

DRAINAGE PLAN
FALCON FALLS EAST
TO
WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY



21 MAY 2008



DRAINAGE PLAN FALCON FALLS EAST

FINAL REPORT

Prepared by Baughman Company, P.A.
22 May 2008

By N. Brent Wooten, P.E.
Trevor R. Kurth, P.E.
Nicholas H. Jefferson, P.E.

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PROJECT NARRATIVE

EXISTING CONDITIONS

The site is located on the east side of Hillside Avenue just north of Highway K-254. The site is located along east bank of the Middle Fork Chisholm Creek in Wichita, Sedgwick County, Kansas. The site is currently agricultural pasture and farmground. The proposed site is approximately 58 acres.

The Middle Branch of Chisholm Creek flows through this site from the northeast to the southwest and under Hillside Avenue via a bridge. There is an existing pond located near the southeast corner of the property. This site accepts offsite runoff from the east and southeast. There are existing trees which encompass the property as well as tree rows interspersed throughout. A sanitary sewer main is also located on the property. The main, which runs along the Chisholm Creek, will be left at elevation and be included a Reserve.

The majority of the site drains to the west and into the Middle Fork Chisholm Creek. The existing pond drains via a 10" CMP. The pond is bermed on the west to allow for storage. The site location is depicted on the USGS Quadrangle Sheet as Exhibit 1. The aerial photograph with existing topography can be seen as Exhibit 2. There is a FEMA Zone AE located on the property as of this report. Existing trees, which bound the property and pond, will be retained at existing grades, where applicable.

PROPOSED CONDITIONS

The proposed Falcon Falls East will consist of approximately 98 lots with associated streets, utilities, and drainage systems. There are two ponds proposed in this subdivision. The existing pond will remain and will be over excavated with a re-work of the banks and outlet. A second pond is anticipated to be located on the west edge of the property running along the existing sanitary sewer force main. The pond will be excavation only and will not place fill in the regulatory floodway. The pond will have 5:1 sideslopes and is expected to be a groundwater pit. The pond will discharge directly into the Middle Fork Chisholm Creek.

Offsite flow from the southeast will be conveyed to the existing (re-worked) pond via a ditch section. The ditch section will have ditch checks due to its slope and the quantity of runoff entering. There is also offsite runoff entering the site near the northeast corner, through Lot 26, Block A. There is an existing channel and flow path which will be left original and will be included in an easement. This area will remain in a FEMA SFHA.

A portion of the site is currently in a FEMA SFHA. This includes Regulatory Floodway as well as studied Floodplain. The Floodway boundary will be located fully in a reserve and no fill will be placed in this area. Fill will be placed on the proposed lots to remove them from FEMA Floodplain. This will require a DWR permit and we anticipate the lots will then be removed from flood insurance requirements via a FEMA LOMR-F.

For a half scale copy of the Plat, see Exhibit 3.

OFFSITE CONDITIONS

The site generally drains to the west and into the Middle Fork Chisholm Creek. There is offsite flow which encroaches the property from the east and the south east. The flow at the southeast corner enters the property through 2-24" HRCP

which are located under K-254. These pipes, as well as additional adjacent runoff, convey approximately 15 acres of runoff totaling 56 cfs of discharge. This runoff will be conveyed in a ditch section which will run to the pond in Reserve C. There will be ditch checks in the section because of the slope of the section. There is a large volume of runoff entering the site near the northeast corner of the plat, through proposed Lot 26, Block A. This area will remain in the existing channel section and will be located in an easement. The area is, and will still be after development, located in a FEMA Floodplain. This area flows directly into the Middle Fork Chisholm Creek.

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.

Ø STORM SERIES

- 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
- 2-yr Rainfall Depth = 3.5 in
- 5-yr Rainfall Depth = 4.5 in
- 10-yr Rainfall Depth = 5.3 in
- 25-yr Rainfall Depth = 6.1 in
- 100-yr Rainfall Depth = 7.9 in

Ø FLOW DATA

- Existing Conditions modeled in HydraFlow Hydrographs
- Areas per USGS Quadrangle Sheet, Aerial Photos, and Site Visits
- HydraFlow Hydrograph software for existing offsite flows
- Runoff Coefficient: CN = 70 (Type B & C Soils, Open Space – Good Condition)
- Time of Concentration: Lag Method (15 min minimum)

SITE CHARACTERISTICS

The current site is mostly agricultural farmland and pasture. There is an existing pond located near the southeast corner of the site which accepts offsite runoff as well as site runoff. This pond discharges to the west and eventually into the Middle Branch Chisholm Creek. The site generally slopes to the west and drains into the creek. There are trees lining the property as well as tree rows interspersed on the property.

The Aerial Exhibit can be seen as Exhibit 2.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-development conditions using the hydrograph method for the 2, 5, 10, 25, and 100-year storm events. A curve number of 70 was used for existing conditions assuming undeveloped agricultural land use (open space – good condition) with Types B & C soils. The time of concentration was calculated using the Lag Method with a minimum time of concentration of 15 minutes. The existing pond was not modeled for its detention value. This pond was originally constructed as a farm pond.

DOWNSTREAM DRAINAGE CAPACITY

This site drains to the west and into the Middle Branch Chisholm Creek. The creek flows to the southwest under Hillside Avenue via a bridge. Adjacent to Hillside Avenue to the west is Falcon Falls Additions. There appears to be adequate drainage capacity downstream of this project. Based on topography and the FEMA mapping which is available, there does not appear to be any overtopping of Hillside Avenue.

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.

- Ø STORM SERIES
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
 - HydraFlow Hydrographs software for existing flows
 - SCS Curve Number; CN = 83 (Type C Soils, Residential – 1/4 acre lot)
 - Time of Concentration; Lag method, minimum Tc = 15min

- Ø GRADING CONSTRAINTS
 - Minimum 0.5% Street & Pavement Grades
 - Minimum 1.0% Rear Lot Grades
 - Double Curb Inlets utilized at all street sump locations
 - Emergency Overflows for 24-hr, 100-yr Storm Event

- Ø POND ROUTING / GRADING
 - HydraFlow Hydrographs software utilized for pond routing

DETENTION FACILITIES

There are two detention ponds proposed in this subdivision. This can be seen on the half-scale Drainage & Grading Plans in Exhibits 4 and 5. The ponds are described in more detail below.

Ø SOUTHEAST POND –EXISTING LOCATION –RESERVE C

The existing pond will be re-graded and re-worked and will be located in Reserve C. This pond will accept offsite runoff from the southeast and also developed runoff from the proposed subdivision. The pond will have a static water surface of a 1355.0 and a corresponding 100-year water surface elevation of a 1358.8. The pond will discharge via a 36" RCP and into the proposed pond located at the west of the development. The trees at the west of the pond will be retained at their respective elevations. The pond will have side slopes of 5:1 and is expected to be approximately 8 feet deep. This pond will be of surface water and will accept runoff from storm sewer systems as well as the adjacent proposed channel section.

Ø WEST POND –RESERVE B

The proposed pond in Reserve B will be partially located in the FEMA Regulatory Floodway and will be adjacent to the existing sanitary sewer force main. This pond will be constructed by excavation only and will match grades along its west bank, which is the utility easement which confines the sanitary sewer force main. This pond will be of ground water and is expected to have a static pool elevation of a 1339.0. This is the approximate groundwater elevation based on the adjacent Middle Branch Chisholm Creek flowline as well measurements taken downstream in Falcon Falls Additions. The pond will discharge at elevation of 1340.0, to preserve the live flow in

the creek, and will be conveyed in a 36" RCP. The 100-year water surface elevation is expected to be a 1343.4 with no tailwater elevation of the adjacent creek applied. As stated earlier, the west bank will match existing grades at approximate elevation 1346.0. A 30' weir section will be located, anticipating a 1.0 foot cut, over the sanitary sewer to the creek. This will allow for an outlet when full inundation by the 100-year flood event of the creek occurs. The adjacent lots will be 1.0 foot higher than that of the Base Flood Elevation which is at a 1348.6.

This pond was not modeled with a true tailwater of the adjacent creek. The pond will be fully inundated if this scenario would occur and the adjacent homesites would be one foot higher –based on the FEMA FIRM Panels BFE for this area.

DETENTION SUMMARY

Detention will be provided on the proposed site to limit the developed runoff to less than or equal to the existing conditions. The following tables represents the pond systems inflow and outflow for the 24-hour, 100-yr storm event.

POND

POND	INFLOW	OUTFLOW	100-yr WSE	OUTLET
South East	129 cfs	51 cfs	1358.8	36" RCP
West	240 cfs	41 cfs	1343.4*	36" RCP

* This WSE does not include a Tailwater of the adjacent creek. Upon the 100-year flood event, the pond will be fully inundated and will be equal to the creeks BFE.

DISCHARGE POINTS SUMMARY

This site drains to the west and into the adjacent Middle Branch Chisholm Creek. The creek is currently studied and located in a FEMA SFHA. This creek discharges under Hillside Avenue via a bridge and into the adjacent Falcon Falls Additions.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

There does not appear to be any significant impacts upstream or downstream of this proposed development. The development will detain its developed runoff as well as accept all offsite runoff from the east.

FLOODPLAIN SUBMITTAL

SOURCE OF FLOODPLAIN INFORMATION

This site lies in a FEMA SFHA Zone AE. A portion of the site is in the Regulatory Floodway and this area will be located in a Reserve. No fill will be placed in this reserve. Proposed lots will be located in the Floodplain and these areas will be filled to at least 1 foot above the published Base Flood Elevation. We expect these lots to then be removed from SFHA via LOMR-F. The location of the property, on FEMA FIRM Panel 218 of 700 for Sedgwick County, Kansas, revised to reflect LOMR Effective Date December 31, 2007 is attached as Exhibit 6.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

We do not expect any USACOE permitting at this time. Areas with stream sections are expected to be left as existing conditions. There does not appear to be any wetlands on the property as of this report.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

DWR permitting will be required in areas of the floodplain where fill is to be placed. These areas will require a Floodplain Fill permit prior to placement of any fill.

FEMA

A FEMA SFHA exists on this property and we expect a LOMR-F to be done after fill is placed. This will effectively remove the properties from the FEMA SFHA as well as update the respective maps.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project.

SEDGWICK COUNTY ROW

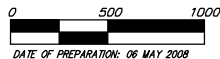
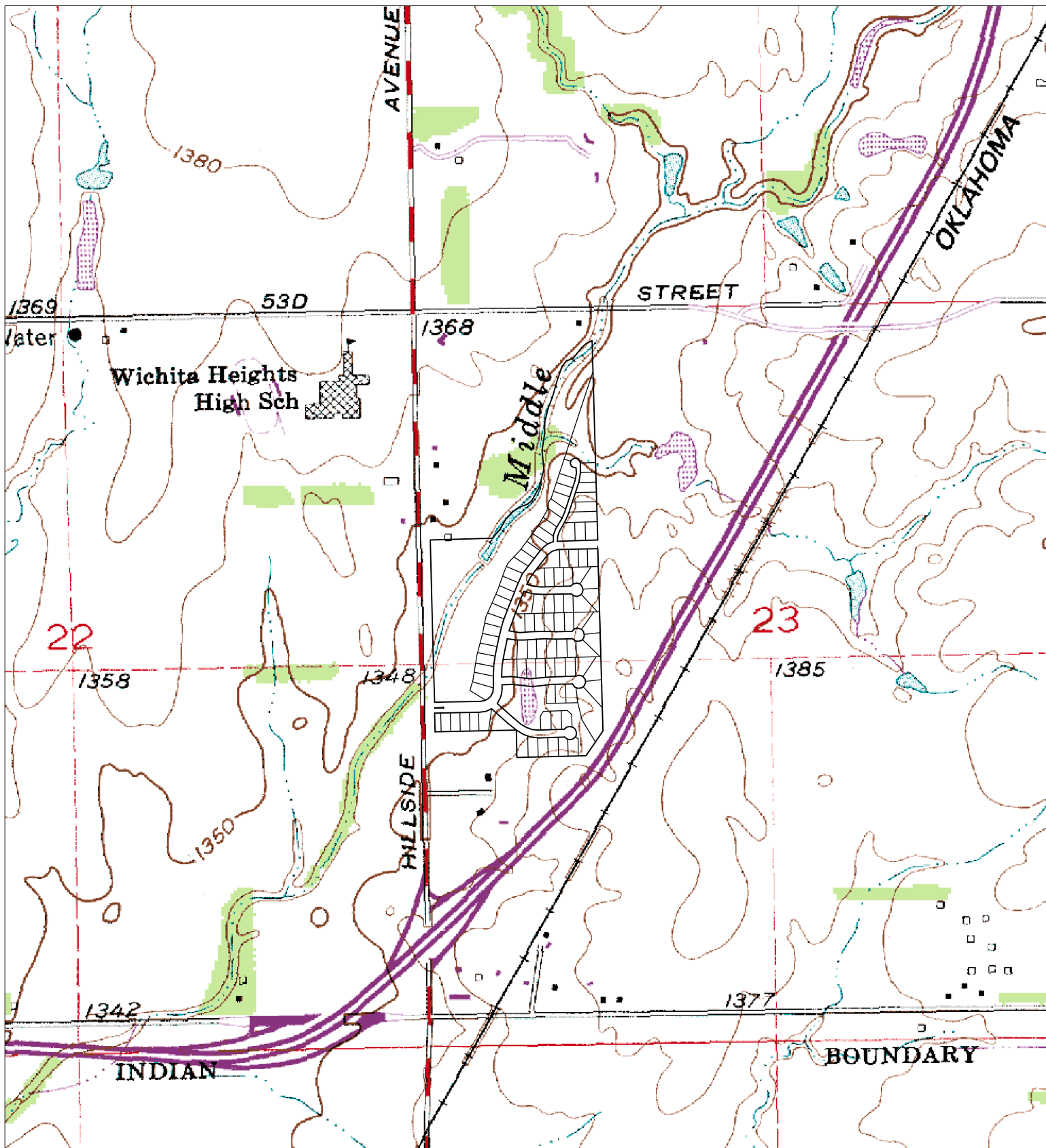
There does not appear to be any additional discharge into the county ROW. No permit is expected at this time.

EXHIBITS

- EXHIBIT 1: Site Location Map
- EXHIBIT 2: Aerial Photo Exhibit with Topography
- EXHIBIT 3: Plat –Half Scale
- EXHIBIT 4: Drainage Plan –Half Scale
- EXHIBIT 5: Grading Plan –Half Scale
- EXHIBIT 6: Floodplain Location (FIRM)

FALCON FALLS EAST

WICHITA, SEDGWICK COUNTY, KANSAS



AERIAL EXHIBIT
FALCON FALLS EAST
WICHITA, SEDGWICK COUNTY, KANSAS



0 250 500
DATE OF PREPARATION: 06 MAY 2008



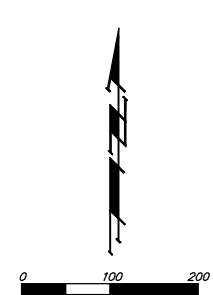
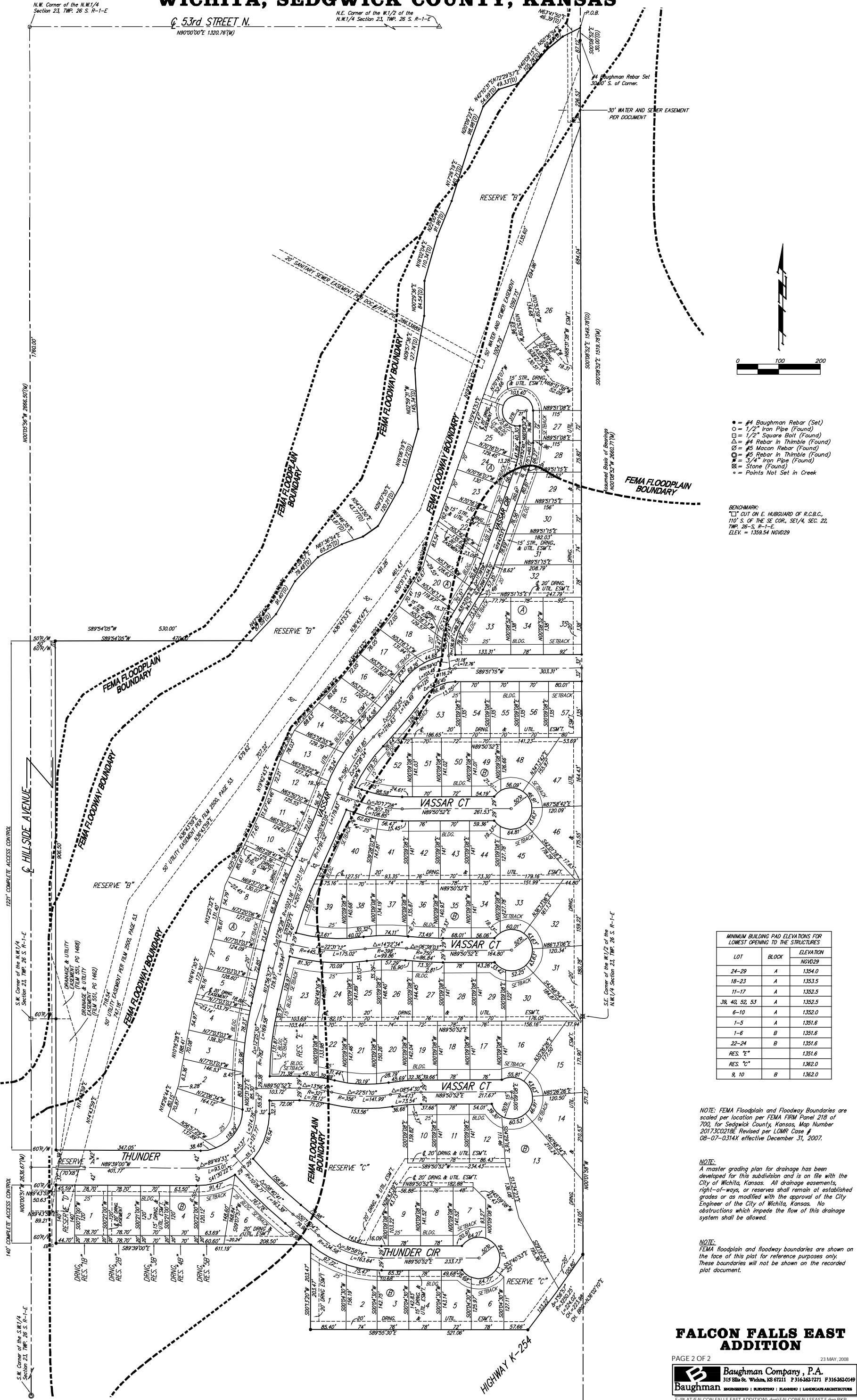
EXHIBIT 3
FALCON FALLS EAST

22 MAY 2008

 **Baughman Company, P.A.**
315 Ellis St. Wichita, KS 67211 P 316-262-2271 F 316-262-0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

FALCON FALLS EAST ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



- = #4 Baughman Rebar (Set)
 - = 1/2" Iron Pipe (Found)
 - = 1/2" Square Bolt (Found)
 - △ = #4 Rebar in Thimble (Found)
 - ⊙ = #5 Mason Rebar (Found)
 - ⊖ = #5 Rebar in Thimble (Found)
 - ⊗ = 3/4" Iron Pipe (Found)
 - ⊠ = Stone (Found)
 - = Points Not Set in Creek
- BENCHMARK:
 □ OUT ON E. HUBGUARD OF R.C.B.C.,
 110' S. OF THE SE COR., SE 1/4, SEC. 22,
 TWP. 26-S, R-1-E.
 ELEV. = 1359.54 NGVD29

LOT	BLOCK	ELEVATION NGVD29
24-29	A	1354.0
18-23	A	1353.5
11-17	A	1352.5
38, 40, 52, 53	A	1352.5
6-10	A	1352.0
1-5	A	1351.6
1-6	B	1351.6
22-24	B	1351.6
RES. "E"		1351.6
RES. "G"		1362.0
9, 10	B	1362.0

NOTE: FEMA Floodplain and Floodway Boundaries are scaled per location per FEMA FIRM Panel 218 of 700, for Sedgwick County, Kansas, Map Number 2017300218E Revised per LOMR Case # 08-07-0314X effective December 31, 2007.

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.

NOTE:
 FEMA floodplain and floodway boundaries are shown on the face of this plat for reference purposes only. These boundaries will not be shown on the recorded plat document.

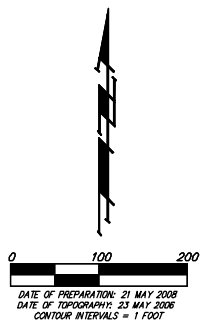
FALCON FALLS EAST ADDITION

DRAINAGE PLAN

FALCON FALLS EAST

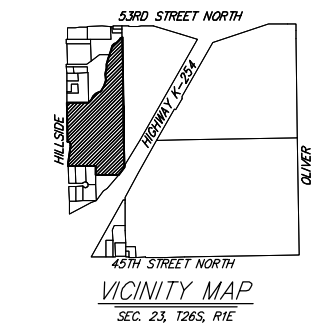
WICHITA, SEDGWICK COUNTY, KANSAS

© 53rd STREET N.



BENCHMARK:
 "C" CUT ON E HUBGUARD OF R.C.B.C.,
 110' S. OF THE SE COR., SEC. 22,
 TWP. 26-S, R-1-E,
 ELEV. = 1,359.54 NGVD29

NOTE: FEMA Floodplain and Floodway Boundaries are scaled per location per FEMA FIRM Panel 218 of 700, for Sedgwick County, Kansas, Map Number 20173C0218E Revised per LOMR Case # 08-07-0314X effective December 31, 2007.



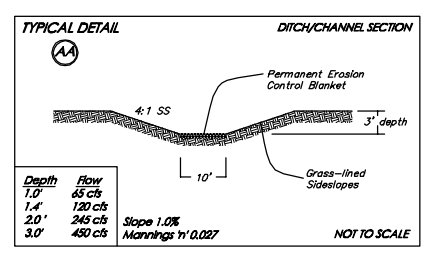
OFFSITE FLOW
 DA = 337 acres
 Tc = 264 min
 Qs = 58 cfs
 Q10 = 140 cfs
 Q100 = 283 cfs

OFFSITE FLOW
 DA = 1 acre
 SHEET FLOW

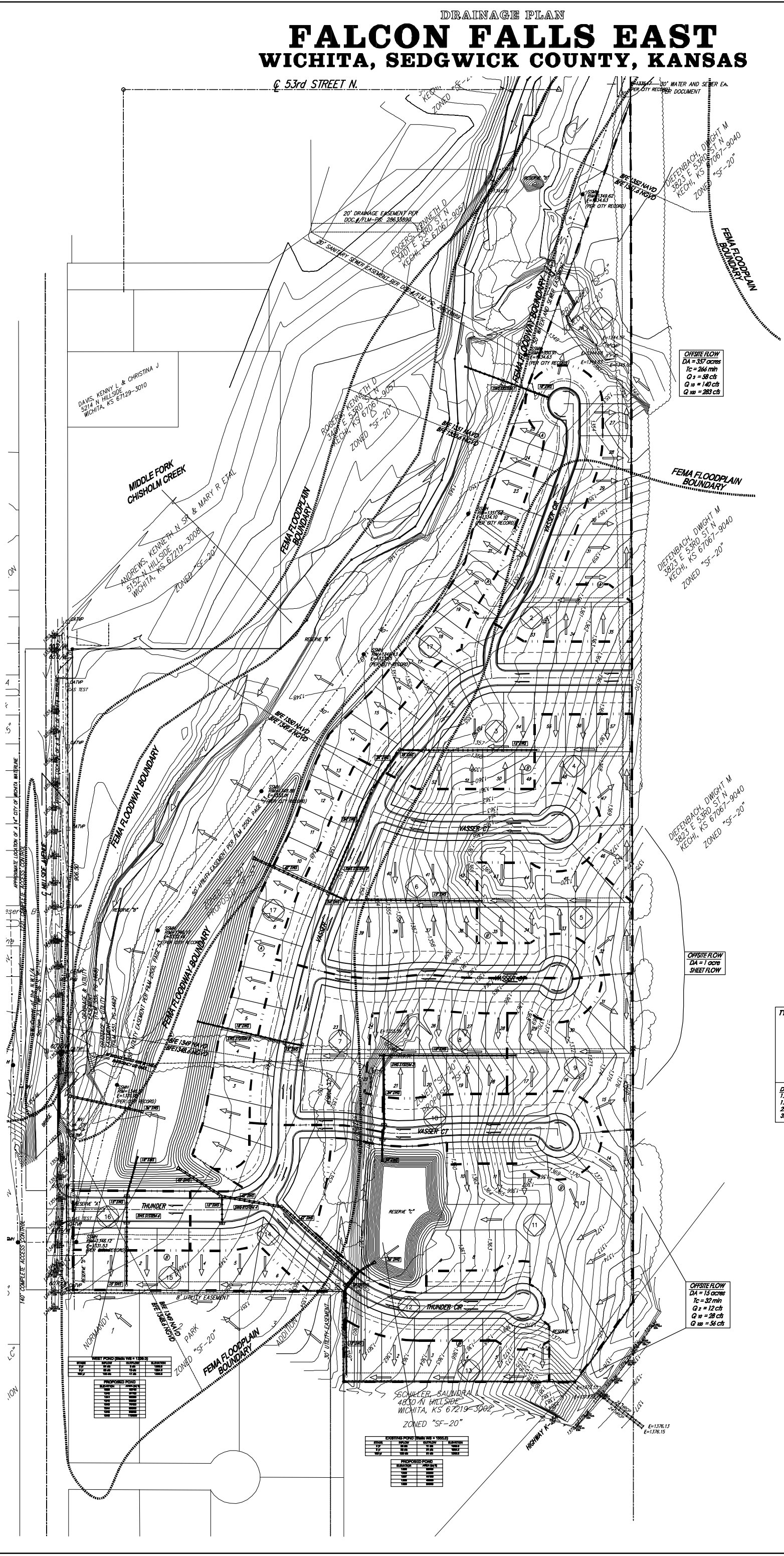
OFFSITE FLOW
 DA = 16 acres
 Tc = 32 min
 Qs = 28 cfs
 Q10 = 54 cfs
 Q100 = 54 cfs

Developed Intensity Rational C	2yr	10yr	100yr
	3.8	6.06	7.38
	0.48	0.57	0.68

Basin ID	Area acres	Developed Flowrates		
		2-yr cfs	25-yr cfs	100-yr cfs
1	2.6	4.7	9.0	13
2	2.5	4.6	8.6	13
3	3.2	5.8	11	16
4	1.2	2.2	4.1	6.0
5	1.4	2.6	4.8	7.0
6	5.5	10	19	28
7	3.0	5.5	10	15
8	1.4	2.6	4.8	7.0
9	1.5	2.7	5.2	7.5
10	1.7	3.1	5.9	8.5
11	5.1	9.3	18	26
12	1.5	2.7	5.2	7.5
13	1.0	1.8	3.5	5.0
14	1.9	3.5	6.6	9.5
15	1.0	1.8	3.5	5.0
16	0.8	1.5	2.8	4.0
17	3.7	6.7	13	19
TOTAL	39.0	71	135	195



LOT	BLOCK	ELEVATION NGVD29
24-29	A	1,354.0
18-23	A	1,353.5
11-17	A	1,352.5
39, 40, 52, 53	A	1,352.5
6-10	A	1,352.0
1-5	A	1,351.6
1-6	B	1,351.6
22-24	B	1,351.6
RES. "E"		1,351.6
RES. "C"		1,362.0
9, 10	B	1,362.0



PROPOSED POND

NO.	AREA	VOLUME	REMARKS
1	1.2	1000	
2	1.5	1200	
3	1.8	1500	
4	2.1	1800	
5	2.4	2100	
6	2.7	2400	
7	3.0	2700	
8	3.3	3000	
9	3.6	3300	
10	3.9	3600	
11	4.2	3900	
12	4.5	4200	
13	4.8	4500	
14	5.1	4800	
15	5.4	5100	
16	5.7	5400	
17	6.0	5700	
18	6.3	6000	
19	6.6	6300	
20	6.9	6600	
21	7.2	6900	
22	7.5	7200	
23	7.8	7500	
24	8.1	7800	
25	8.4	8100	
26	8.7	8400	
27	9.0	8700	
28	9.3	9000	
29	9.6	9300	
30	9.9	9600	
31	10.2	9900	
32	10.5	10200	
33	10.8	10500	
34	11.1	10800	
35	11.4	11100	
36	11.7	11400	
37	12.0	11700	
38	12.3	12000	
39	12.6	12300	
40	12.9	12600	
41	13.2	12900	
42	13.5	13200	
43	13.8	13500	
44	14.1	13800	
45	14.4	14100	
46	14.7	14400	
47	15.0	14700	
48	15.3	15000	
49	15.6	15300	
50	15.9	15600	
51	16.2	15900	
52	16.5	16200	
53	16.8	16500	
54	17.1	16800	
55	17.4	17100	
56	17.7	17400	
57	18.0	17700	
58	18.3	18000	
59	18.6	18300	
60	18.9	18600	
61	19.2	18900	
62	19.5	19200	
63	19.8	19500	
64	20.1	19800	
65	20.4	20100	
66	20.7	20400	
67	21.0	20700	
68	21.3	21000	
69	21.6	21300	
70	21.9	21600	
71	22.2	21900	
72	22.5	22200	
73	22.8	22500	
74	23.1	22800	
75	23.4	23100	
76	23.7	23400	
77	24.0	23700	
78	24.3	24000	
79	24.6	24300	
80	24.9	24600	
81	25.2	24900	
82	25.5	25200	
83	25.8	25500	
84	26.1	25800	
85	26.4	26100	
86	26.7	26400	
87	27.0	26700	
88	27.3	27000	
89	27.6	27300	
90	27.9	27600	
91	28.2	27900	
92	28.5	28200	
93	28.8	28500	
94	29.1	28800	
95	29.4	29100	
96	29.7	29400	
97	30.0	29700	
98	30.3	30000	
99	30.6	30300	
100	30.9	30600	

EXISTING POND (BASED ON 1980)

NO.	AREA	VOLUME	REMARKS
1	1.2	1000	
2	1.5	1200	
3	1.8	1500	
4	2.1	1800	
5	2.4	2100	
6	2.7	2400	
7	3.0	2700	
8	3.3	3000	
9	3.6	3300	
10	3.9	3600	
11	4.2	3900	
12	4.5	4200	
13	4.8	4500	
14	5.1	4800	
15	5.4	5100	
16	5.7	5400	
17	6.0	5700	
18	6.3	6000	
19	6.6	6300	
20	6.9	6600	
21	7.2	6900	
22	7.5	7200	
23	7.8	7500	
24	8.1	7800	
25	8.4	8100	
26	8.7	8400	
27	9.0	8700	
28	9.3	9000	
29	9.6	9300	
30	9.9	9600	
31	10.2	9900	
32	10.5	10200	
33	10.8	10500	
34	11.1	10800	
35	11.4	11100	
36	11.7	11400	
37	12.0	11700	
38	12.3	12000	
39	12.6	12300	
40	12.9	12600	
41	13.2	12900	
42	13.5	13200	
43	13.8	13500	
44	14.1	13800	
45	14.4	14100	
46	14.7	14400	
47	15.0	14700	
48	15.3	15000	
49	15.6	15300	
50	15.9	15600	
51	16.2	15900	
52	16.5	16200	
53	16.8	16500	
54	17.1	16800	
55	17.4	17100	
56	17.7	17400	
57	18.0	17700	
58	18.3	18000	
59	18.6	18300	
60	18.9	18600	
61	19.2	18900	
62	19.5	19200	
63	19.8	19500	
64	20.1	19800	
65	20.4	20100	
66	20.7	20400	
67	21.0	20700	
68	21.3	21000	
69	21.6	21300	
70	21.9	21600	
71	22.2	21900	
72	22.5	22200	
73	22.8	22500	
74	23.1	22800	
75	23.4	23100	
76	23.7	23400	
77	24.0	23700	
78	24.3	24000	
79	24.6	24300	
80	24.9	24600	
81	25.2	24900	
82	25.5	25200	
83	25.8	25500	
84	26.1	25800	
85	26.4	26100	
86	26.7	26400	
87	27.0	26700	
88	27.3	27000	
89	27.6	27300	
90	27.9	27600	
91	28.2	27900	
92	28.5	28200	
93	28.8	28500	
94	29.1	28800	
95	29.4	29100	
96	29.7	29400	
97	30.0	29700	
98	30.3	30000	
99	30.6	30300	
100	30.9	30600	

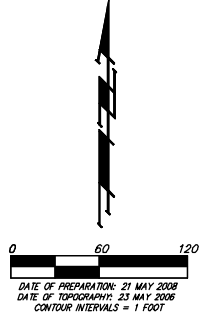
GRADING PLAN

FALCON FALLS EAST

WICHITA, SEDGWICK COUNTY, KANSAS

c. 53rd STREET N.

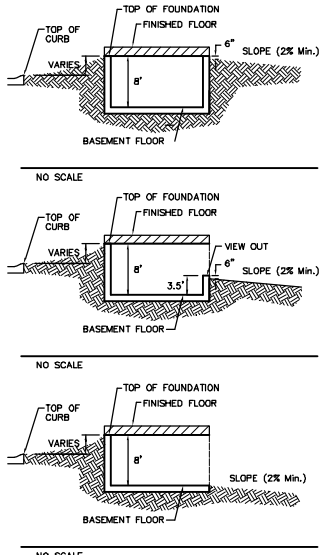
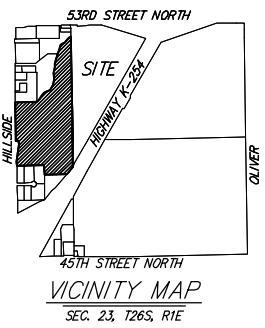
FEMA FLOODPLAIN BOUNDARY



BENCHMARK:
"1" CUT ON E. HUBGARD OF R.C.B.C.,
110' S. OF THE SE COR. SE 1/4, SEC. 22,
TWP. 26-S., R-1-E.
ELEV. = 1359.54 NGVD29

NOTE: FEMA Floodplain and Floodway Boundaries are scaled per location per FEMA FIRM Panel 218 of 700, for Sedgwick County, Kansas, Map Number 2317300218E Revised per LOMR Case # 08-07-0314X effective December 31, 2007.

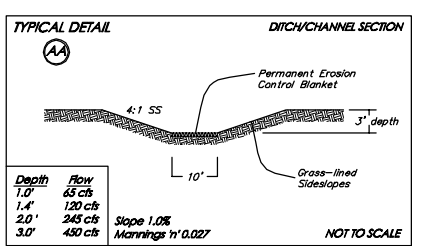
OFFSITE FLOW
DA = 357 acres
Tc = 266 min
Q 2 = 58 cfs
Q 10 = 140 cfs
Q 100 = 283 cfs



- NOTES:**
1. PROPOSED TOP OF FOUNDATION ELEVATIONS ARE SHOWN ON PLANS. CONTRACTOR TO SET FINISHED FLOOR AND GARAGE FLOOR ELEVATIONS. ALL STREET ELEVATIONS SHOWN ON PLANS ARE FOR TOP OF CURB (FULL-HEIGHT).
 2. THIS GRADING PLAN IS DESIGNED WITH VIEW-OUTS AND WALK-OUTS. ELEVATIONS SHOWN AS XXX V.O. DEPICT VIEW-OUT STRUCTURES. ELEVATIONS SHOWN AS XXX W.O. DEPICT WALK-OUT STRUCTURES.
 3. ALL LOTS SHALL MEET MINIMUM PAD REQUIREMENT AS SHOWN ON THE RECORDED PLAT.

MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION NGVD29
24-29	A	1354.0
18-23	A	1353.5
11-17	A	1352.5
39, 40, 52, 53	A	1352.5
6-10	A	1352.0
1-5	A	1351.6
1-6	B	1351.6
22-24	B	1351.6
RES. "E"		1351.6
RES. "C"		1362.0
9, 10	B	1362.0

4. LOT DIMENSIONS HAVE BEEN OMITTED ON THIS PLAN. REFER TO THE RECORDED PLAT FOR FINAL DIMENSION, EASEMENT, & BUILDING SETBACK INFORMATION.
5. HOUSE PAD ELEVATIONS DEPICTED NOTED WITH THIS SYMBOL ● INDICATE THAT DEEP FOOTINGS OR DEEP FOUNDATIONS MAY BE REQUIRED.
6. A DRAINAGE PLAN HAS BEEN DEVELOPED FOR THIS SUBDIVISION AND IS ON FILE WITH THE CITY OF WICHITA, KANSAS. DRAINAGE INTENT SHALL REMAIN AS DEPICTED 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 PLAN SHALL BE ALLOWED.
7. ALL ELEVATIONS SHOWN ARE IN NGVD.



OFFSITE FLOW
DA = 1 acre
SHEET FLOW

DIEFFENBACH, DWIGHT M
3823 E 53RD ST N
KECHI, KS 67067-9040
ZONED "SF-20"

GRADING PLAN SHEET 1 FALCON FALLS EAST

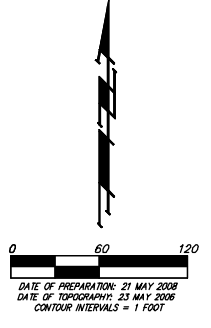
Baughman **Baughman Company, P.A.**
315 Ellis St. Wichita, KS 67211 P 316-262-7211 F 316-262-0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

GRADING PLAN

FALCON FALLS EAST

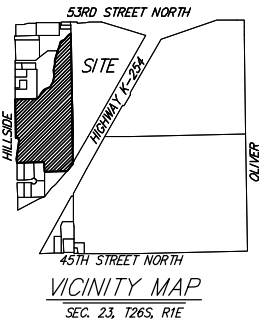
WICHITA, SEDGWICK COUNTY, KANSAS

c. 53rd STREET N.

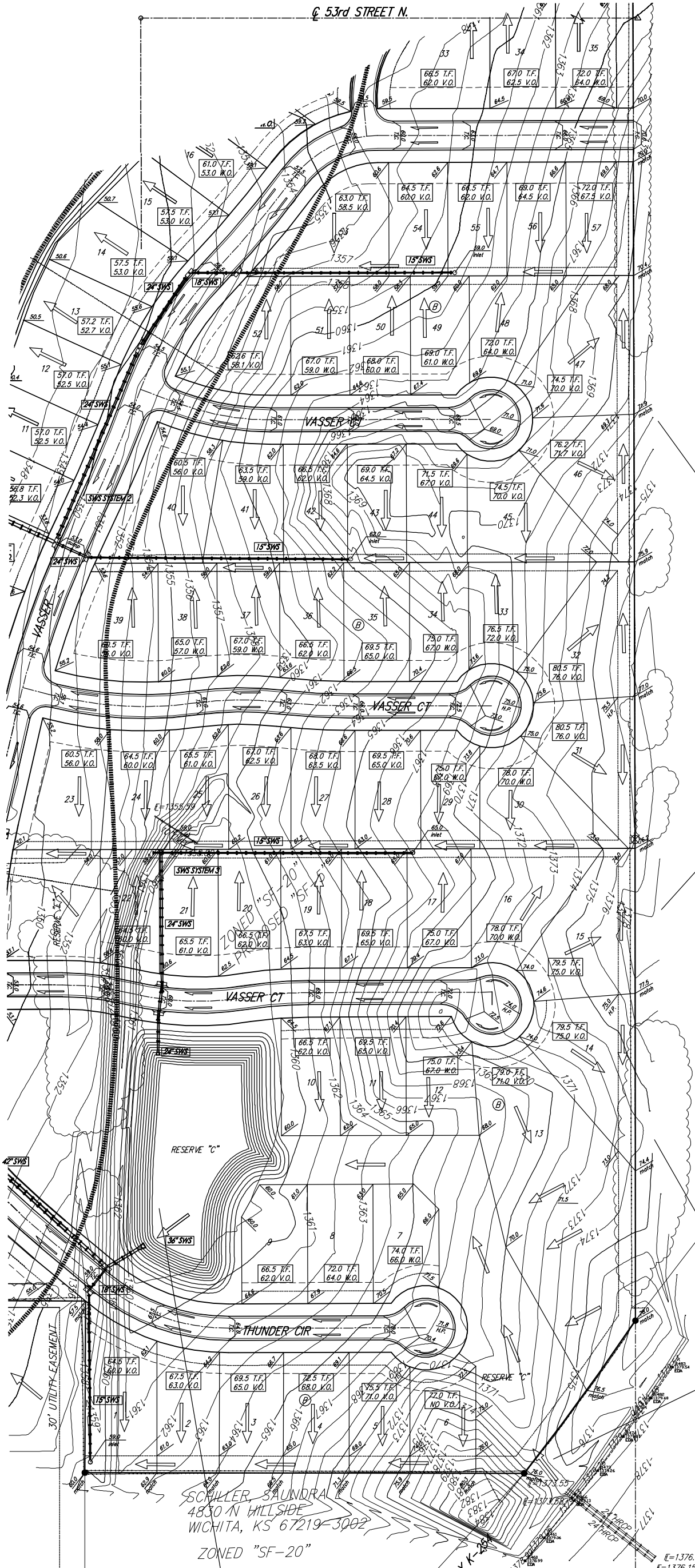


BENCHMARK:
"C" CUT ON E. HUBGUARD OF R.C.B.C.,
110' S. OF THE SE COR. SE 1/4, SEC. 22,
TWP. 26-S, R-1-E.
ELEV. = 1359.54 NGVD29

NOTE: FEMA Floodplain and Floodway
Boundaries are scaled per location per
FEMA FIRM Panel 218 of 700, for Sedgwick
County, Kansas, Map Number 2317300218E
Revised per LOMR Case # 08-07-0314X
effective December 31, 2007.

