# KEEFE PROPERTY TRACT 2 & 3

## *Detention Calculations*

**LIBERTY WAY**

**WEST CHESTER TOWNSHIP, BUTLER COUNTY, OHIO**

**SEPTEMBER 13, 2016**

*PREPARED BY:*

*BAYER BECKER*

*6900 TYLERSVILLE ROAD*

*MASON, OHIO 45040*

*P (513) 336-6600*

# SUMMARY OF DATA

**Method of Hydrograph Development:** TR-55

**Software:** Autodesk Storm and Sanitary Stand Alone

## Site Stormwater Summary

See Previous Keefe Detention Reports

Critical Storm = 50yr

| Drainage Area Descriptions | Drainage Area (Acres) | CN | Tc (Mins) | Q1 (cfs) | Q1 (Cu. Ft.) | Q10 (cfs) | Q50 (cfs) | |
|---|---|---|---|---|---|---|---|---|
| **On-Site Pre-Dev Areas** | | | | | | | | |
| Previously Detained Areas | 44.88 | 71.0 | 13.80 | 15.70 | | 71.24 | 123.57 | Pg 6 |
| 16.4 + 4.3+18.3+5.9 = 44.90 (rounding error) | | | | | | | | |
| New Commercial | 7.66 | 71.0 | 13.80 | 2.68 | 9,724 | 12.64 | 21.19 | Pg 7 |
| New Residential | 5.23 | 71.0 | 13.80 | 1.83 | 6,647 | 8.63 | 14.44 | Pg 8 |
| **On-Site Post Developed to Basin** | | | | | | | | |
| Weatherington Pointe Cabelas & Outlots | 18.30 | 94.0 | 12.00 | 37.48 | | 73.47 | 100.72 | Pg 9 |
| Tylers Place Blvd to Pond | 4.30 | 90.0 | 12.00 | 7.19 | | 15.69 | 22.18 | Pg 10 |
| Keefe Tract 2 to Basin | 5.90 | 94.0 | 12.00 | 12.08 | | 24.15 | 32.49 | Pg 11 |
| Weatherington Residential | 16.40 | 74.0 | 13.80 | 8.09 | | 30.84 | 52.33 | Pg 12 |
| New Commerical | 7.02 | 96.0 | 12.00 | 15.62 | 45,136 | 29.26 | 39.54 | Pg 13 / Pg 18 |
| **Off-Site Areas** | | | | | | | | |
| Golf Course | 41.60 | 77.0 | 22.20 | 21.29 | | 73.09 | 119.72 | Pg 16 |
| Liberty Way | 6.50 | 90.0 | 11.00 | 10.87 | | 23.73 | 33.53 | Pg 17 |
| **Bypass Areas** | | | | | | | | |
| New Commerical | 0.57 | 95.0 | 10.00 | 1.26 | 3,454 | 2.40 | 3.25 | Pg 14 / Pg 19 |
| New Residential | 5.21 | 81.0 | 12.00 | 5.02 | 13,889 | 14.41 | 22.23 | Pg 15 / Pg 21 |

| **Allowable Release Rate=** | |
|---|---|
| **Q1 On-Site Pre Developed + Q10 Previously Detained + Q50 Offsite** | **223.27 CFS** |

Note: CN for pre-developed conditions are based on previously developed and approved stormwater calculations for the Keefe Property.
These numbers were based on a composite of B and C soils with open space in fair condition

See Page 30 for routed flow rates

# Storm Water
# Detention/Retention Summary

Date: 9/9/2016 Revised: _____
Design By: MJL Revised: _____
Checked By: _____ Revised: _____

Project: Keefe Tract 2 File No.: 15M053-000
County: Butler City/Township: West Chester Twp

Basin Primary Basin

| | |
|---|---|
| On-Site Area | 29.32 Acres |
| Off-Site Area | 41.60 Acres |
| Bypass Area | 5.78 Acres |

| Primary Basin | | |
|---|---|---|
| Orifice | Size | Inv Elev |
| Spillway | 60' | 862.54 |
| 1 | 16' | 860.50 |
| 1 | 66" ø | 854.50 |
| 1 | 6" ø | 852.50 |

**Primary Basin**

| A Event | B Inflow | C Outflow | D Elev | E Storage | F Com Byp | G Res Byp | =F+G Bypass | =C+F+G Total | Allowable |
|---|---|---|---|---|---|---|---|---|---|
| $Q_1$ | 79.90 | 20.05 | 855.40 | 303,109 | 1.27 | 5.09 | 6.36 | 26.41 | |
| $Q_{10}$ | 203.64 | 110.43 | 858.03 | 435,128 | 2.44 | 14.42 | 16.86 | 127.29 | |
| $Q_{50}$ | 296.85 | 178.22 | 859.66 | 520,447 | 3.32 Pg 19 | 22.24 Pg 21 | 25.56 | 203.78 | 223.27 Pg 30 |
| $Q_{100}$ | 329.42 | 208.15 | 860.11 | 544,737 | 3.63 Pg 26 | 25.12 Pg 27 | 28.75 | 236.90 | 325.08 Pg 31 |

Basin Existing Pond

| | |
|---|---|
| On-Site Area | 4.30 Acres |
| Off-Site Area | 0.00 Acres |
| Bypass Area | 0.00 Acres |

| Existing Pond | | |
|---|---|---|
| Orifice | Size | Inv Elev |
| T/GR | 8' | 867.30 |
| Spillway | 35' | 866.80 |
| 3 | 12"X36" | 865.50 |

| A Event | B Inflow | C Outflow | D Elev | E Storage |
|---|---|---|---|---|
| $Q_1$ | 17.85 | 10.73 | 864.98 | 10,583 |
| $Q_{10}$ | 52.24 | 36.79 | 865.67 | 26,321 |
| $Q_{50}$ | 63.93 | 41.16 | 866.25 | 42,017 |
| $Q_{100}$ | 67.81 | 42.67 | 866.53 | 49,766 |

_____ -

# Storm Water
# Detention/Retention Summary

| | | | |
|---|---|---|---|
| Date: | 9/9/2016 | Revised: | |
| Design By: | MJL | Revised: | |
| Checked By: | | Revised: | |

| | | | |
|---|---|---|---|
| Project: | Keefe Tract 2 | File No.: | 15M053-000 |
| County: | Butler | City/Township: | West Chester Twp |

Basin Cabelas WQ Basin

| | | |
|---|---|---|
| On-Site Area | 18.30 | Acres |
| Off-Site Area | 6.50 | Acres |
| Bypass Area | 0.00 | Acres |

| Cabelas WQ | | |
|---|---|---|
| Orifice | Size | Inv Elev |
| T/Dike | | 871.00 |
| South | 8' | 869.17 |
| North | 16' | 868.92 |
| 1 | 3.75" ø | 866.97 |

| A | B | C | D | E |
|---|---|---|---|---|
| Event | Inflow | Outflow | Elev | Storage |
| $Q_1$ | 48.15 | 43.28 | 869.72 | 80,402 |
| $Q_{10}$ | 97.12 | 84.16 | 870.48 | 91,769 |
| $Q_{50}$ | 134.06 | 102.19 | 871.41 | 107,120 |
| $Q_{100}$ | 146.85 | 108.61 | 871.84 | 114,387 |

5.21 AC RESIDENTIAL
2.81 ACRES IMPERVIOUS
CN = 81

0.57 AC BYPASS
CN = 95

7.02 AC TO BASIN
CN = 96

5.90 AC TO BASIN
CN = 94

6.5 AC OFF SITE TO CABELAS POND
CN=90

18.3 AC ON SITE TO CABELAS POND
CN=94

4.3 AC TO EX POND
CN=90

16.4 AC TO BASIN 2
CN=74

41.6 AC OFF SITE
CN=77

Basis of Bearing:
State Plane NAD83 (2011)

0 120 180

SCALE: 1" = 120'

| Item | Revision Description | Date | Drwn | Chk |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |

# KEEFE PROPERTY SP-PUD TRACTS 2&3
## PRELIMINARY DEVELOPMENT PLAN

LIBERTY WAY & TYLERS PLACE BLVD
SECTION 18, TOWN 3, RANGE 2
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OHIO

## DRAINAGE MAP

bayer becker
www.bayerbecker.com
6901 Wilkinson Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 15M053-000 DR
Drawn by: MJL
Checked By: JSD
Issue Date: 09/13/16

Sheet: **DR1**

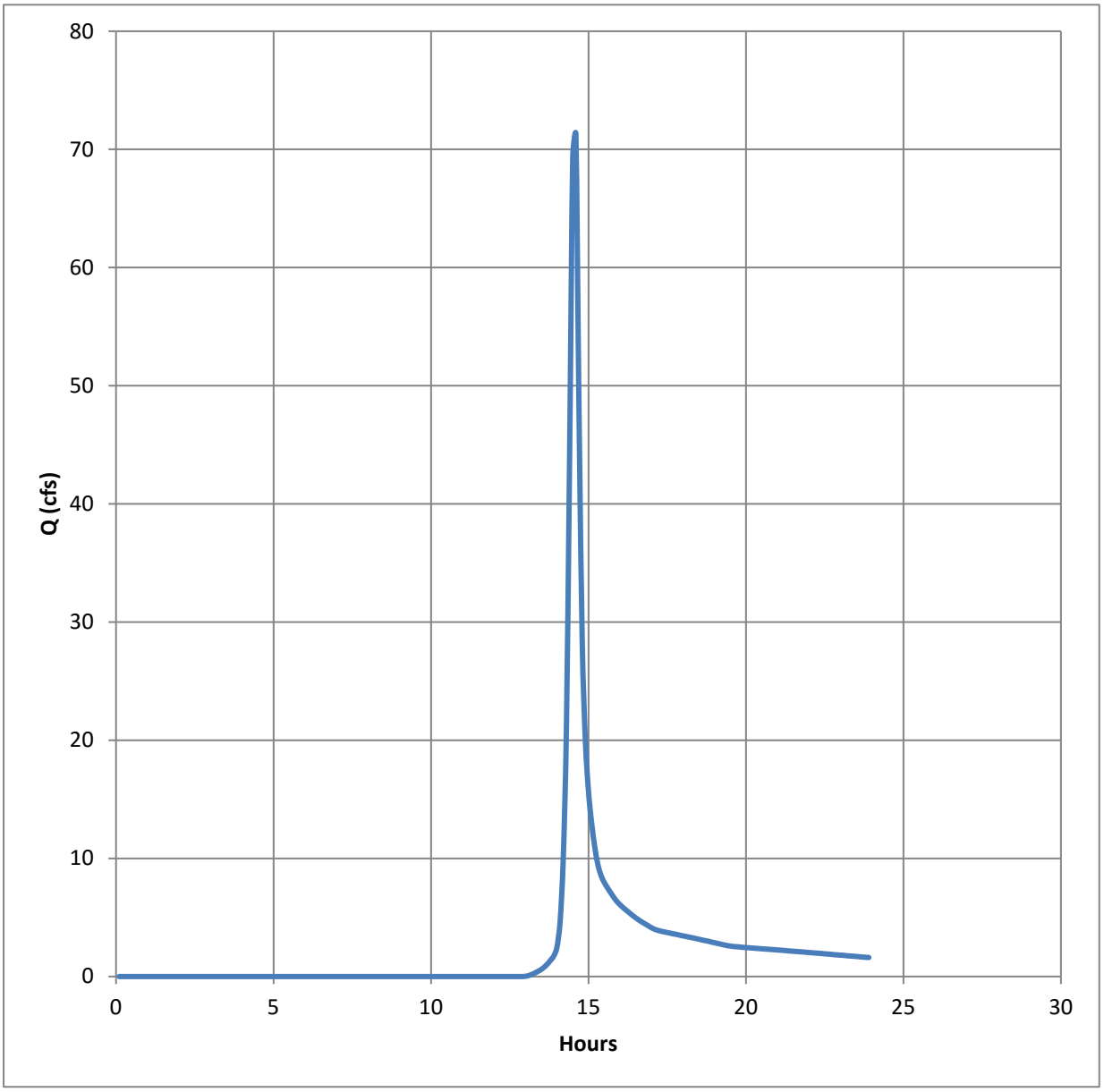


Plot time: Sep 08, 2016 - 5:17pm
Drawing name: J:\2015\15M053-000\CIVIDWG\15M053-000 DR.dwg - Layout Tab: Layout2

# Previously Detained Areas

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 71.24 |
| Storm Frequency | = | 10 yrs | Time to Peak | = | 14:36 |
| Time Interval | = | 6 min | Hyd. Volume | = | 216,358 $Ft^3$ |
| Drainage Area | = | 44.88 Acres | Curve Number | = | 71 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 3.9 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

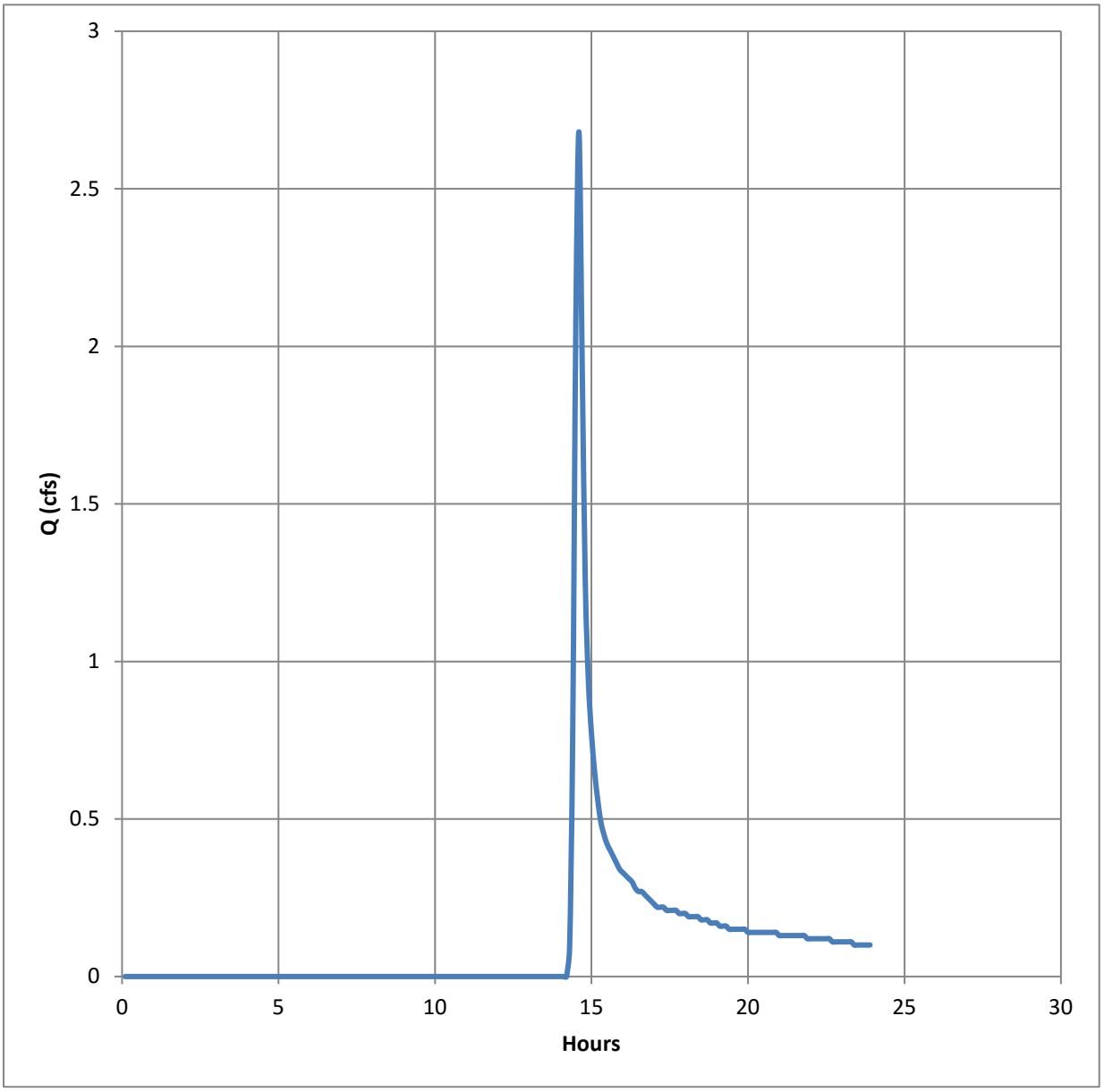
Notes:



