDITION

10 MAR 2014

Baughman Company , P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

E:\PROJECTS\CASTLEGATE ADDITION_13-12-P008\WATER RESOURCES\CASTLEGATE_P_DRAIN PLAN.DWG