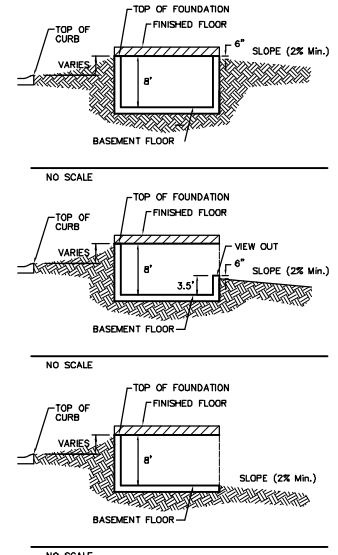


DIEFFENBACH, DWIGHT M
3823 E 53RD ST N
KECHI, KS 67067-9040
ZONED "SF-20"



OFFSITE FLOW
DA = 1 acre
SHEET FLOW

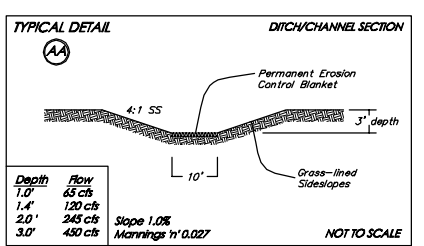
OFFSITE FLOW
DA = 15 acres
Tc = 32 min
Q2 = 12 cfs
Q10 = 28 cfs
Q100 = 56 cfs



- NOTES:**
1. PROPOSED TOP OF FOUNDATION ELEVATIONS ARE SHOWN ON PLANS. CONTRACTOR TO SET FINISHED FLOOR AND GARAGE FLOOR ELEVATIONS. ALL STREET ELEVATIONS SHOWN ON PLANS ARE FOR TOP OF CURB (FULL-HEIGHT).
 2. THIS GRADING PLAN IS DESIGNED WITH VIEW-OUTS AND WALK-OUTS. ELEVATIONS SHOWN AS XXX V.O. DEPICT VIEW-OUT STRUCTURES. ELEVATIONS SHOWN AS XXX W.O. DEPICT WALK-OUT STRUCTURES.
 3. ALL LOTS SHALL MEET MINIMUM PAD REQUIREMENT AS SHOWN ON THE RECORDED PLAT.

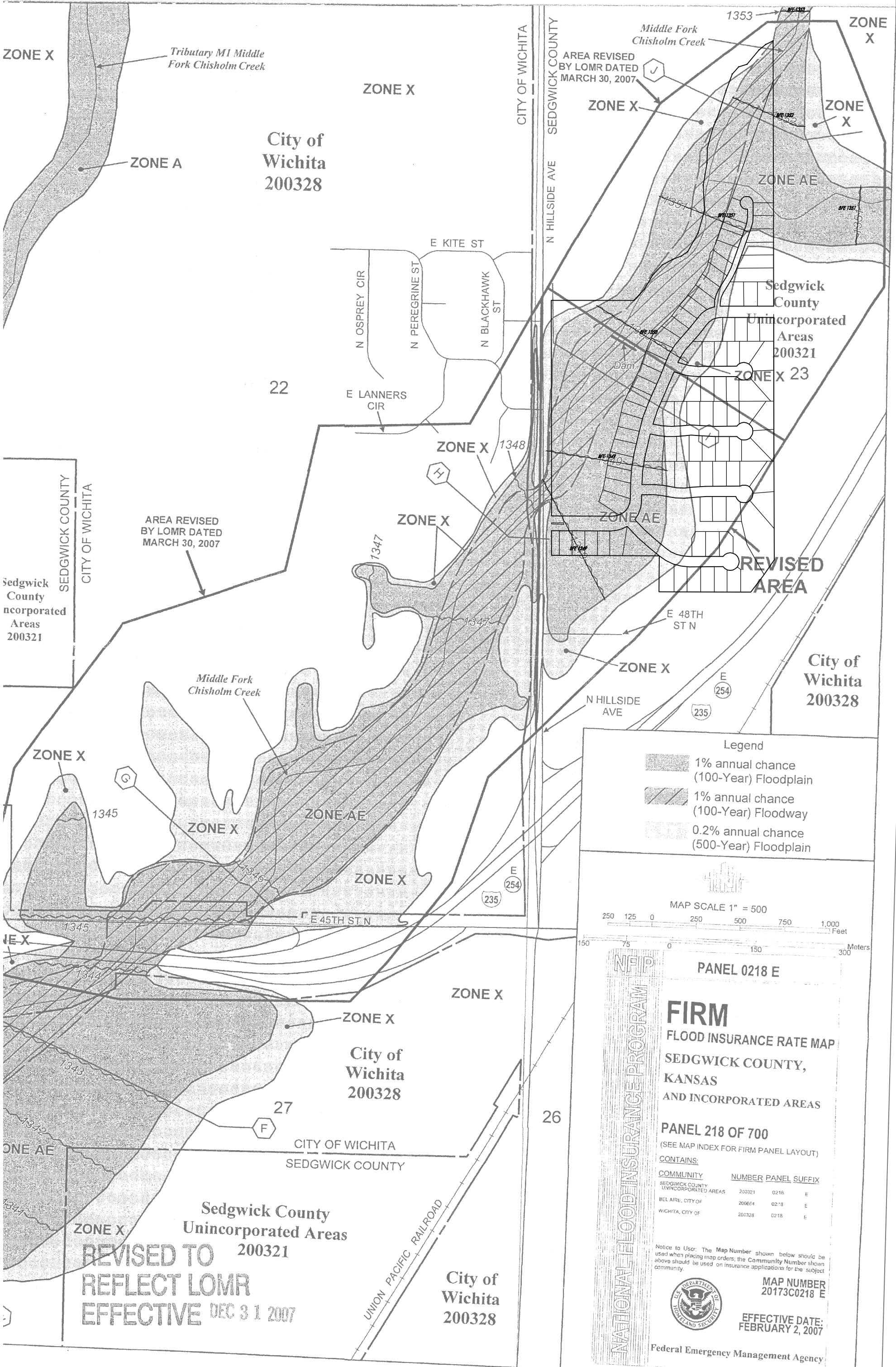
MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION NGVD29
24-29	A	1354.0
18-23	A	1353.5
11-17	A	1352.5
39, 40, 52, 53	A	1352.5
6-10	A	1352.0
1-5	A	1351.6
1-6	B	1351.6
22-24	B	1351.6
RES. "E"		1351.6
RES. "C"		1362.0
9, 10	B	1362.0

4. LOT DIMENSIONS HAVE BEEN OMITTED ON THIS PLAN. REFER TO THE RECORDED PLAT FOR FINAL DIMENSION, EASEMENT, & BUILDING SETBACK INFORMATION.
5. HOUSE PAD ELEVATIONS DEPICTED NOTED WITH THIS SYMBOL (circle with dot) INDICATE THAT DEEP FOOTINGS OR DEEP FOUNDATIONS MAY BE REQUIRED.
6. A DRAINAGE PLAN HAS BEEN DEVELOPED FOR THIS SUBDIVISION AND IS ON FILE WITH THE CITY OF WICHITA, KANSAS. DRAINAGE INTENT SHALL REMAIN AS DEPICTED 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 PLAN SHALL BE ALLOWED.
7. ALL ELEVATIONS SHOWN ARE IN NGVD.



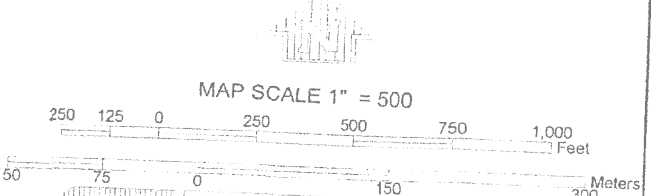
EXISTING POND (Stagc WS = 1365.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	36 cfs	11 cfs	1363.9
5 yr	26 cfs	8 cfs	1363.2
100 yr	128 cfs	81 cfs	1365.8

PROPOSED POND	
ELEVATION	AREA (sq ft)
1366	36000
1367	44100
1368	48600



Legend

- 1% annual chance (100-Year) Floodplain
- 1% annual chance (100-Year) Floodway
- 0.2% annual chance (500-Year) Floodplain



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0218 E

FIRM
FLOOD INSURANCE RATE MAP
SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 218 OF 700
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY UNINCORPORATED AREAS	200321	0216	E
BEL AIRE, CITY OF	2006E4	0218	E
WICHITA, CITY OF	200328	0218	E

Notice to User: The Map Number shown below should be used when placing map orders, the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0218 E

EFFECTIVE DATE:
FEBRUARY 2, 2007

Federal Emergency Management Agency

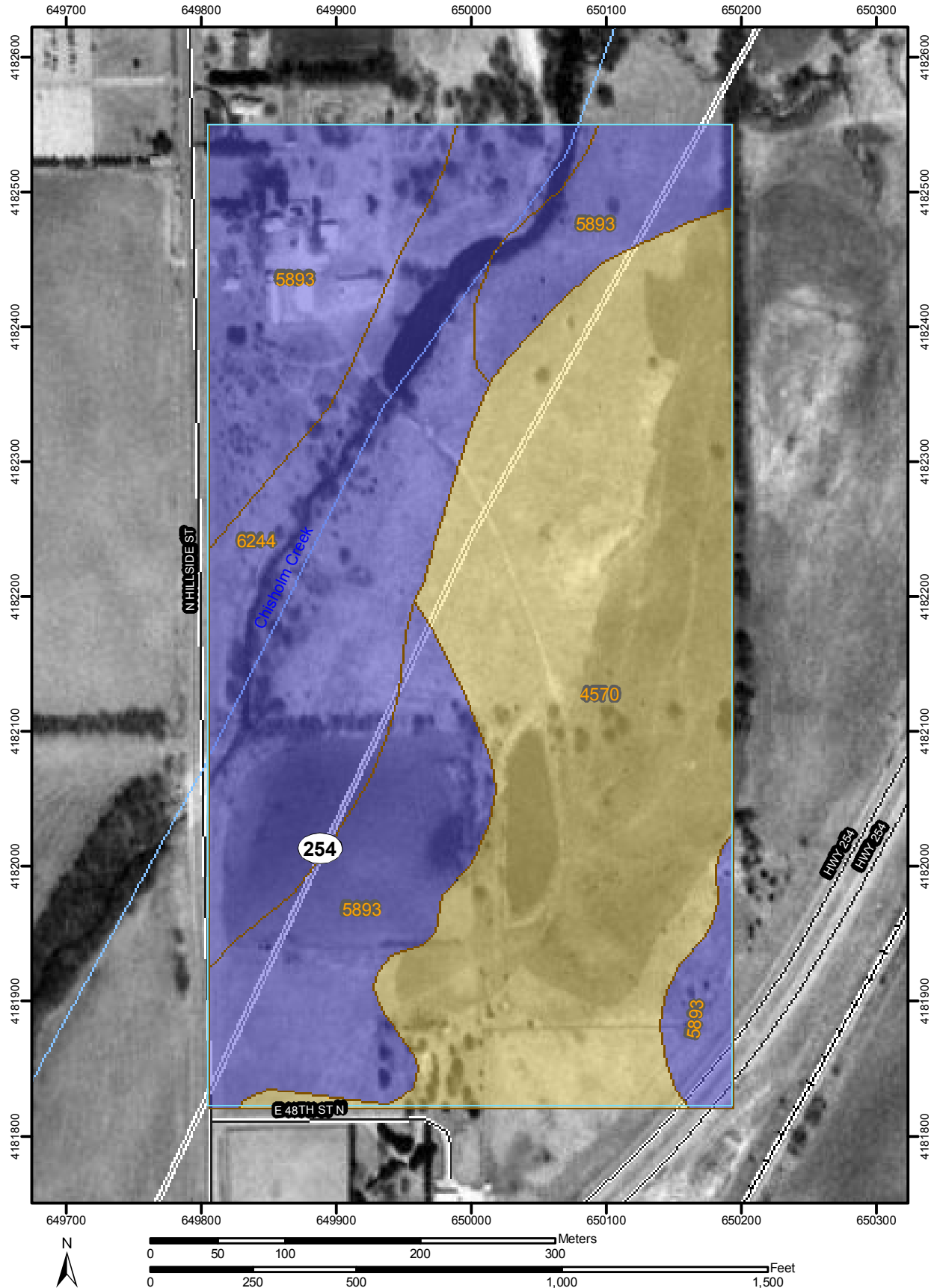
REVISED TO REFLECT LOMR EFFECTIVE DEC 31 2007

SUPPORTING CALCULATIONS

- APPENDIX A: USGS Soils Survey
- APPENDIX B: HydraFlow Hydrographs Routing
- Existing & Proposed Conditions
- APPENDIX C: HydraFlow Stormsewer Routing
- Systems 1-7
- APPENDIX D: HydraFlow Express
- Proposed Channel


USGS Soils Survey

Hydrologic Soil Group—Sedgwick County, Kansas
(Falcon Falls East)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 A

 A/D

 B

 B/D

 C

 C/D


 D

 Not rated or not available

Political Features


Municipalities

 Cities

 Urban Areas

Water Features

 Oceans

 Streams and Canals

Transportation

 Rails


Roads

 Interstate Highways

 US Routes

 State Highways

 Local Roads

 Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 14N

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 4, Dec 29, 2007

Date(s) aerial images were photographed: 3/20/1996

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				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
4570	Clime silty clay, 3 to 7 percent slopes	C	30.6	43.9%
5893	Farnum loam, 1 to 3 percent slopes	B	22.8	32.7%
6244	Elandco silt loam, rarely flooded	B	16.4	23.5%
Totals for Area of Interest (AOI)			69.8	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: Lower

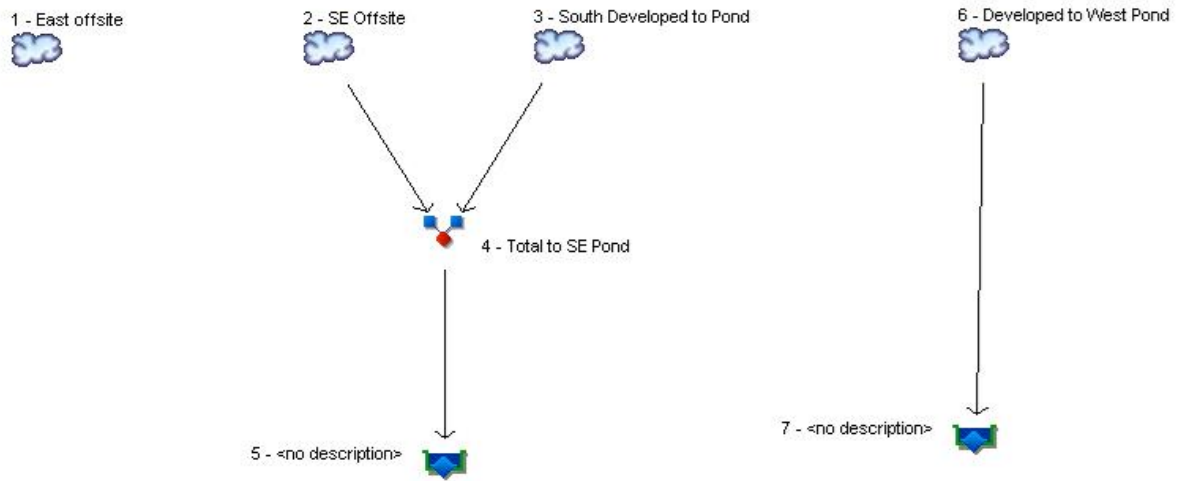
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

HydraFlow Hydrographs Routing

Existing & Proposed Conditions

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.02



Legend

Hyd.	Origin	Description
1	SCS Runoff	East offsite
2	SCS Runoff	SE Offsite
3	SCS Runoff	South Developed to Pond
4	Combine	Total to SE Pond
5	Reservoir	<no description>
6	SCS Runoff	Developed to West Pond
7	Reservoir	<no description>

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.02

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	-----	-----	57.68	-----	101.16	140.34	182.27	-----	282.96	East offsite
2	SCS Runoff	-----	-----	11.71	-----	20.63	28.43	36.65	-----	56.14	SE Offsite
3	SCS Runoff	-----	-----	28.16	-----	41.17	51.78	62.46	-----	86.54	South Developed to Pond
4	Combine	2, 3	-----	35.83	-----	55.54	72.12	89.17	-----	128.52	Total to SE Pond
5	Reservoir	4	-----	10.98	-----	20.93	29.48	37.67	-----	51.18	<no description>
6	SCS Runoff	-----	-----	61.01	-----	89.20	112.18	135.33	-----	187.50	Developed to West Pond
7	Reservoir	6	-----	5.063	-----	13.33	22.17	30.46	-----	40.89	<no description>

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	
1	SCS Runoff	57.68	2	890	1,308,471	----	-----	-----	East offsite	
2	SCS Runoff	11.71	2	734	55,948	----	-----	-----	SE Offsite	
3	SCS Runoff	28.16	2	722	78,935	----	-----	-----	South Developed to Pond	
4	Combine	35.83	2	724	134,883	2, 3	-----	-----	Total to SE Pond	
5	Reservoir	10.98	2	752	134,834	4	1356.27	49,240	<no description>	
6	SCS Runoff	61.01	2	722	171,026	----	-----	-----	Developed to West Pond	
7	Reservoir	5.063	2	776	123,065	6	1340.84	94,597	<no description>	
Ponds.gpw					Return Period: 2 Year			Thursday, May 22, 2008		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 1

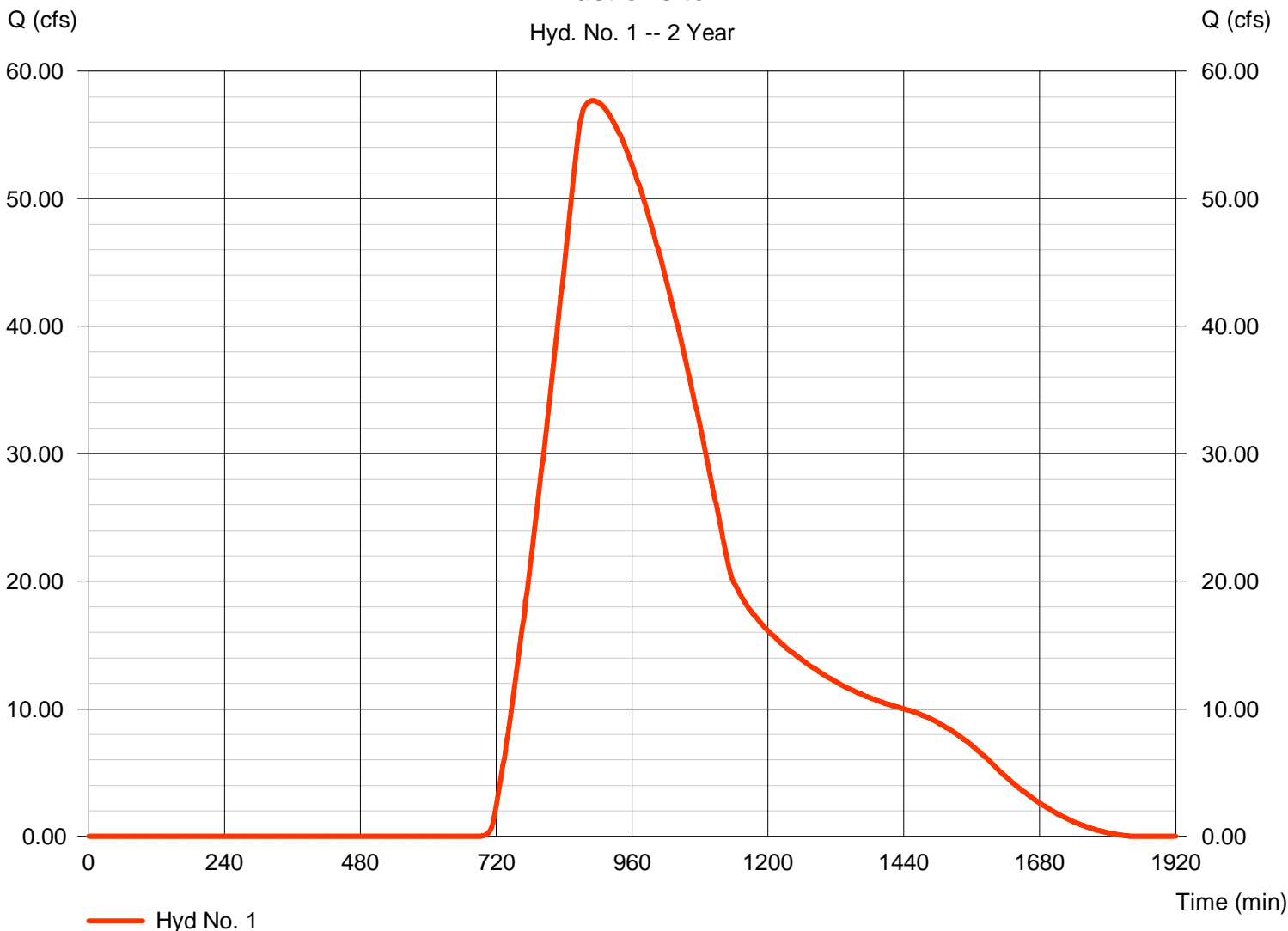
East offsite

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 357.000 ac
 Basin Slope = 0.8 %
 Tc method = LAG
 Total precip. = 3.50 in
 Storm duration = 24 hrs

Peak discharge = 57.68 cfs
 Time to peak = 890 min
 Hyd. volume = 1,308,471 cuft
 Curve number = 70
 Hydraulic length = 8600 ft
 Time of conc. (Tc) = 265.67 min
 Distribution = Type II
 Shape factor = 484

East offsite

Hyd. No. 1 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

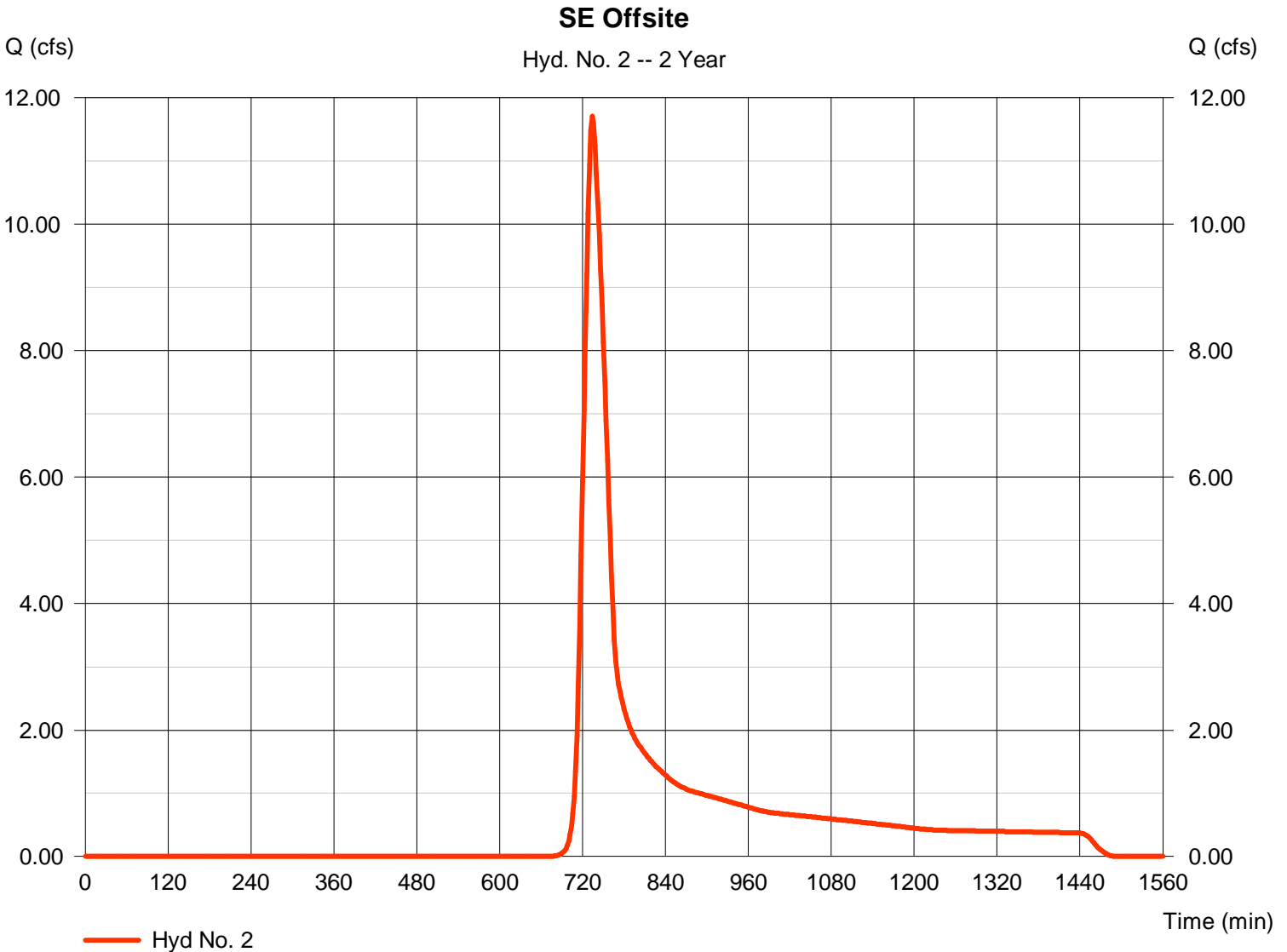
Thursday, May 22, 2008

Hyd. No. 2

SE Offsite

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 15.100 ac
 Basin Slope = 1.2 %
 Tc method = LAG
 Total precip. = 3.50 in
 Storm duration = 24 hrs

Peak discharge = 11.71 cfs
 Time to peak = 734 min
 Hyd. volume = 55,948 cuft
 Curve number = 70
 Hydraulic length = 800 ft
 Time of conc. (Tc) = 32.45 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 3

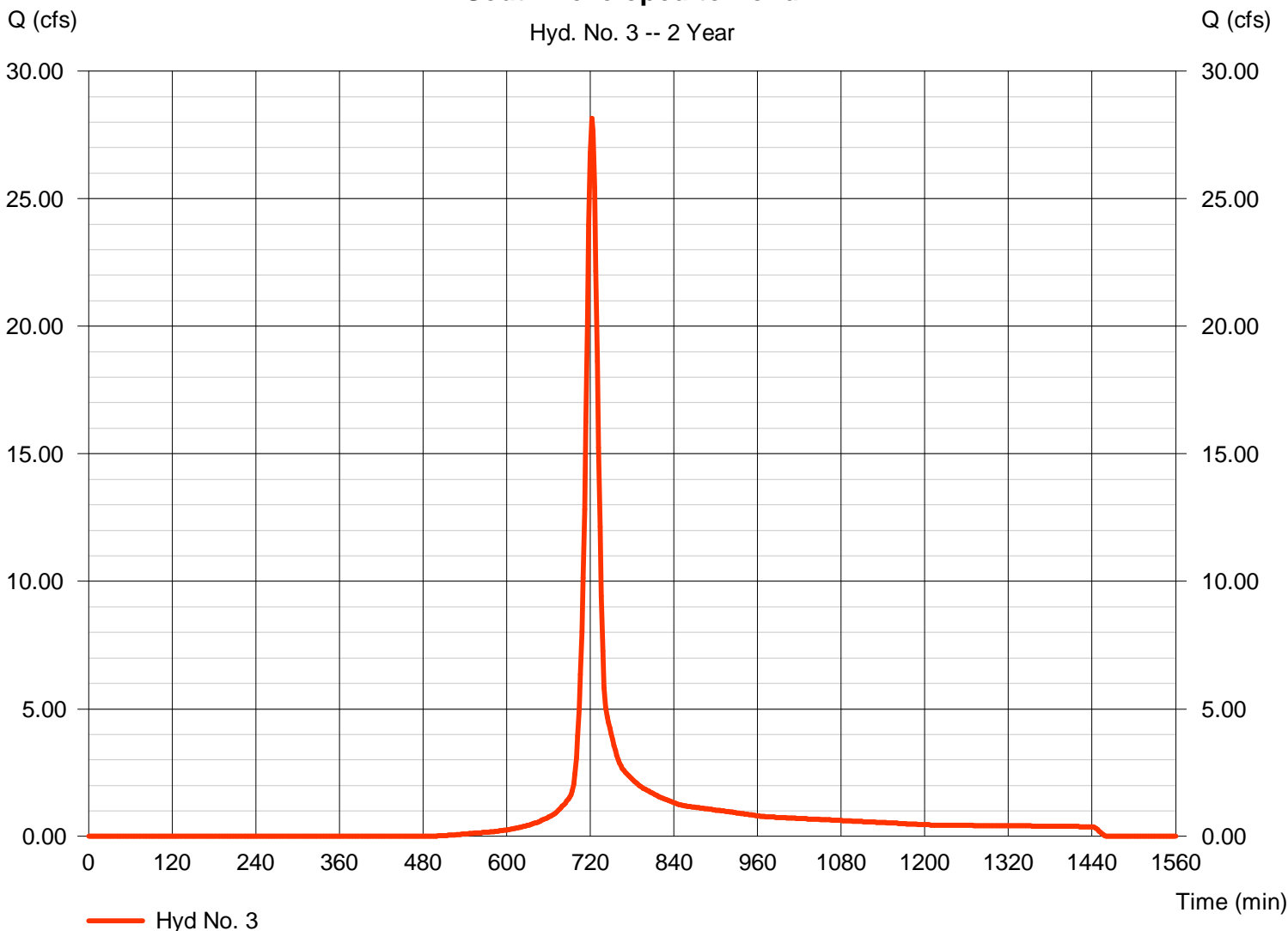
South Developed to Pond

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 12.000 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.50 in
 Storm duration = 24 hrs

Peak discharge = 28.16 cfs
 Time to peak = 722 min
 Hyd. volume = 78,935 cuft
 Curve number = 83
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.00 min
 Distribution = Type II
 Shape factor = 484

South Developed to Pond

Hyd. No. 3 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

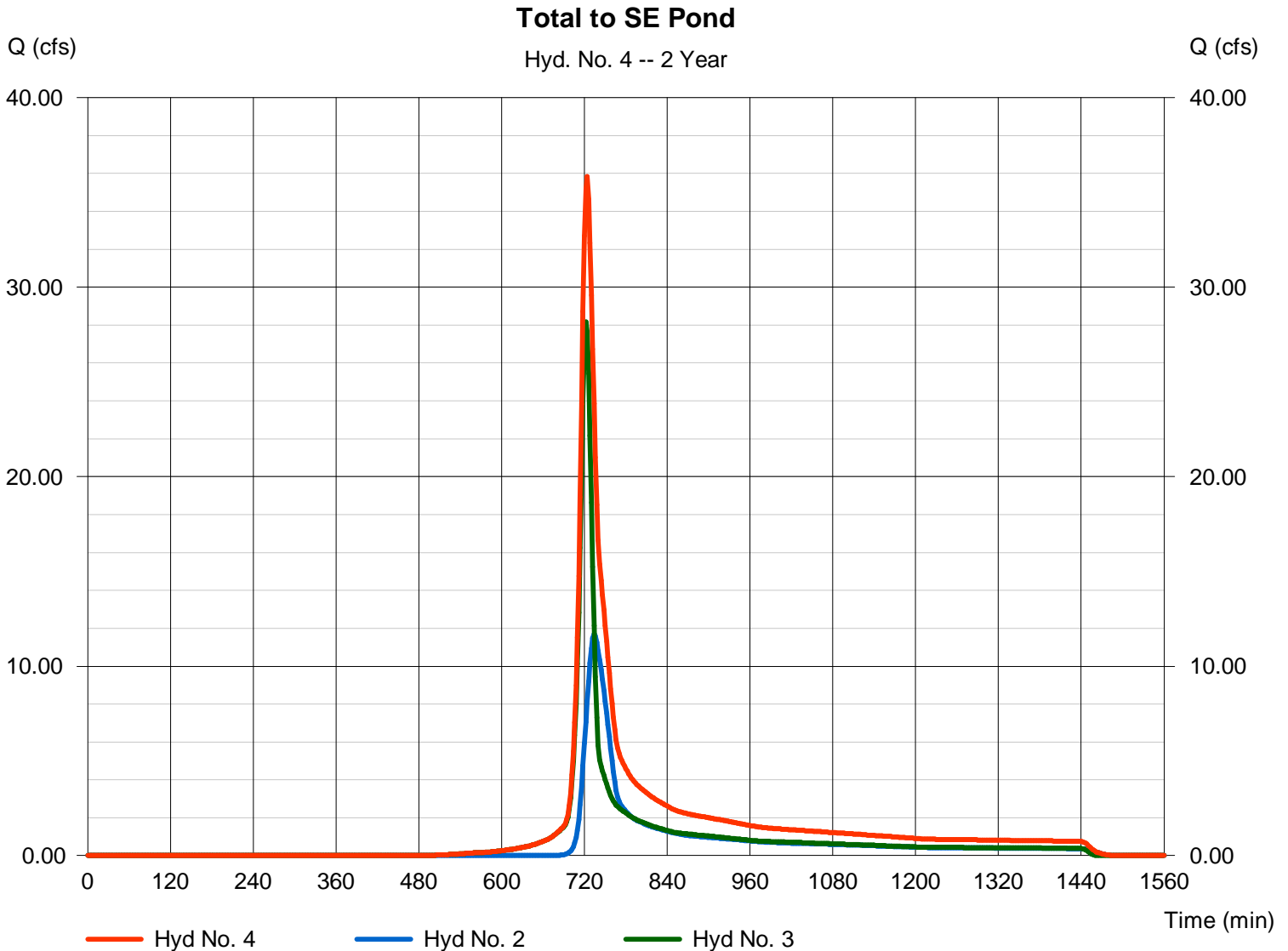
Thursday, May 22, 2008

Hyd. No. 4

Total to SE Pond

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 35.83 cfs
Time to peak = 724 min
Hyd. volume = 134,883 cuft
Contrib. drain. area = 27.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

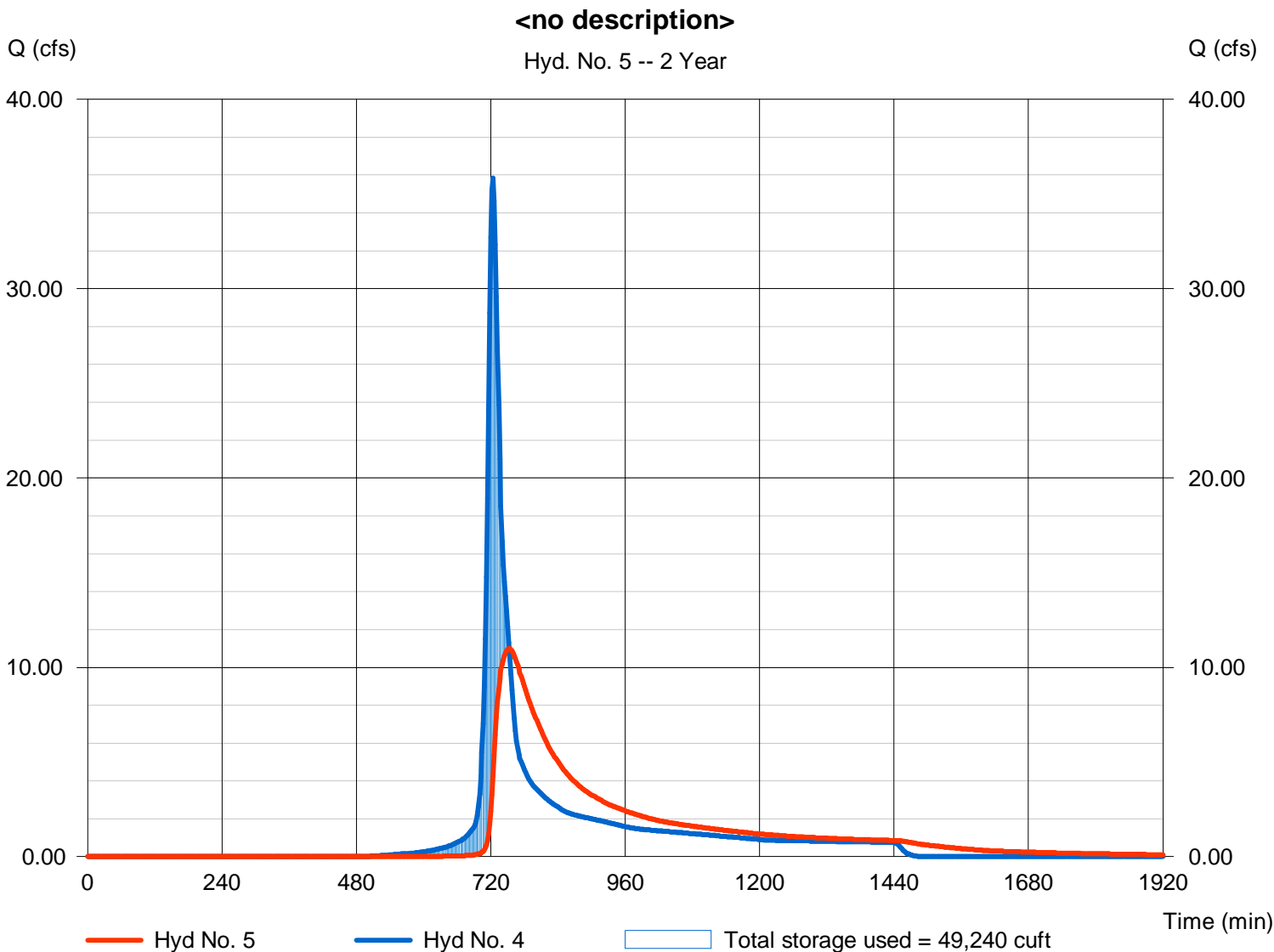
Thursday, May 22, 2008

Hyd. No. 5

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 10.98 cfs
Storm frequency	= 2 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 134,834 cuft
Inflow hyd. No.	= 4 - Total to SE Pond	Max. Elevation	= 1356.27 ft
Reservoir name	= South East Pond	Max. Storage	= 49,240 cuft

Storage Indication method used.