# Predeveloped Commercial Areas

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 2.68 |
| Storm Frequency | = | 1 yrs | Time to Peak | = | 14:36 |
| Time Interval | = | 6 min | Hyd. Volume | = | 9,724 $Ft^3$ |
| Drainage Area | = | 7.66 Acres | Curve Number | = | 71 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 2.4 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

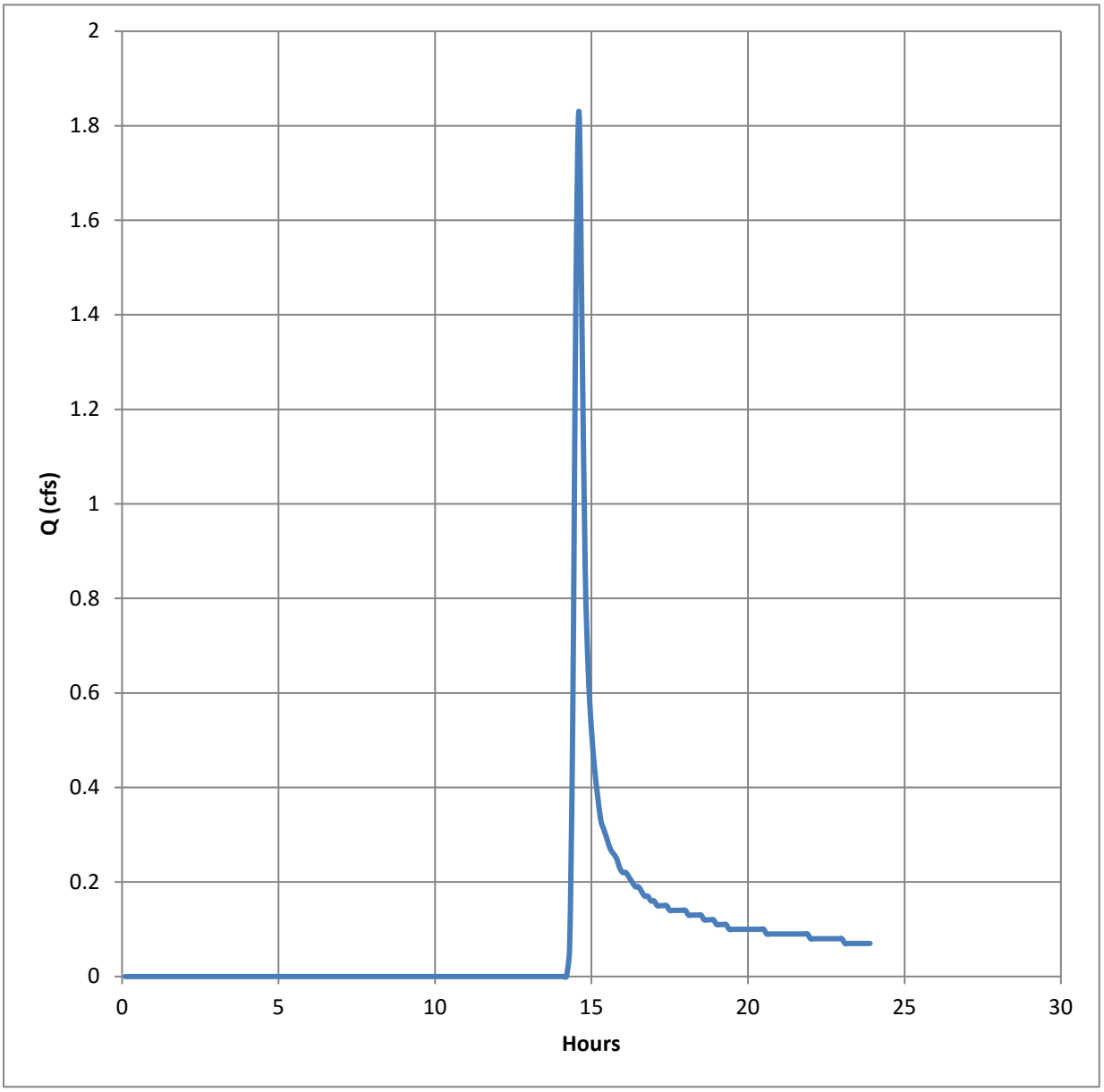
Notes:



# Predeveloped Residential Area

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 1.83 |
| Storm Frequency | = | 1 yrs | Time to Peak | = | 14:36 |
| Time Interval | = | 6 min | Hyd. Volume | = | 6,647 $Ft^3$ |
| Drainage Area | = | 5.23 Acres | Curve Number | = | 71 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 2.4 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

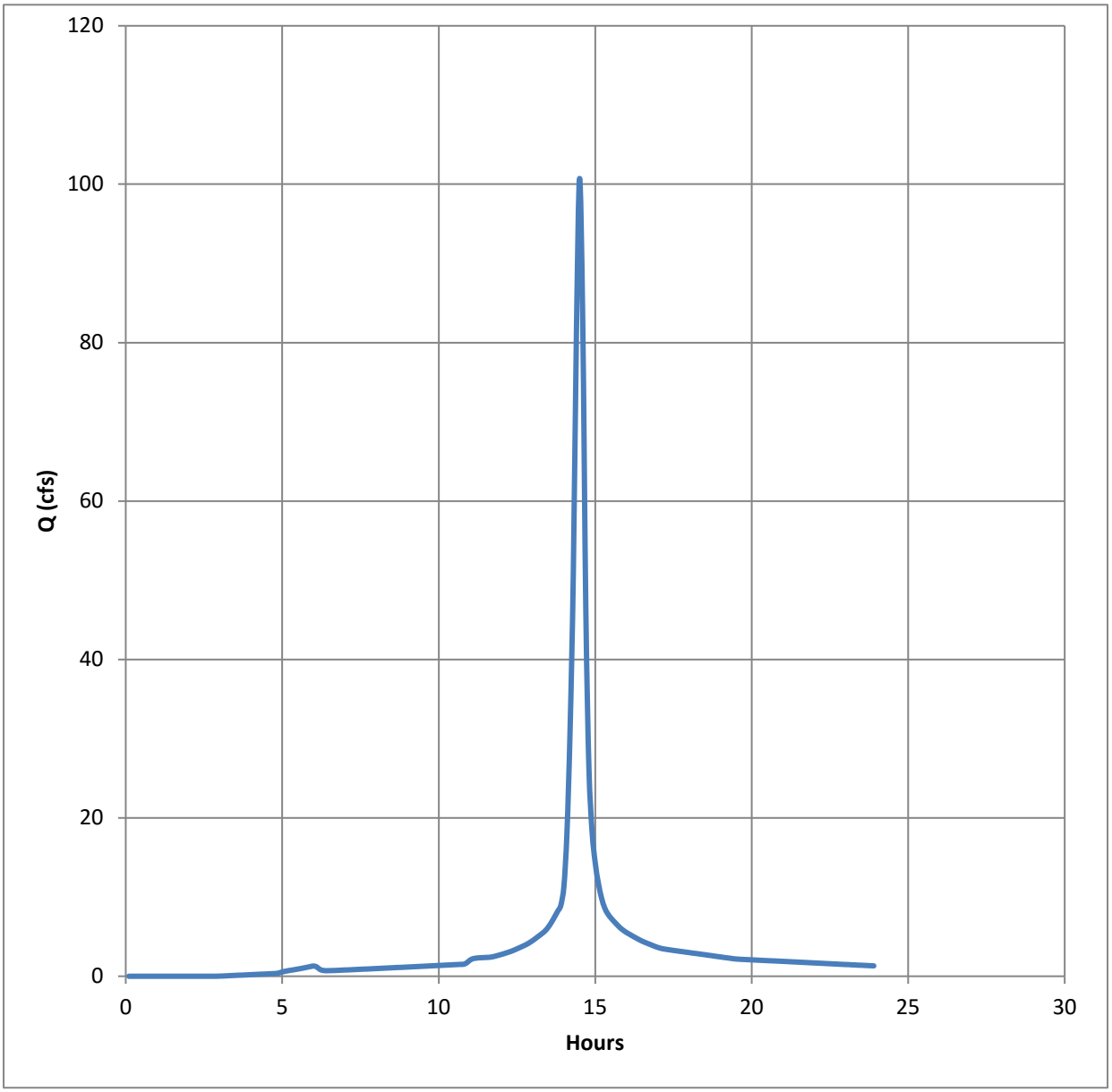
Notes:



# Weatherington Pointe Cabelas & Outlots

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 100.72 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 299,066 $Ft^3$ |
| Drainage Area | = | 18.30 Acres | Curve Number | = | 94 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

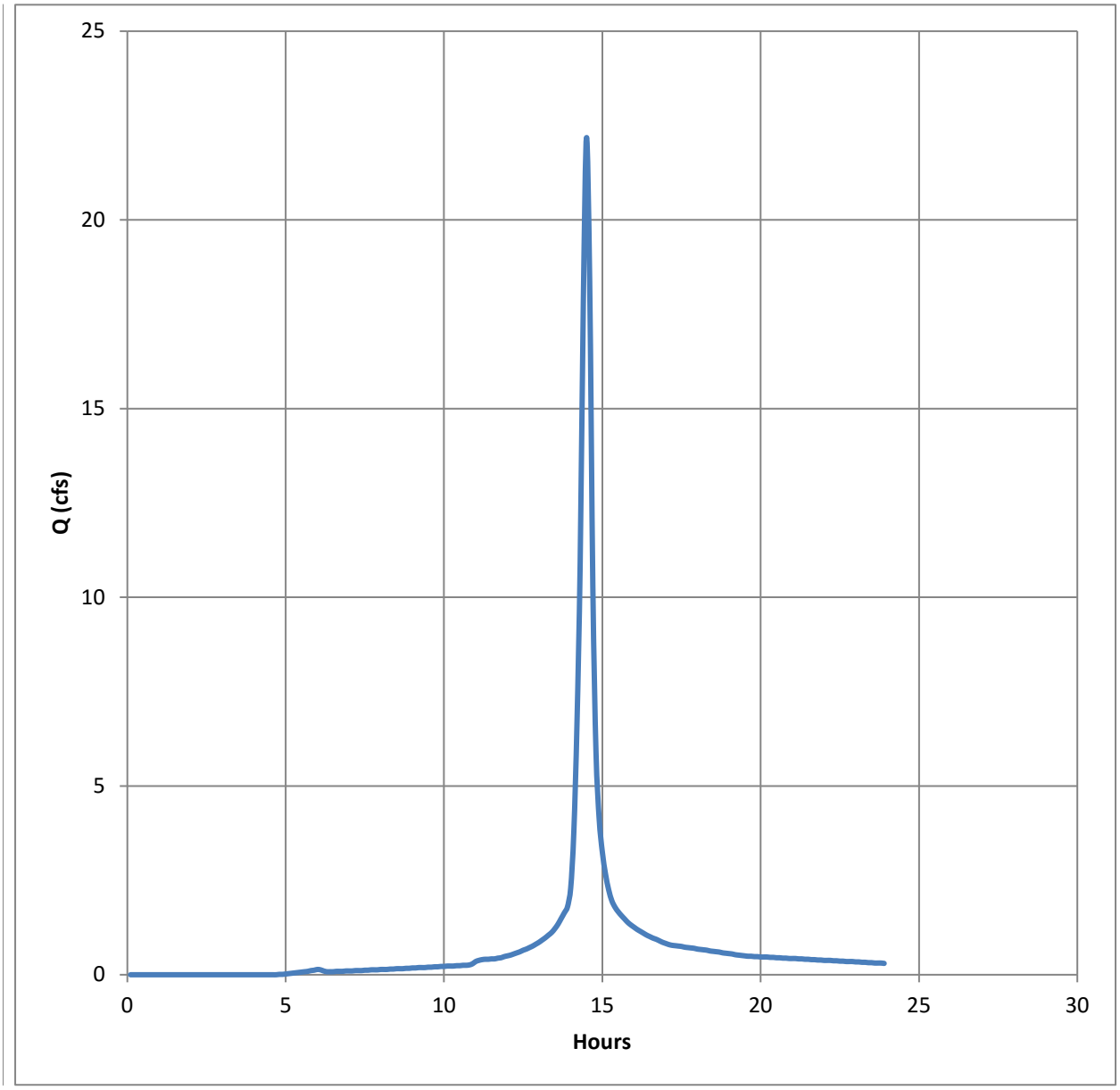
Notes:



# Tylers Place Blvd to Pond

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 22.18 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 63,568 $Ft^3$ |
| Drainage Area | = | 4.30 Acres | Curve Number | = | 90 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

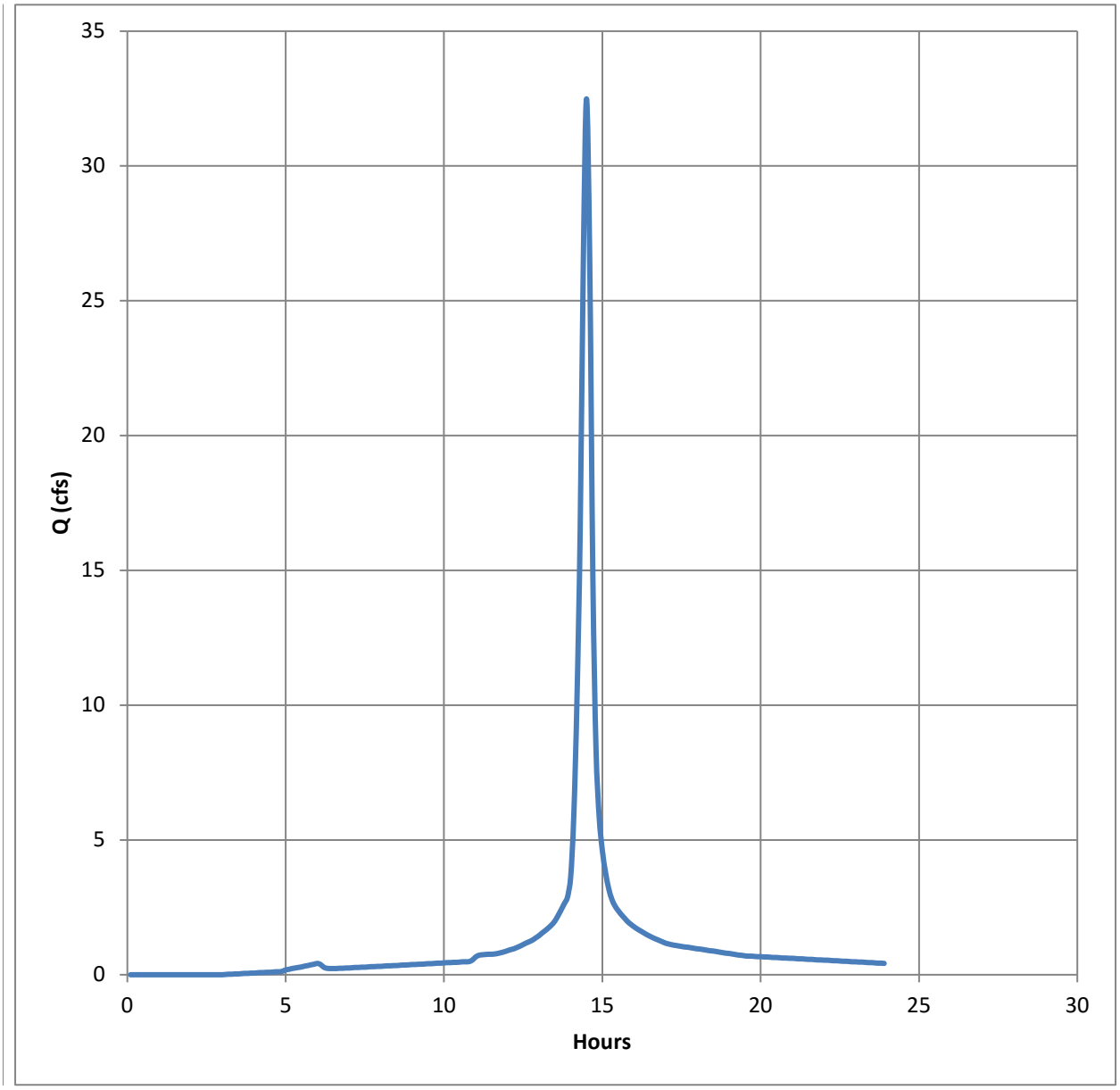
Notes:



# Keefe Tract 2 to Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 32.49 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 96,465 $Ft^3$ |
| Drainage Area | = | 5.90 Acres | Curve Number | = | 94 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

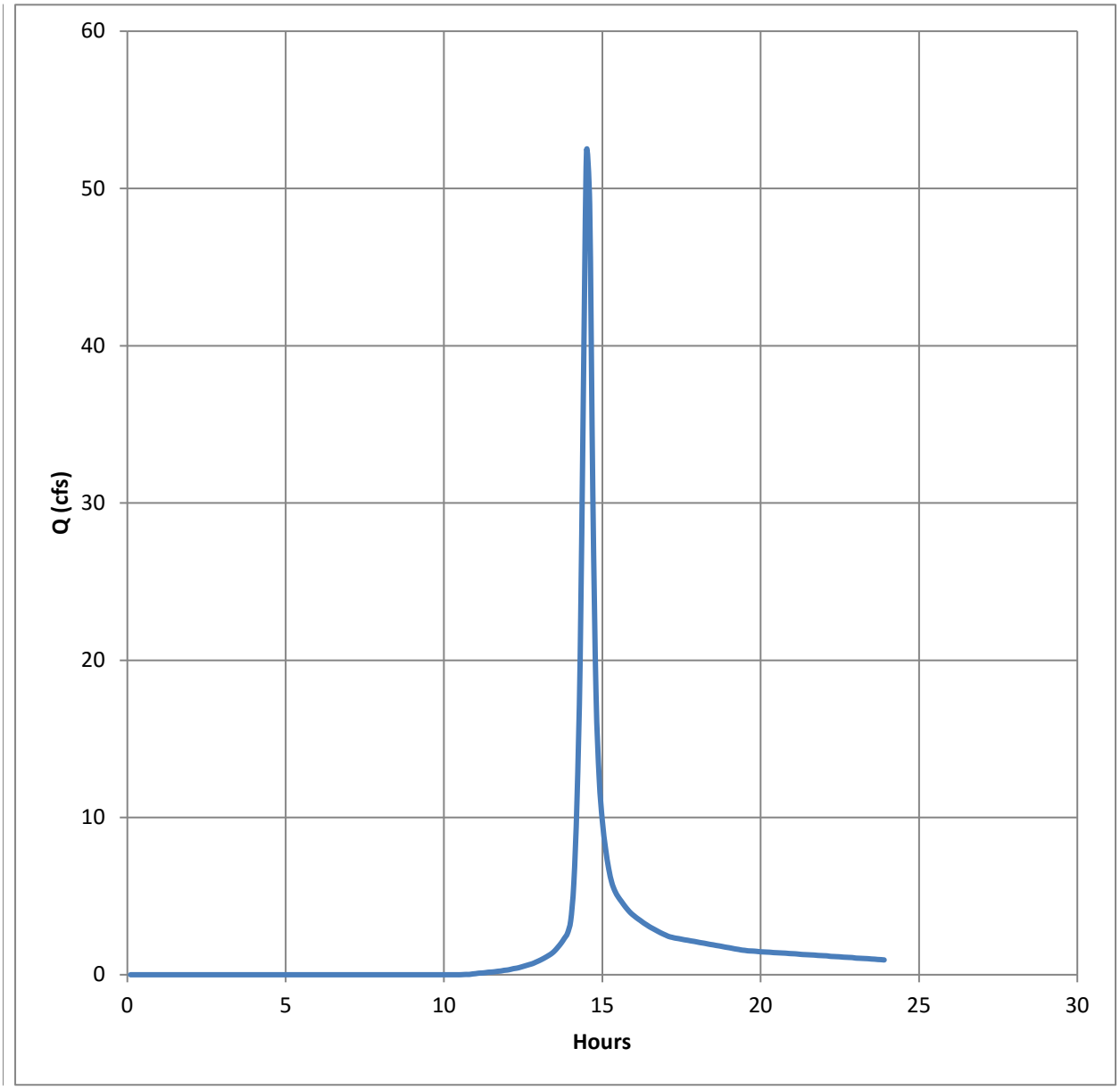
Notes:



# Weatherington Residential

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 52.33 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 150,217 $Ft^3$ |
| Drainage Area | = | 16.40 Acres | Curve Number | = | 74 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 5.2 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

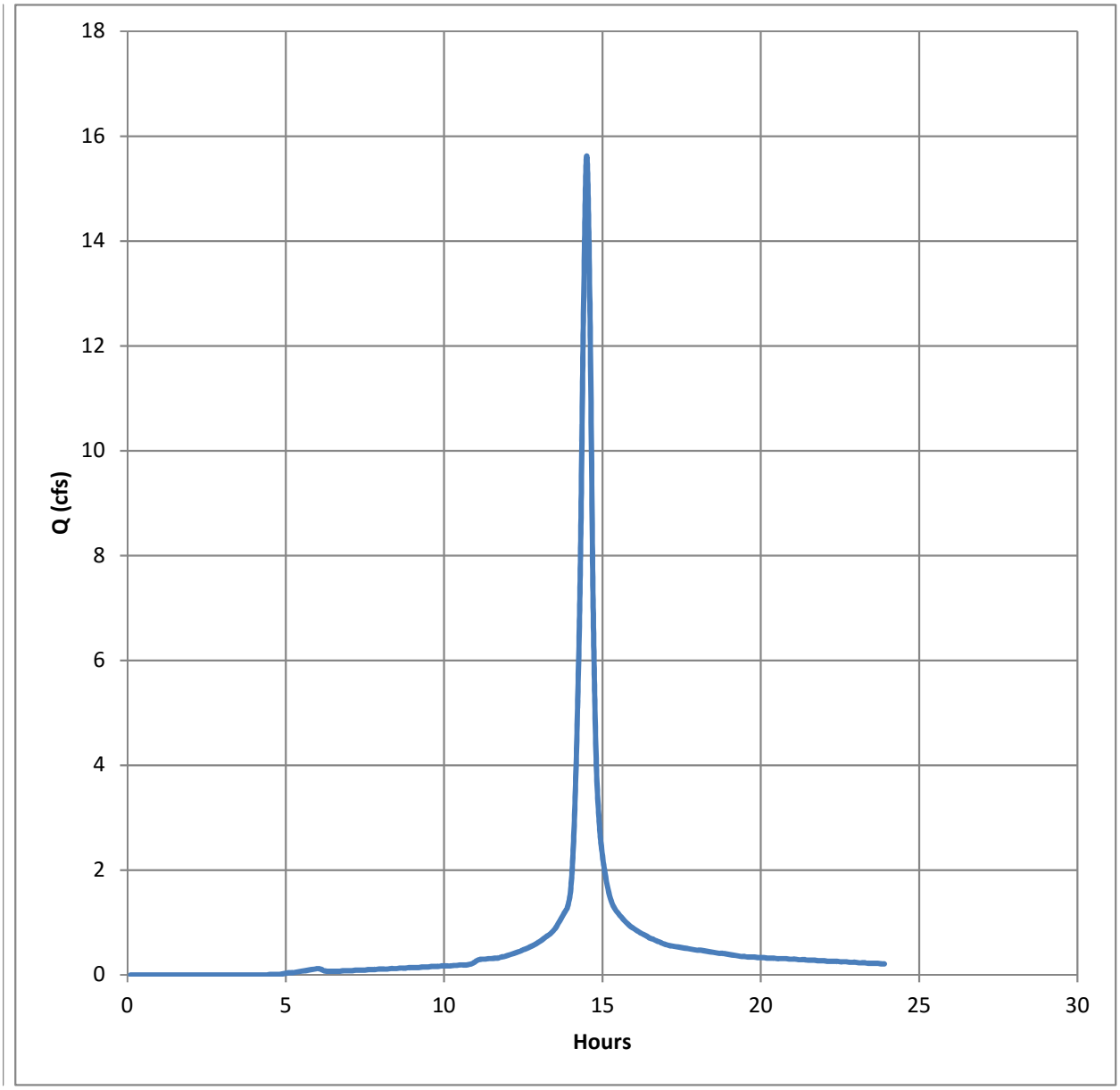
Notes:



# Postdeveloped New Commerical to Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 15.62 |
| Storm Frequency | = | 1 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 45,136 $Ft^3$ |
| Drainage Area | = | 6.86 Acres | Curve Number | = | 96 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 2.4 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

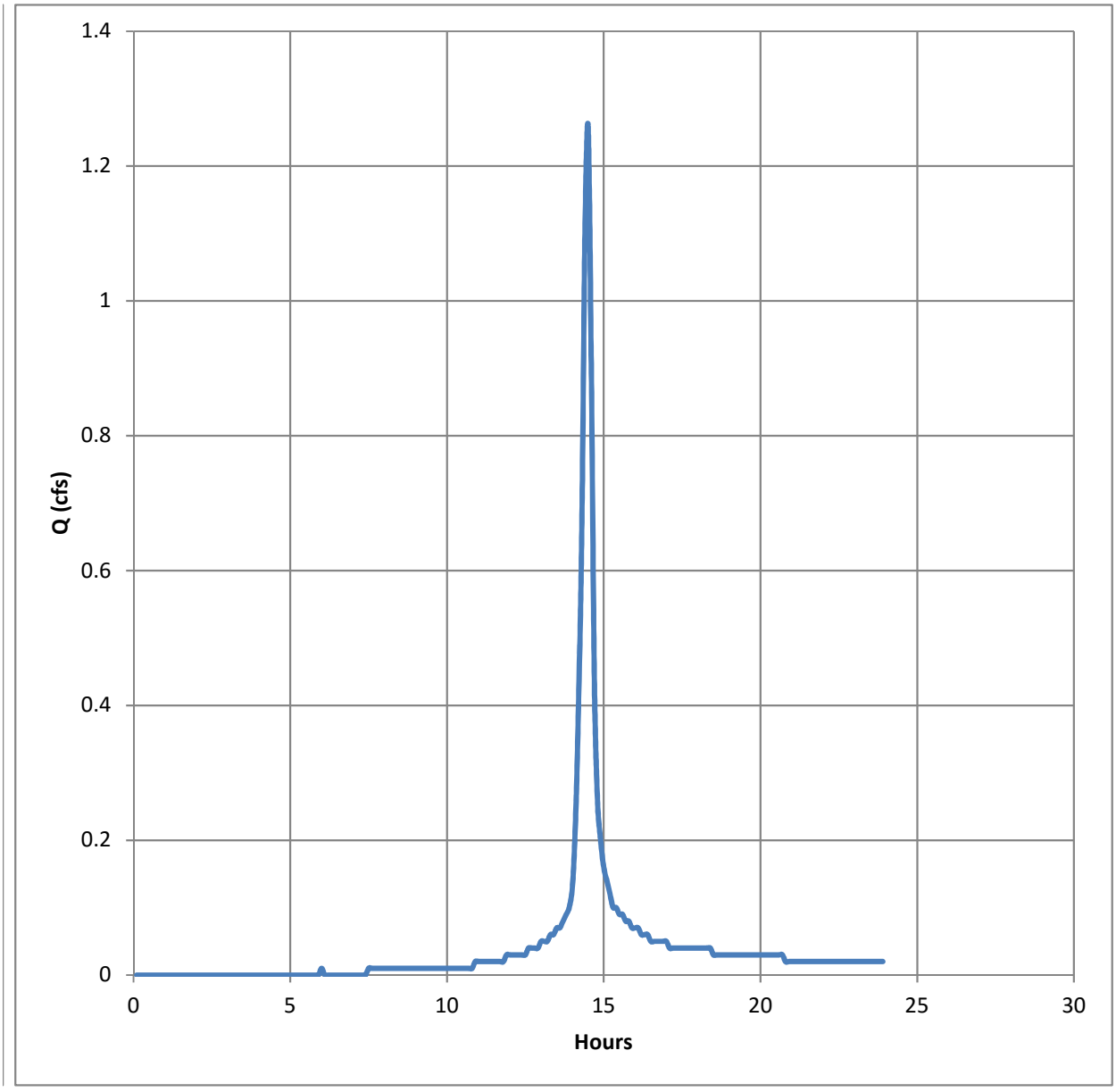
Notes:



# Postdeveloped New Commercial to Bypass

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 1.26 |
| Storm Frequency | = | 1 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 3.454 $Ft^3$ |
| Drainage Area | = | 0.80 Acres | Curve Number | = | 95 |
| Tc Method | = | User | Time of conc. (Tc) | = | 10.00 Mins |
| Total precip. | = | 2.4 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