Pond No. 1 - South East Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1355.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1355.00	35,700	0	0
1.00	1356.00	39,900	37,777	37,777
2.00	1357.00	44,100	41,978	79,755
3.00	1358.00	48,500	46,278	126,033
4.00	1359.00	53,000	50,728	176,761

Culvert / Orifice Structures

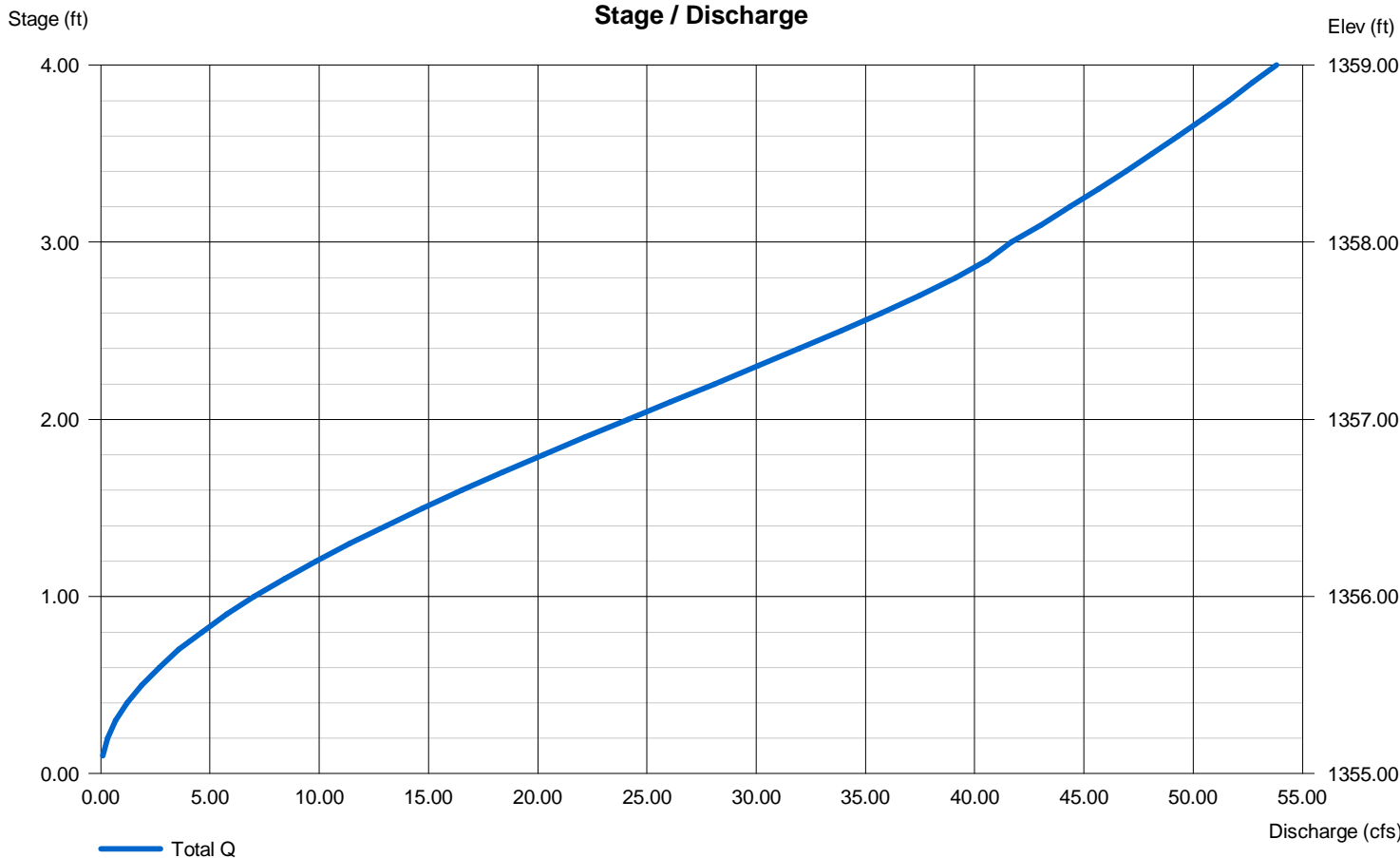
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1355.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Discharge



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

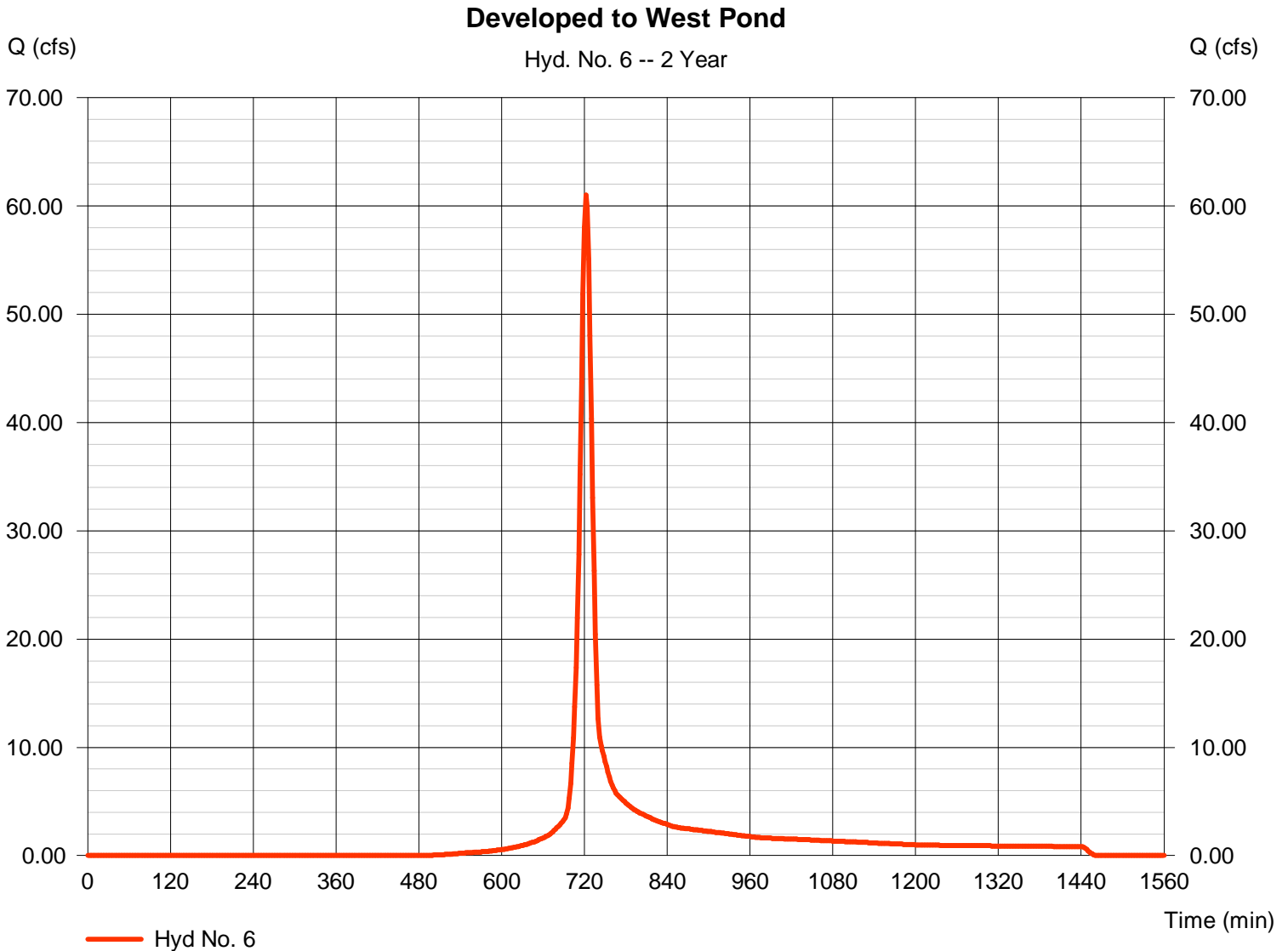
Thursday, May 22, 2008

Hyd. No. 6

Developed to West Pond

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 26.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.50 in
Storm duration = 24 hrs

Peak discharge = 61.01 cfs
Time to peak = 722 min
Hyd. volume = 171,026 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

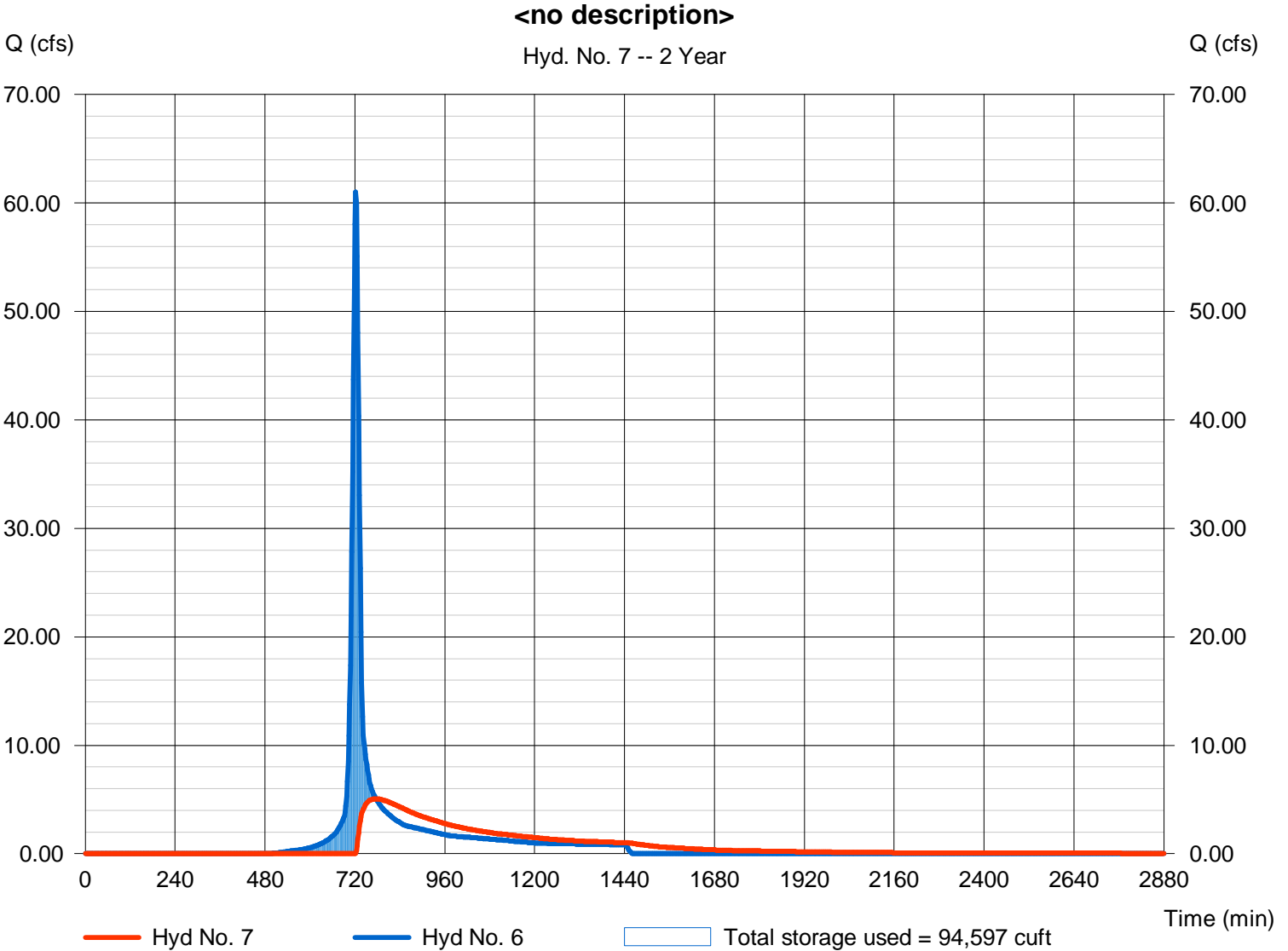
Thursday, May 22, 2008

Hyd. No. 7

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 5.063 cfs
Storm frequency	= 2 yrs	Time to peak	= 776 min
Time interval	= 2 min	Hyd. volume	= 123,065 cuft
Inflow hyd. No.	= 6 - Developed to West Pond	Max. Elevation	= 1340.84 ft
Reservoir name	= West Pond	Max. Storage	= 94,597 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - West Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1339.00	43,740	0	0
1.00	1340.00	51,700	47,660	47,660
2.00	1341.00	60,250	55,915	103,575
3.00	1342.00	69,500	64,813	168,388
4.00	1343.00	79,100	74,241	242,629
5.00	1344.00	89,300	84,140	326,769
6.00	1345.00	99,800	94,492	421,261
7.00	1346.00	113,600	106,615	527,876
8.00	1347.00	135,100	124,182	652,058

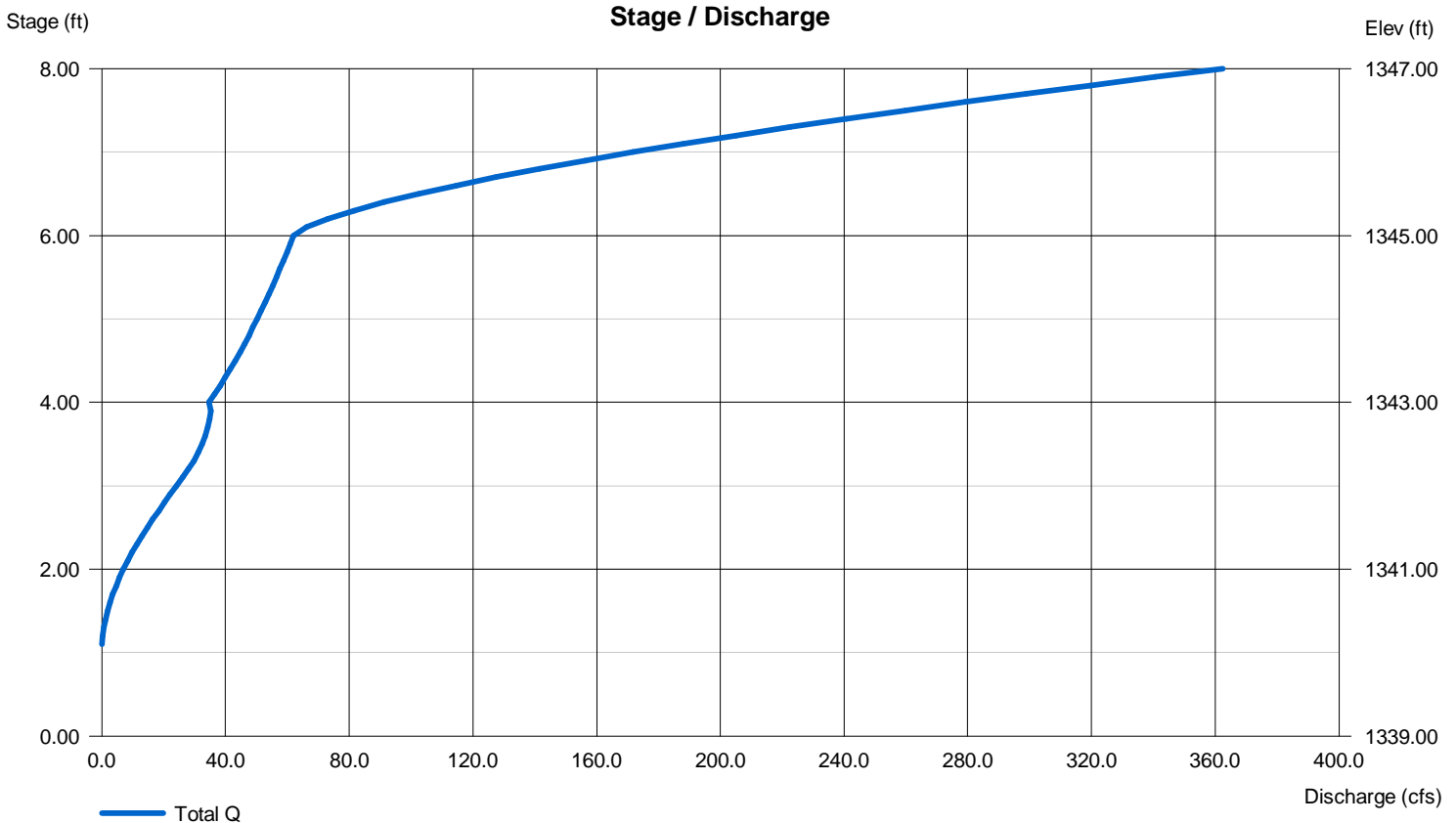
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1340.00	0.00	0.00	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.70	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)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1345.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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
1	SCS Runoff	101.16	2	882	2,172,451	----	-----	-----	East offsite
2	SCS Runoff	20.63	2	734	92,890	----	-----	-----	SE Offsite
3	SCS Runoff	41.17	2	722	115,758	----	-----	-----	South Developed to Pond
4	Combine	55.54	2	724	208,647	2, 3	-----	-----	Total to SE Pond
5	Reservoir	20.93	2	748	208,599	4	1356.84	72,846	<no description>
6	SCS Runoff	89.20	2	722	250,808	----	-----	-----	Developed to West Pond
7	Reservoir	13.33	2	746	202,837	6	1341.42	130,597	<no description>
Ponds.gpw					Return Period: 5 Year			Thursday, May 22, 2008	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

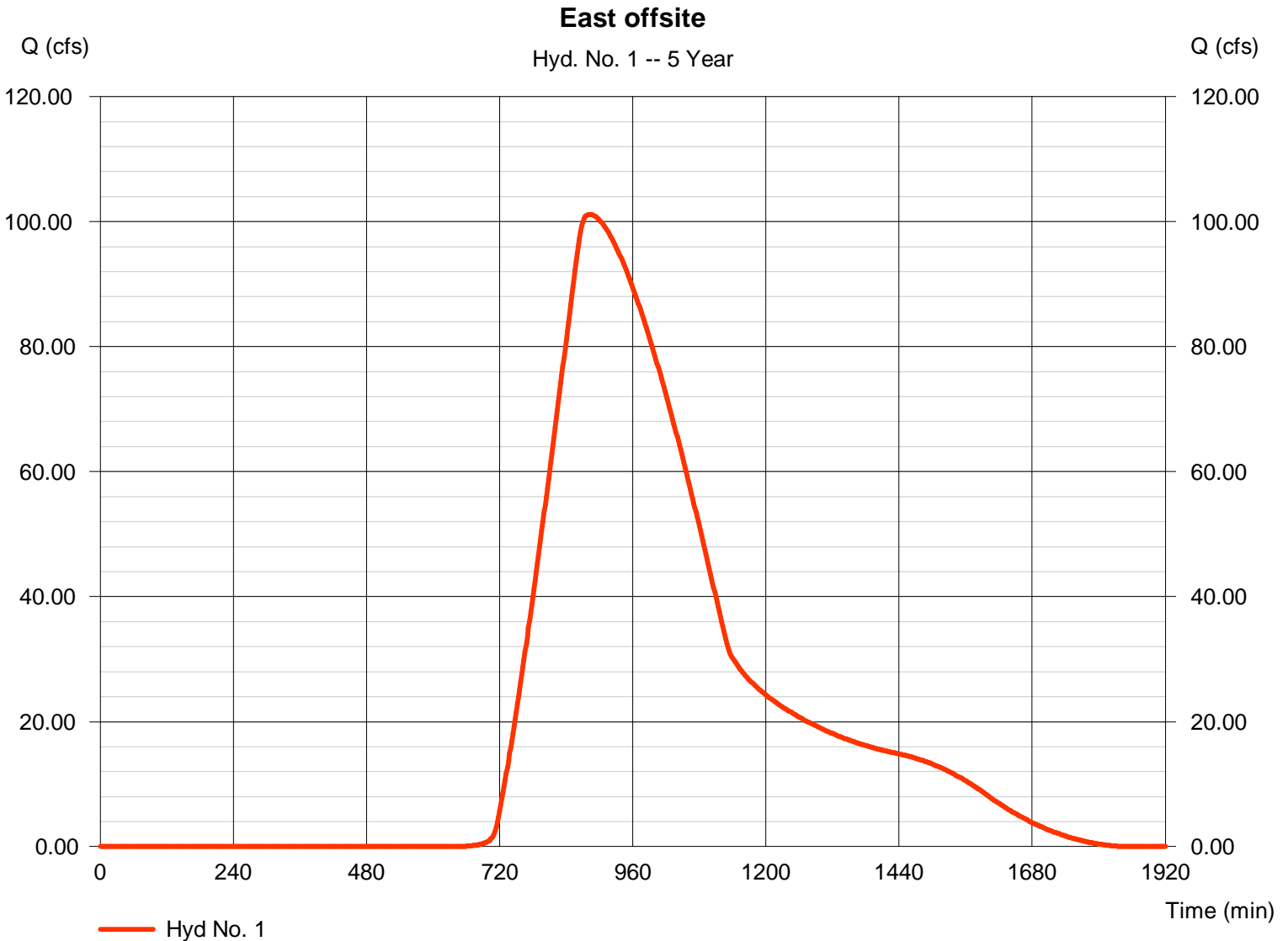
Thursday, May 22, 2008

Hyd. No. 1

East offsite

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 357.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 101.16 cfs
Time to peak = 882 min
Hyd. volume = 2,172,451 cuft
Curve number = 70
Hydraulic length = 8600 ft
Time of conc. (Tc) = 265.67 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

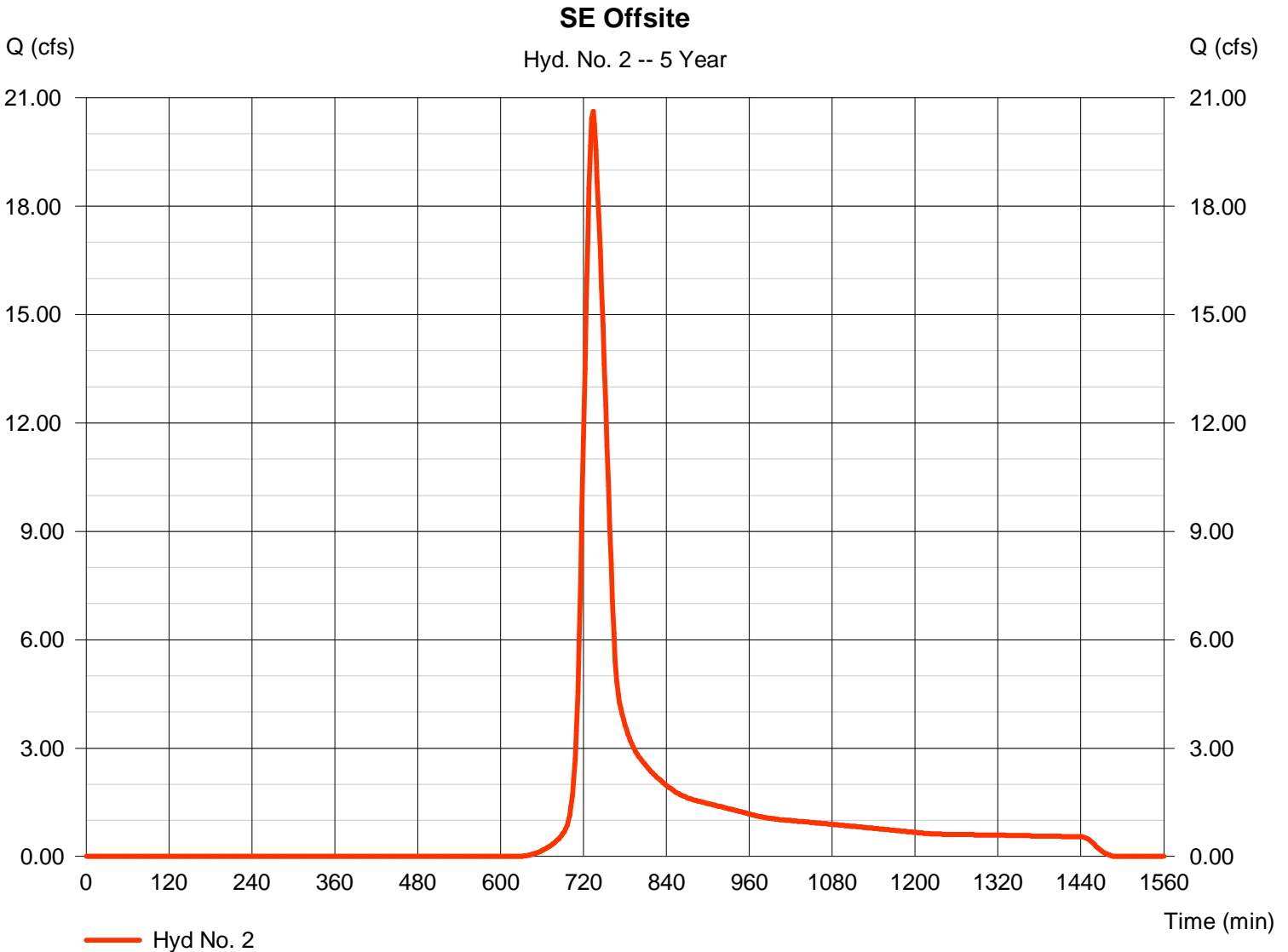
Thursday, May 22, 2008

Hyd. No. 2

SE Offsite

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 15.100 ac
Basin Slope = 1.2 %
Tc method = LAG
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 20.63 cfs
Time to peak = 734 min
Hyd. volume = 92,890 cuft
Curve number = 70
Hydraulic length = 800 ft
Time of conc. (Tc) = 32.45 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 3

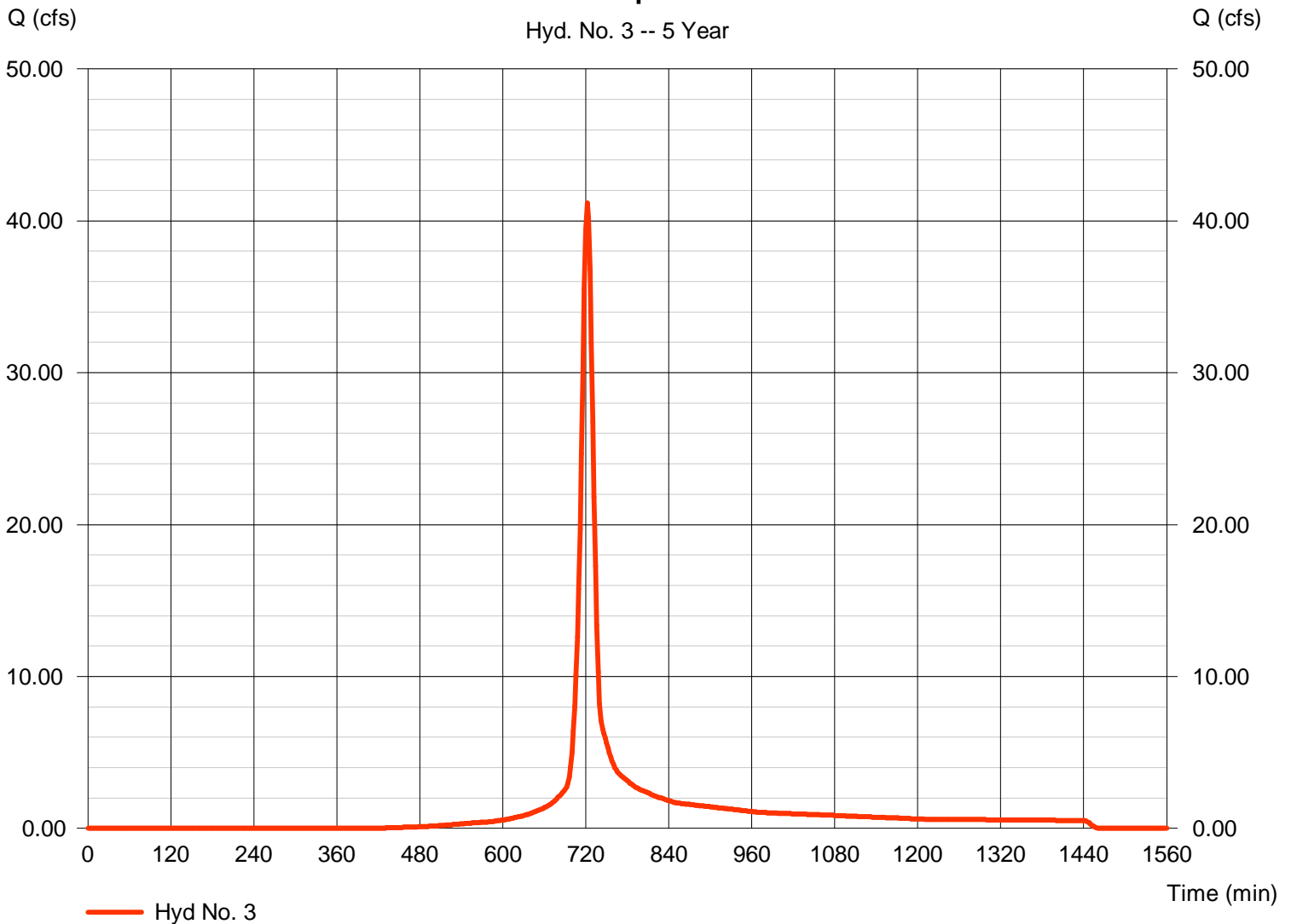
South Developed to Pond

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 12.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 41.17 cfs
Time to peak = 722 min
Hyd. volume = 115,758 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

South Developed to Pond

Hyd. No. 3 -- 5 Year



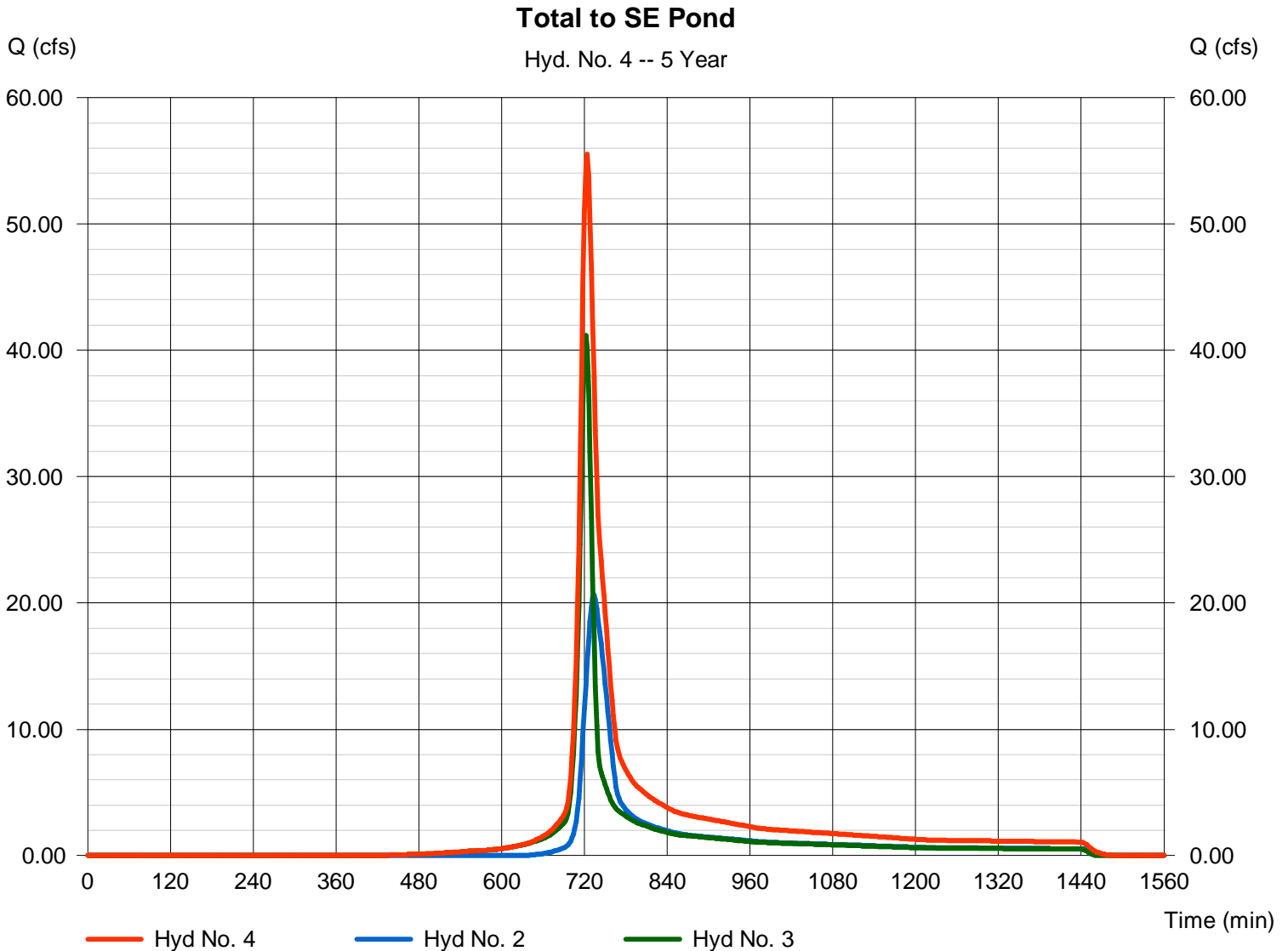
Hydrograph Report

Hyd. No. 4

Total to SE Pond

Hydrograph type = Combine
Storm frequency = 5 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 55.54 cfs
Time to peak = 724 min
Hyd. volume = 208,647 cuft
Contrib. drain. area = 27.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

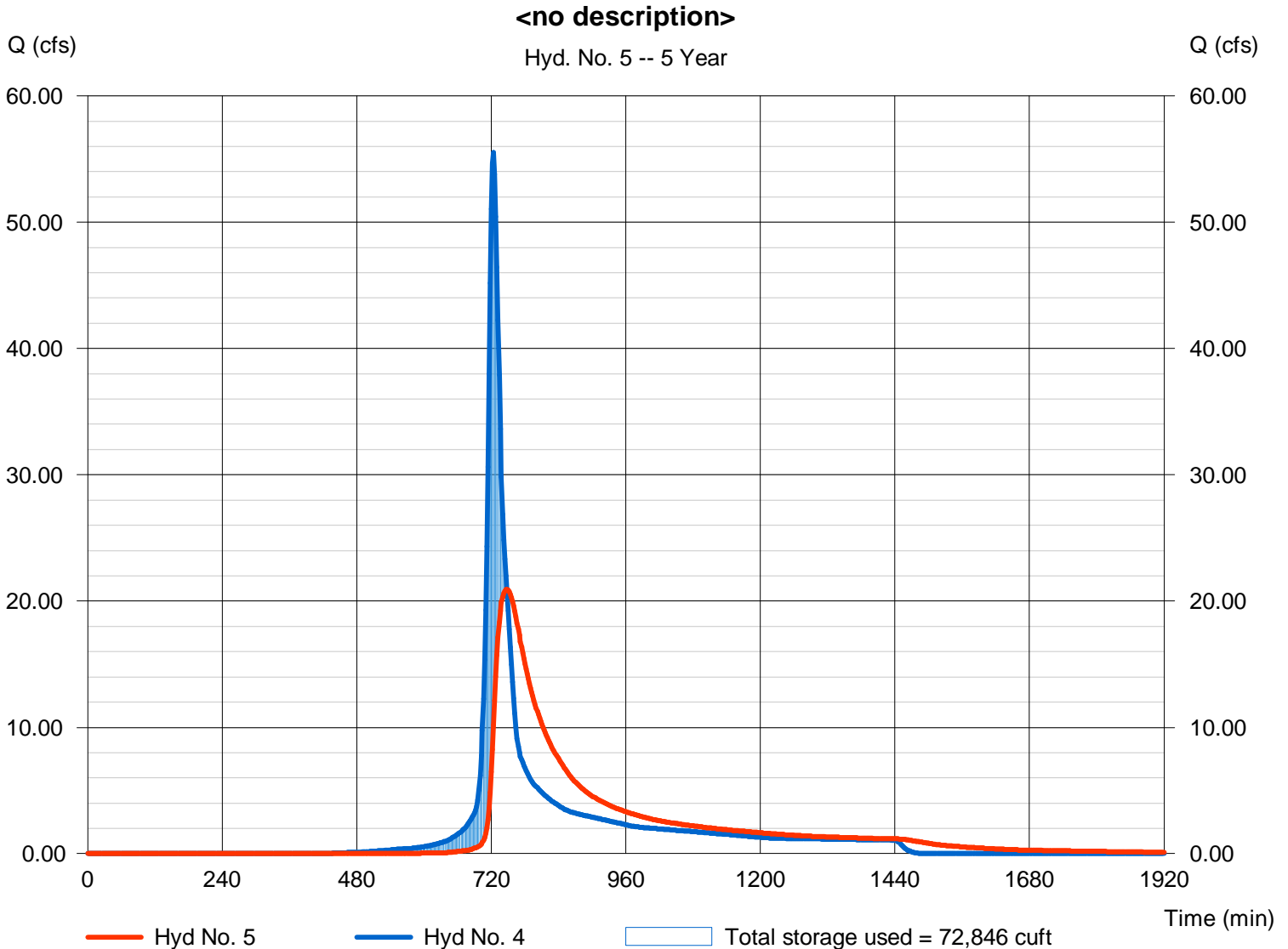
Thursday, May 22, 2008

Hyd. No. 5

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 20.93 cfs
Storm frequency	= 5 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 208,599 cuft
Inflow hyd. No.	= 4 - Total to SE Pond	Max. Elevation	= 1356.84 ft
Reservoir name	= South East Pond	Max. Storage	= 72,846 cuft

Storage Indication method used.