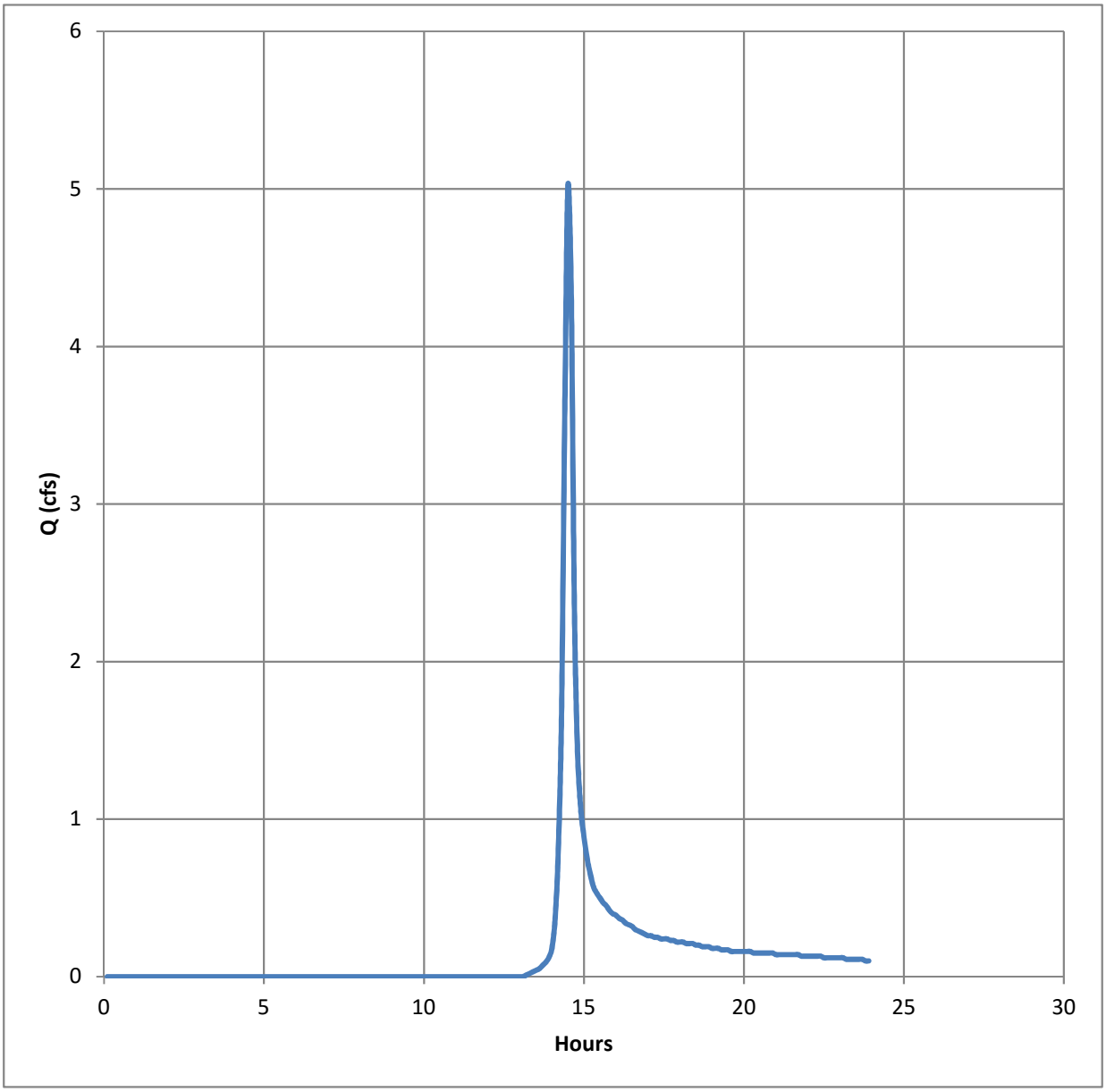
Notes:



# Postdeveloped New Residential

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 5.02 |
| Storm Frequency | = | 1 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 13,889 $Ft^3$ |
| Drainage Area | = | 5.23 Acres | Curve Number | = | 81 |
| Tc Method | = | User | Time of conc. (Tc) | = | 10.00 Mins |
| Total precip. | = | 2.4 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

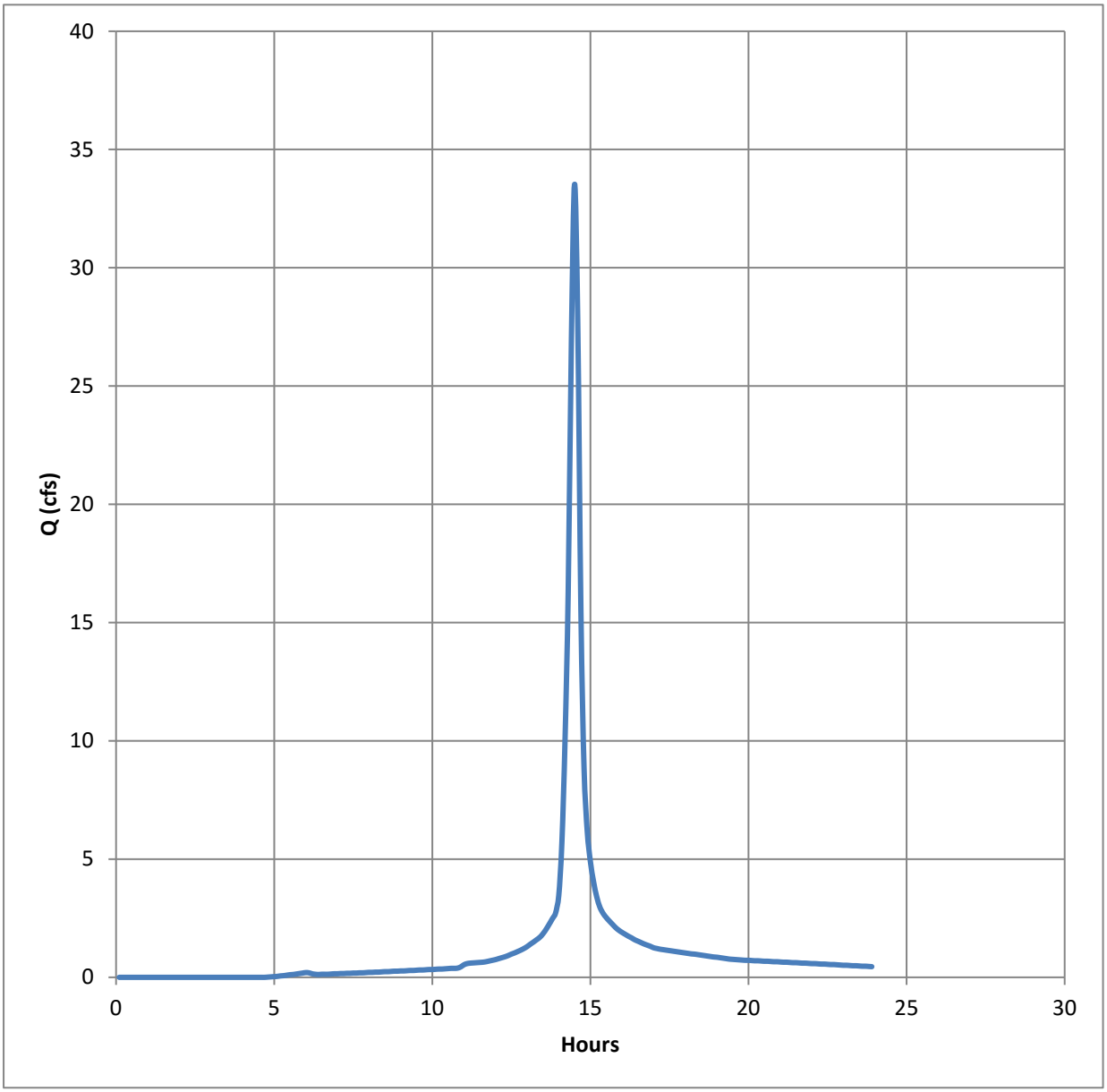
Notes:



# Liberty Way Off-Site

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 33.53 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 96,034 $Ft^3$ |
| Drainage Area | = | 6.50 Acres | Curve Number | = | 90 |
| Tc Method | = | User | Time of conc. (Tc) | = | 11.00 Mins |
| Total precip. | = | 5.20 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

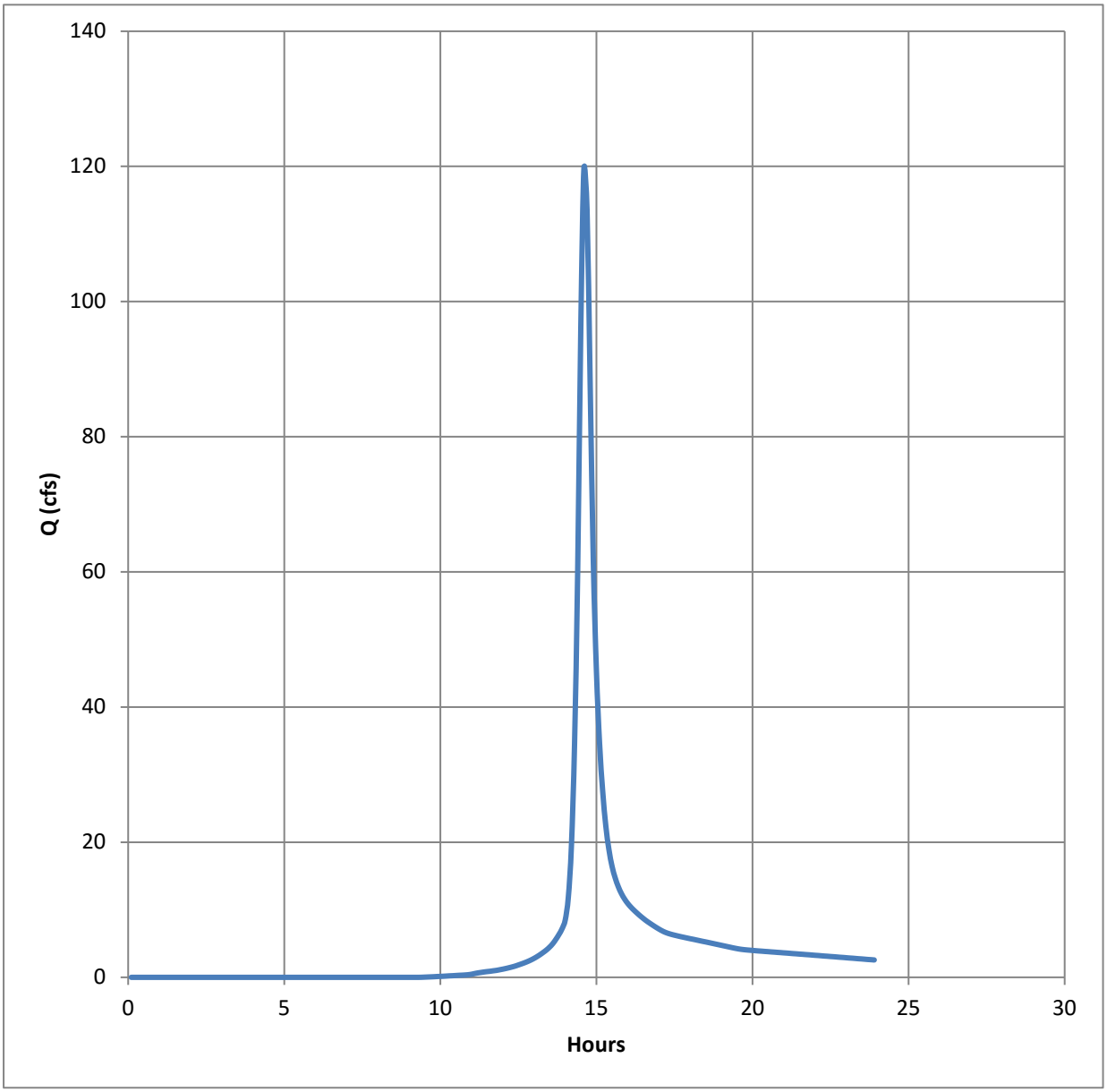
Notes:



# Golf Course - Off Site

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 119.72 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 421,422 $Ft^3$ |
| Drainage Area | = | 41.60 Acres | Curve Number | = | 77 |
| Tc Method | = | User | Time of conc. (Tc) | = | 22.20 Mins |
| Total precip. | = | 5.2 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

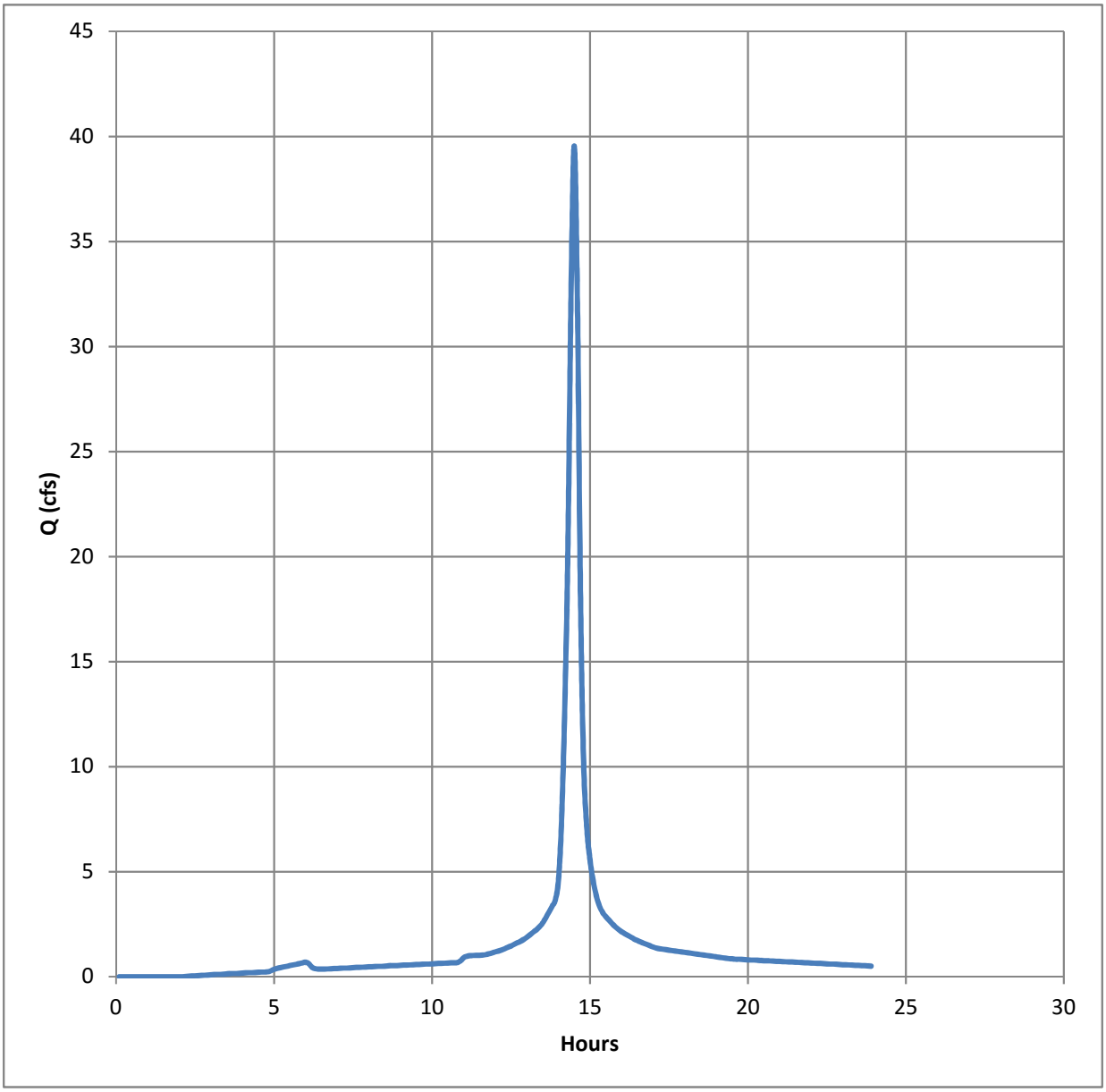
Notes:



# Postdeveloped New Commercial

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 39.54 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 120,512 $Ft^3$ |
| Drainage Area | = | 6.86 Acres | Curve Number | = | 96 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

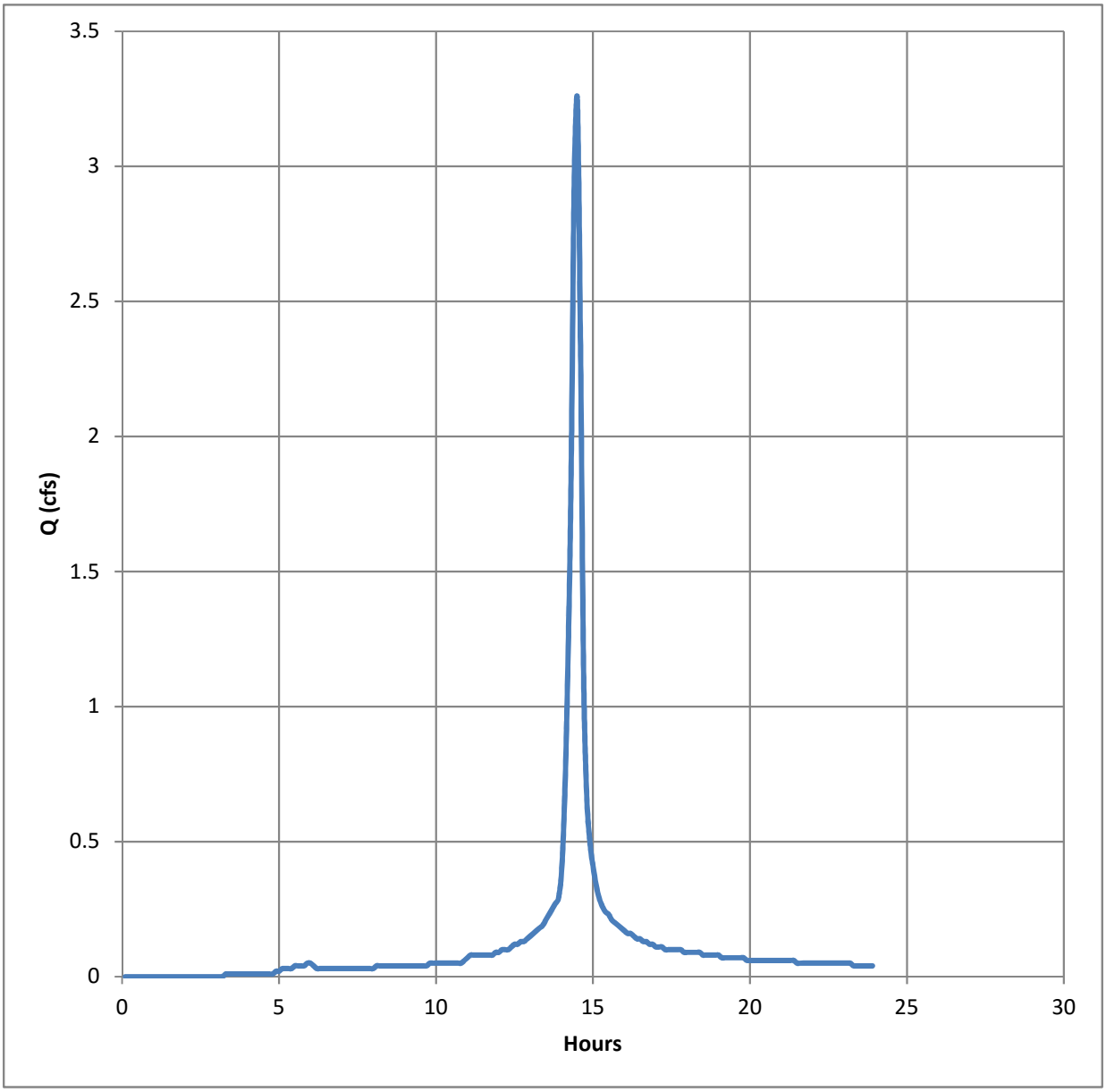
Notes:



# Postdeveloped New Commercial to Bypass

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 3.25 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 9,544 $Ft^3$ |
| Drainage Area | = | 0.80 Acres | Curve Number | = | 95 |
| Tc Method | = | User | Time of conc. (Tc) | = | 10.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

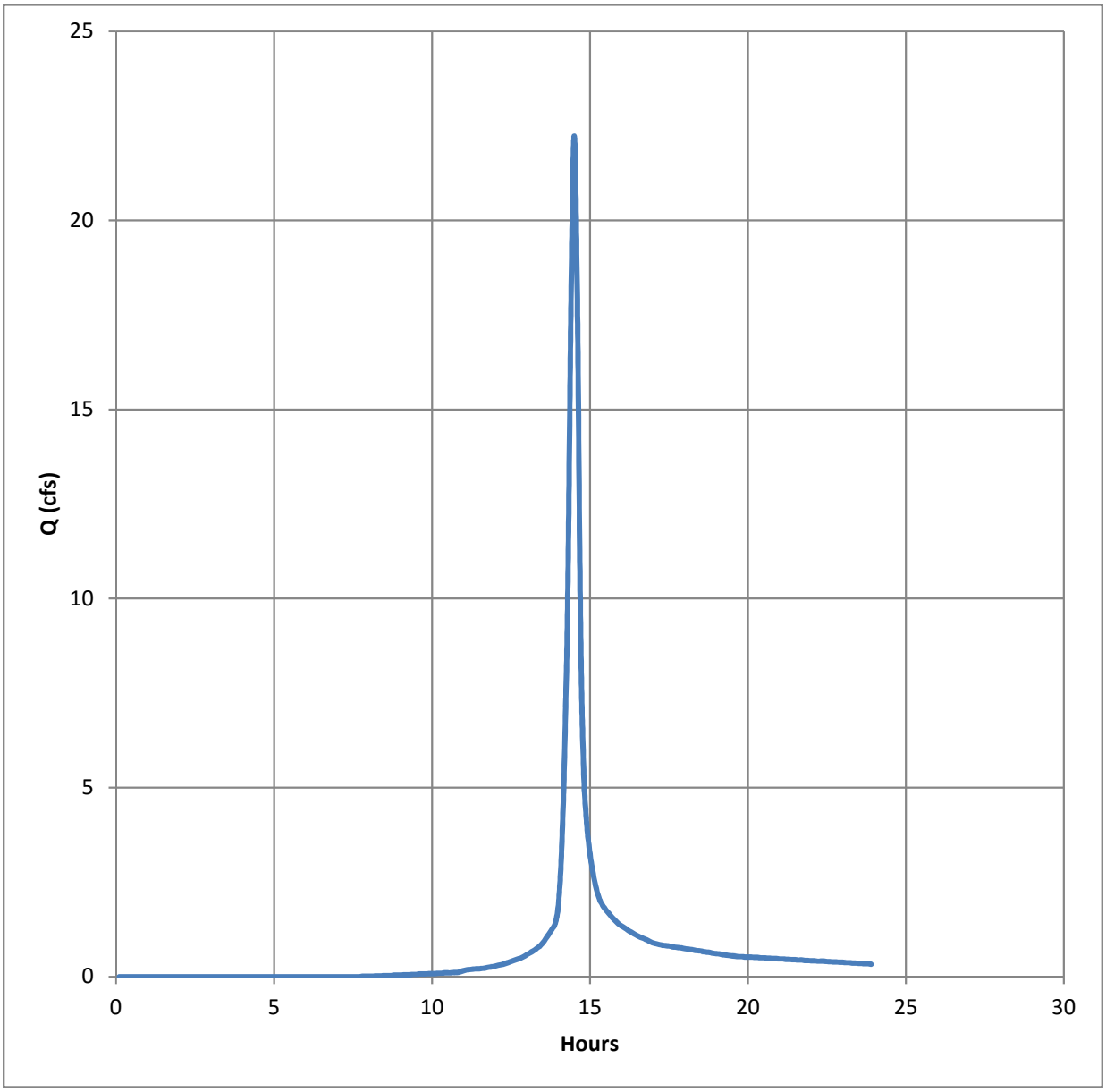
Notes:



# Postdeveloped New Residential

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 22.23 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 14:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 59,816 $Ft^3$ |
| Drainage Area | = | 5.23 Acres | Curve Number | = | 81 |
| Tc Method | = | User | Time of conc. (Tc) | = | 11.00 Mins |
| Total precip. | = | 5.2 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

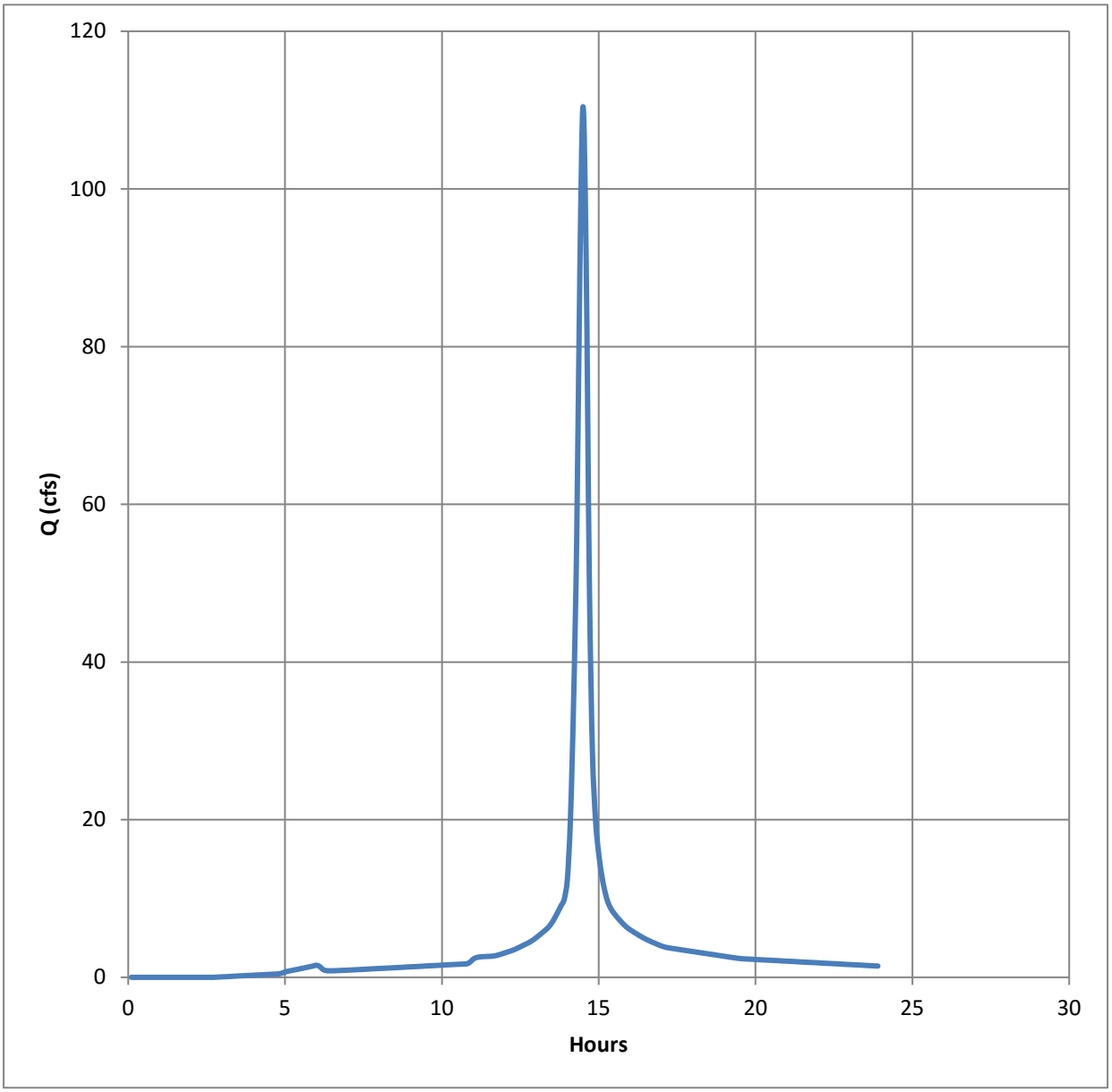
Notes:



# Weatherington Pointe Cabelas and Outlots

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 110.43 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 329,991 $Ft^3$ |
| Drainage Area | = | 18.30 Acres | Curve Number | = | 94 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

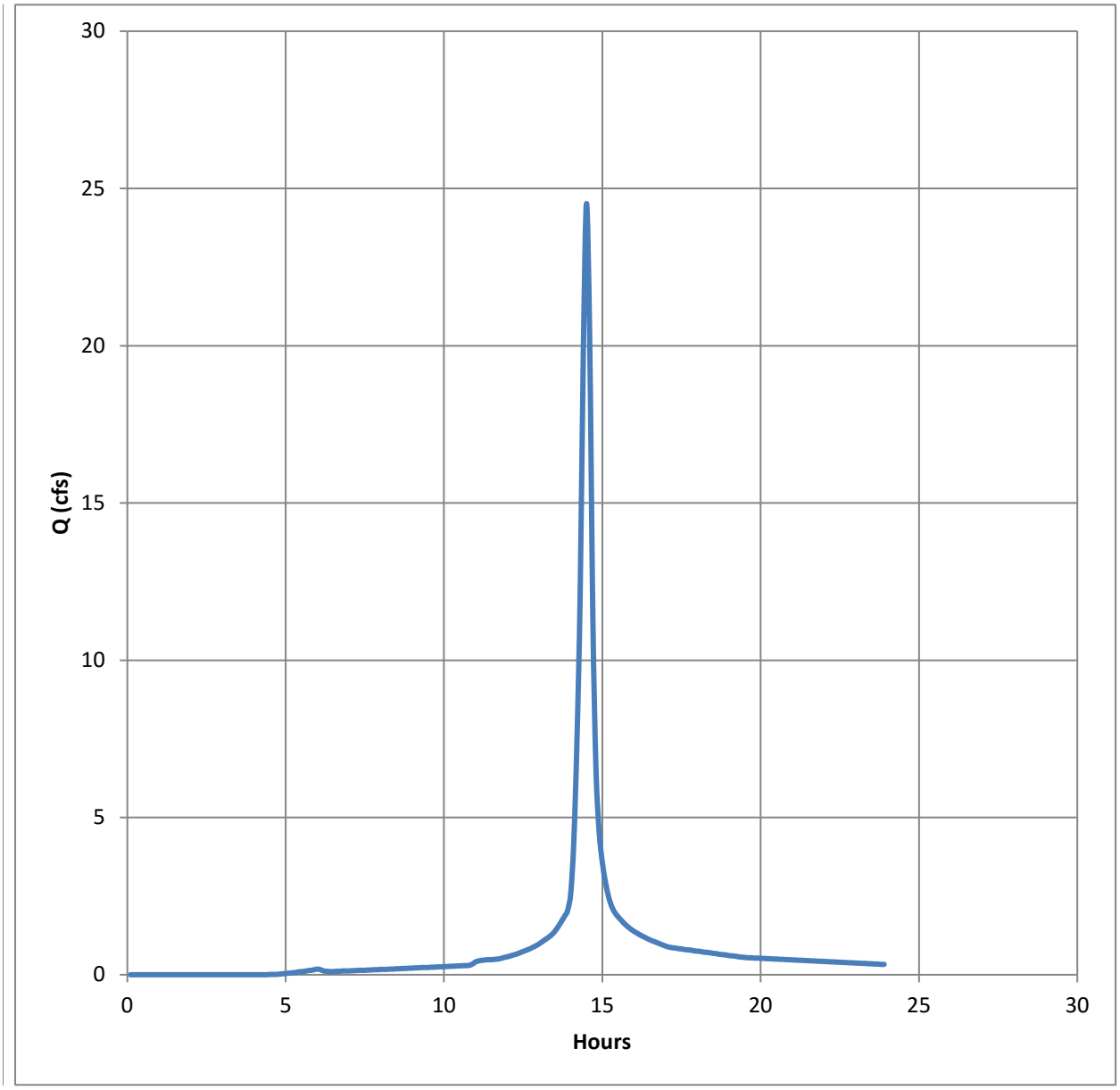
Notes:



# Tylers Place Blvd to Pond

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 24.52 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 70,708 $Ft^3$ |
| Drainage Area | = | 4.30 Acres | Curve Number | = | 90 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

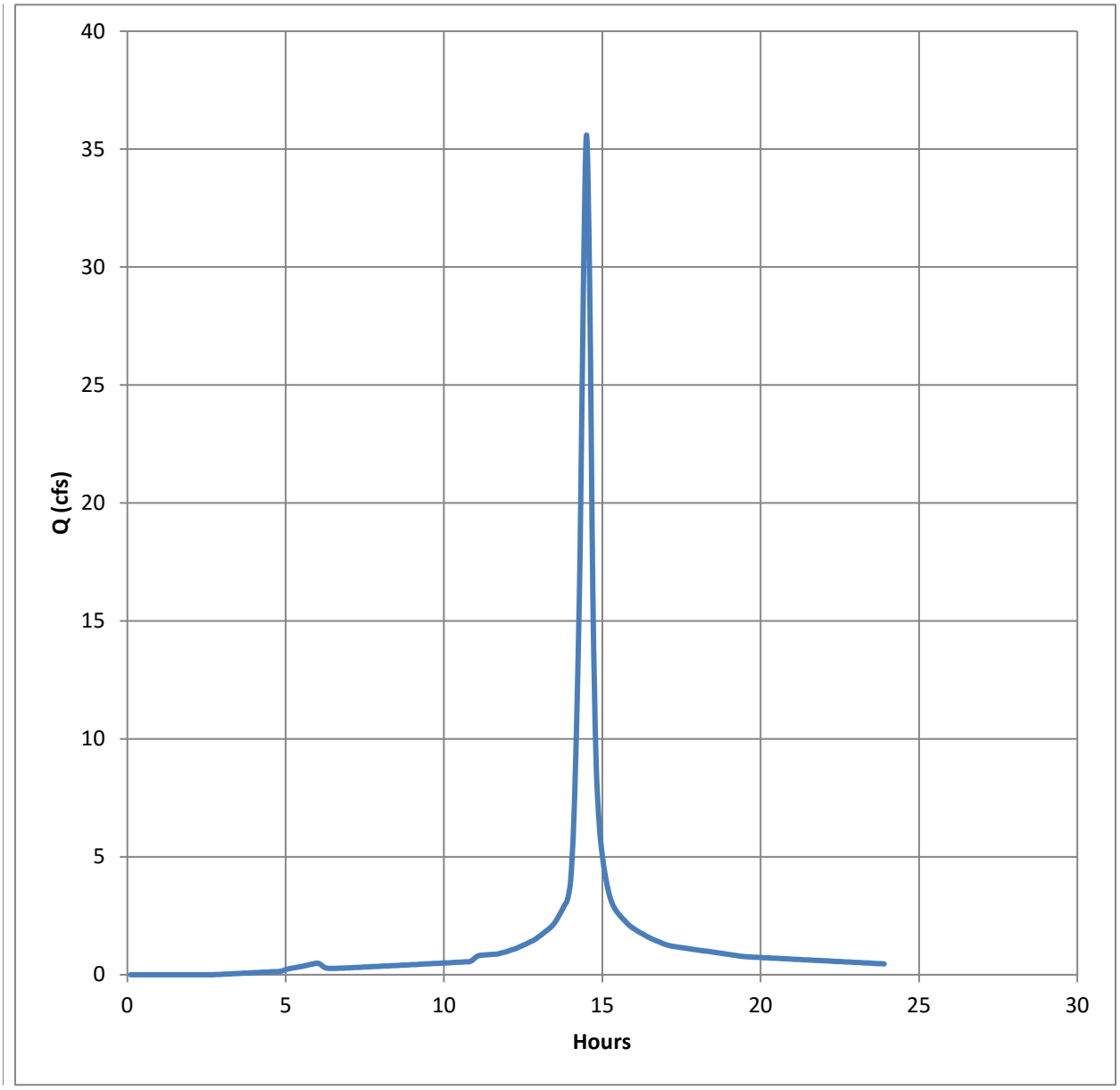
Notes:



# Keefe Tract 2 to Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 35.6 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 106,363 $Ft^3$ |
| Drainage Area | = | 5.90 Acres | Curve Number | = | 94 |
| Tc Method | = | User | Time of conc. (Tc) | = | 12.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

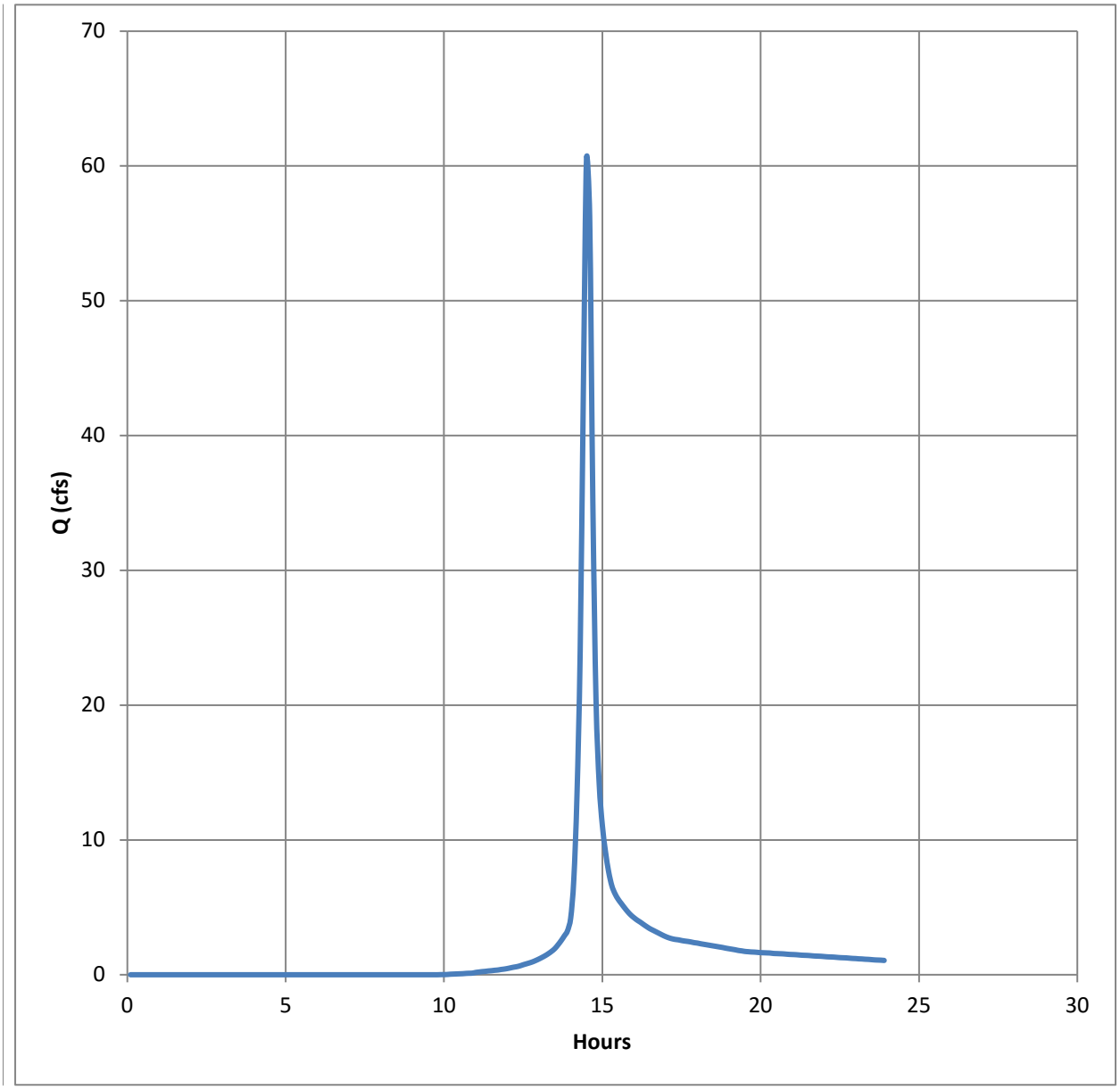
Notes:



# Weatherington Residential

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 60.54 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 173,243 $Ft^3$ |
| Drainage Area | = | 16.40 Acres | Curve Number | = | 74 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

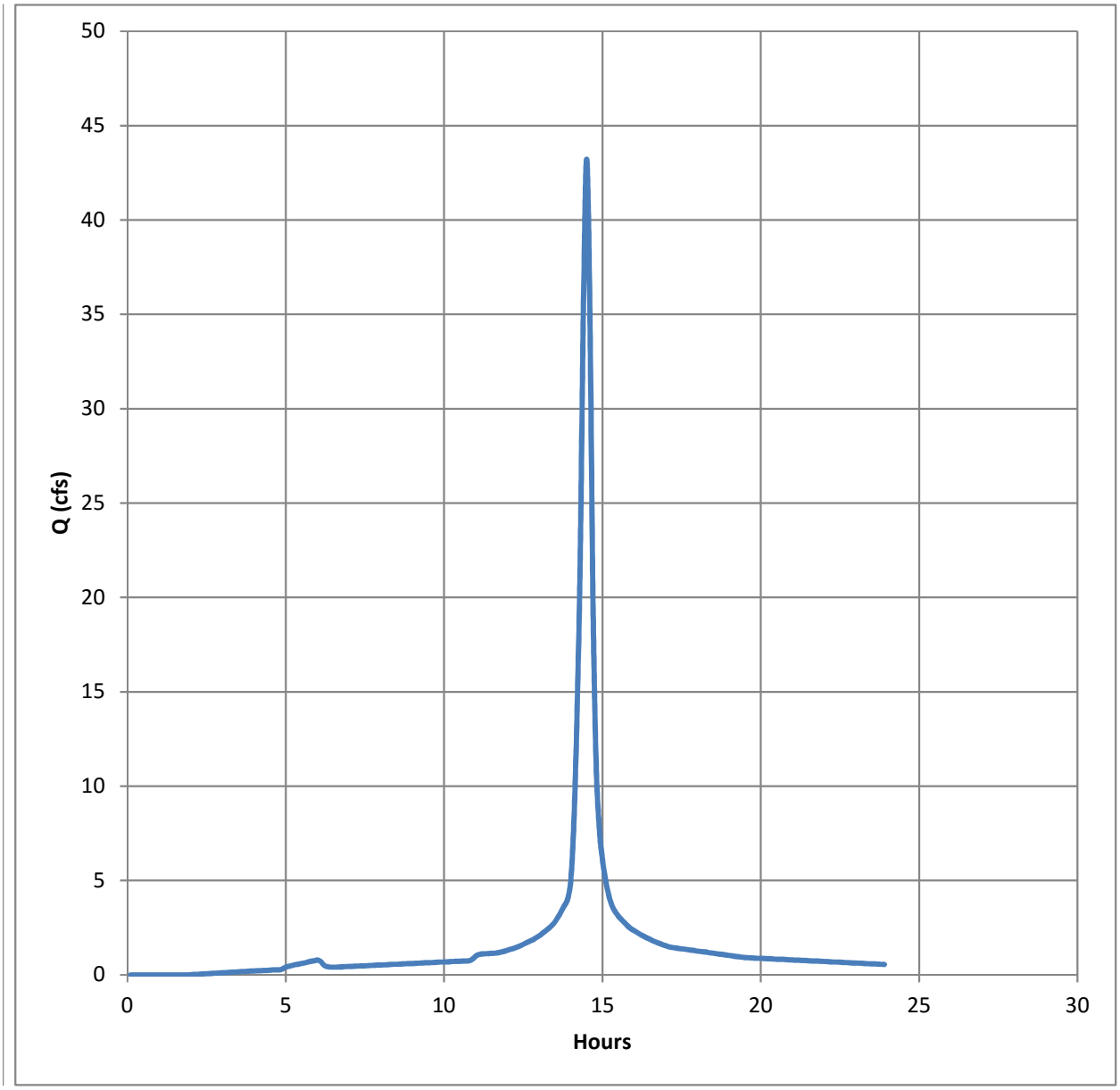
Notes:



# Postdeveloped New Commercial to Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 43.22 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 132,674 $Ft^3$ |
| Drainage Area | = | 6.86 Acres | Curve Number | = | 96 |
| Tc Method | = | User | Time of conc. (Tc) | = | 13.80 Mins |
| Total precip. | = | 5.67 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