Pond No. 1 - South East Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1355.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1355.00	35,700	0	0
1.00	1356.00	39,900	37,777	37,777
2.00	1357.00	44,100	41,978	79,755
3.00	1358.00	48,500	46,278	126,033
4.00	1359.00	53,000	50,728	176,761

Culvert / Orifice Structures

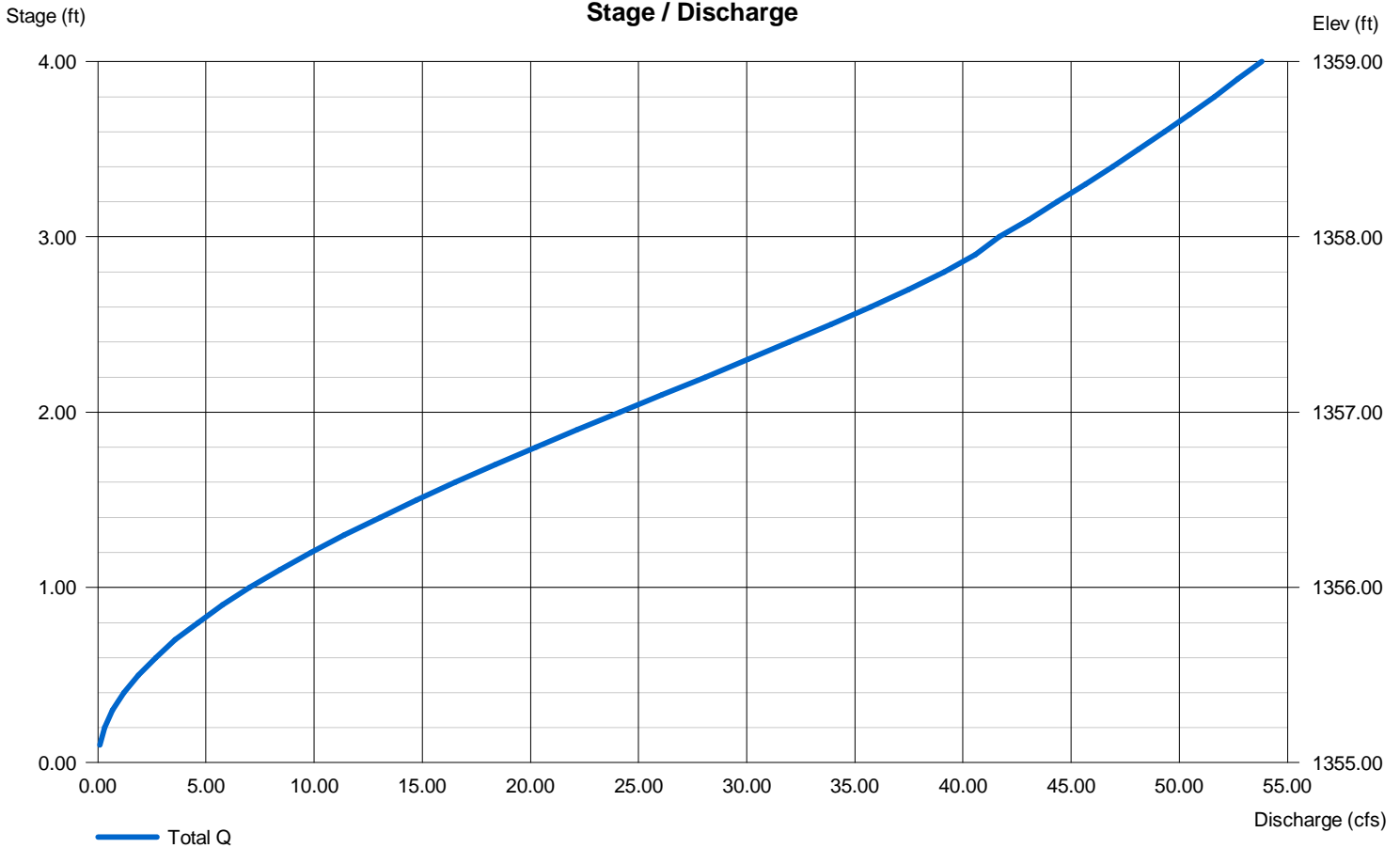
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1355.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Discharge



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

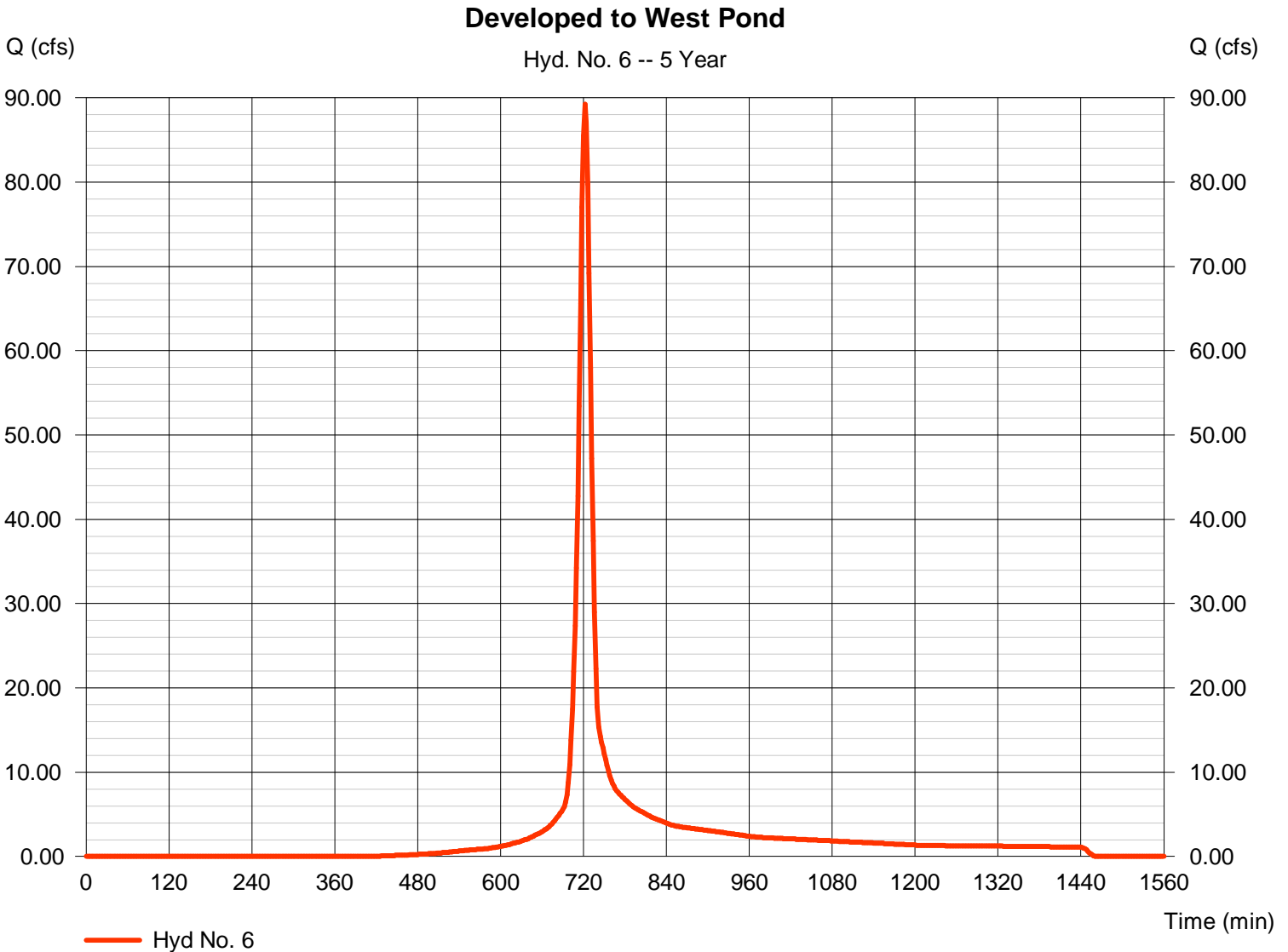
Thursday, May 22, 2008

Hyd. No. 6

Developed to West Pond

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Time interval = 2 min
Drainage area = 26.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 4.50 in
Storm duration = 24 hrs

Peak discharge = 89.20 cfs
Time to peak = 722 min
Hyd. volume = 250,808 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

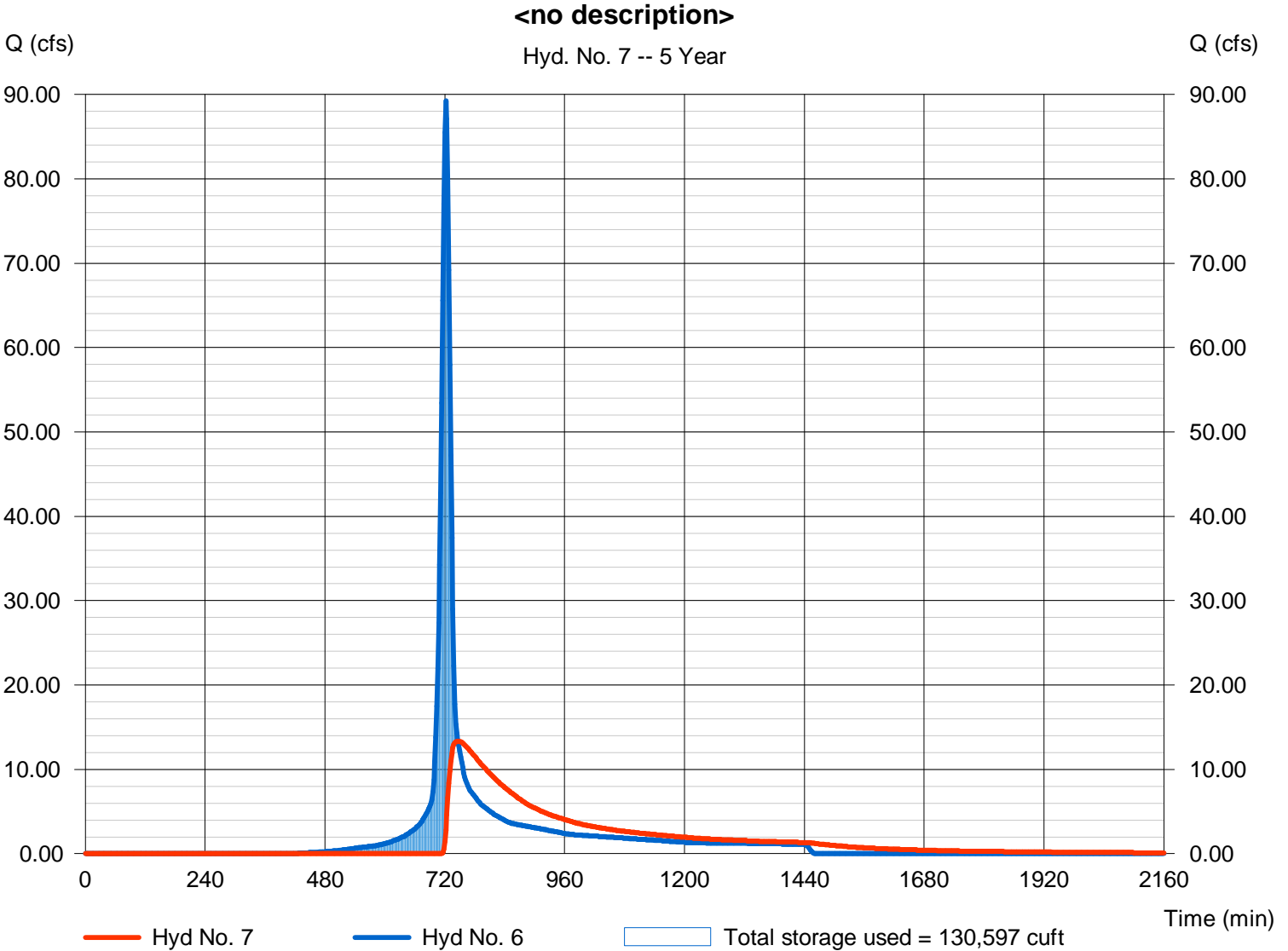
Thursday, May 22, 2008

Hyd. No. 7

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 13.33 cfs
Storm frequency	= 5 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 202,837 cuft
Inflow hyd. No.	= 6 - Developed to West Pond	Max. Elevation	= 1341.42 ft
Reservoir name	= West Pond	Max. Storage	= 130,597 cuft

Storage Indication method used.



Pond No. 2 - West Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1339.00	43,740	0	0
1.00	1340.00	51,700	47,660	47,660
2.00	1341.00	60,250	55,915	103,575
3.00	1342.00	69,500	64,813	168,388
4.00	1343.00	79,100	74,241	242,629
5.00	1344.00	89,300	84,140	326,769
6.00	1345.00	99,800	94,492	421,261
7.00	1346.00	113,600	106,615	527,876
8.00	1347.00	135,100	124,182	652,058

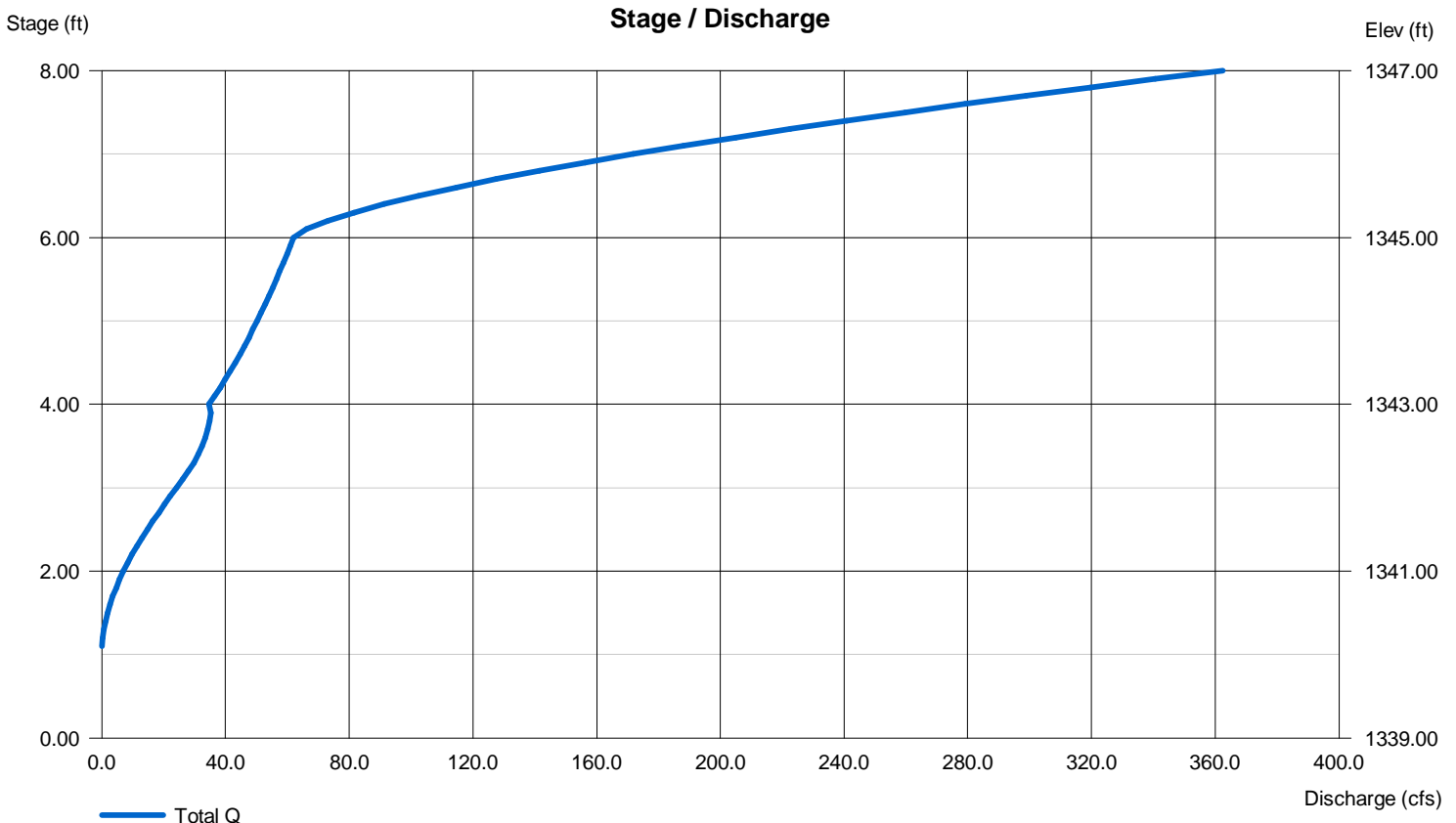
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1340.00	0.00	0.00	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.70	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)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1345.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	
1	SCS Runoff	140.34	2	878	2,935,231	----	-----	-----	East offsite	
2	SCS Runoff	28.43	2	734	125,505	----	-----	-----	SE Offsite	
3	SCS Runoff	51.78	2	722	146,388	----	-----	-----	South Developed to Pond	
4	Combine	72.12	2	724	271,893	2, 3	-----	-----	Total to SE Pond	
5	Reservoir	29.48	2	746	271,845	4	1357.27	92,302	<no description>	
6	SCS Runoff	112.18	2	722	317,174	----	-----	-----	Developed to West Pond	
7	Reservoir	22.17	2	740	269,195	6	1341.90	161,971	<no description>	
Ponds.gpw					Return Period: 10 Year			Thursday, May 22, 2008		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

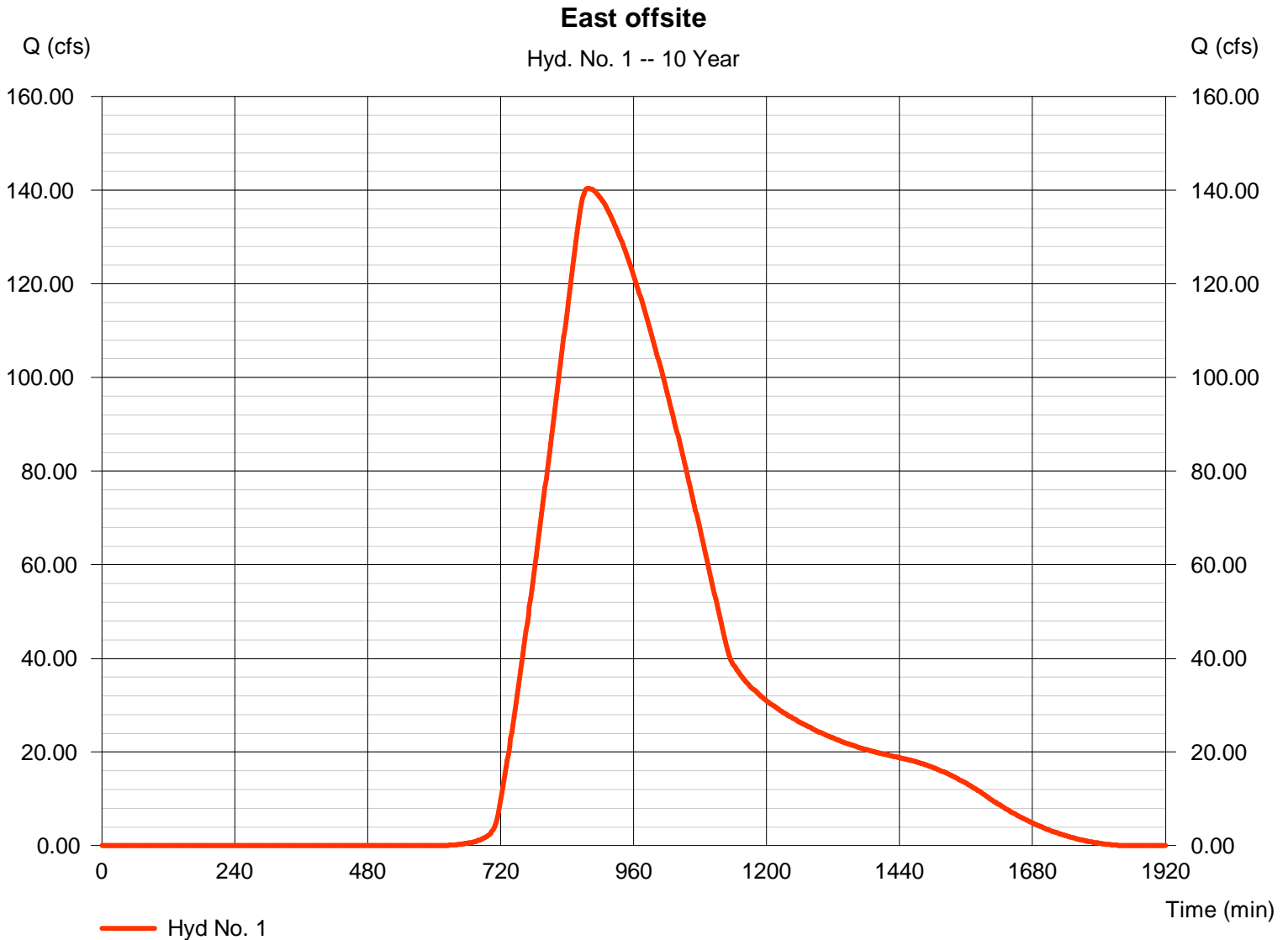
Thursday, May 22, 2008

Hyd. No. 1

East offsite

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 357.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 5.30 in
Storm duration = 24 hrs

Peak discharge = 140.34 cfs
Time to peak = 878 min
Hyd. volume = 2,935,231 cuft
Curve number = 70
Hydraulic length = 8600 ft
Time of conc. (Tc) = 265.67 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

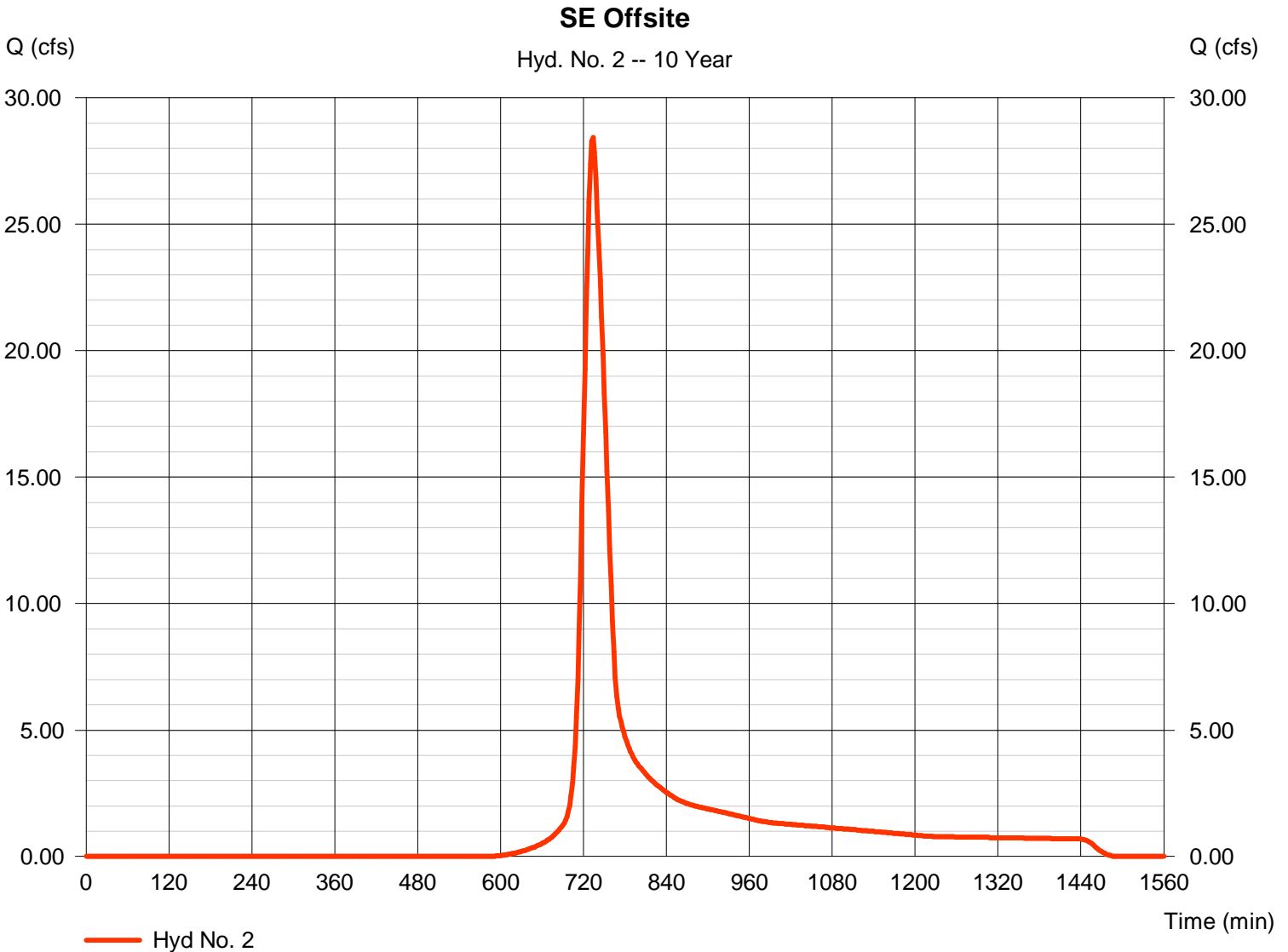
Thursday, May 22, 2008

Hyd. No. 2

SE Offsite

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 15.100 ac
Basin Slope = 1.2 %
Tc method = LAG
Total precip. = 5.30 in
Storm duration = 24 hrs

Peak discharge = 28.43 cfs
Time to peak = 734 min
Hyd. volume = 125,505 cuft
Curve number = 70
Hydraulic length = 800 ft
Time of conc. (Tc) = 32.45 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 3

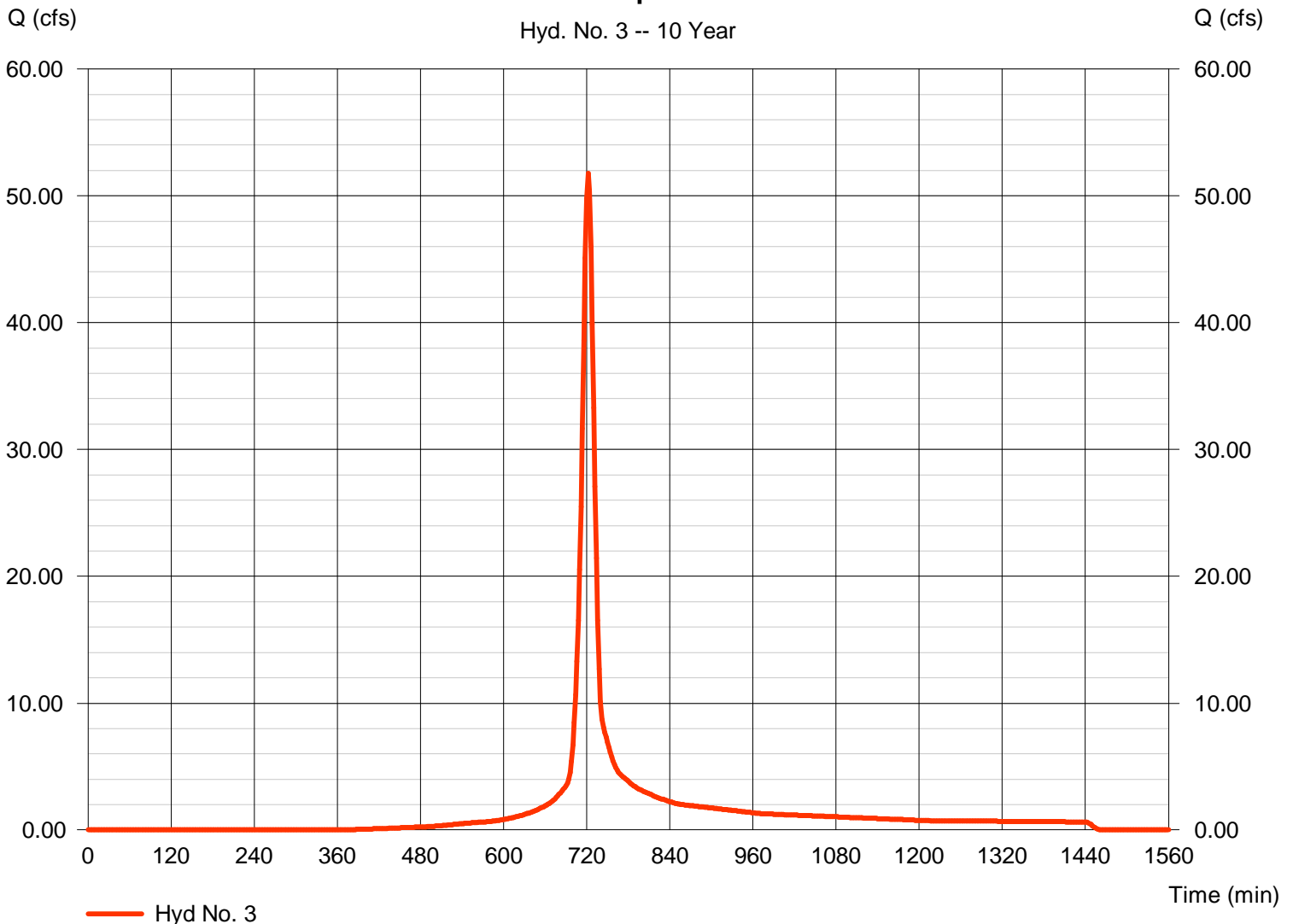
South Developed to Pond

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 12.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 5.30 in
Storm duration = 24 hrs

Peak discharge = 51.78 cfs
Time to peak = 722 min
Hyd. volume = 146,388 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

South Developed to Pond

Hyd. No. 3 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

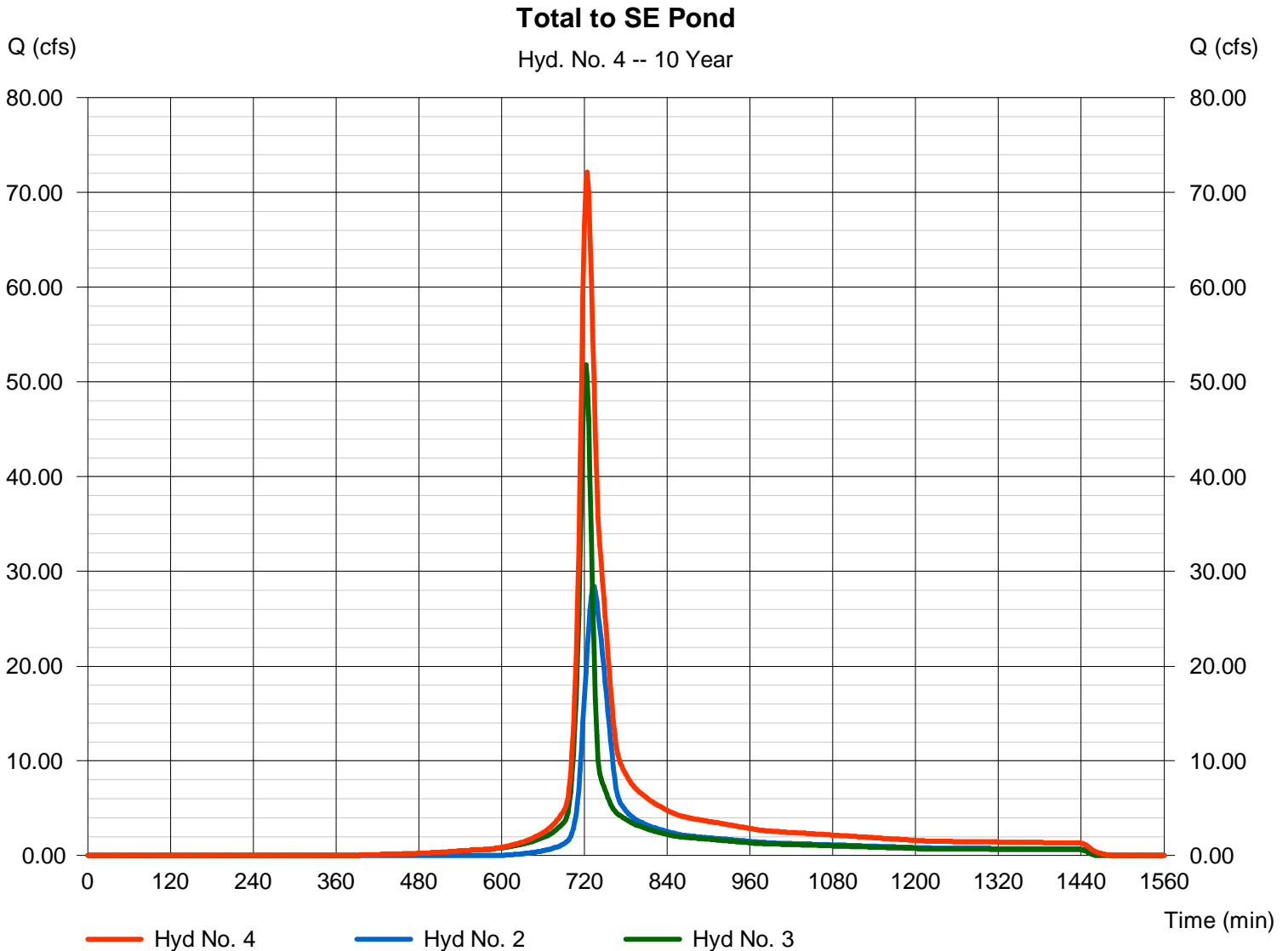
Thursday, May 22, 2008

Hyd. No. 4

Total to SE Pond

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 72.12 cfs
Time to peak = 724 min
Hyd. volume = 271,893 cuft
Contrib. drain. area = 27.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

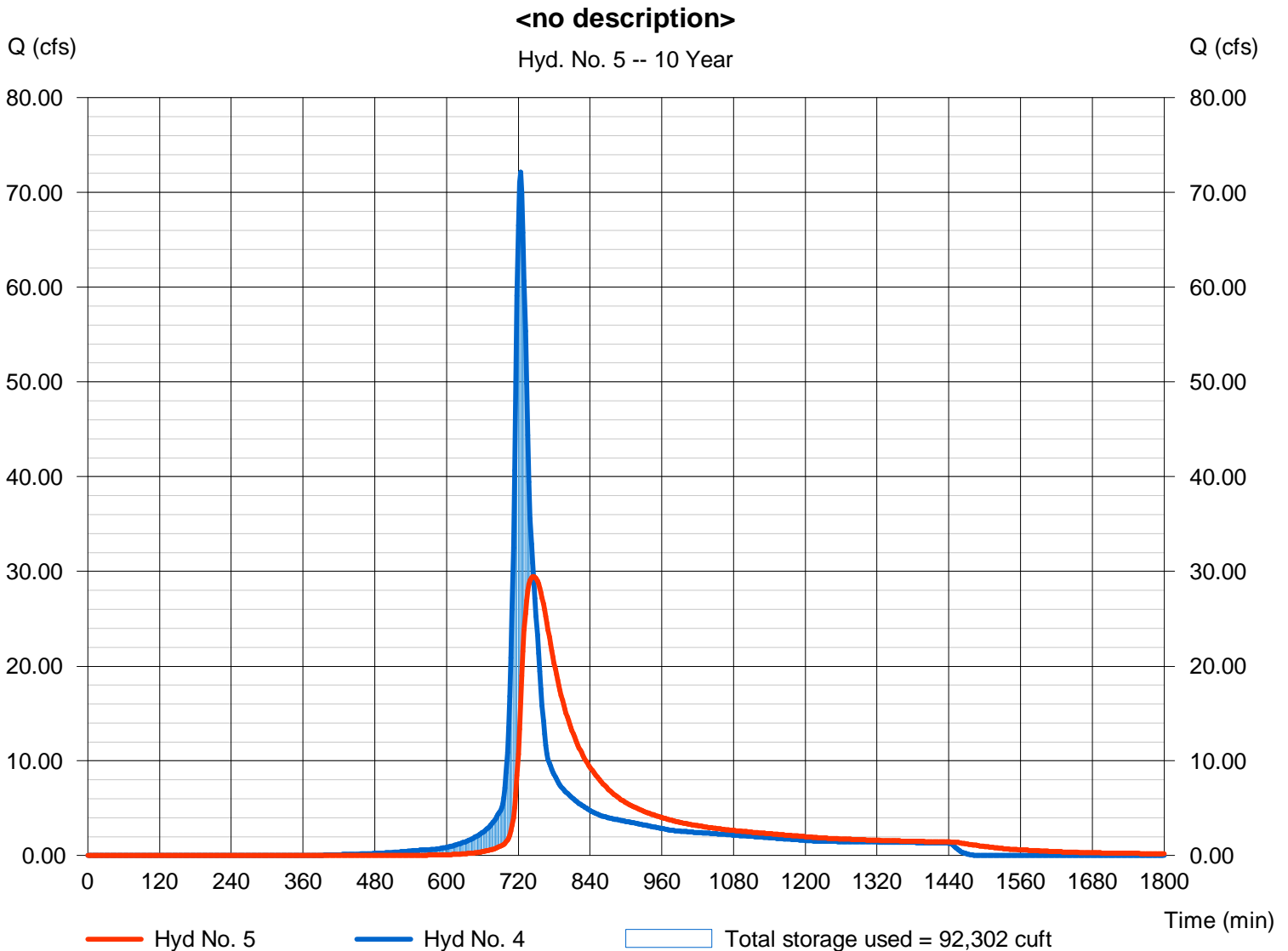
Hyd. No. 5

<no description>

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 4 - Total to SE Pond
Reservoir name = South East Pond

Peak discharge = 29.48 cfs
Time to peak = 746 min
Hyd. volume = 271,845 cuft
Max. Elevation = 1357.27 ft
Max. Storage = 92,302 cuft

Storage Indication method used.



Pond No. 1 - South East Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1355.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1355.00	35,700	0	0
1.00	1356.00	39,900	37,777	37,777
2.00	1357.00	44,100	41,978	79,755
3.00	1358.00	48,500	46,278	126,033
4.00	1359.00	53,000	50,728	176,761

Culvert / Orifice Structures

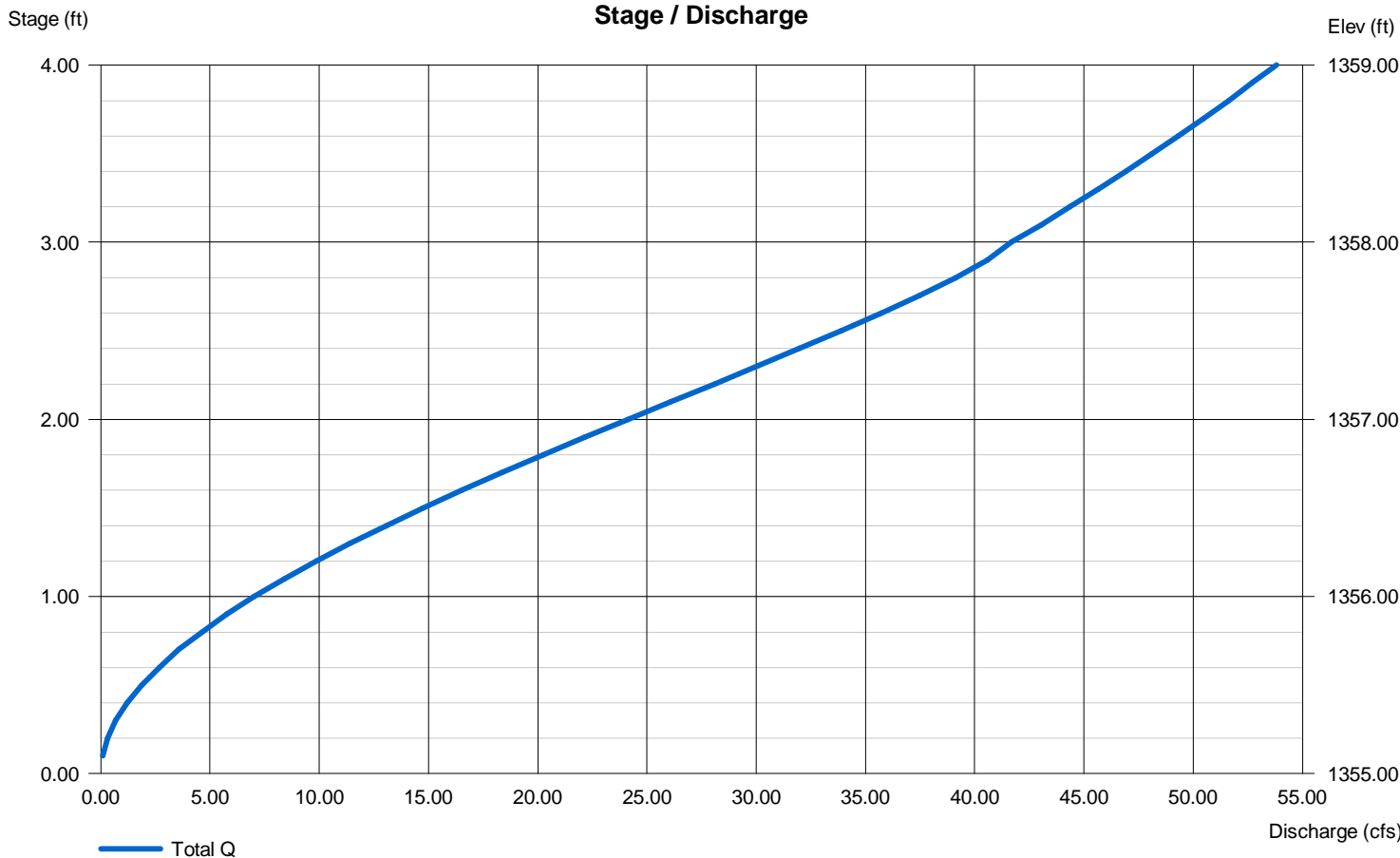
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1355.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Discharge



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 6

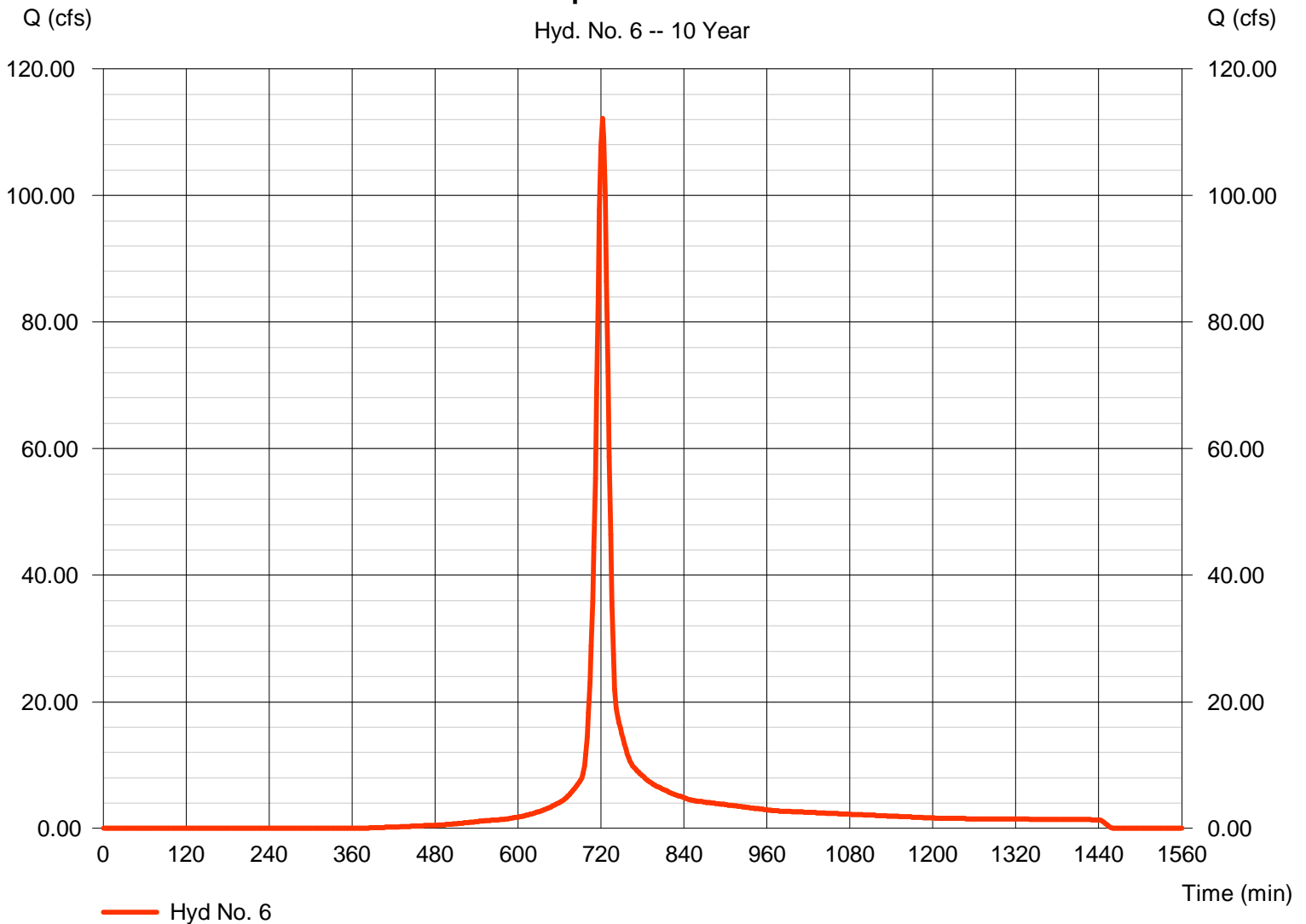
Developed to West Pond

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 26.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 5.30 in
Storm duration = 24 hrs

Peak discharge = 112.18 cfs
Time to peak = 722 min
Hyd. volume = 317,174 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

Developed to West Pond

Hyd. No. 6 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

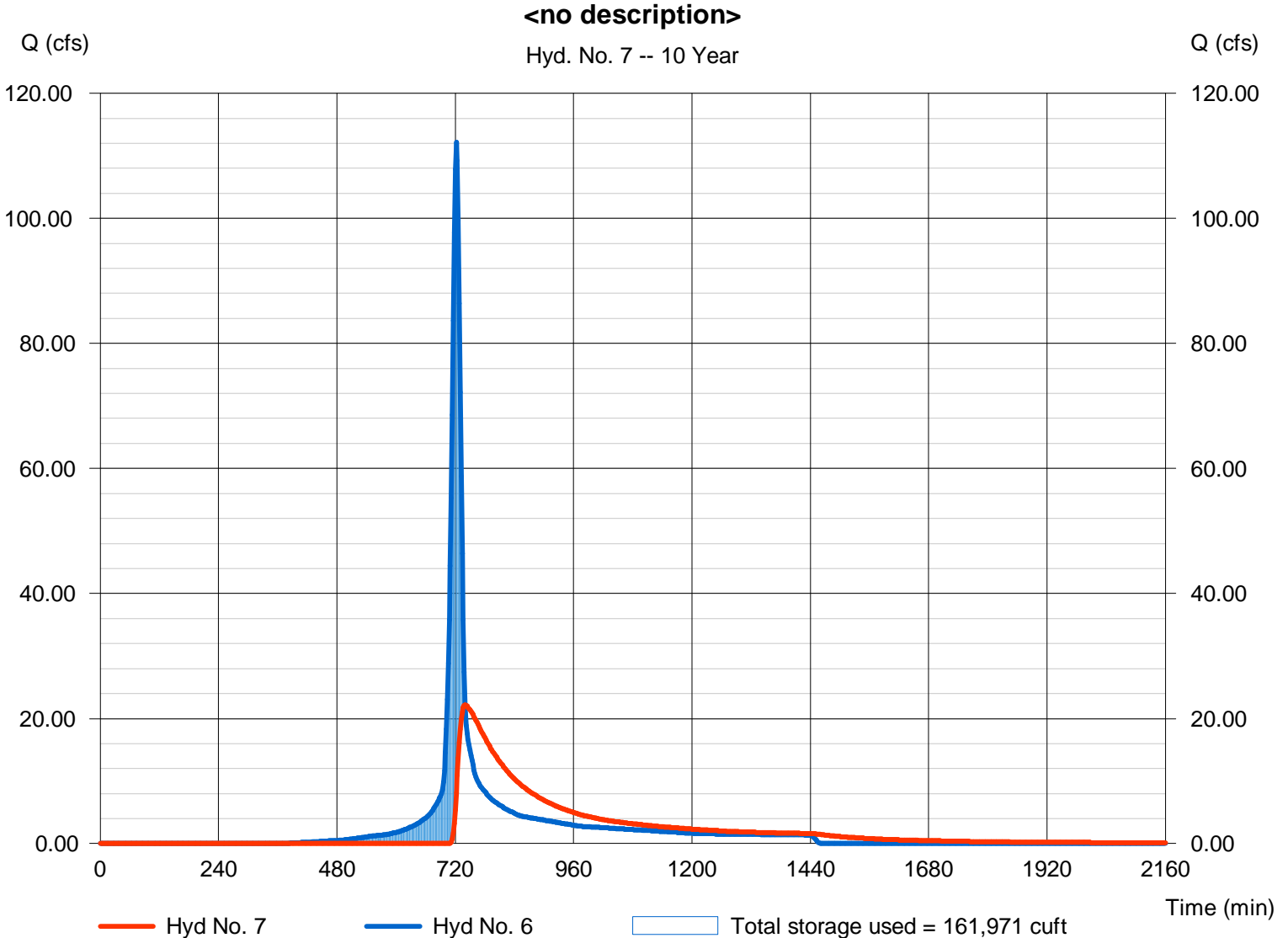
Thursday, May 22, 2008

Hyd. No. 7

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 22.17 cfs
Storm frequency	= 10 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 269,195 cuft
Inflow hyd. No.	= 6 - Developed to West Pond	Max. Elevation	= 1341.90 ft
Reservoir name	= West Pond	Max. Storage	= 161,971 cuft

Storage Indication method used.



Pond No. 2 - West Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1339.00	43,740	0	0
1.00	1340.00	51,700	47,660	47,660
2.00	1341.00	60,250	55,915	103,575
3.00	1342.00	69,500	64,813	168,388
4.00	1343.00	79,100	74,241	242,629
5.00	1344.00	89,300	84,140	326,769
6.00	1345.00	99,800	94,492	421,261
7.00	1346.00	113,600	106,615	527,876
8.00	1347.00	135,100	124,182	652,058

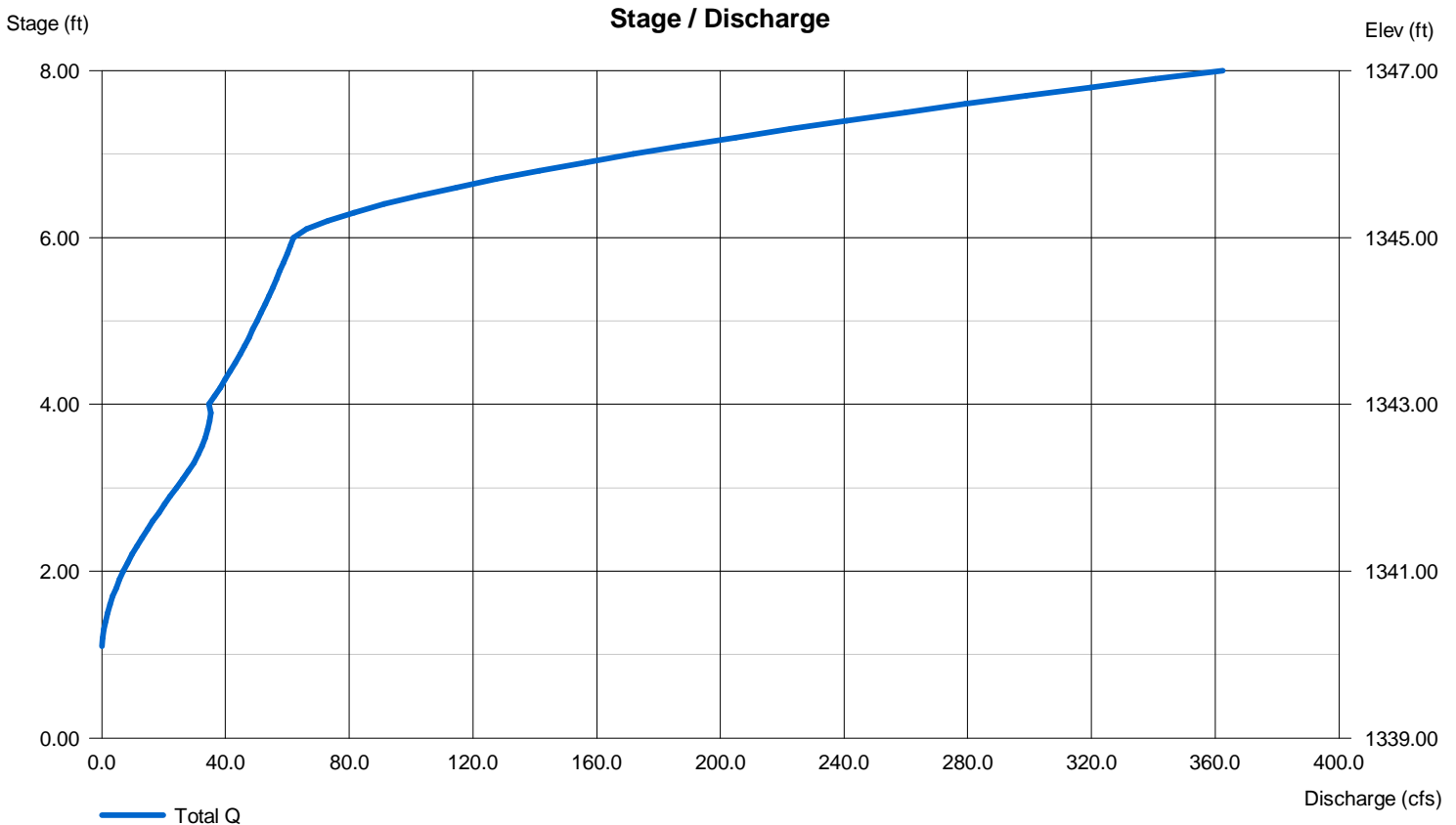
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1340.00	0.00	0.00	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.70	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)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1345.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	
1	SCS Runoff	182.27	2	876	3,744,288	----	-----	-----	East offsite	
2	SCS Runoff	36.65	2	734	160,098	----	-----	-----	SE Offsite	
3	SCS Runoff	62.46	2	722	177,710	----	-----	-----	South Developed to Pond	
4	Combine	89.17	2	724	337,809	2, 3	-----	-----	Total to SE Pond	
5	Reservoir	37.67	2	744	337,760	4	1357.71	112,639	<no description>	
6	SCS Runoff	135.33	2	722	385,039	----	-----	-----	Developed to West Pond	
7	Reservoir	30.46	2	738	337,055	6	1342.35	194,042	<no description>	
Ponds.gpw					Return Period: 25 Year			Thursday, May 22, 2008		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

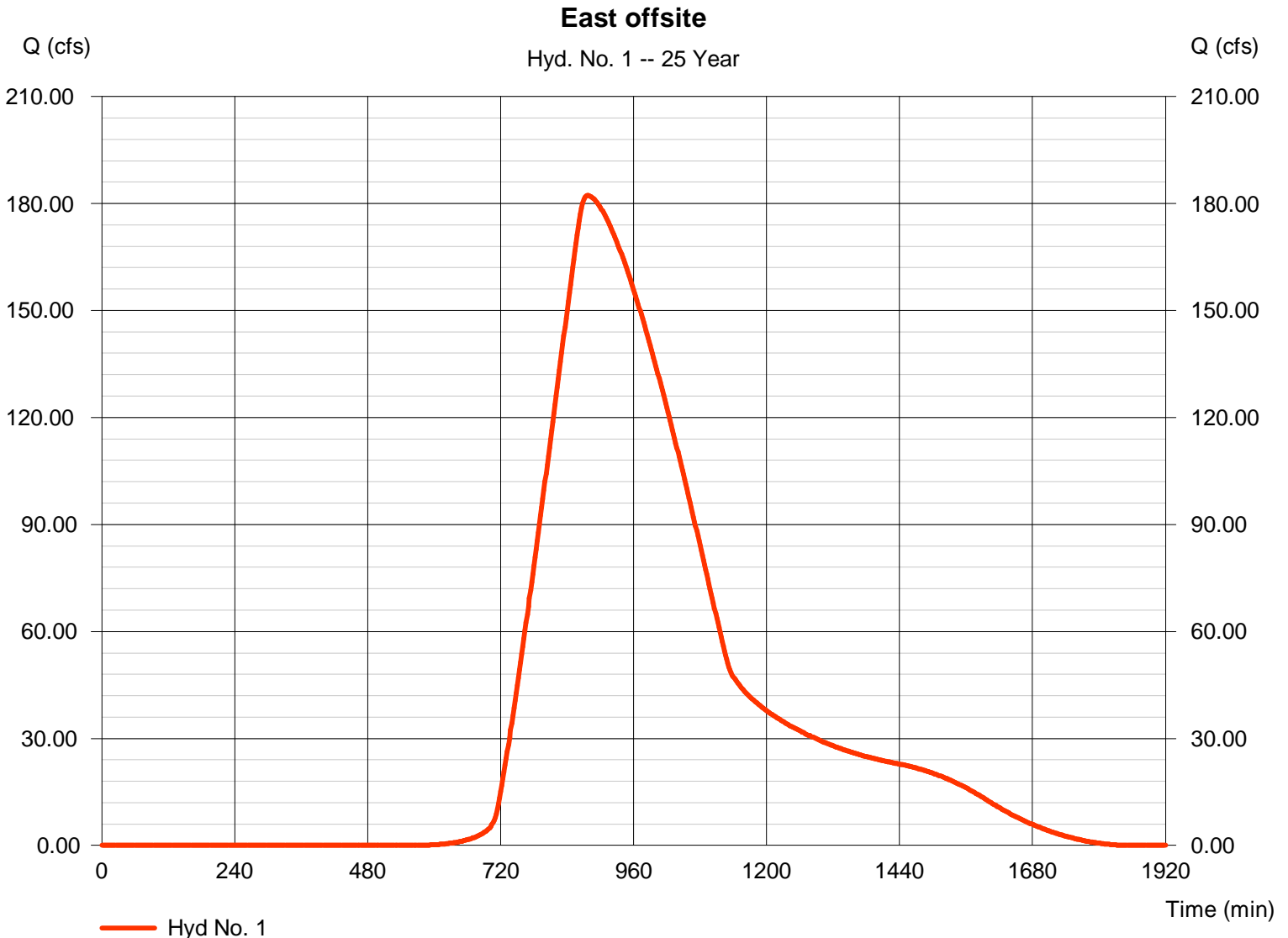
Thursday, May 22, 2008

Hyd. No. 1

East offsite

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 357.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 6.10 in
Storm duration = 24 hrs

Peak discharge = 182.27 cfs
Time to peak = 876 min
Hyd. volume = 3,744,288 cuft
Curve number = 70
Hydraulic length = 8600 ft
Time of conc. (Tc) = 265.67 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

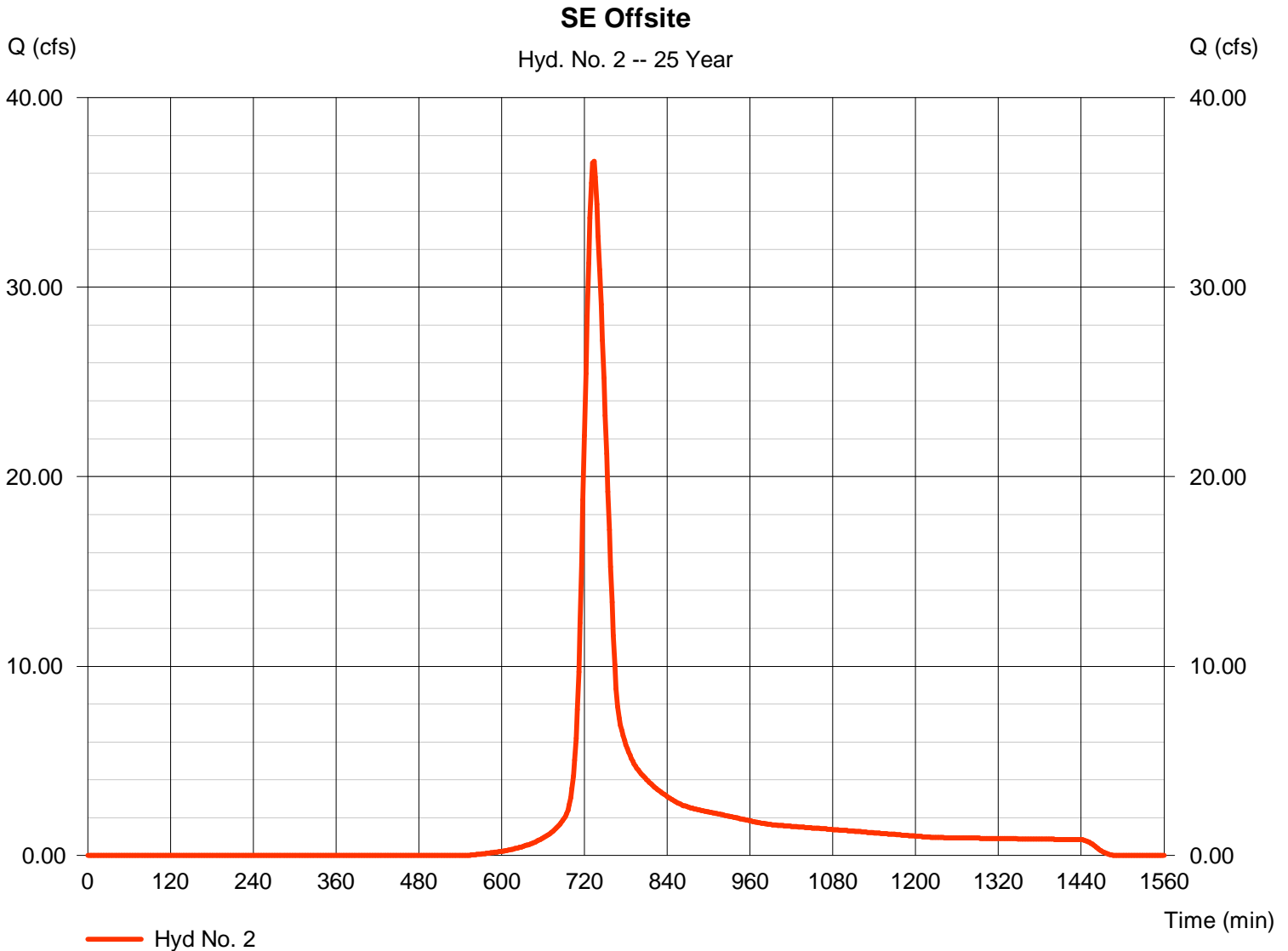
Thursday, May 22, 2008

Hyd. No. 2

SE Offsite

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 15.100 ac
Basin Slope = 1.2 %
Tc method = LAG
Total precip. = 6.10 in
Storm duration = 24 hrs

Peak discharge = 36.65 cfs
Time to peak = 734 min
Hyd. volume = 160,098 cuft
Curve number = 70
Hydraulic length = 800 ft
Time of conc. (Tc) = 32.45 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 3

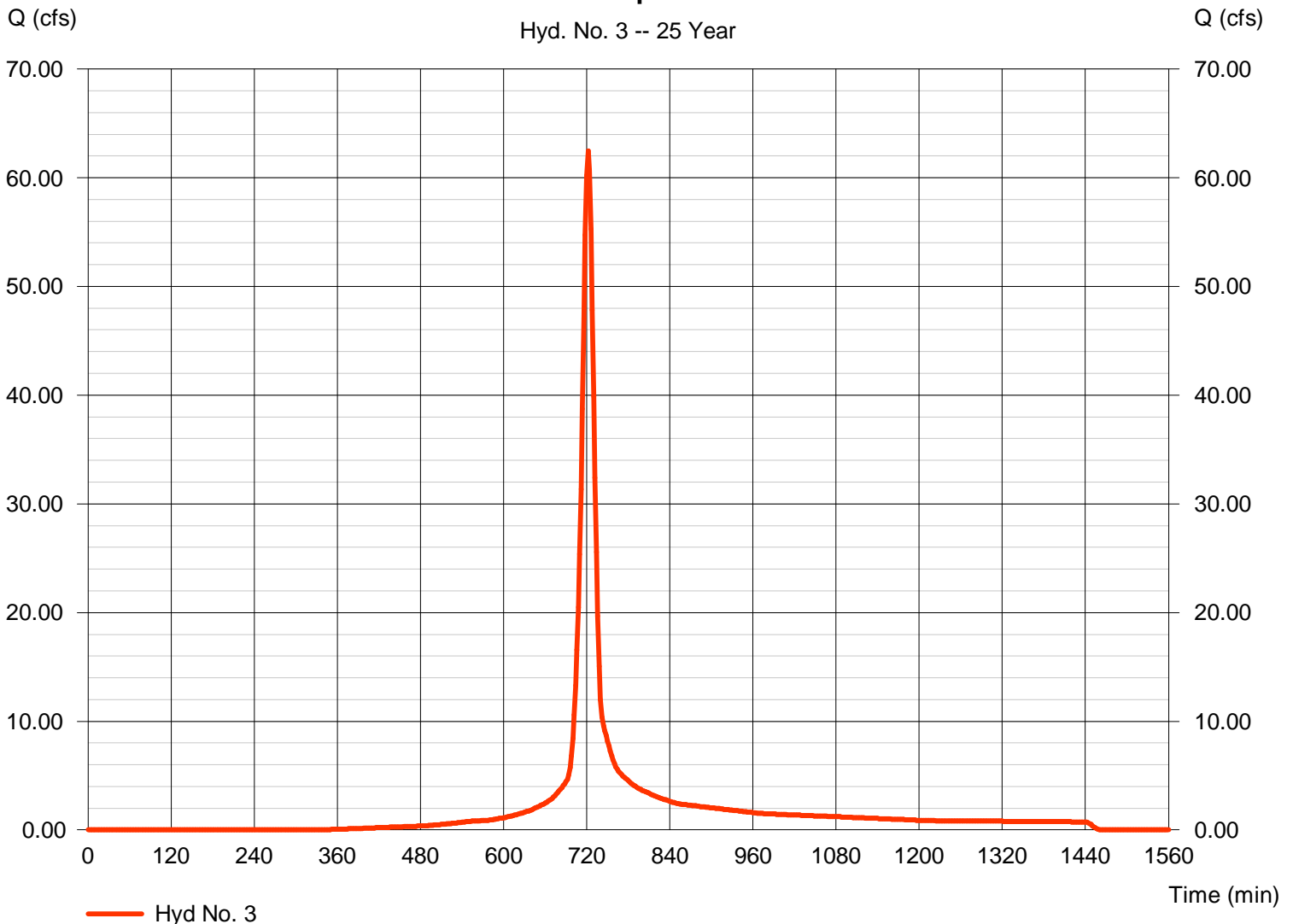
South Developed to Pond

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 12.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.10 in
Storm duration = 24 hrs

Peak discharge = 62.46 cfs
Time to peak = 722 min
Hyd. volume = 177,710 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

South Developed to Pond

Hyd. No. 3 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

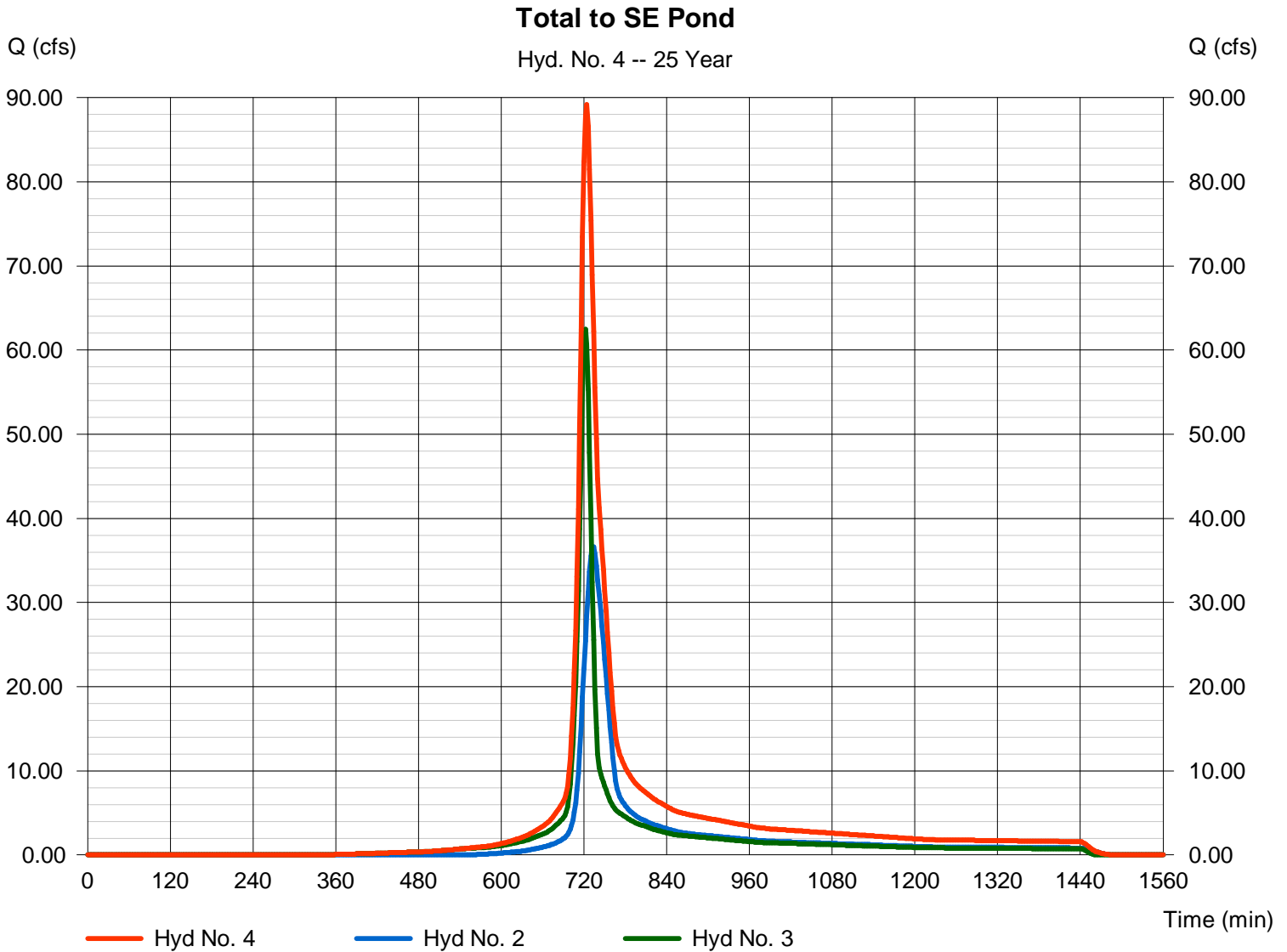
Thursday, May 22, 2008

Hyd. No. 4

Total to SE Pond

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 89.17 cfs
Time to peak = 724 min
Hyd. volume = 337,809 cuft
Contrib. drain. area = 27.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

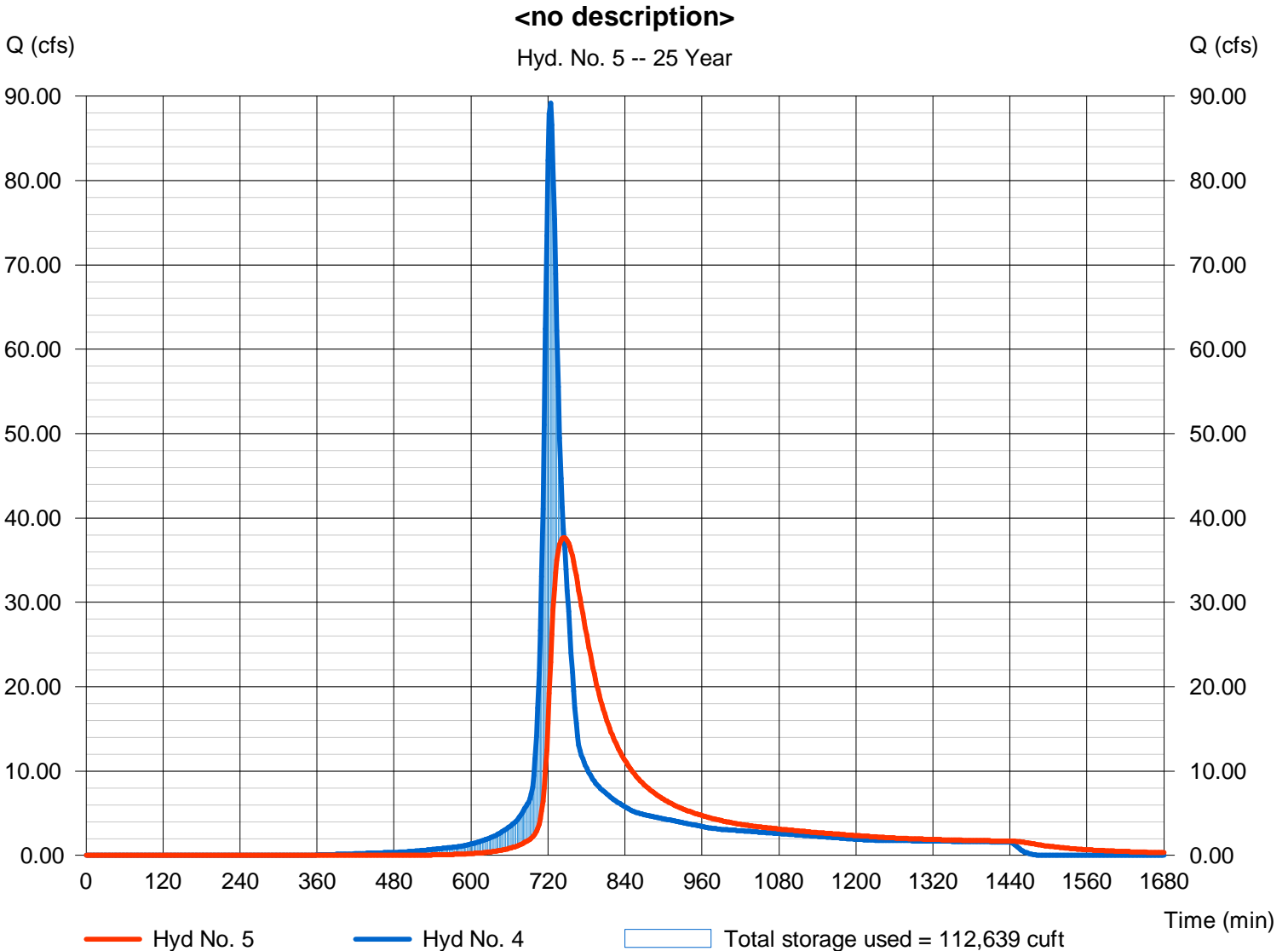
Hyd. No. 5

<no description>

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 2 min
Inflow hyd. No. = 4 - Total to SE Pond
Reservoir name = South East Pond

Peak discharge = 37.67 cfs
Time to peak = 744 min
Hyd. volume = 337,760 cuft
Max. Elevation = 1357.71 ft
Max. Storage = 112,639 cuft

Storage Indication method used.



Pond No. 1 - South East Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1355.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1355.00	35,700	0	0
1.00	1356.00	39,900	37,777	37,777
2.00	1357.00	44,100	41,978	79,755
3.00	1358.00	48,500	46,278	126,033
4.00	1359.00	53,000	50,728	176,761

Culvert / Orifice Structures

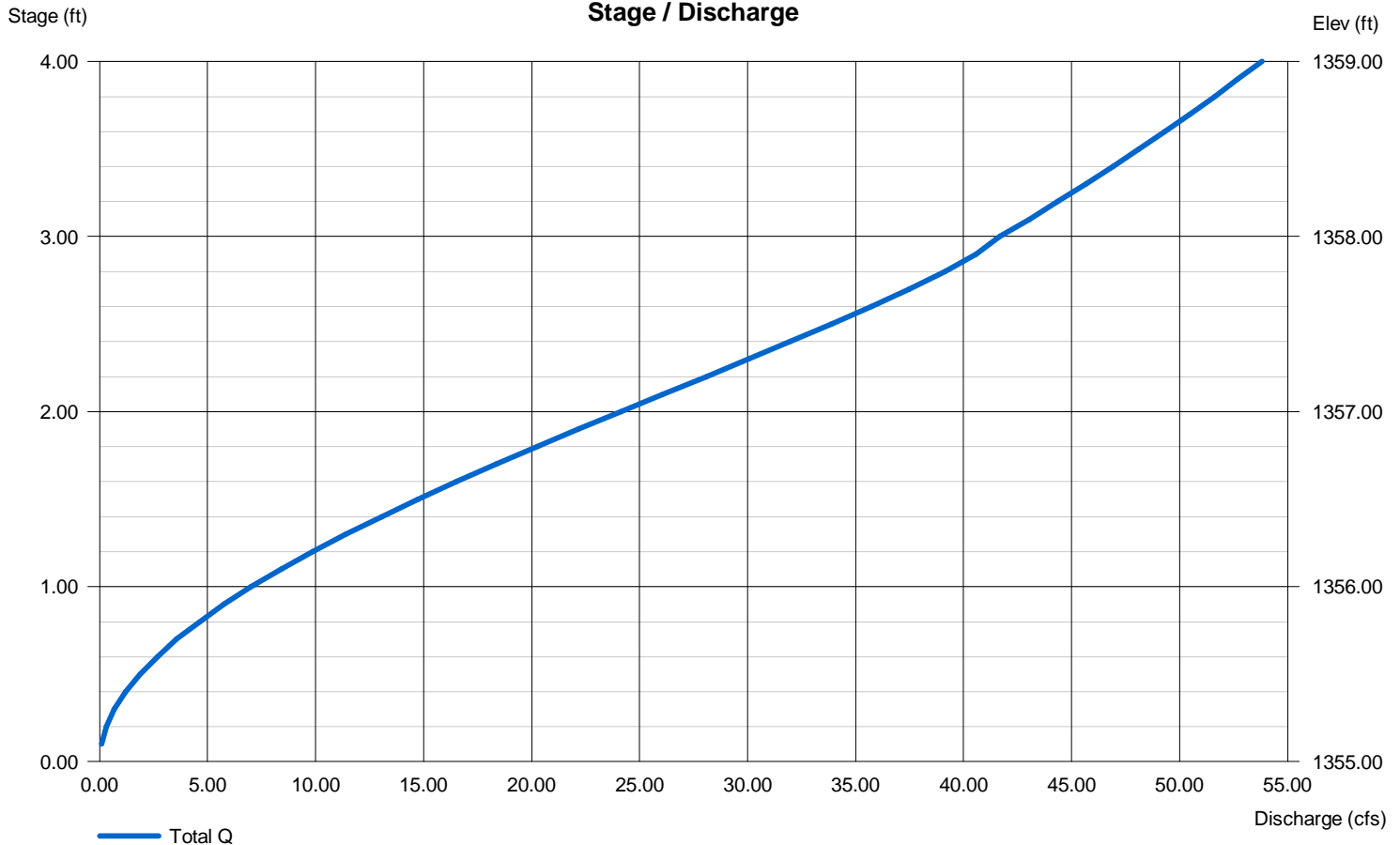
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1355.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

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

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.

Stage / Discharge



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 6

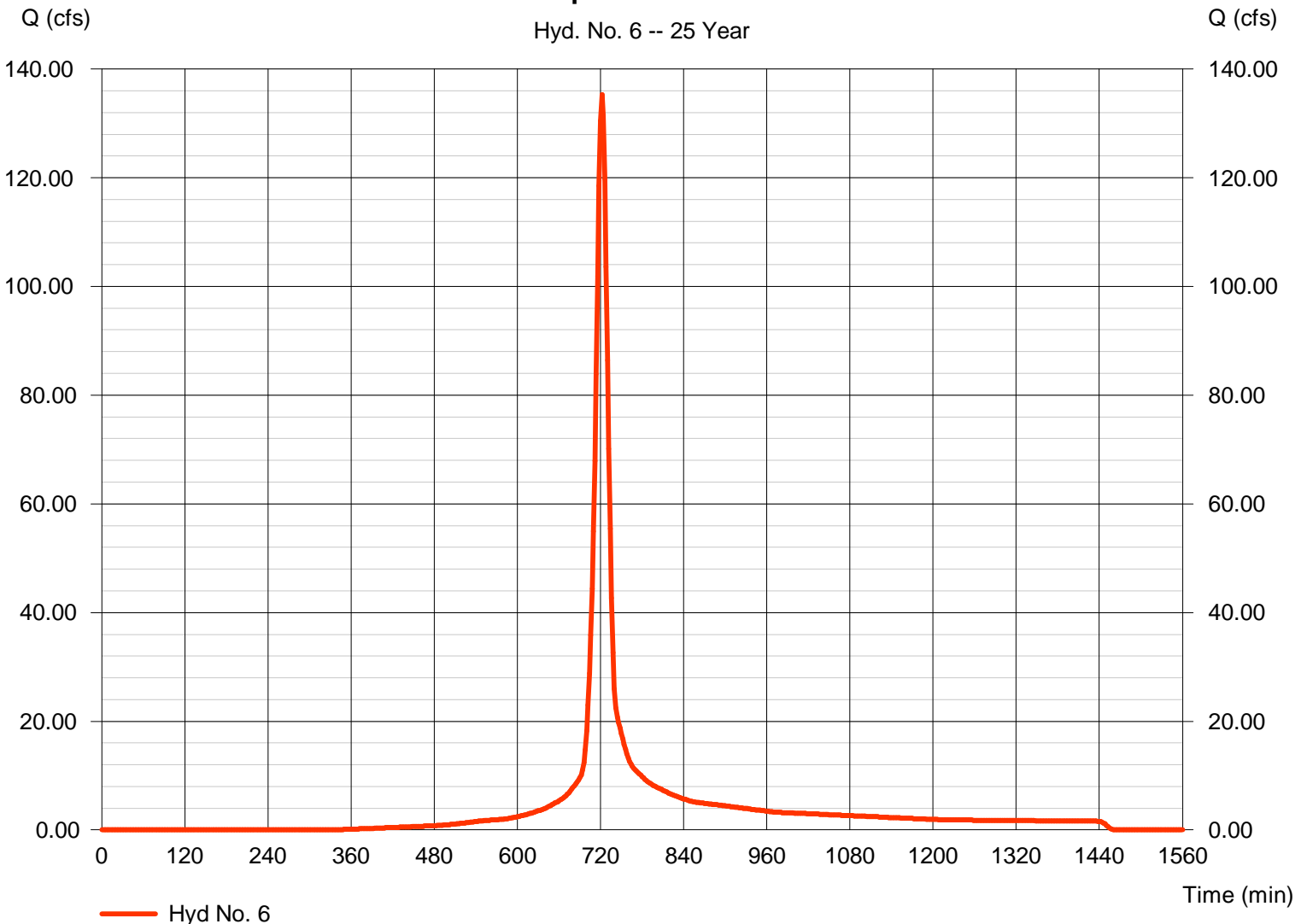
Developed to West Pond

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 26.000 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.10 in
Storm duration = 24 hrs

Peak discharge = 135.33 cfs
Time to peak = 722 min
Hyd. volume = 385,039 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.00 min
Distribution = Type II
Shape factor = 484

Developed to West Pond

Hyd. No. 6 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

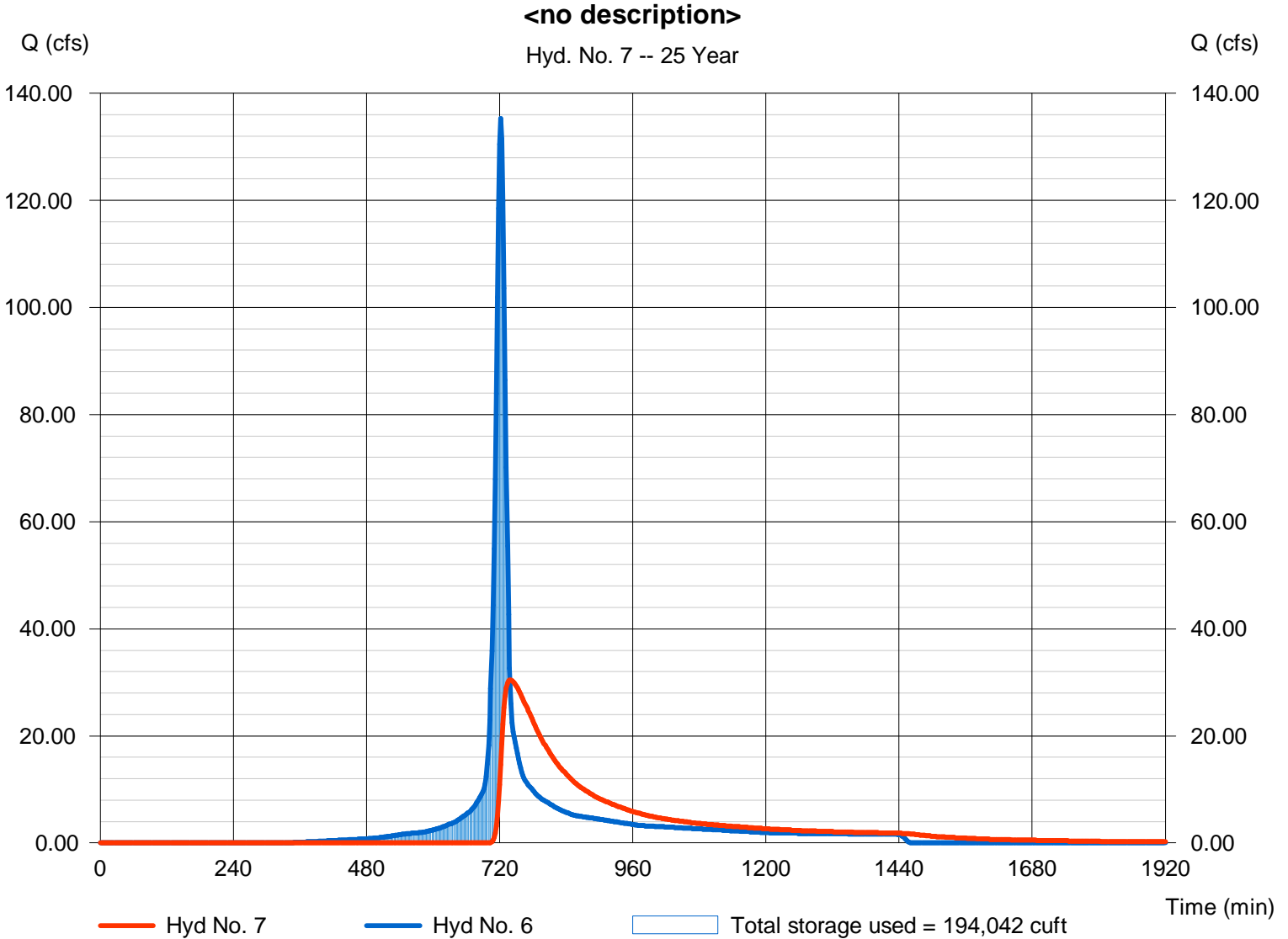
Thursday, May 22, 2008

Hyd. No. 7

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 30.46 cfs
Storm frequency	= 25 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 337,055 cuft
Inflow hyd. No.	= 6 - Developed to West Pond	Max. Elevation	= 1342.35 ft
Reservoir name	= West Pond	Max. Storage	= 194,042 cuft

Storage Indication method used.



Pond No. 2 - West Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1339.00	43,740	0	0
1.00	1340.00	51,700	47,660	47,660
2.00	1341.00	60,250	55,915	103,575
3.00	1342.00	69,500	64,813	168,388
4.00	1343.00	79,100	74,241	242,629
5.00	1344.00	89,300	84,140	326,769
6.00	1345.00	99,800	94,492	421,261
7.00	1346.00	113,600	106,615	527,876
8.00	1347.00	135,100	124,182	652,058

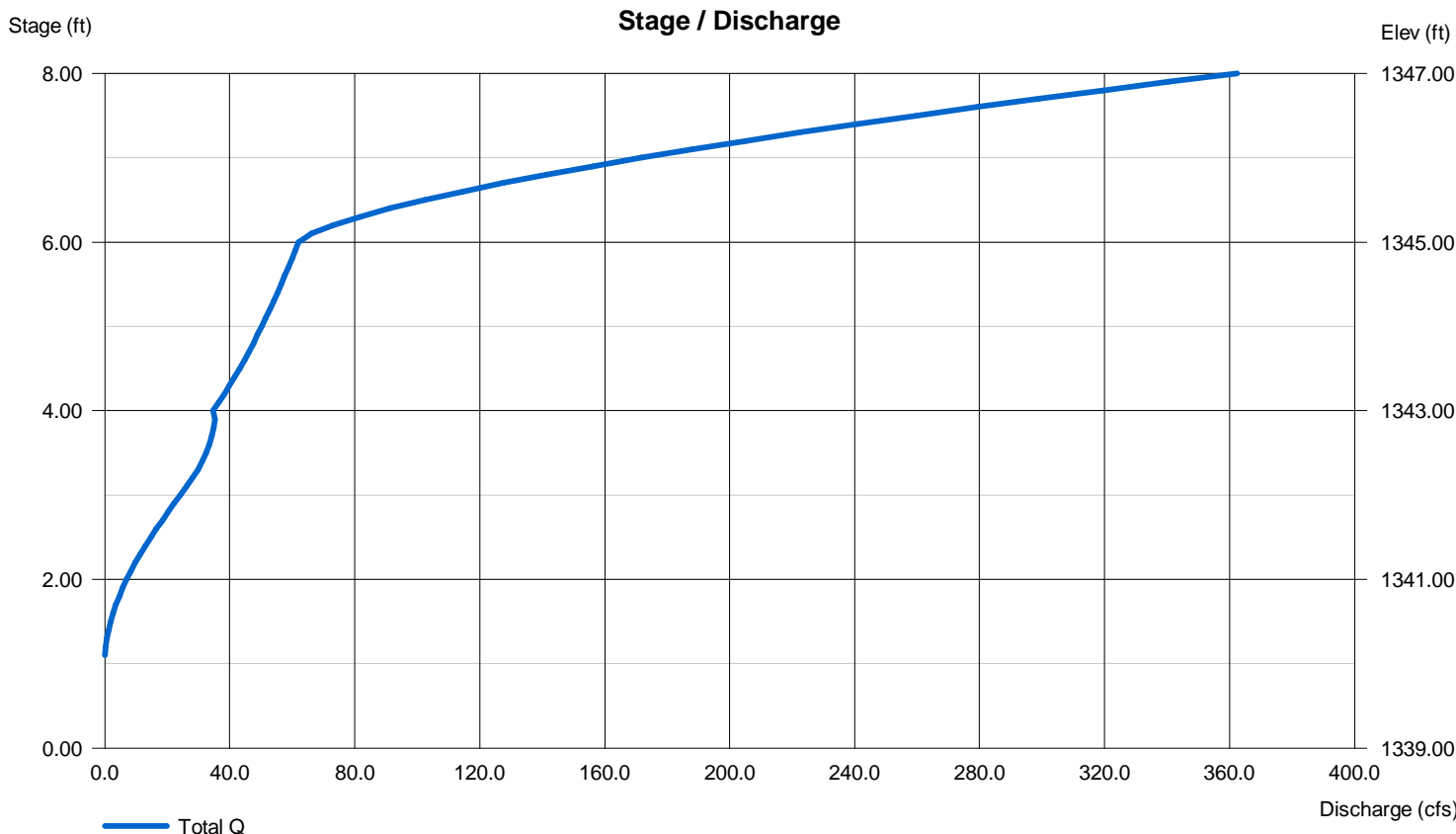
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1340.00	0.00	0.00	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.70	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)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1345.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.02

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	
1	SCS Runoff	282.96	2	874	5,683,077	----	-----	-----	East offsite	
2	SCS Runoff	56.14	2	732	242,997	----	-----	-----	SE Offsite	
3	SCS Runoff	86.54	2	722	249,813	----	-----	-----	South Developed to Pond	
4	Combine	128.52	2	724	492,811	2, 3	-----	-----	Total to SE Pond	
5	Reservoir	51.18	2	748	492,762	4	1358.76	164,691	<no description>	
6	SCS Runoff	187.50	2	722	541,262	----	-----	-----	Developed to West Pond	
7	Reservoir	40.89	2	738	493,269	6	1343.36	272,586	<no description>	
Ponds.gpw					Return Period: 100 Year			Thursday, May 22, 2008		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

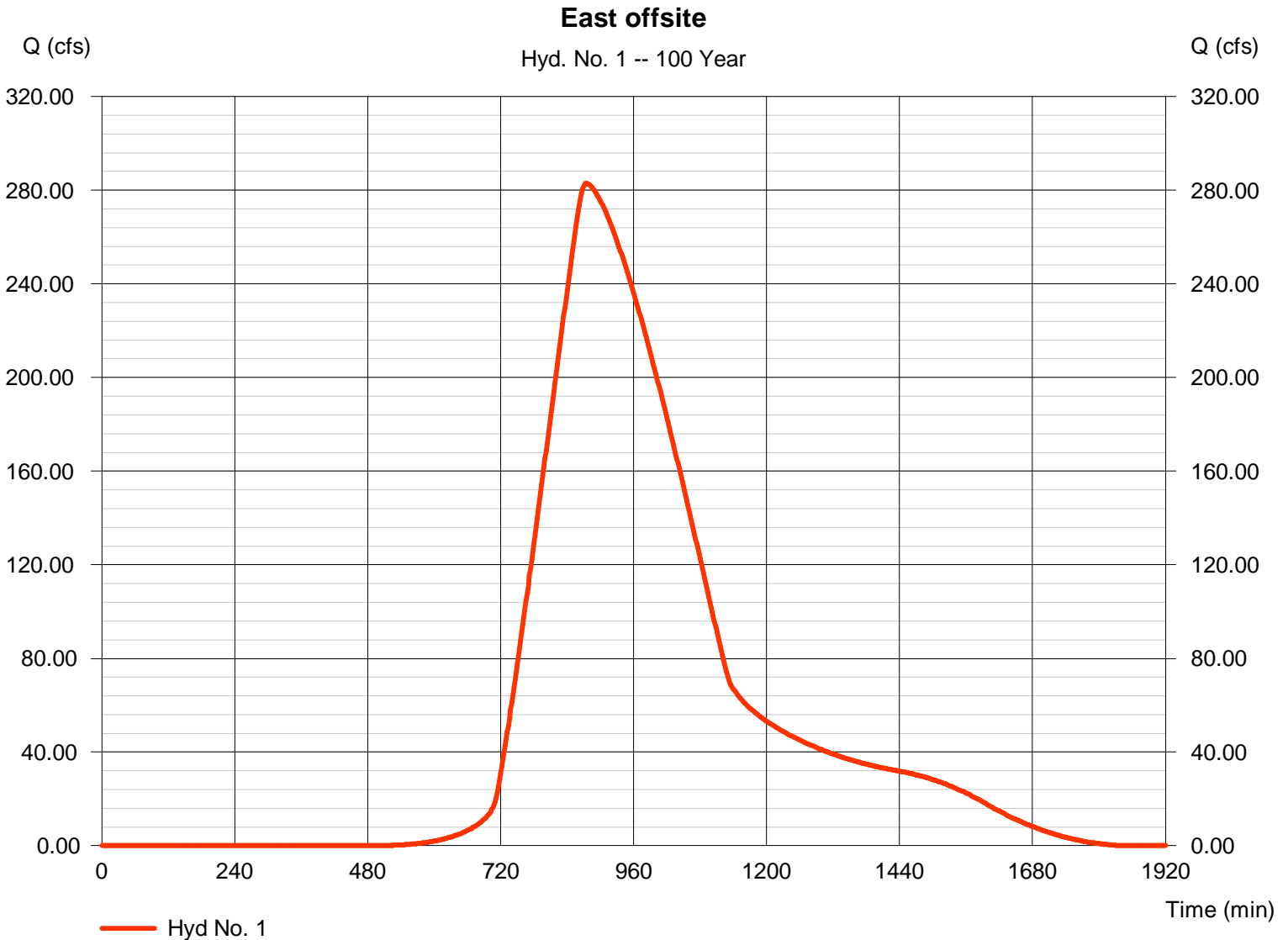
Thursday, May 22, 2008

Hyd. No. 1

East offsite

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 357.000 ac
 Basin Slope = 0.8 %
 Tc method = LAG
 Total precip. = 7.90 in
 Storm duration = 24 hrs

Peak discharge = 282.96 cfs
 Time to peak = 874 min
 Hyd. volume = 5,683,077 cuft
 Curve number = 70
 Hydraulic length = 8600 ft
 Time of conc. (Tc) = 265.67 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

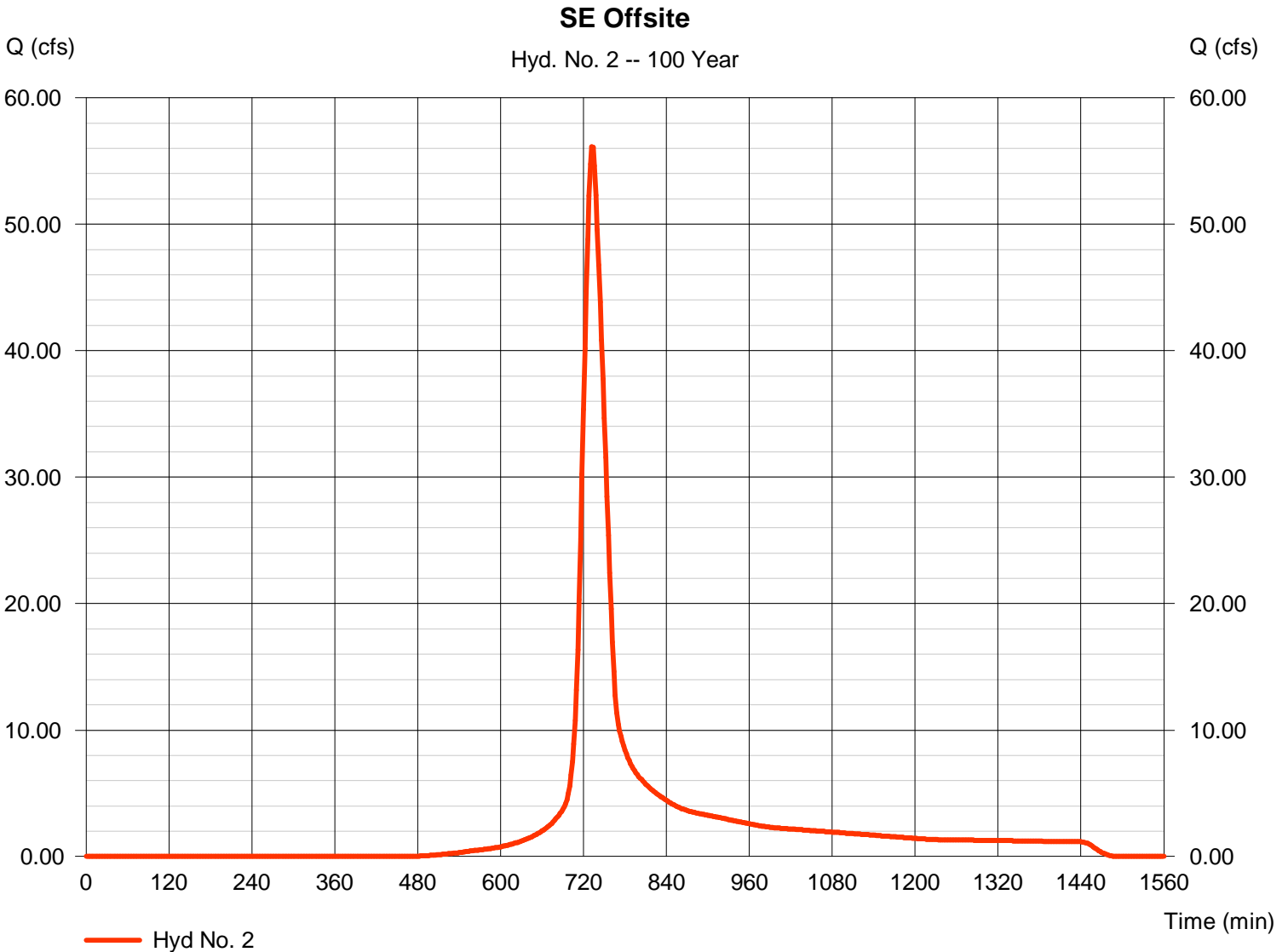
Thursday, May 22, 2008

Hyd. No. 2

SE Offsite

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 15.100 ac
Basin Slope = 1.2 %
Tc method = LAG
Total precip. = 7.90 in
Storm duration = 24 hrs

Peak discharge = 56.14 cfs
Time to peak = 732 min
Hyd. volume = 242,997 cuft
Curve number = 70
Hydraulic length = 800 ft
Time of conc. (Tc) = 32.45 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 3

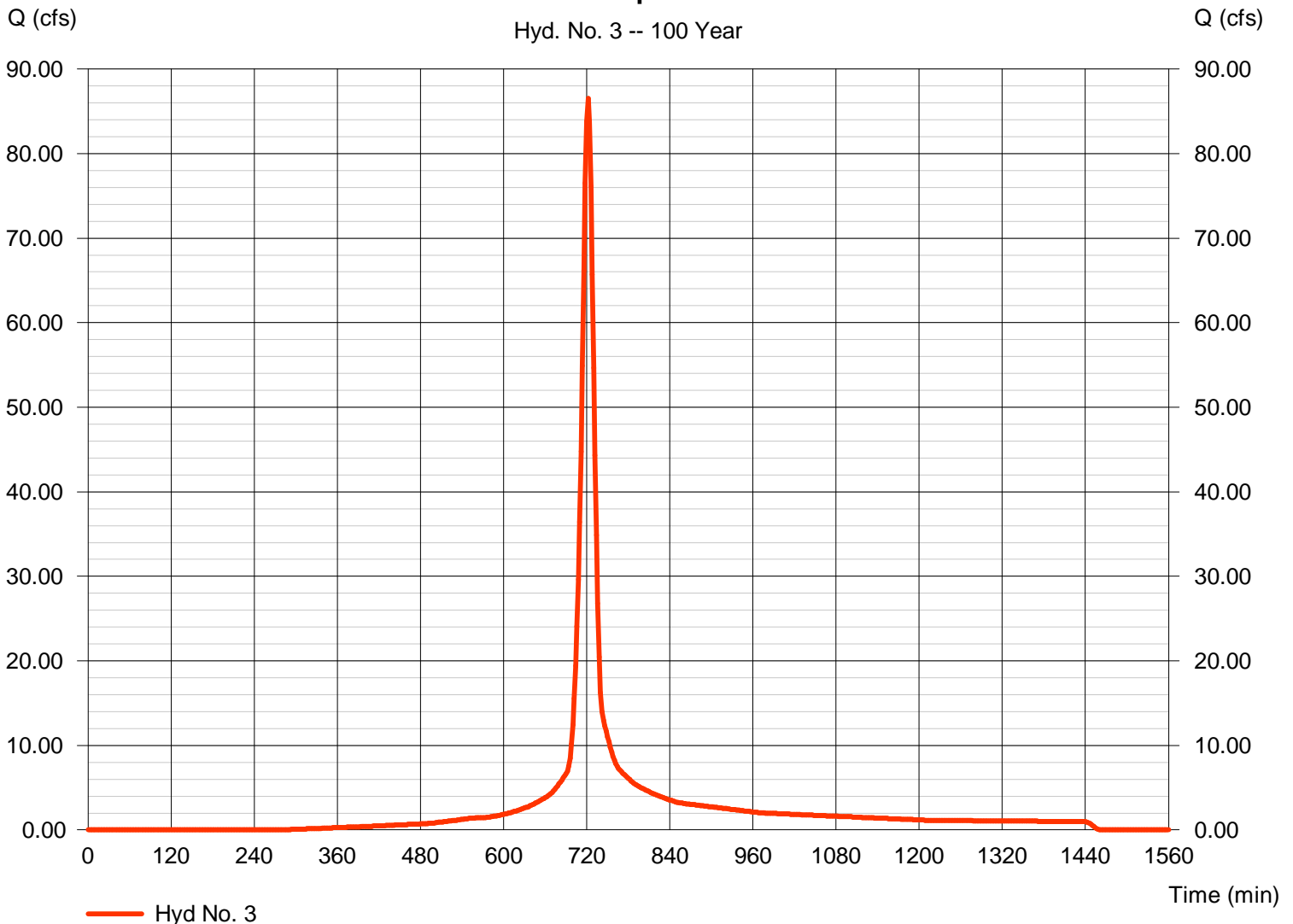
South Developed to Pond

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 12.000 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.90 in
 Storm duration = 24 hrs

Peak discharge = 86.54 cfs
 Time to peak = 722 min
 Hyd. volume = 249,813 cuft
 Curve number = 83
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.00 min
 Distribution = Type II
 Shape factor = 484

South Developed to Pond

Hyd. No. 3 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

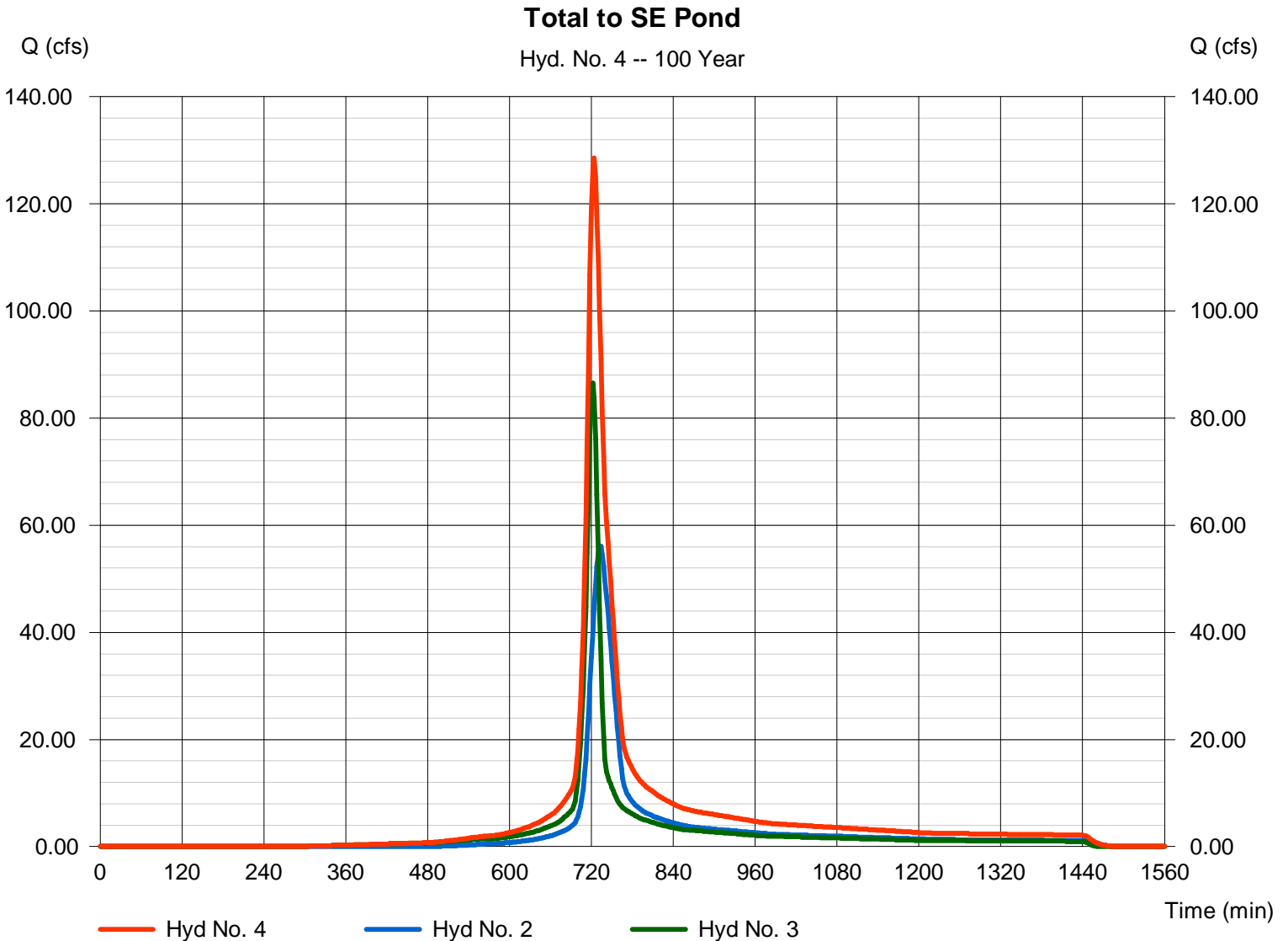
Thursday, May 22, 2008

Hyd. No. 4

Total to SE Pond

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 128.52 cfs
Time to peak = 724 min
Hyd. volume = 492,811 cuft
Contrib. drain. area = 27.100 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

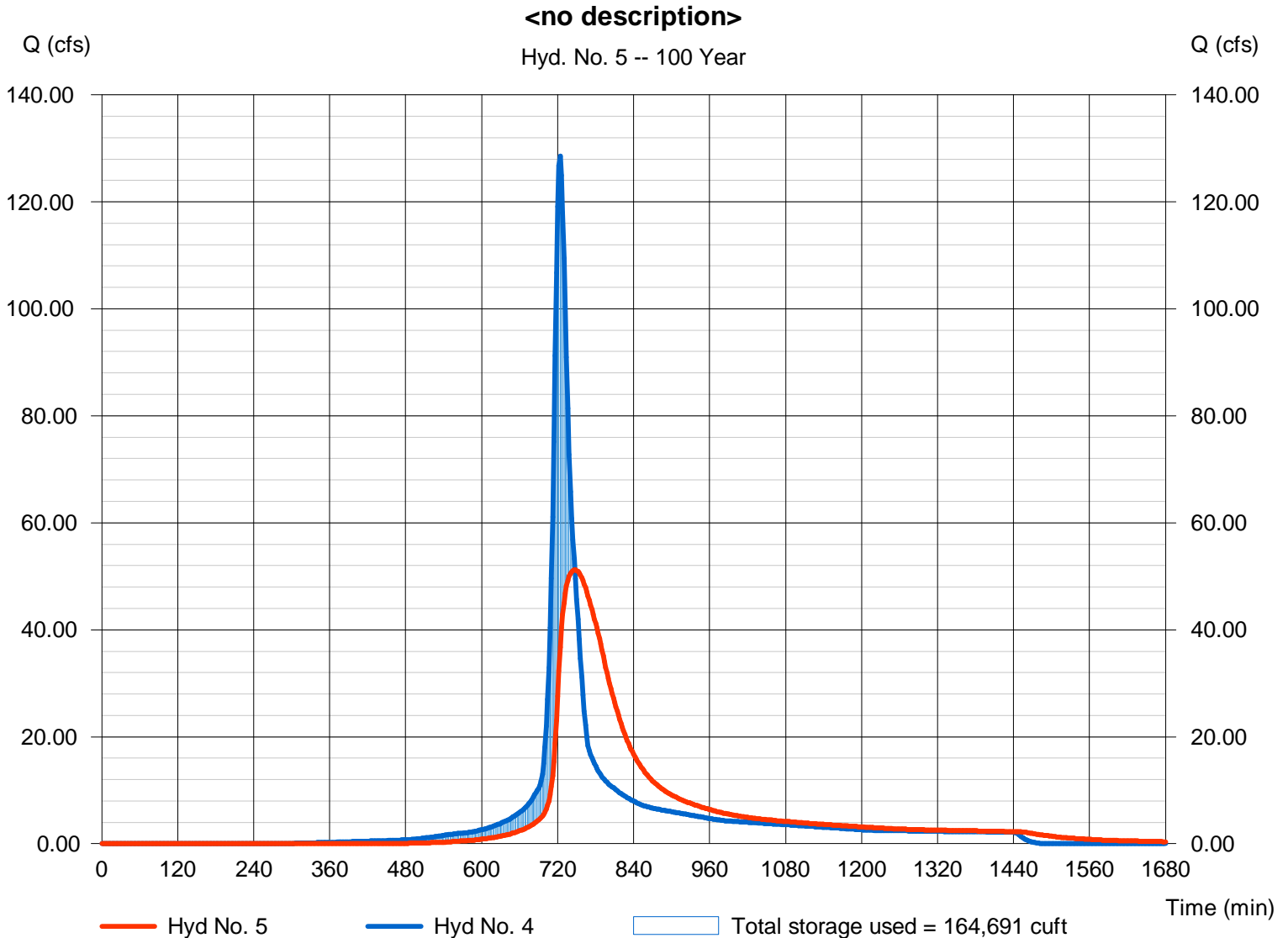
Hyd. No. 5

<no description>

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 4 - Total to SE Pond
Reservoir name = South East Pond

Peak discharge = 51.18 cfs
Time to peak = 748 min
Hyd. volume = 492,762 cuft
Max. Elevation = 1358.76 ft
Max. Storage = 164,691 cuft

Storage Indication method used.



Pond No. 1 - South East Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1355.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1355.00	35,700	0	0
1.00	1356.00	39,900	37,777	37,777
2.00	1357.00	44,100	41,978	79,755
3.00	1358.00	48,500	46,278	126,033
4.00	1359.00	53,000	50,728	176,761

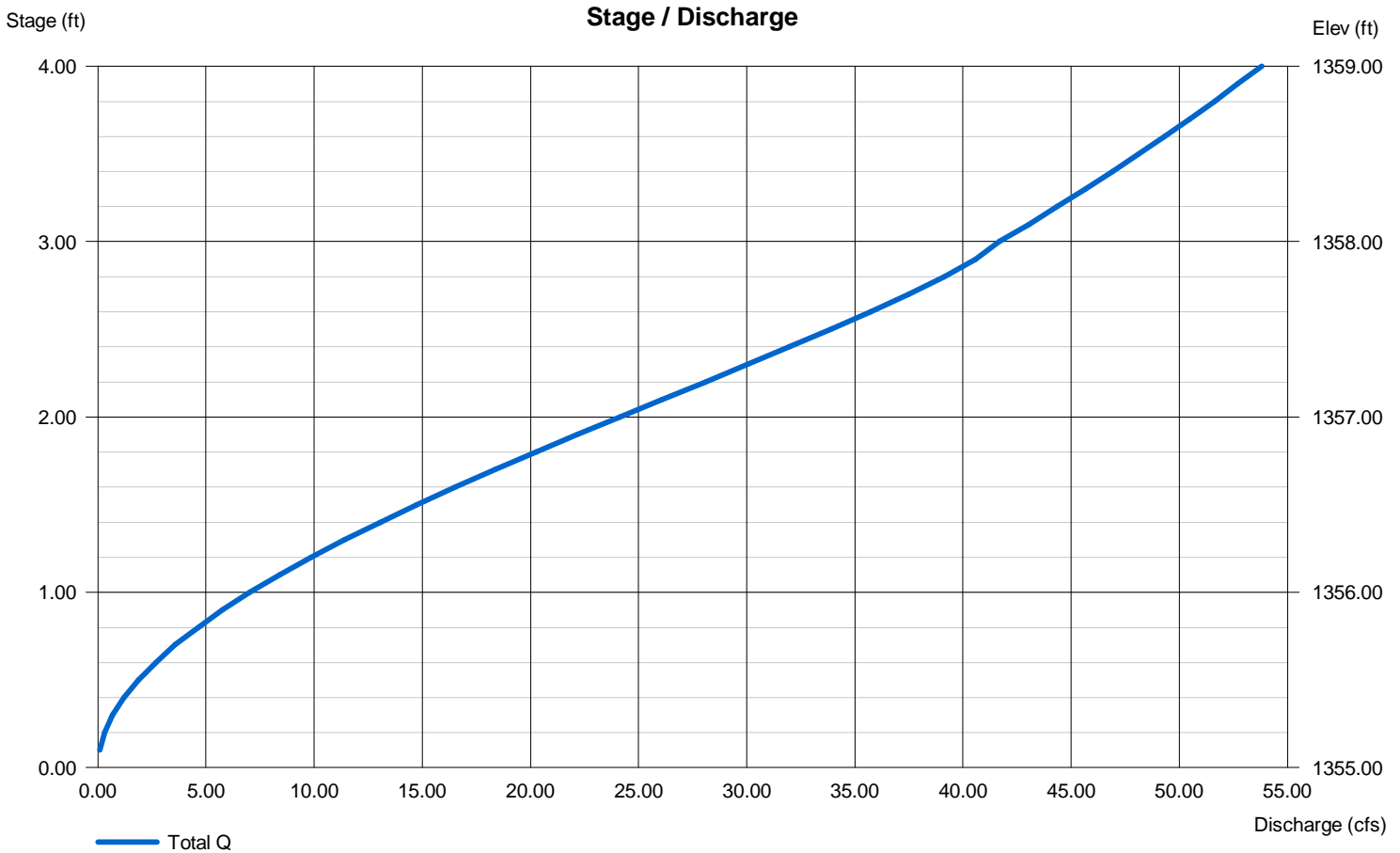
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1355.00	0.00	0.00	0.00
Length (ft)	= 500.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Hyd. No. 6

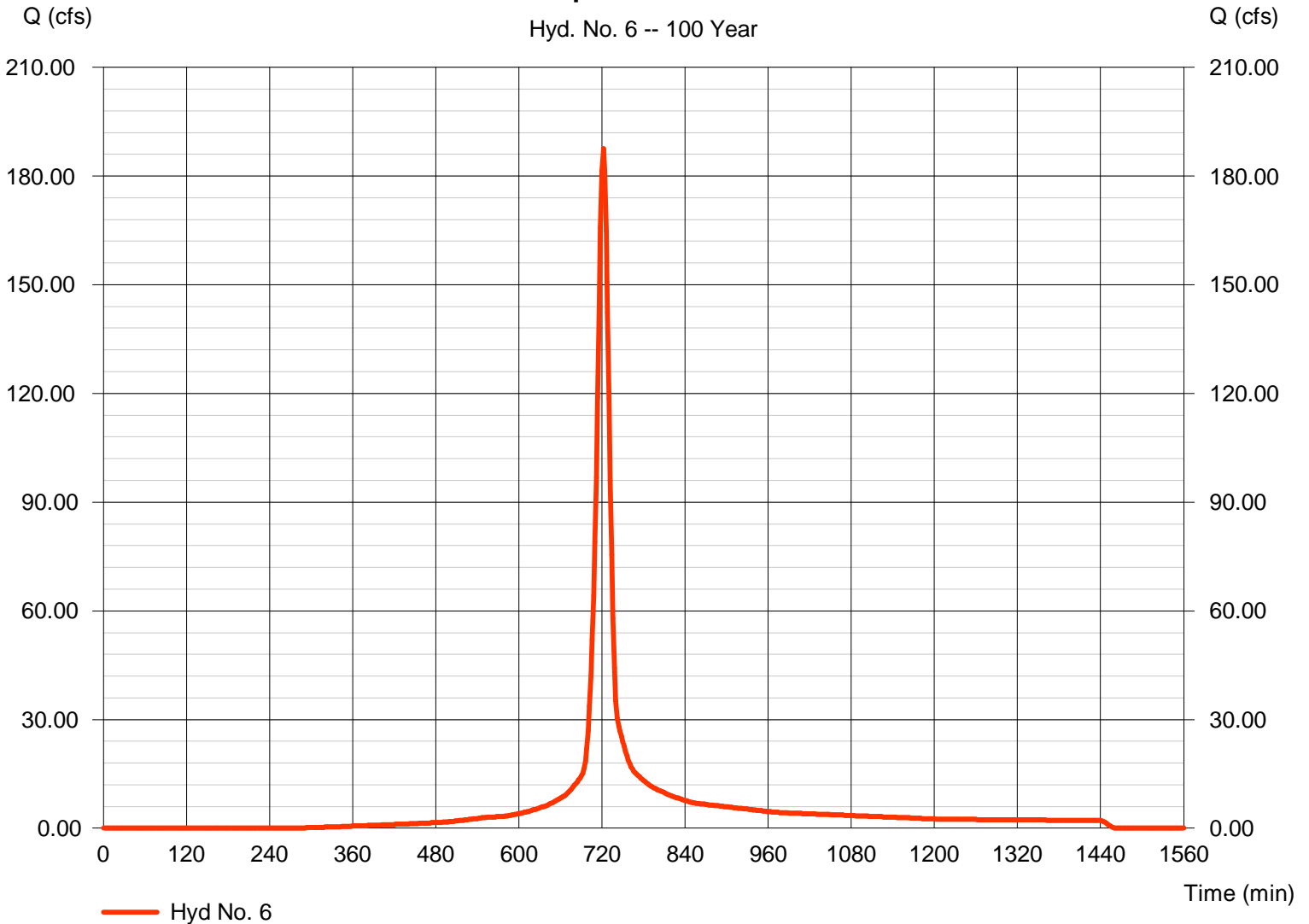
Developed to West Pond

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 26.000 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.90 in
 Storm duration = 24 hrs

Peak discharge = 187.50 cfs
 Time to peak = 722 min
 Hyd. volume = 541,262 cuft
 Curve number = 83
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.00 min
 Distribution = Type II
 Shape factor = 484

Developed to West Pond

Hyd. No. 6 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.02

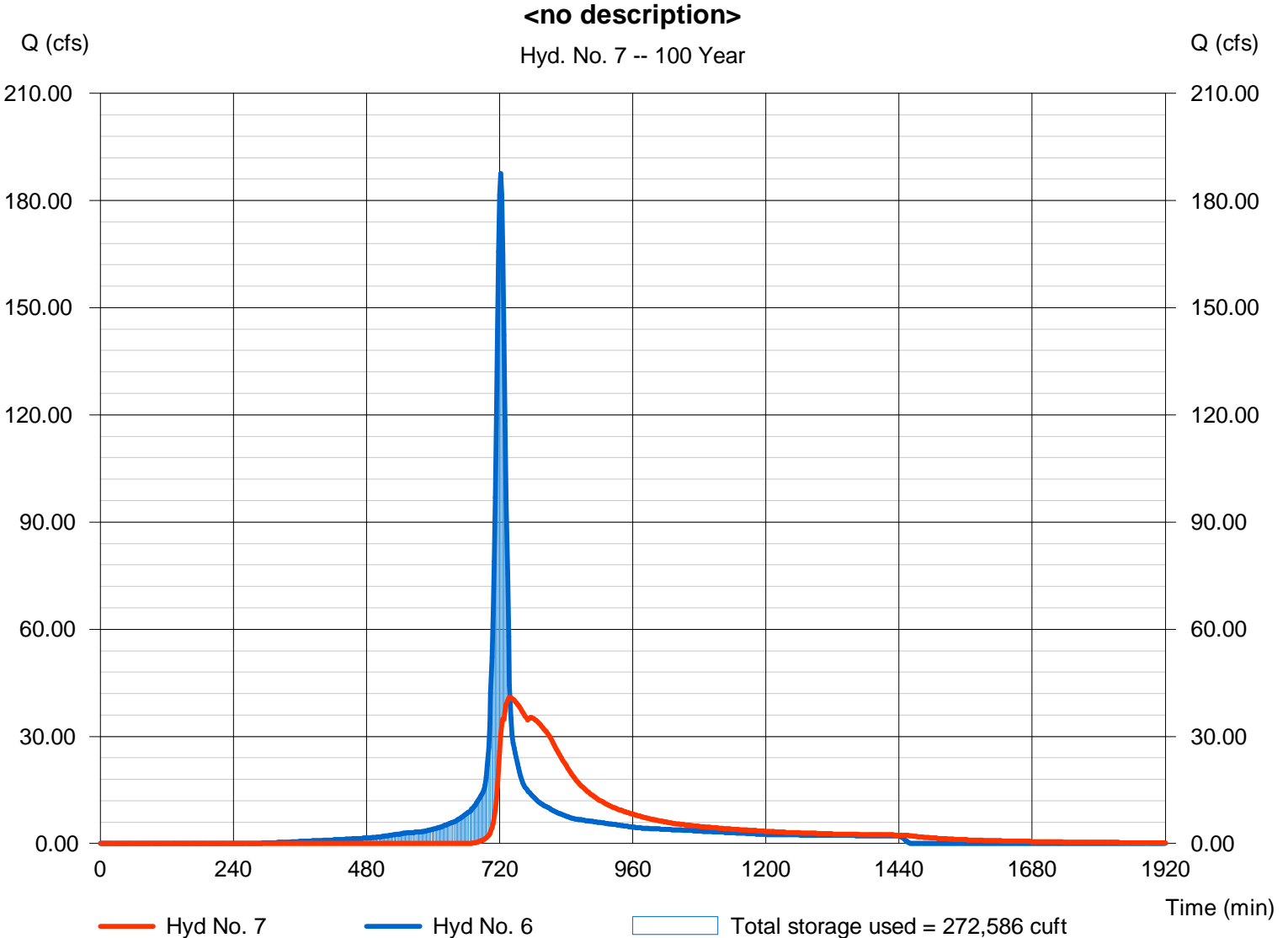
Thursday, May 22, 2008

Hyd. No. 7

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 40.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 493,269 cuft
Inflow hyd. No.	= 6 - Developed to West Pond	Max. Elevation	= 1343.36 ft
Reservoir name	= West Pond	Max. Storage	= 272,586 cuft

Storage Indication method used.



Pond No. 2 - West Pond

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1339.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1339.00	43,740	0	0
1.00	1340.00	51,700	47,660	47,660
2.00	1341.00	60,250	55,915	103,575
3.00	1342.00	69,500	64,813	168,388
4.00	1343.00	79,100	74,241	242,629
5.00	1344.00	89,300	84,140	326,769
6.00	1345.00	99,800	94,492	421,261
7.00	1346.00	113,600	106,615	527,876
8.00	1347.00	135,100	124,182	652,058

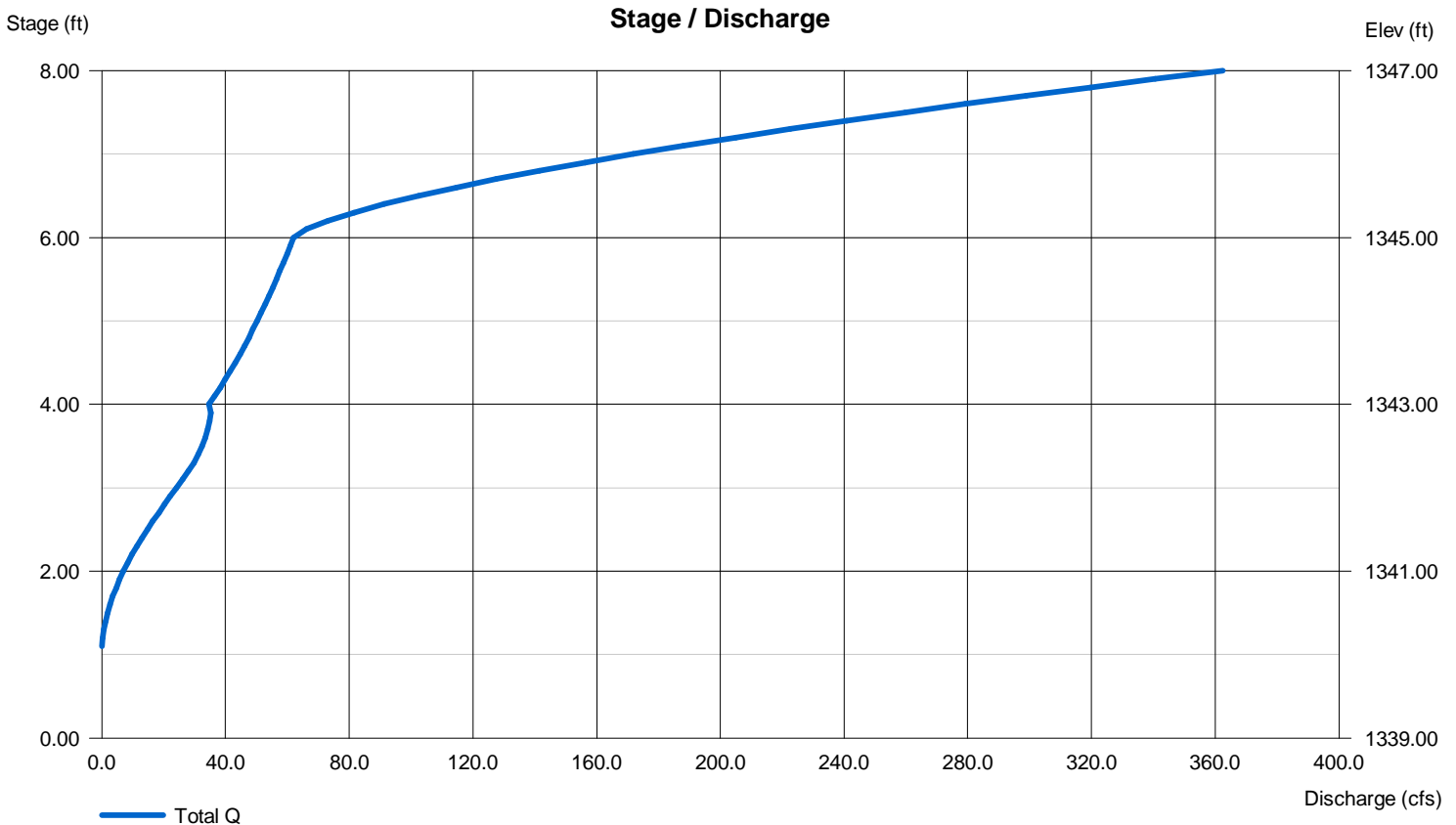
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1340.00	0.00	0.00	0.00
Length (ft)	= 130.00	0.00	0.00	0.00
Slope (%)	= 0.70	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)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1345.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet and outlet control. Weir risers are checked for orifice conditions.



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intelisolve v9.02

Thursday, May 22, 2008

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	76.3137	14.3000	0.8844	-----
3	0.0000	0.0000	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: wichita.IDF

$$\text{Intensity} = B / (T_c + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	3.50	0.00	4.50	5.30	6.10	6.80	7.90
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

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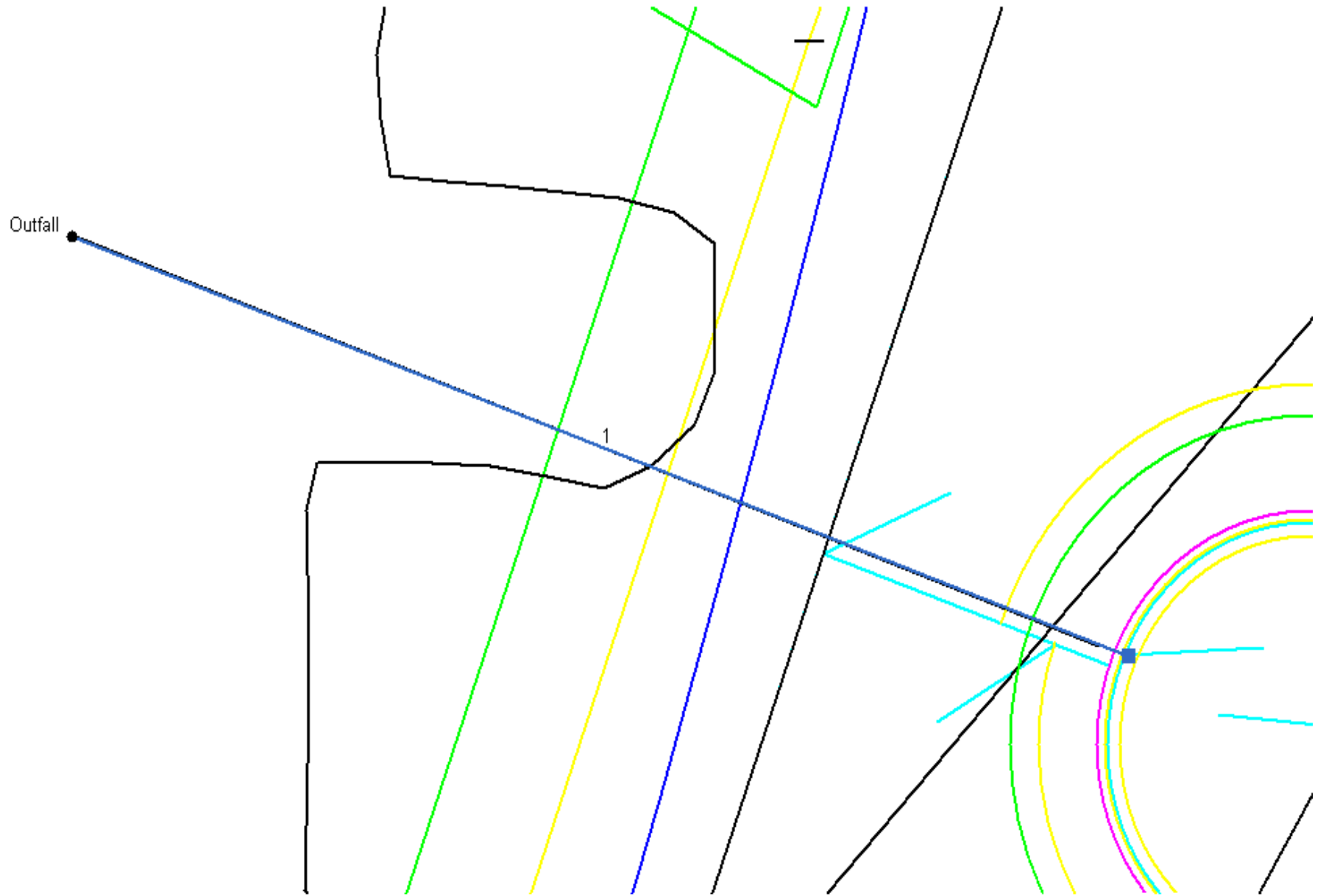
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HydraFlow Storm Sewer

Systems 1-7
10-year Storm Event

Hydraflow Plan View



Project File: sws1.stm

No. Lines: 1

05-21-2008

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 type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	195.3	19.9	Curb	0.00	2.50	0.61	15.0	1340.00	0.30	1340.59	18	Cir	0.013	1.00	1354.00	
Project File: sws1.stm												Number of lines: 1			Date: 05-21-2008		

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
1		7.96	18 c	195.3	1340.00	1340.59	0.300	1341.50*	1342.62*	0.32	1342.94	End

Project File: sws1.stm	Number of lines: 1	Run Date: 05-21-2008
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NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
1		7.96	0.00	7.96	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.56	10.10	0.67	10.10	2.00	Off

Project File: sws1.stm Number of lines: 1 Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

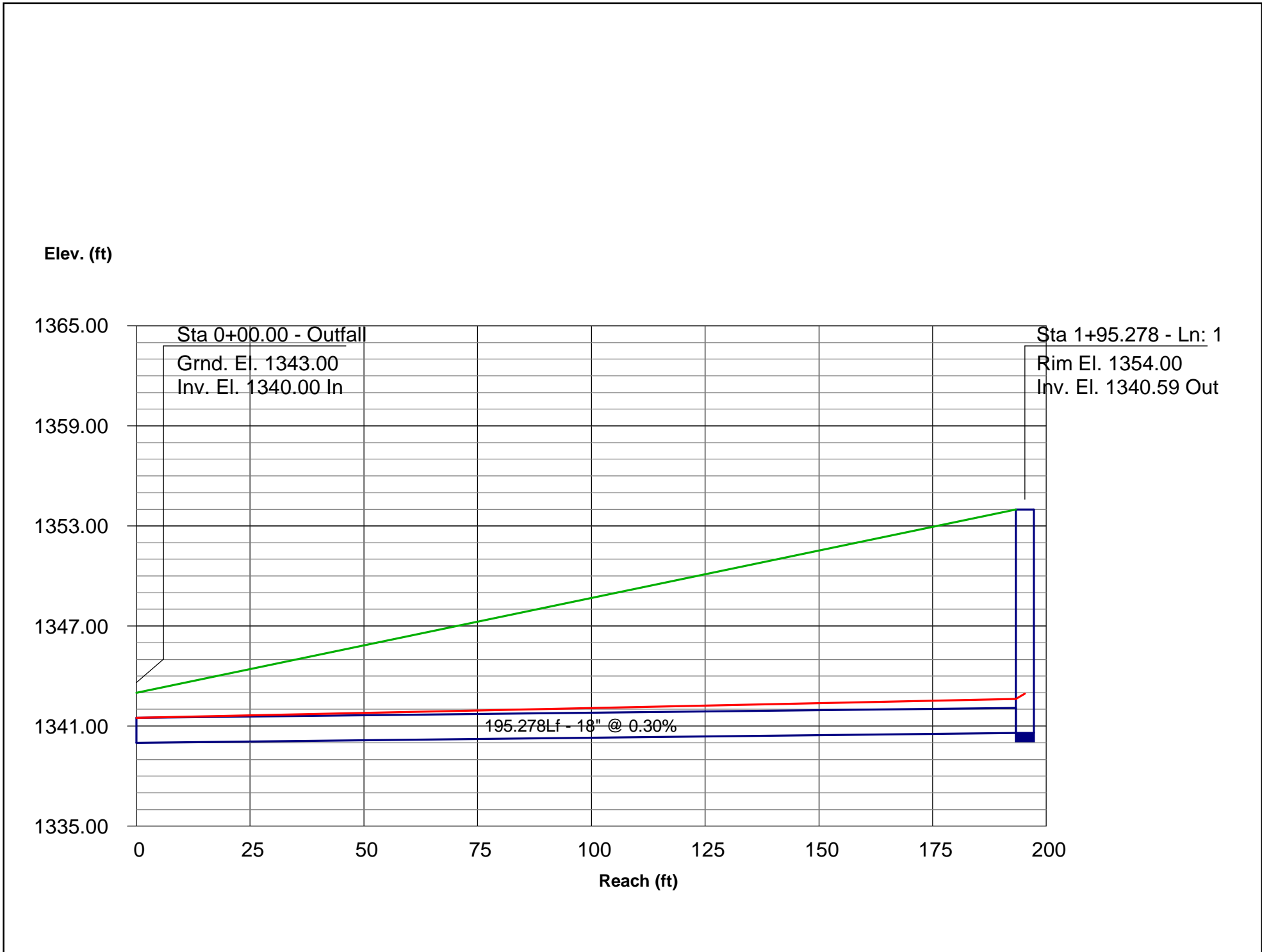
Line (1)	Size (in) (2)	Q (cfs) (3)	Downstream								Len (ft) (12)	Upstream								Check		JL coeff (K) (23)	Minor loss (ft) (24)
			Invert elev (ft) (4)	HGL elev (ft) (5)	Depth (ft) (6)	Area (sqft) (7)	Vel (ft/s) (8)	Vel head (ft) (9)	EGL elev (ft) (10)	Sf (%) (11)		Invert elev (ft) (13)	HGL elev (ft) (14)	Depth (ft) (15)	Area (sqft) (16)	Vel (ft/s) (17)	Vel head (ft) (18)	EGL elev (ft) (19)	Sf (%) (20)	Ave Sf (%) (21)	Enrgy loss (ft) (22)		
1	18	7.96	1340.00	1341.50	1.50	1.77	4.51	0.32	1341.82	0.575	195	1340.59	1342.62	1.50	1.77	4.51	0.32	1342.94	0.575	0.575	1.123	1.00	0.32

Project File: sws1.stm

Number of lines: 1

Run Date: 05-21-2008

Storm Sewer Profile



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

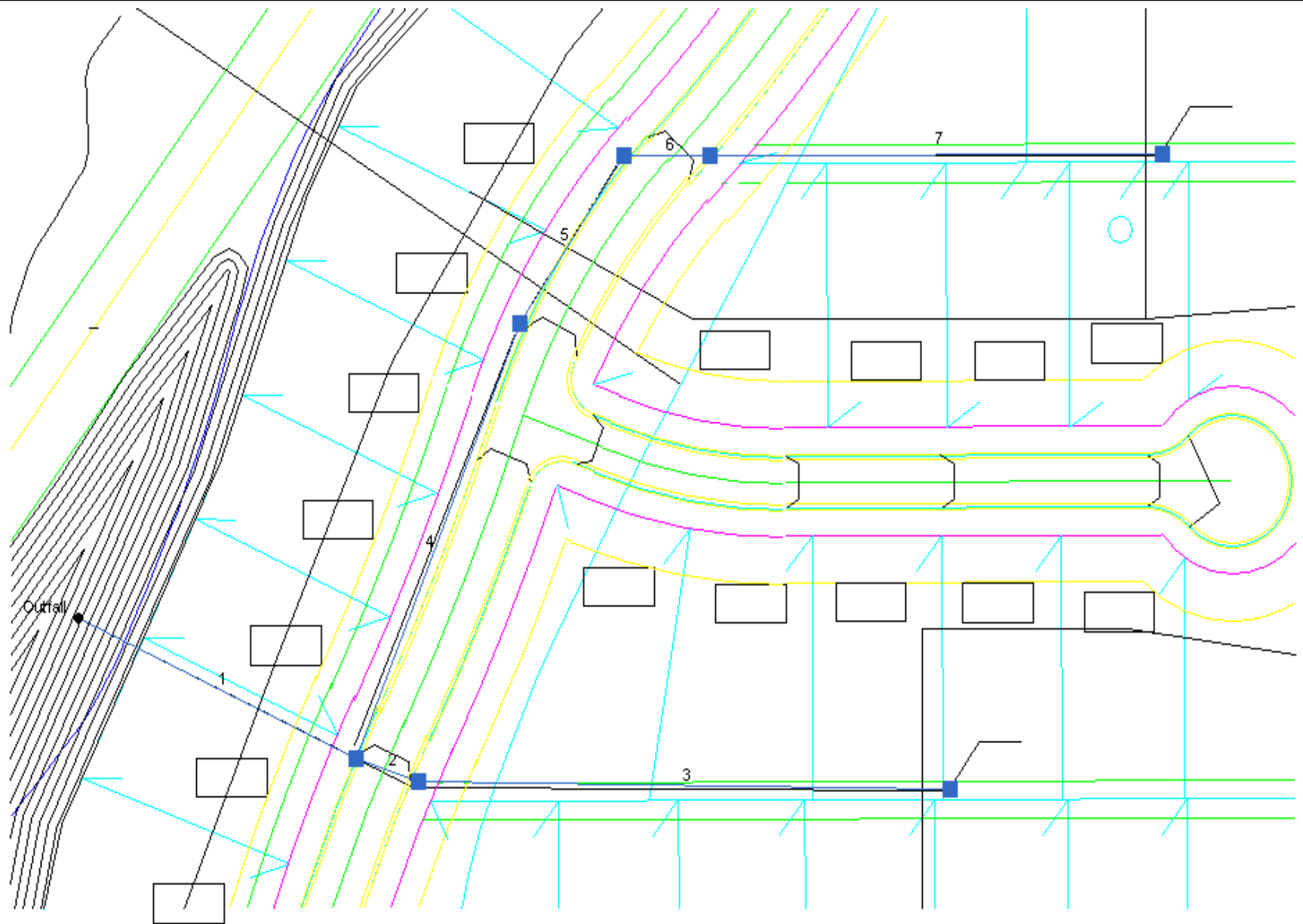
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times$ Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Hydraflow Plan View



Project File: sws2.stm

No. Lines: 7

05-21-2008

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 EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim EI (ft)	
7	6	265.1	-0.1	DrGrt	0.00	1.20	0.61	15.0	1344.02	0.33	1344.88	15	Cir	0.013	1.00	1359.00	
6	5	50.3	55.7	Curb	0.00	1.60	0.61	15.0	1343.62	0.30	1343.77	18	Cir	0.013	0.50	1356.00	
5	4	108.3	11.9	Curb	0.00	1.60	0.61	15.0	1342.79	0.30	1343.12	24	Cir	0.013	1.28	1355.50	
4	1	251.6	-92.4	Curb	0.00	0.20	0.61	15.0	1342.04	0.30	1342.79	24	Cir	0.013	0.50	1354.50	
3	2	312.0	-18.2	DrGrt	0.00	1.40	0.61	15.0	1342.90	0.33	1343.92	15	Cir	0.013	1.00	1362.00	
2	1	38.5	-6.0	Curb	0.00	2.65	0.61	15.0	1342.04	0.30	1342.15	24	Cir	0.013	0.55	1353.00	
1	End	179.0	24.9	Curb	0.00	2.65	0.61	15.0	1340.00	0.30	1340.54	42	Cir	0.013	1.50	1353.00	
Project File: sws2.stm												Number of lines: 7				Date: 05-21-2008	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
7		3.82	15 c	265.1	1344.02	1344.88	0.325	1346.64*	1347.57*	0.15	1347.72	6
6		8.58	18 c	50.3	1343.62	1343.77	0.300	1345.90*	1346.24*	0.18	1346.42	5
5		13.43	24 c	108.3	1342.79	1343.12	0.300	1345.16*	1345.54*	0.36	1345.90	4
4		13.88	24 c	251.6	1342.04	1342.79	0.300	1344.04*	1344.99*	0.15	1345.14	1
3		4.46	15 c	312.0	1342.90	1343.92	0.325	1344.15*	1345.64*	0.21	1345.85	2
2		12.41	24 c	38.5	1342.04	1342.15	0.299	1343.68	1343.80	0.17	1343.97	1
1		33.29	42 c	179.0	1340.00	1340.54	0.300	1341.96	1342.50	n/a	1342.98 i	End

Project File: sws2.stm	Number of lines: 7	Run Date: 05-21-2008
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NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; i - Inlet control.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
7		3.82	0.00	3.82	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.22	10.96	0.22	10.96	0.00	6
6		5.10	0.00	3.27	1.83	Curb	6.0	6.00	2.50	4.00	2.00	0.010	2.00	0.080	0.050	0.013	0.39	6.66	0.47	6.09	2.00	2
5		5.10	0.00	3.27	1.83	Curb	6.0	6.00	2.50	4.00	2.00	0.010	2.00	0.080	0.050	0.013	0.39	6.66	0.47	6.09	2.00	4
4		0.64	1.83	2.05	0.42	Curb	6.0	6.00	2.50	4.00	2.00	0.010	2.00	0.080	0.050	0.013	0.31	4.92	0.37	4.15	2.00	1
3		4.46	0.00	4.46	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.25	11.93	0.25	11.93	0.00	2
2		8.44	1.83	10.27	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.66	11.97	0.77	11.97	2.00	1
1		8.44	0.42	8.86	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.60	10.85	0.71	10.85	2.00	Off

Project File: sws2.stm Number of lines: 7 Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
7	15	3.82	1344.02	1346.64	1.25	1.23	3.11	0.15	1346.79	0.350	265	1344.88	1347.57	1.25	1.23	3.11	0.15	1347.72	0.350	0.350	0.929	1.00	0.15
6	18	8.58	1343.62	1345.90	1.50	1.77	4.86	0.37	1346.27	0.668	50.3	1343.77	1346.24	1.50	1.77	4.86	0.37	1346.61	0.668	0.668	0.336	0.50	0.18
5	24	13.43	1342.79	1345.16	2.00	3.14	4.27	0.28	1345.44	0.353	108	1343.12	1345.54	2.00	3.14	4.27	0.28	1345.82	0.352	0.352	0.382	1.28	0.36
4	24	13.88	1342.04	1344.04	2.00*	3.14	4.42	0.30	1344.34	0.377	252	1342.79	1344.99	2.00	3.14	4.42	0.30	1345.29	0.377	0.377	0.948	0.50	0.15
3	15	4.46	1342.90	1344.15	1.25*	1.23	3.63	0.21	1344.36	0.477	312	1343.92	1345.64	1.25	1.23	3.63	0.21	1345.85	0.477	0.477	1.488	1.00	0.21
2	24	12.41	1342.04	1343.68	1.65*	2.77	4.49	0.31	1344.00	0.299	38.5	1342.15	1343.80	1.64	2.76	4.49	0.31	1344.11	0.299	0.299	0.115	0.55	0.17
1	42	33.29	1340.00	1341.96	1.96	5.55	6.00	0.56	1342.52	n/a	179	1340.54	1342.50	1.96	5.54	6.01	0.56	1343.06i	n/a	n/a	-0.026	1.50	n/a

Project File: sws2.stm

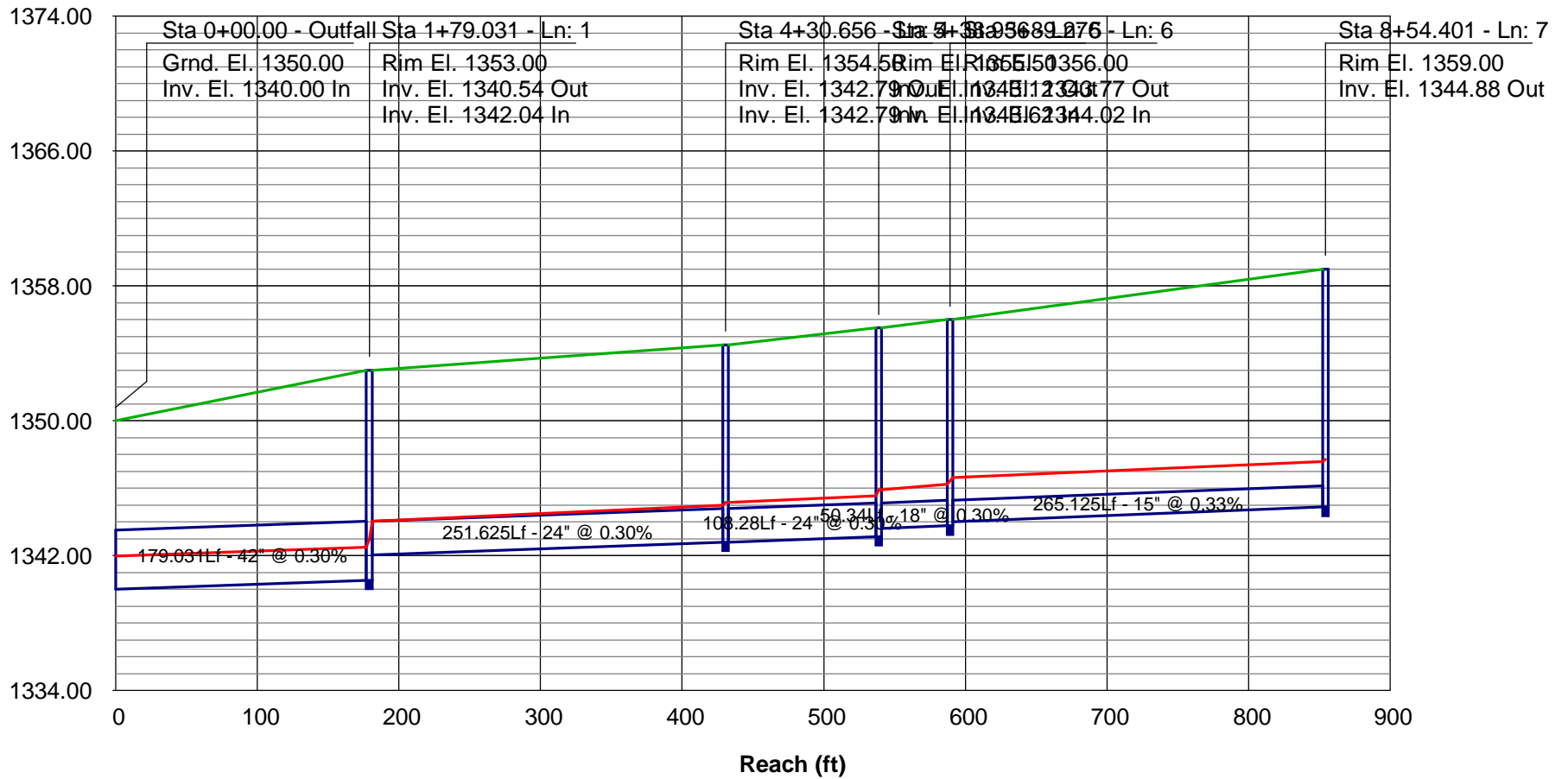
Number of lines: 7

Run Date: 05-21-2008

Notes: * Normal depth assumed.

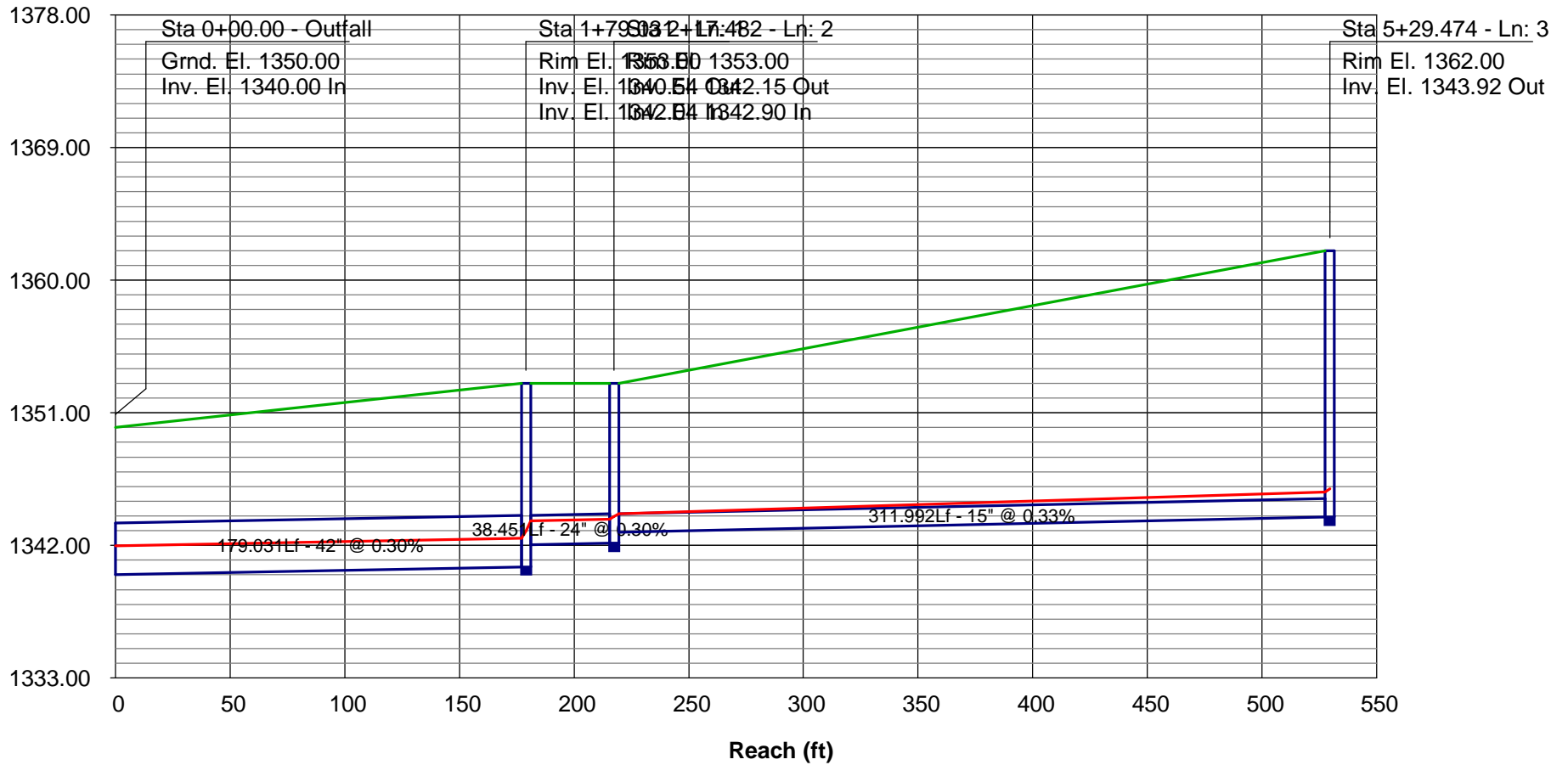
Storm Sewer Profile

Elev. (ft)



Storm Sewer Profile

Elev. (ft)



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

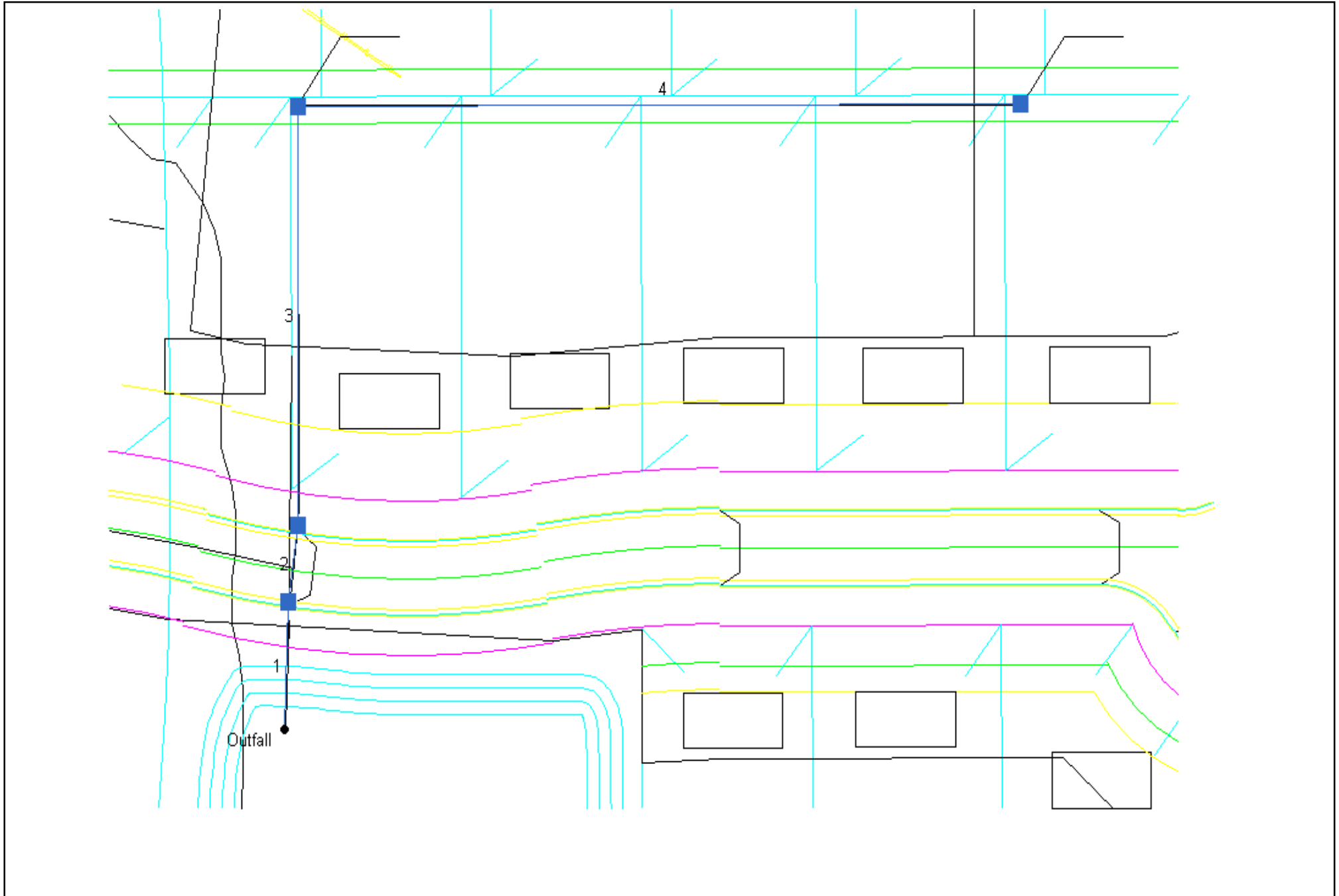
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Hydraflow Plan View



Project File: sws3.stm

No. Lines: 4

05-21-2008

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 EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim EI (ft)	
4	3	297.6	89.8	DrGrt	0.00	1.50	0.61	15.0	1356.45	0.33	1357.42	15	Cir	0.013	1.00	1365.00	
3	2	157.3	-8.0	DrGrt	0.00	1.40	0.61	15.0	1355.23	0.30	1355.70	24	Cir	0.013	1.50	1359.00	
2	1	29.1	5.8	Curb	0.00	0.85	0.61	15.0	1355.14	0.30	1355.23	24	Cir	0.013	0.50	1360.00	
1	End	47.8	-87.8	Curb	0.00	0.85	0.61	15.0	1355.00	0.29	1355.14	24	Cir	0.013	0.50	1360.00	
Project File: sws3.stm												Number of lines: 4				Date: 05-21-2008	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
4		4.78	15 c	297.6	1356.45	1357.42	0.325	1358.07*	1359.70*	0.24	1359.93	3
3		8.92	24 c	157.3	1355.23	1355.70	0.300	1357.63*	1357.88*	0.19	1358.07	2
2		11.26	24 c	29.1	1355.14	1355.23	0.299	1357.39*	1357.46*	0.10	1357.56	1
1		13.77	24 c	47.8	1355.00	1355.14	0.293	1357.00	1357.14	0.15	1357.29	End
Project File: sws3.stm							Number of lines: 4			Run Date: 05-21-2008		
NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).												

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
4		4.78	0.00	4.78	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.26	12.40	0.26	12.40	0.00	3
3		4.46	0.00	4.46	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.25	11.93	0.25	11.93	0.00	2
2		2.71	0.00	2.71	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.31	4.90	0.41	4.90	2.00	1
1		2.71	0.00	2.71	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.31	4.90	0.41	4.90	2.00	Off

Project File: sws3.stm Number of lines: 4 Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
4	15	4.78	1356.45	1358.07	1.25	1.23	3.89	0.24	1358.30	0.548	298	1357.42	1359.70	1.25	1.23	3.89	0.24	1359.93	0.547	0.547	1.629	1.00	0.24
3	24	8.92	1355.23	1357.63	2.00	3.14	2.84	0.13	1357.76	0.156	157	1355.70	1357.88	2.00	3.14	2.84	0.13	1358.00	0.156	0.156	0.245	1.50	0.19
2	24	11.26	1355.14	1357.39	2.00	3.14	3.59	0.20	1357.59	0.248	29.1	1355.23	1357.46	2.00	3.14	3.58	0.20	1357.66	0.248	0.248	0.072	0.50	0.10
1	24	13.77	1355.00	1357.00	2.00	3.14	4.38	0.30	1357.30	0.371	47.8	1355.14	1357.14	2.00	3.14	4.38	0.30	1357.44	0.364	0.367	0.176	0.50	0.15

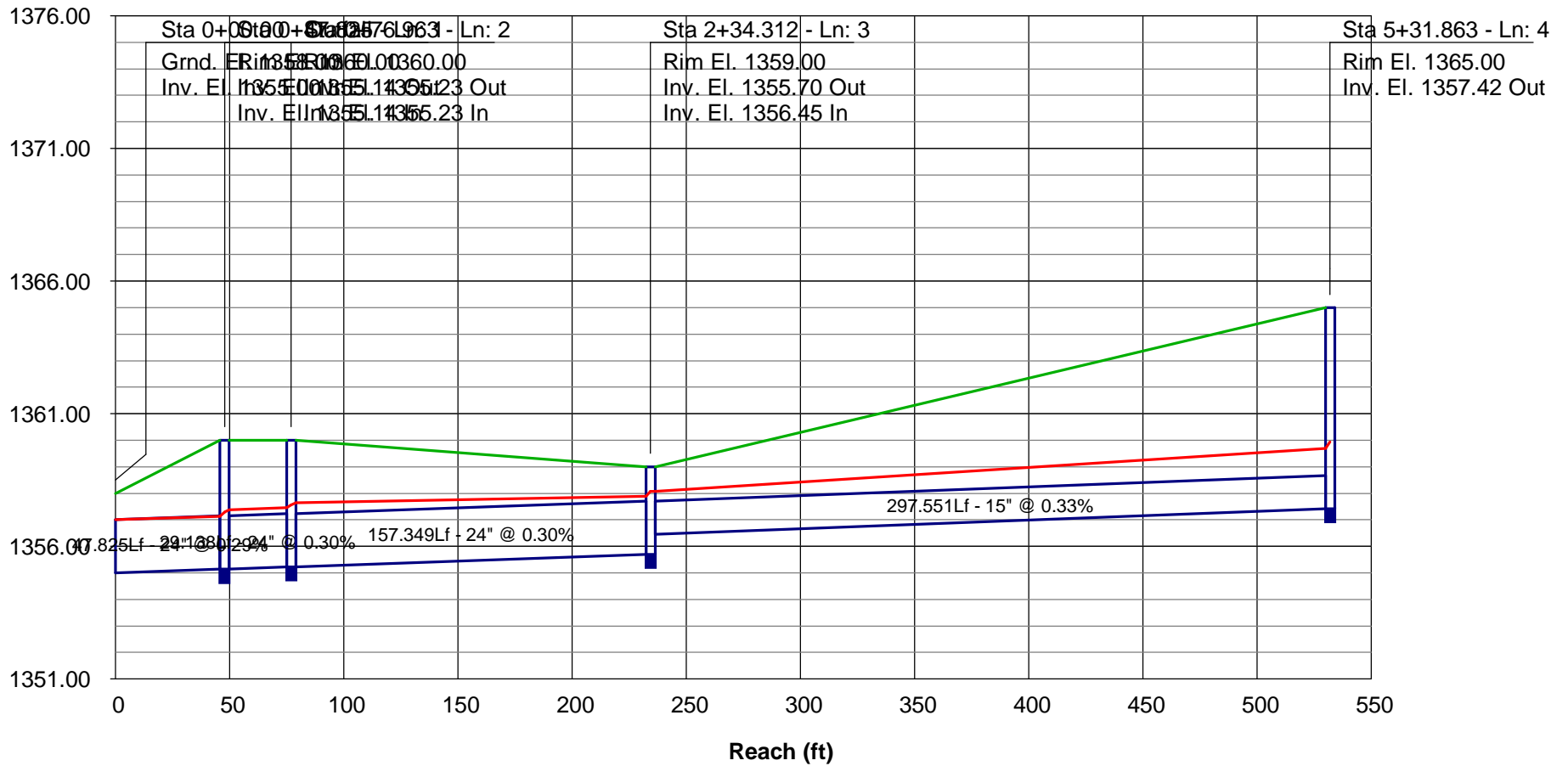
Project File: sws3.stm

Number of lines: 4

Run Date: 05-21-2008

Storm Sewer Profile

Elev. (ft)



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

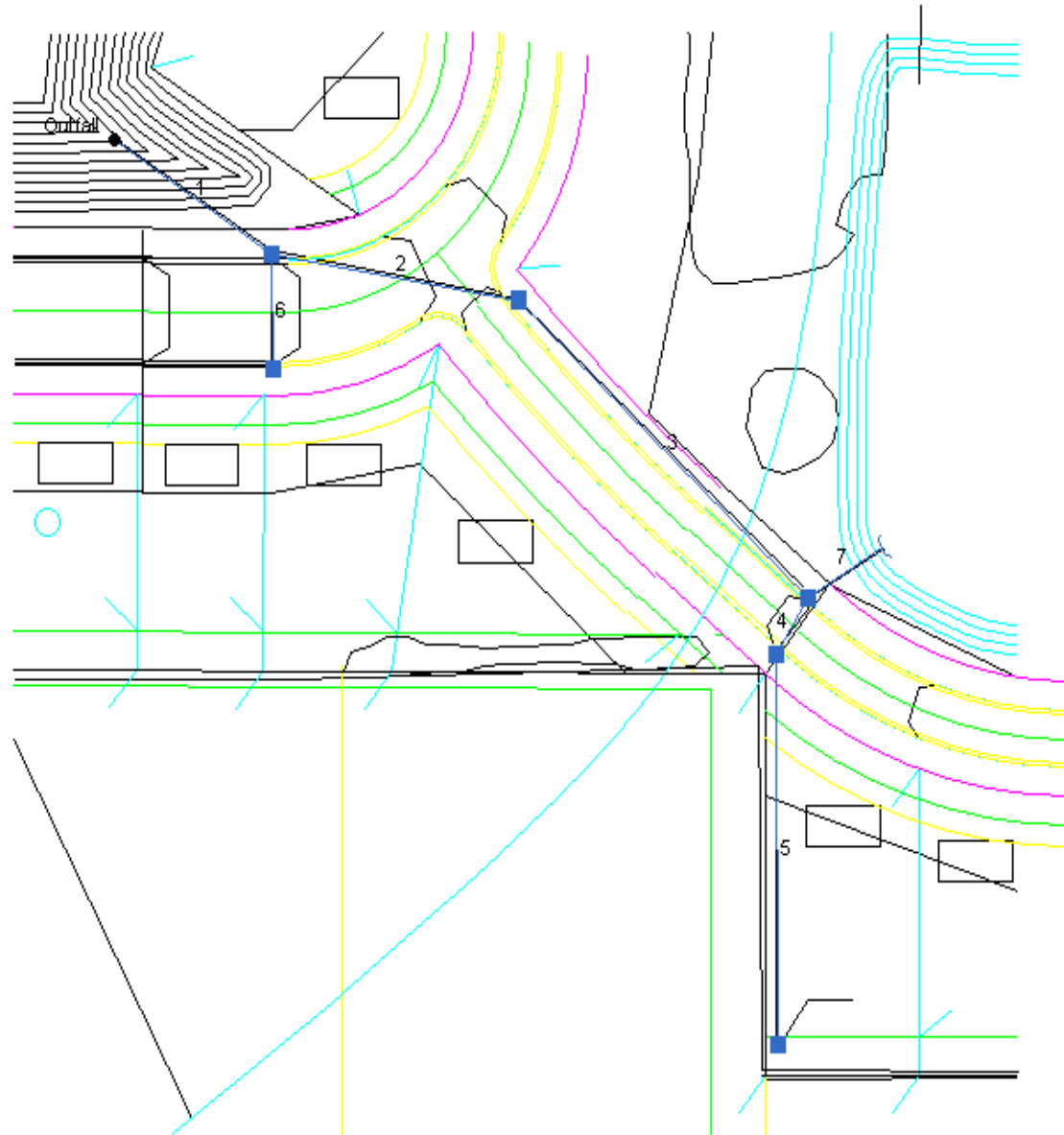
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Hydraflow Plan View



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 EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim EI (ft)	
7	3	48.5	-74.8	Hdwl	30.00	0.00	0.00	0.0	1354.70	0.49	1354.94	36	Cir	0.013	1.00	1358.00	
6	1	58.1	55.8	Curb	0.00	0.87	0.61	15.0	1344.57	0.33	1344.76	15	Cir	0.013	1.00	1351.00	
5	4	198.3	-33.0	DrGrt	0.00	1.00	0.61	15.0	1345.75	0.32	1346.40	15	Cir	0.013	1.00	1358.00	
4	3	33.6	79.4	Curb	0.00	0.75	0.61	15.0	1345.40	0.30	1345.50	18	Cir	0.013	0.90	1359.00	
3	2	220.7	33.6	Curb	0.00	0.75	0.61	15.0	1342.74	0.30	1343.40	42	Cir	0.013	1.48	1359.00	
2	1	139.7	-23.9	Curb	0.00	0.15	0.61	15.0	1342.32	0.30	1342.74	42	Cir	0.013	0.91	1352.50	
1	End	105.2	33.5	Curb	0.00	0.87	0.61	15.0	1342.00	0.30	1342.32	42	Cir	0.013	1.28	1351.00	
Project File: sws4.stm												Number of lines: 7				Date: 05-21-2008	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
7		30.00	36 c	48.5	1354.70	1354.94	0.495	1356.44	1356.69	n/a	1357.79 i	3
6		2.77	15 c	58.1	1344.57	1344.76	0.325	1345.38	1345.57	n/a	1345.60 i	1
5		3.18	15 c	198.3	1345.75	1346.40	0.325	1347.04	1347.48	0.12	1347.60	4
4		5.38	18 c	33.6	1345.40	1345.50	0.300	1346.75	1346.83	0.15	1346.98	3
3		37.66	42 c	220.7	1342.74	1343.40	0.300	1345.80	1346.04	0.54	1346.58	2
2		37.92	42 c	139.7	1342.32	1342.74	0.300	1345.12	1345.28	0.36	1345.64	1
1		42.93	42 c	105.2	1342.00	1342.32	0.304	1344.10	1344.63	n/a	1345.12 i	End

Project File: sws4.stm	Number of lines: 7	Run Date: 05-21-2008
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NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; i - Inlet control.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
7		30.00*	0.00	30.00	0.00	Hdwl	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.00	0.00	0.00	0.00	0.00	3
6		2.77	0.18	2.95	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.32	5.19	0.43	5.19	2.00	1
5		3.18	0.00	3.18	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.20	9.94	0.20	9.94	0.00	4
4		2.39	0.00	2.21	0.18	Curb	6.0	6.00	2.50	4.00	2.00	0.005	2.00	0.080	0.050	0.013	0.34	5.62	0.41	4.95	2.00	6
3		2.39	0.00	2.21	0.18	Curb	6.0	6.00	2.50	4.00	2.00	0.005	2.00	0.080	0.050	0.013	0.34	5.62	0.41	4.95	2.00	2
2		0.48	0.18	0.66	0.00	Curb	6.0	6.00	2.50	4.00	2.00	0.005	2.00	0.080	0.050	0.013	0.22	3.16	0.27	1.99	2.00	1
1		2.77	0.00	2.77	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.31	4.98	0.42	4.98	2.00	Off

Project File: sws4.stm Number of lines: 7 Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
7	36	30.00	1354.70	1356.44	1.74*	4.26	7.04	0.77	1357.21	n/a	48.5	1354.94	1356.69	1.75**	4.29	6.99	0.76	1357.45i	n/a	n/a	-0.521	1.00	n/a
6	15	2.77	1344.57	1345.38	0.81*	0.84	3.30	0.17	1345.55	n/a	58.1	1344.76	1345.57	0.81	0.84	3.29	0.17	1345.74i	n/a	n/a	0.021	1.00	n/a
5	15	3.18	1345.75	1347.04	1.25	1.23	2.60	0.10	1347.14	0.243	198	1346.40	1347.48	1.08	1.13	2.82	0.12	1347.60	0.223	0.233	0.462	1.00	0.12
4	18	5.38	1345.40	1346.75	1.35	1.68	3.21	0.16	1346.91	0.231	33.6	1345.50	1346.83	1.32	1.65	3.26	0.17	1346.99	0.236	0.233	0.079	0.90	0.15
3	42	37.66	1342.74	1345.80	3.06	8.93	4.22	0.28	1346.08	0.127	221	1343.40	1346.04	2.64	7.79	4.84	0.36	1346.41	0.166	0.146	0.323	1.48	0.54
2	42	37.92	1342.32	1345.12	2.80	8.24	4.60	0.33	1345.44	0.149	140	1342.74	1345.28	2.54	7.47	5.07	0.40	1345.68	0.185	0.167	0.234	0.91	0.36
1	42	42.93	1342.00	1344.10	2.10	6.03	7.12	0.79	1344.89	n/a	105	1342.32	1344.63	2.31	6.74	6.37	0.63	1345.26i	n/a	n/a	-0.257	1.28	n/a

Project File: sws4.stm

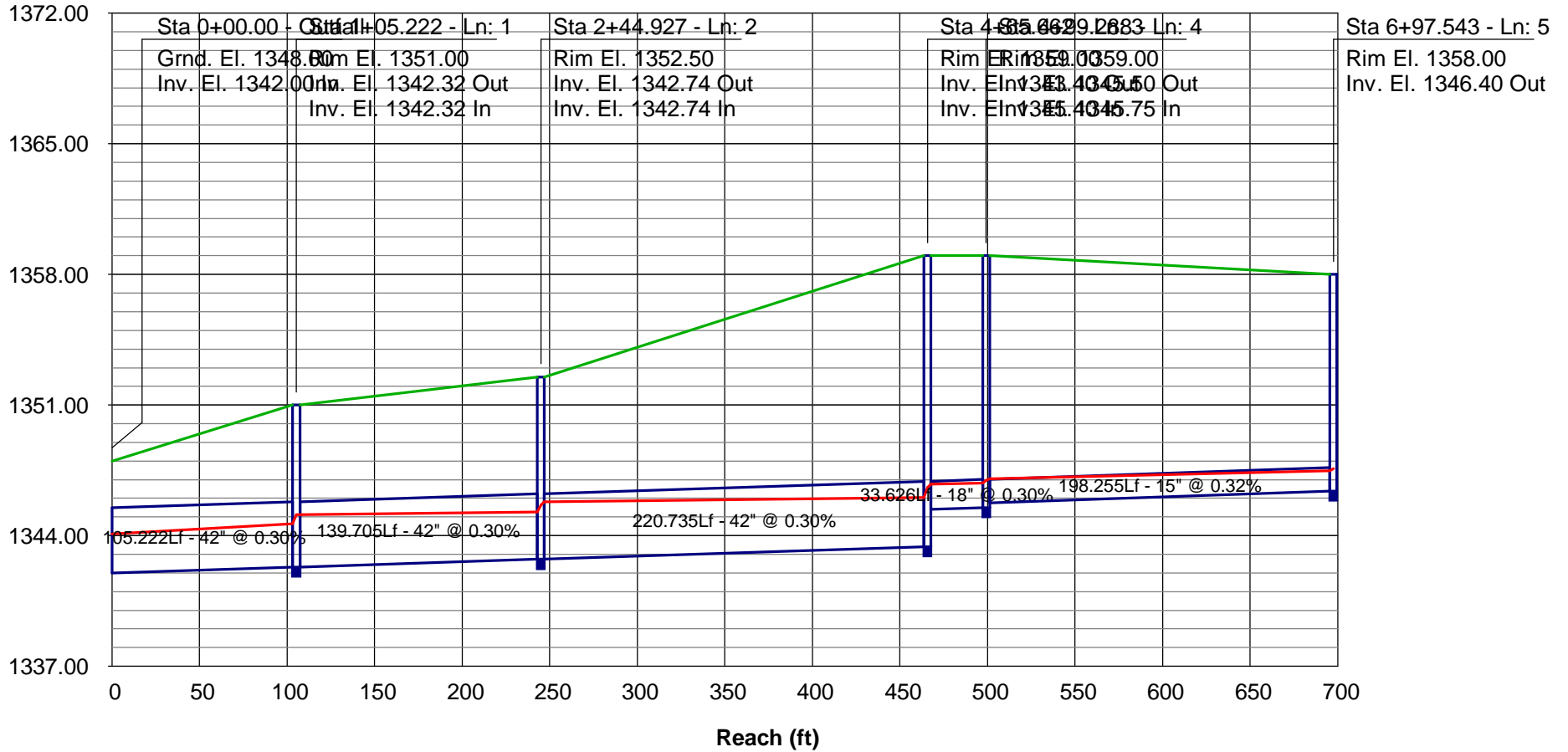
Number of lines: 7

Run Date: 05-21-2008

Notes: * Normal depth assumed.; ** Critical depth.

Storm Sewer Profile

Elev. (ft)



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

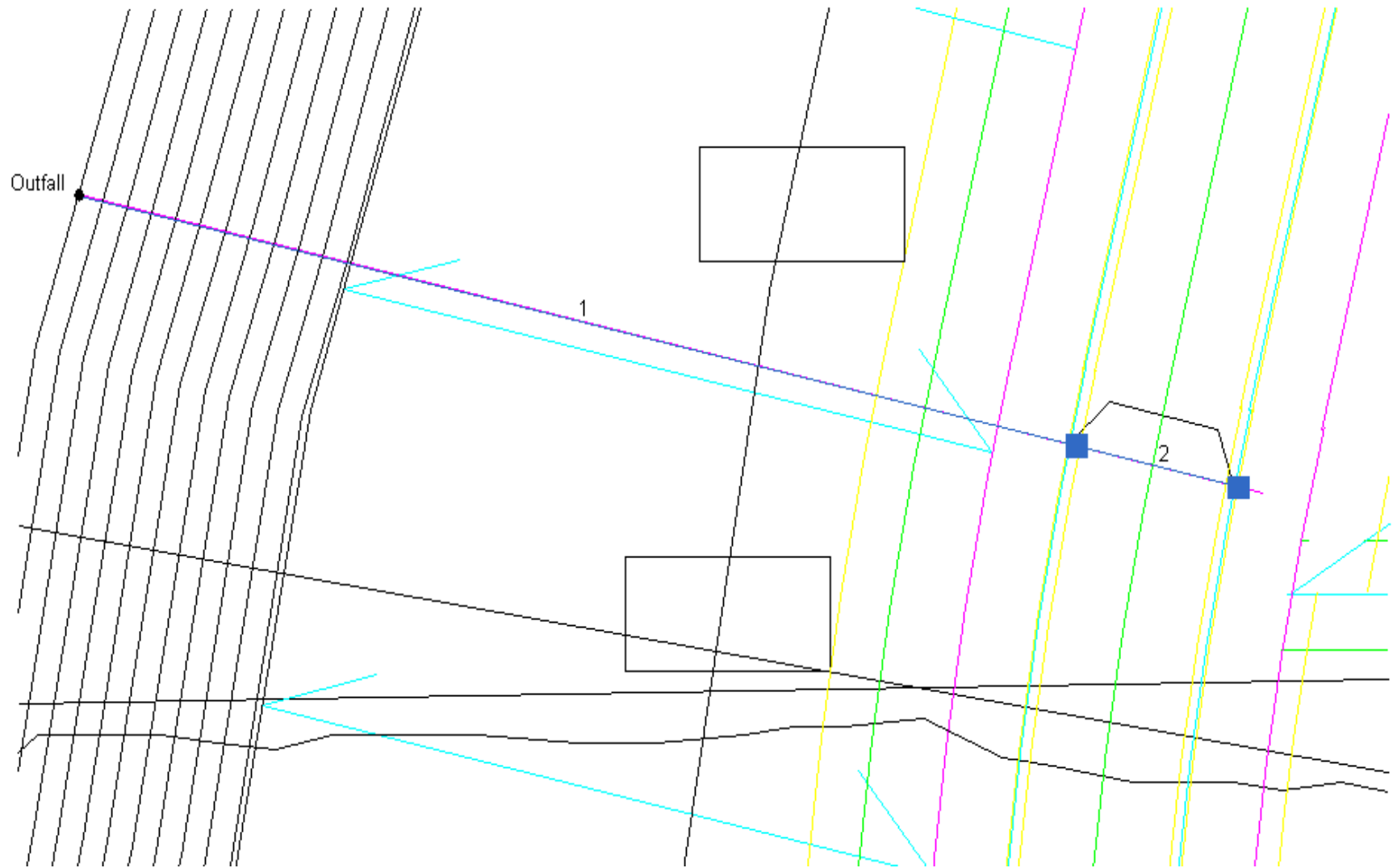
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Hydraflow Plan View



Project File: sws5.stm

No. Lines: 2

05-21-2008

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 type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
2	1	33.4	0.3	Curb	0.00	1.50	0.61	15.0	1340.87	0.33	1340.98	15	Cir	0.013	1.00	1351.50	
1	End	205.7	12.9	Curb	0.00	1.50	0.61	15.0	1340.00	0.30	1340.62	18	Cir	0.013	0.50	1351.50	
Project File: sws5.stm												Number of lines: 2				Date: 05-21-2008	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
2		4.78	15 c	33.4	1340.87	1340.98	0.326	1343.44*	1343.62*	0.24	1343.86	1
1		9.52	18 c	205.7	1340.00	1340.62	0.301	1341.31*	1343.00*	0.23	1343.22	End

Project File: sws5.stm	Number of lines: 2	Run Date: 05-21-2008
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NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
2		4.78	0.00	4.78	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.42	7.17	0.53	7.17	2.00	1
1		4.78	0.00	4.78	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.42	7.17	0.53	7.17	2.00	Off

Project File: sws5.stm

Number of lines: 2

Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
2	15	4.78	1340.87	1343.44	1.25	1.23	3.89	0.24	1343.67	0.548	33.4	1340.98	1343.62	1.25	1.23	3.89	0.24	1343.86	0.547	0.547	0.183	1.00	0.24
1	18	9.52	1340.00	1341.31	1.31	1.64	5.81	0.53	1341.84	0.745	206	1340.62	1343.00	1.50	1.77	5.39	0.45	1343.45	0.821	0.783	1.612	0.50	0.23

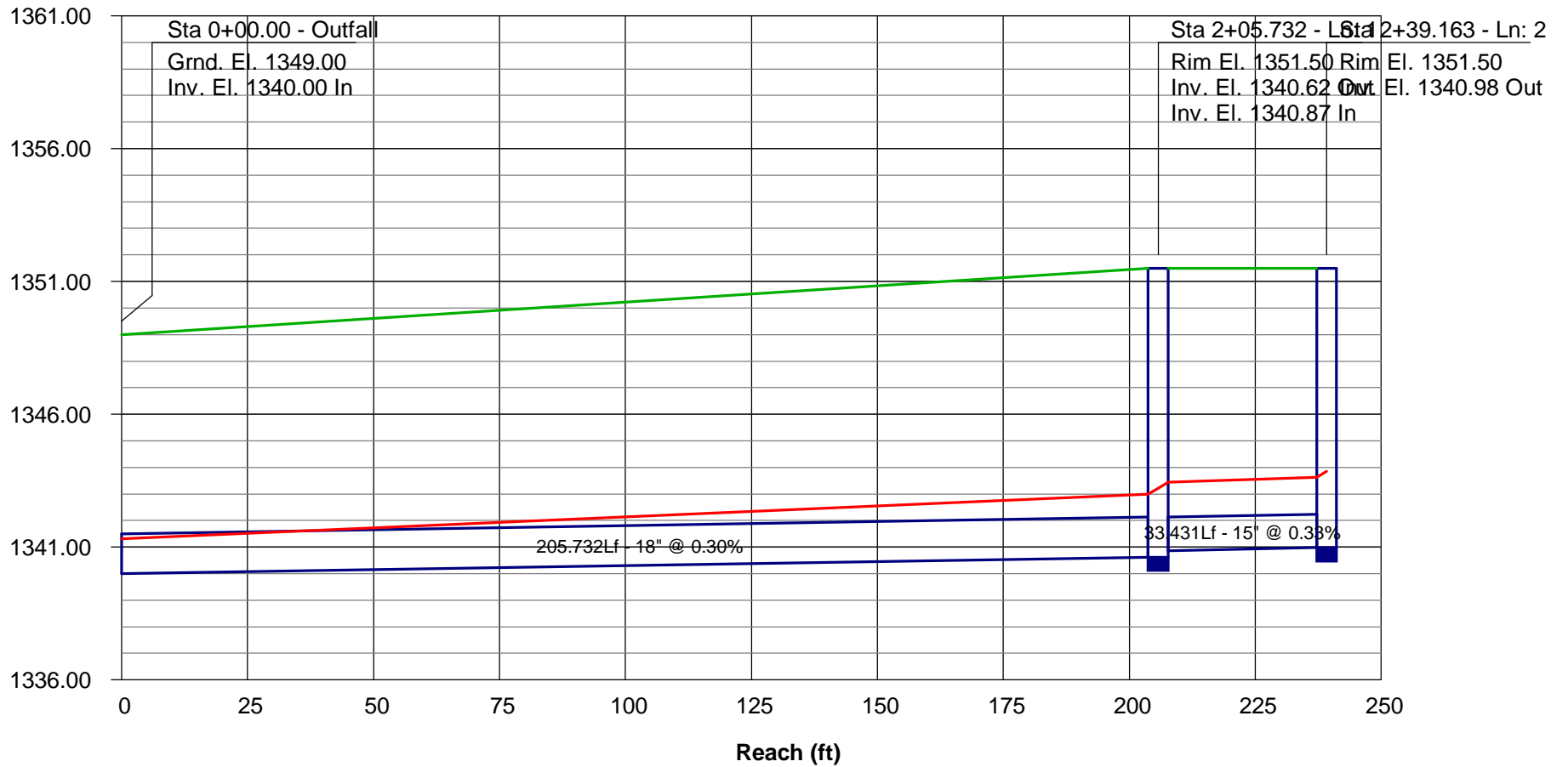
Project File: sws5.stm

Number of lines: 2

Run Date: 05-21-2008

Storm Sewer Profile

Elev. (ft)



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

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Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

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Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

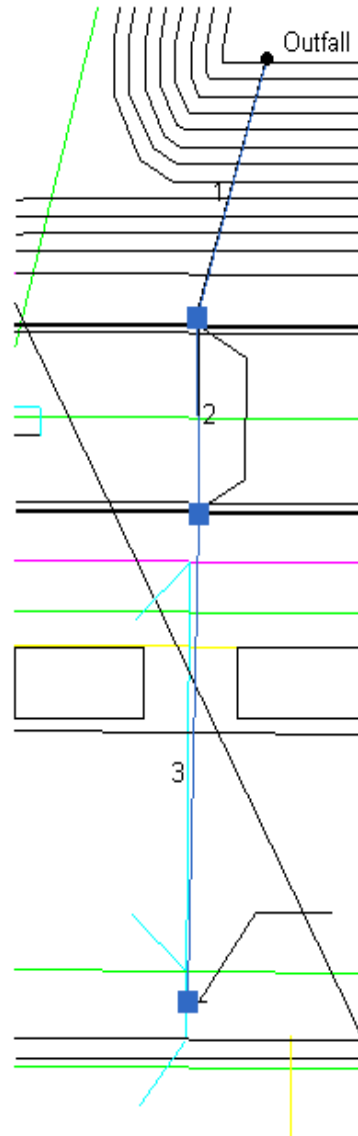
Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Hydraflow Plan View



Project File: sws6.stm

No. Lines: 3

05-21-2008

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 EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim EI (ft)	
3	2	143.2	1.7	DrGrt	0.00	1.00	0.61	15.0	1340.67	0.32	1341.14	15	Cir	0.013	1.00	1347.70	
2	1	57.3	-16.8	Curb	0.00	0.40	0.61	15.0	1340.49	0.31	1340.67	15	Cir	0.013	0.50	1350.50	
1	End	79.1	106.4	Curb	0.00	0.40	0.61	15.0	1340.00	0.30	1340.24	18	Cir	0.013	0.51	1350.50	
Project File: sws6.stm												Number of lines: 3				Date: 05-21-2008	

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	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.
3		3.18	15 c	143.2	1340.67	1341.14	0.325	1342.19*	1342.54*	0.10	1342.64	2
2		4.35	15 c	57.3	1340.49	1340.67	0.314	1341.74*	1342.00*	0.10	1342.10	1
1		5.55	18 c	79.1	1340.00	1340.24	0.303	1341.19	1341.42	0.11	1341.53	End
Project File: sws6.stm							Number of lines: 3			Run Date: 05-21-2008		
NOTES: c = cir; e = ellip; b = box; Return period = 10 Yrs. ; *Surcharged (HGL above crown).												

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q byp (cfs)	Junc type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp line No	
							Ht (in)	L (ft)	area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
3		3.18	0.00	3.18	0.00	DrGrt	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.050	0.050	0.013	0.20	9.94	0.20	9.94	0.00	2
2		1.27	0.00	1.27	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.21	2.96	0.31	2.96	2.00	1
1		1.27	0.00	1.27	0.00	Curb	6.0	6.00	2.50	4.00	2.00	Sag	2.00	0.080	0.050	0.013	0.21	2.96	0.31	2.96	2.00	Off

Project File: sws6.stm

Number of lines: 3

Run Date: 05-21-2008

NOTES: Inlet N-Values = 0.016 ; Intensity = 55.18 / (Inlet time + 11.10) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
3	15	3.18	1340.67	1342.19	1.25	1.23	2.60	0.10	1342.29	0.243	143	1341.14	1342.54	1.25	1.23	2.60	0.10	1342.64	0.243	0.243	0.348	1.00	0.10
2	15	4.35	1340.49	1341.74	1.25*	1.23	3.54	0.20	1341.94	0.454	57.3	1340.67	1342.00	1.25	1.23	3.54	0.20	1342.20	0.453	0.454	0.260	0.50	0.10
1	18	5.55	1340.00	1341.19	1.19	1.50	3.69	0.21	1341.40	0.297	79.1	1340.24	1341.42	1.18	1.49	3.71	0.21	1341.64	0.301	0.299	0.237	0.51	0.11

Project File: sws6.stm

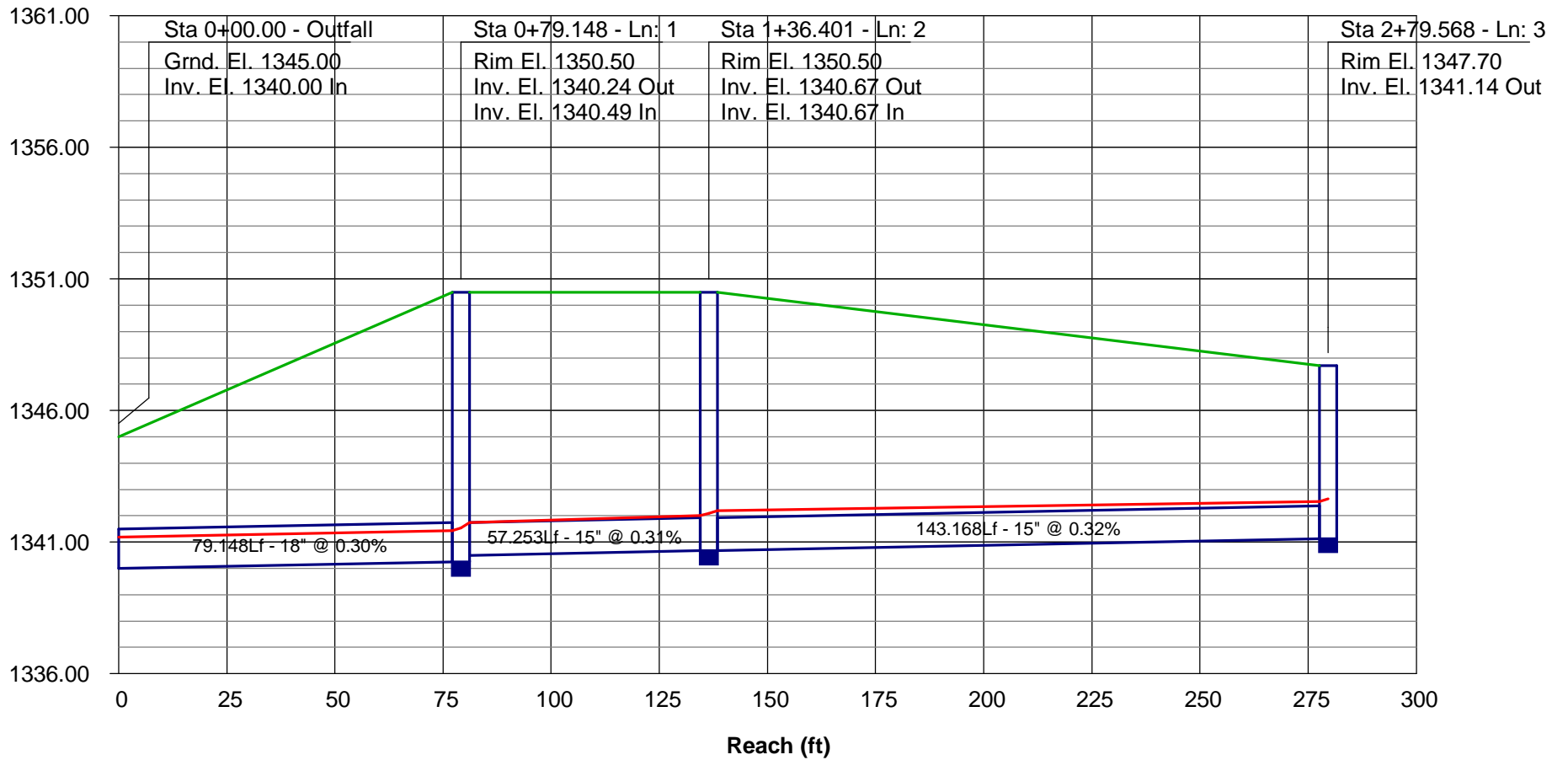
Number of lines: 3

Run Date: 05-21-2008

Notes: * Normal depth assumed.

Storm Sewer Profile

Elev. (ft)



General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average $S_f/100 \times \text{Line Length}$ (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

HydraFlow Express

Proposed Channel

Channel Report

Hydraflow Express by Intelisolve

Thursday, May 22 2008

<Name>

Trapezoidal

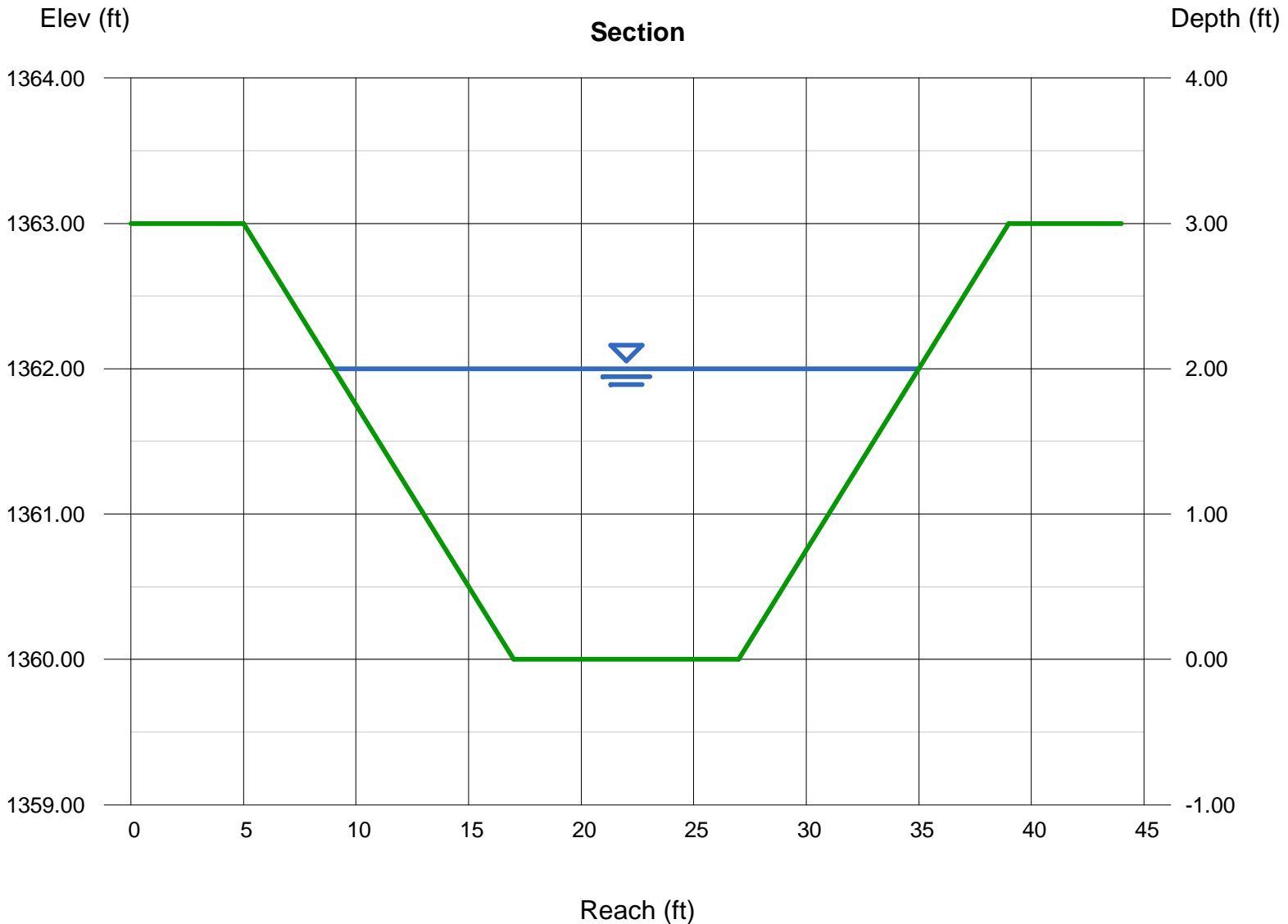
Bottom Width (ft) = 10.00
Side Slopes (z:1) = 4.00, 4.00
Total Depth (ft) = 3.00
Invert Elev (ft) = 1360.00
Slope (%) = 1.00
N-Value = 0.027

Highlighted

Depth (ft) = 2.00
Q (cfs) = 243.10
Area (sqft) = 36.00
Velocity (ft/s) = 6.75
Wetted Perim (ft) = 26.49
Crit Depth, Y_c (ft) = 1.80
Top Width (ft) = 26.00
EGL (ft) = 2.71

Calculations

Compute by: Q vs Depth
No. Increments = 15



PLAN SHEETS

DRAINAGE PLAN Scale 1:100

GRADING PLAN Scale 1: 60