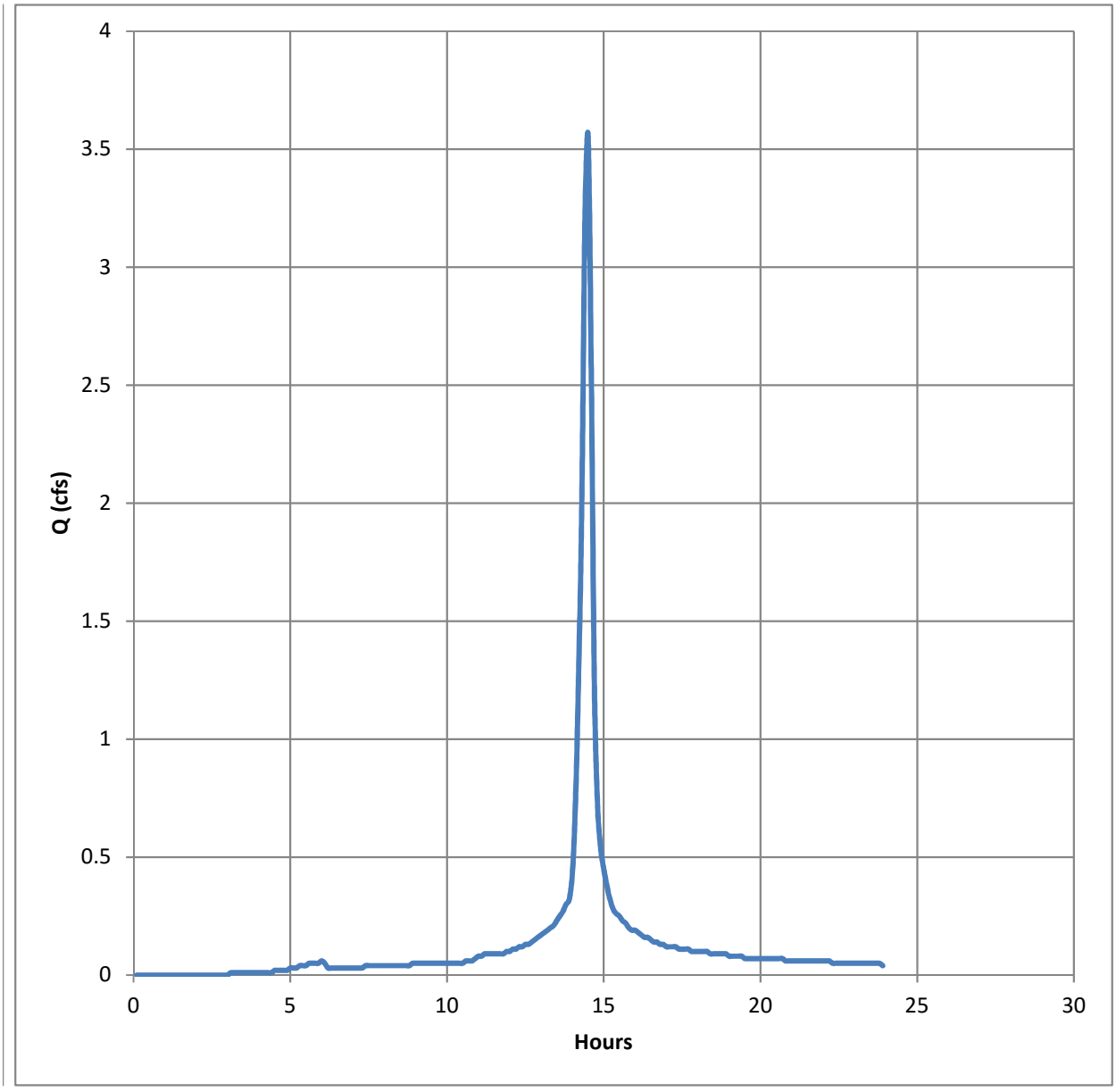
Notes:



# Postdeveloped New Commercial to Bypass

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 3.56 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 10,517 $Ft^3$ |
| Drainage Area | = | 0.80 Acres | Curve Number | = | 95 |
| Tc Method | = | User | Time of conc. (Tc) | = | 10.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

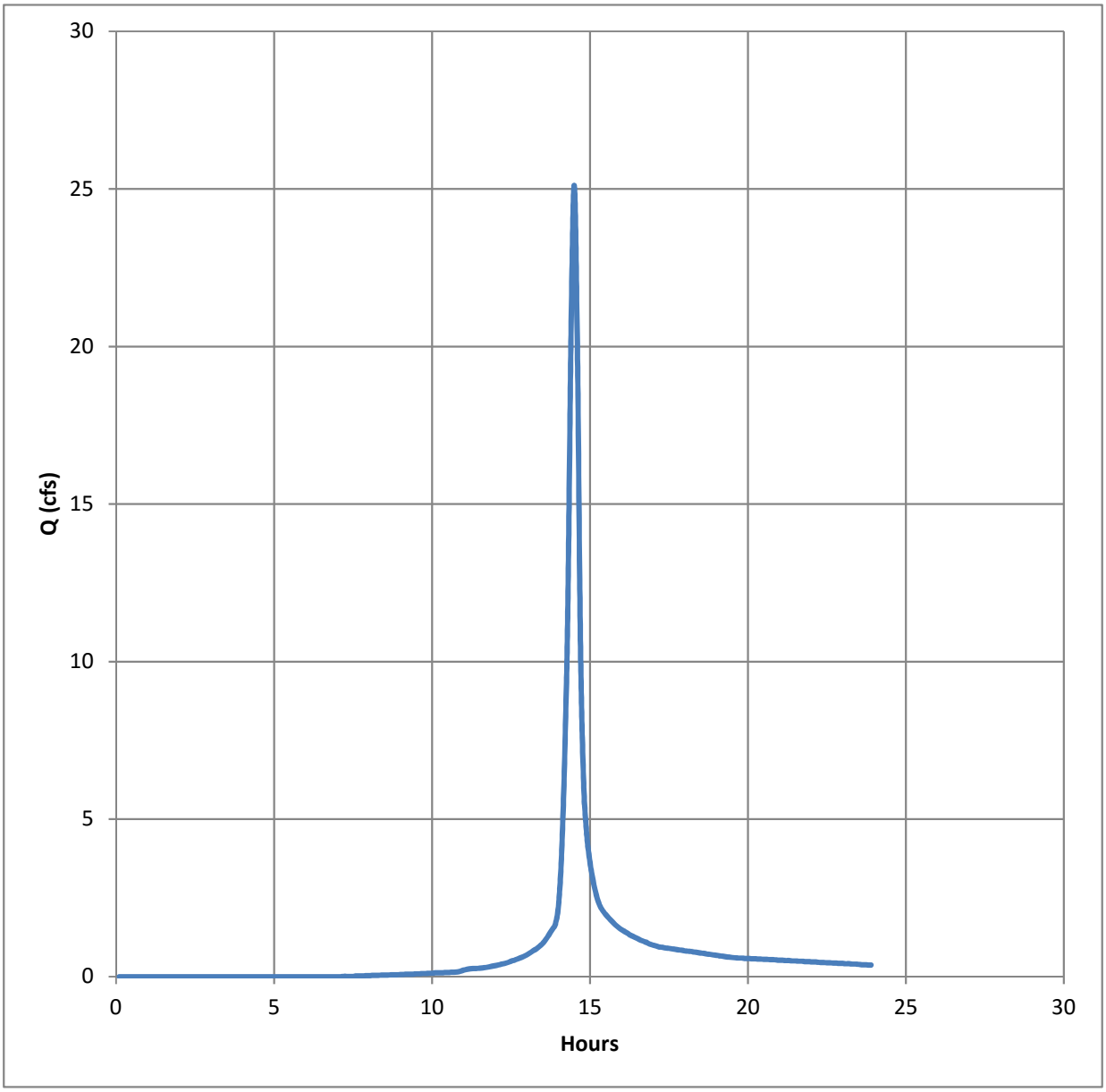
Notes:



# Postdeveloped New Residential

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 25.11 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 67,792 $Ft^3$ |
| Drainage Area | = | 5.23 Acres | Curve Number | = | 81 |
| Tc Method | = | User | Time of conc. (Tc) | = | 10.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 9/8/2016 |
| Storm Duration | = | 24 hrs | | | |

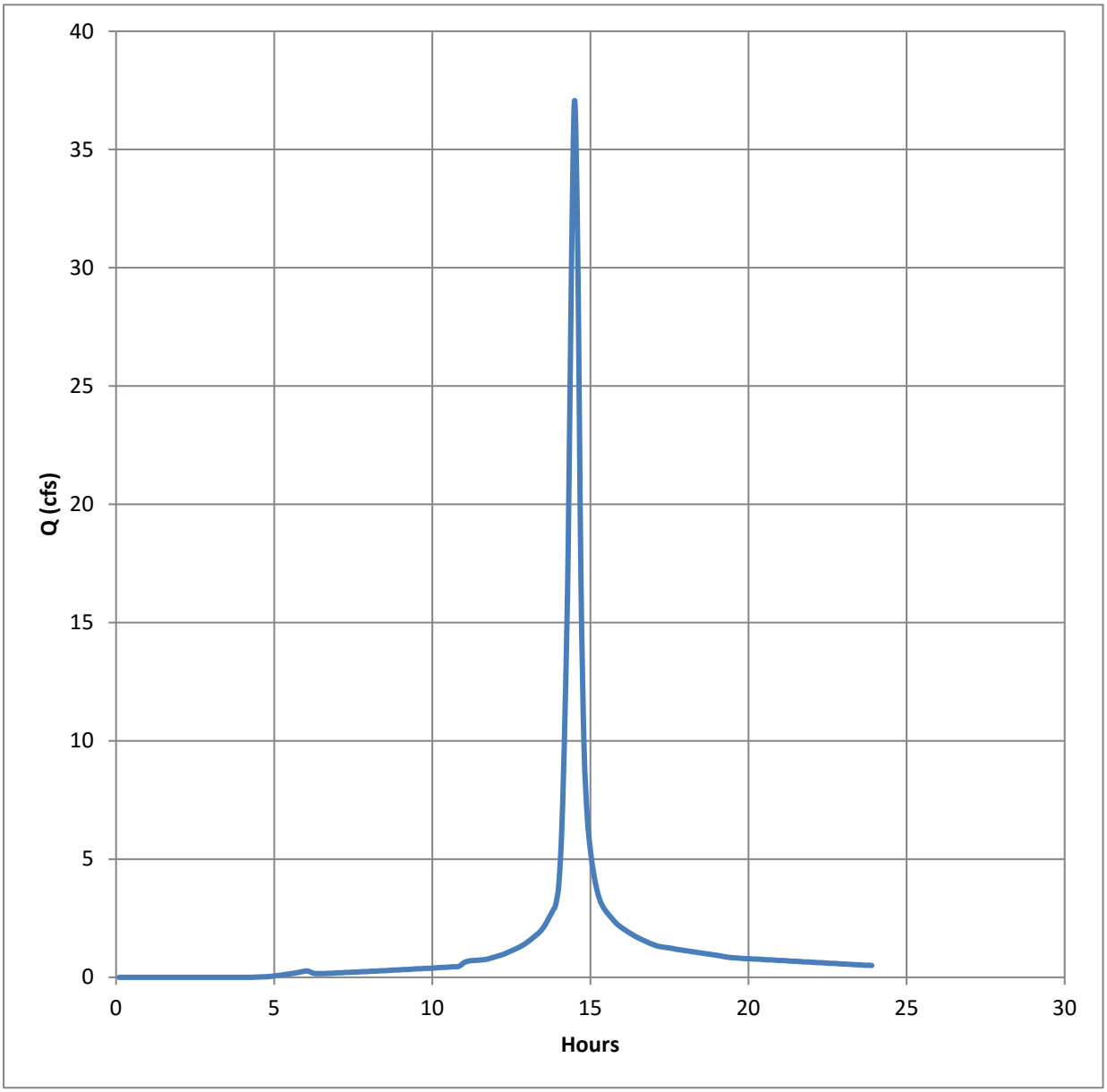
Notes:



# Liberty Way Off-Site

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 37.07 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 106,730 $Ft^3$ |
| Drainage Area | = | 6.50 Acres | Curve Number | = | 90 |
| Tc Method | = | User | Time of conc. (Tc) | = | 11.00 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

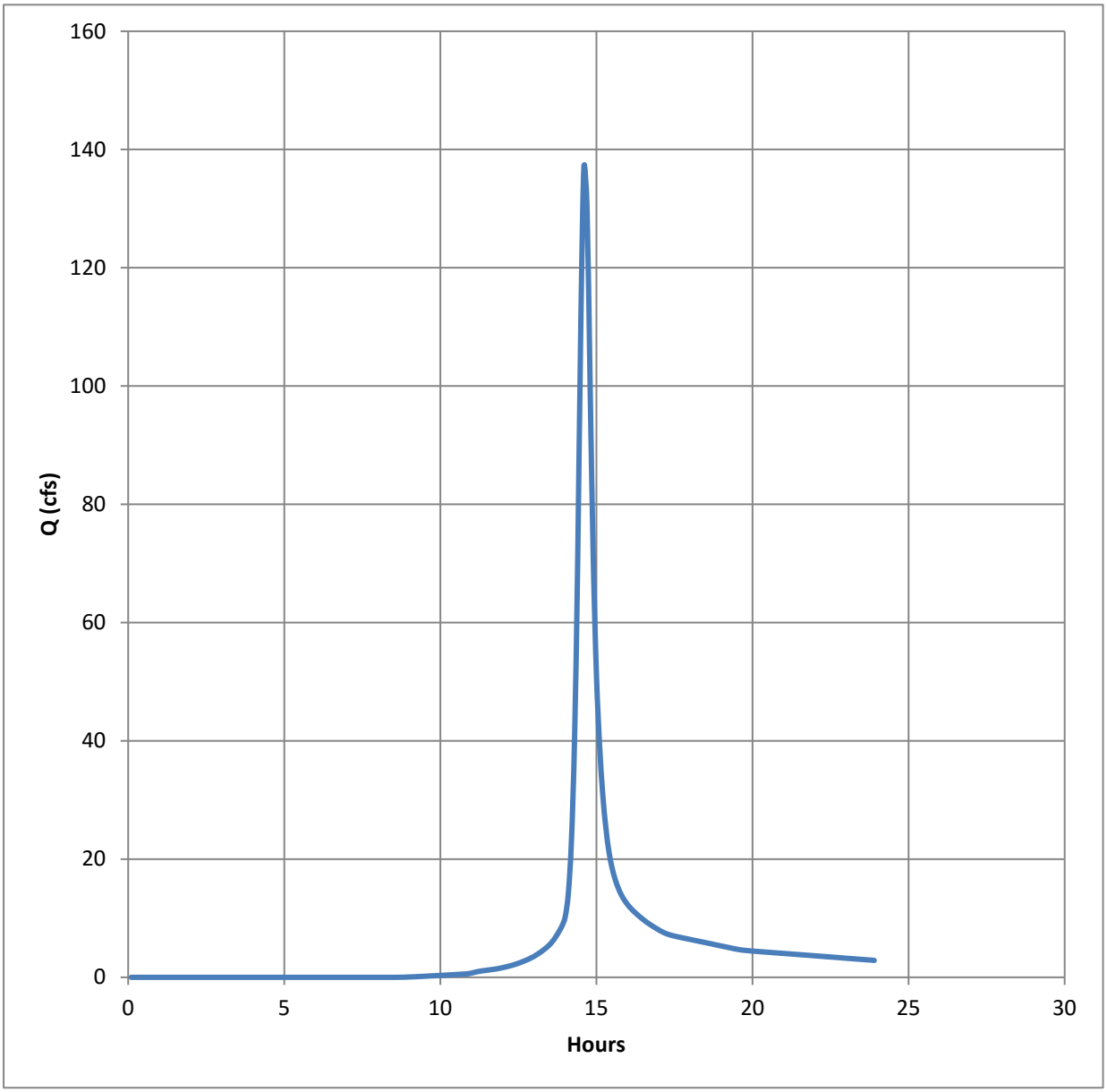
Notes:



# Golf Course - Off Site

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | SCS Runoff Type II | Peak Discharge | = | 137.07 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:30 |
| Time Interval | = | 6 min | Hyd. Volume | = | 482,093 $Ft^3$ |
| Drainage Area | = | 41.60 Acres | Curve Number | = | 77 |
| Tc Method | = | User | Time of conc. (Tc) | = | 22.20 Mins |
| Total precip. | = | 5.67 in | Date | = | 6/2/2016 |
| Storm Duration | = | 24 hrs | | | |

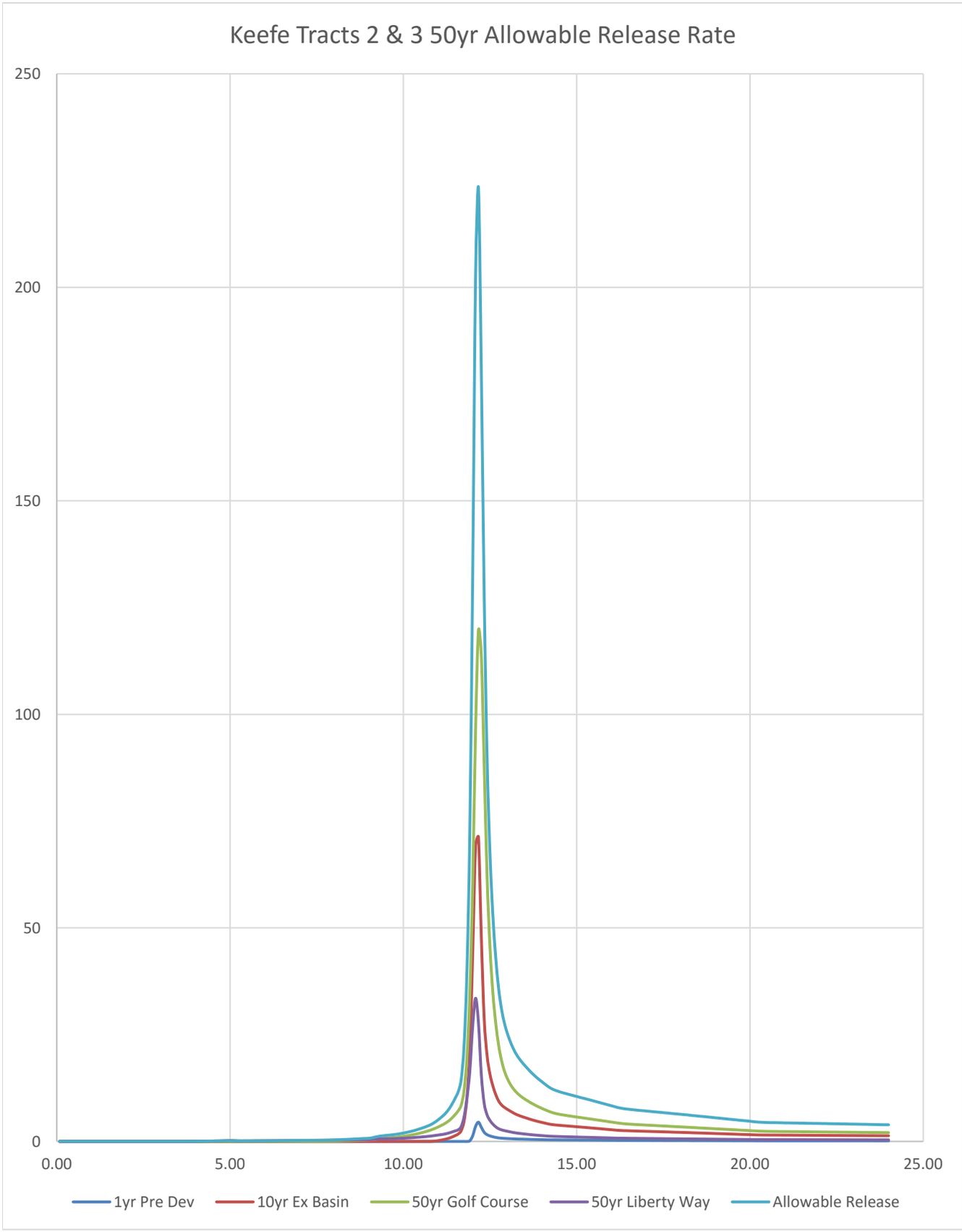
Notes:



# Allowable Release Rate Hydrograph

**Method of Hydrograph Development:** TR-55

**Software:** Autodesk Storm and Sanitary Stand Alone

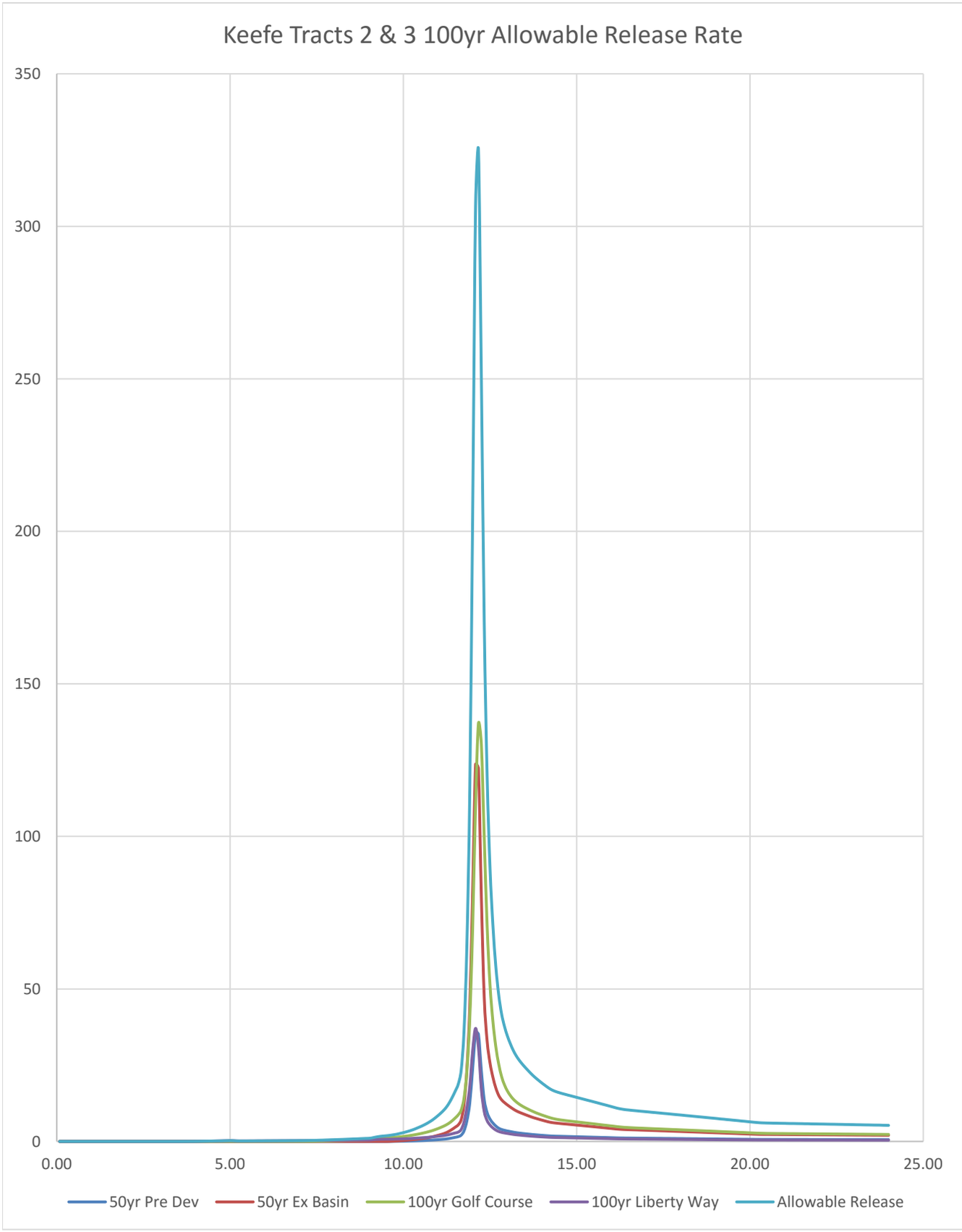



| | Peak | | | | |
|---|---|---|---|---|---|
| 1yr Pre Dev | 4.51 | cfs Pg7 + Pg8 | 50yr Golf | 119.72 | cfs Pg 16 |
| 10yr Ex Basin | 71.24 | cfs Pg 6 | 50yr Lib Way | 33.53 | cfs Pg 17 |
| | | | 50yr Allowabl | 223.27 | cfs |

# Allowable Release Rate Hydrograph

**Method of Hydrograph Development:** TR-55

**Software:** Autodesk Storm and Sanitary Stand Alone




| | Peak | | |
|---|---|---|---|
| 50yr Pre Dev | 35.63 cfs | 100yr Golf | 137.07 cfs |
| 50yr Ex Basin | 123.57 cfs | 100yr Lib Way | 37.07 cfs |
| | | 100yr Allowab | 325.08 cfs |

bayer becker

# Water Quality Volume

| | | | | | |
|---|---|---|---|---|---|
| Project: | Keefe Tracts 2 & 3 | Designed By: | MJL | Date: | 9/13/16 |
| Job No.: | 15M053-000 | Checked By: | | Date: | |
| Basin ID: | Primary Basin | Revised By: | | Date: | |

## Required Water Quality Volume

**$WQ_v = P\ C\ A/12$**

| | | | | | |
|---|---|---|---|---|---|
| Site Drainage Area (A) = | 81.56 acres | (To Basin) | $WQ_v$ = | 2.368 | acre-ft. |
| Rainfall Depth (P) = | 0.75 in. | | | 103,150 | cu.ft. |
| Runoff Coefficient (C) = | 0.46 | | | | |
| | | | 75% Wet Pond | 1.78 | acre-ft. |
| Residential Area (A) = | 16.40 acres | | | 77,363 | cu.ft. |
| Residential (C) = | 0.40 acres | | | | |
| Commercial Area (A) = | 23.56 acres | | | | |
| Commerical (C) = | 0.80 acres | | | | |
| Golf Course Area (A) = | 41.60 acres | | | | |
| Golf Course (C) = | 0.30 acres | | | | |

## Water Quality Release Rate

$Q_{wqv}$ = Total $WQ_v$/RT

Retention Time (RT) = 24 hours

**$Q_{wqv}$ = 0.90 cfs**

Provided Retention Time = 32.42 Hours

## Water Quality Outlet Orifice

### Contour Areas

| | Elevation ft | Area $ft^2$ | Volume $ft^3$ | Cum. Vol. $ft^3$ | Elevation at V | Storage at Elev |
|---|---|---|---|---|---|---|
| Basin Inv. = | 844.00 | 8608.90 | 0.00 | 0.00 | | |
| Contour 1 = | 845.00 | 10164.05 | 9386.48 | 9386.48 | | |
| Contour 2 = | 846.00 | 11827.50 | 10995.78 | 20382.25 | | |
| Contour 3 = | 847.00 | 13596.40 | 12711.95 | 33094.20 | | |
| Contour 4 = | 848.00 | 15472.65 | 14534.53 | 47628.73 | | |
| Contour 5 = | 849.00 | 17455.30 | 16463.98 | 64092.70 | | |
| Contour 6 = | 850.00 | 19545.30 | 18500.30 | 82593.00 | 849.72 | |
| Contour 7 = | 851.00 | 29644.75 | 24595.03 | 107188.03 | | |
| Contour 8 = | 852.00 | 44649.05 | 37146.90 | 144334.93 | | |
| Contour 9 = | 852.50 | 45317.38 | 56221.59 | 0.00 | | |
| Contour 10 = | 853.00 | 45985.70 | 22825.77 | 22825.77 | | |
| Contour 11 = | 854.00 | 47169.40 | 46577.55 | 69403.32 | | |
| Contour 12 = | 855.00 | 48248.60 | 47709.00 | 117112.32 | 854.17 | 104499.82 |
| Contour 13 = | 856.00 | 49300.25 | 48774.43 | 165886.74 | | |
| Contour 14 = | 857.00 | 50414.60 | 49857.43 | 215744.17 | | |
| Contour 15 = | 858.00 | 51512.80 | 50963.70 | 266707.87 | | |
| Contour 16 = | 859.00 | 52725.00 | 52118.90 | 318826.77 | | |
| Contour 17 = | 860.00 | 54096.80 | 53410.90 | 372237.67 | | |
| Contour 18 = | 861.00 | 55616.80 | 54856.80 | 427094.47 | | |
| Contour 19 = | 862.00 | 57234.65 | 56425.73 | 483520.19 | | |
| Contour 20 = | 863.00 | 64314.05 | 60774.35 | 544294.54 | | |

$Q = N\ C_d\ A_o\ (2\ g\ \Delta h)^{1/2}$

$C_d$ = 0.61

$A_o = \pi\ D^2/4$ for circular orifices; = h * w for rectangular orifices

g = 32.20 $ft/sec^2$

$Q = Q_{wqv}$ = 0.895 cfs

Required Volume = V = 77363 $ft^3$ Number of orifices = N = 1

Elevation at V = 854.17

Orifice h = 6.000 inch Orifice w = 0.00 inch (= 0 for circular orifice)

$\Delta h_{min}^{avg}$ = (Elev at V - Basin Inv)/2 - 1/2 h = 4.83 ft

$A_{trial} = Q/(N\ C_d\ (2\ g\ \Delta h_{min})^{1/2})$ = 11.98 $in^2$ Actual A = $A_o$ = 28.27 $in^2$

$\Delta h^{avg} = (Q/(N\ C_d\ A_o))^2/(2\ g)$ = 0.87 ft

Elev = 854.74 > Elevation at V = 854.17 Good

Storage = 104499.82 $ft^3$ Q = 0.895 cfs

## Water Quality Volume

| | | | | | |
|---|---|---|---|---|---|
| Project: | Keefe Tracts 2 & 3 | Designed By: | MJL | Date: | 6/2/16 |
| Job No.: | 15M053-000 | Checked By: | | Date: | |
| Basin ID: | Residential | Revised By: | | Date: | |

# Required Water Quality Volume

**$WQ_v = P\ C\ A/12$**

| | | | | | |
|---|---|---|---|---|---|
| Site Drainage Area (A) = | 5.23 | acres | (To Basin) | $WQ_v$ = | 0.119 acre-ft. |
| Rainfall Depth (P) = | 0.75 | in. | | | 5,180 cu.ft. |
| Impervious Area = | 2.81 | acres | | | |
| i= | 0.54 | | | 20% Sediment | 1,036 cu.ft. |
| | | | | Total WQ= | 6,215 cu.ft. |
| Runoff Coefficient (C) = | 0.36 | | | | |

$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$

Residential Water Quality Volume and Release Rates will be provided per each building in underground storage at building permits

# Pond Report



## Pond No. 2 - Existing Pond

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 853.10 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 853.10 | 00 | 0 | 0 |
| 0.90 | 854.00 | 109 | 33 | 33 |
| 1.90 | 855.00 | 8,505 | 3,192 | 3,225 |
| 2.90 | 856.00 | 20,179 | 13,927 | 17,151 |
| 3.90 | 857.00 | 34,118 | 26,843 | 43,994 |
| 4.90 | 858.00 | 48,025 | 40,870 | 84,864 |
| 5.90 | 859.00 | 61,936 | 54,828 | 139,692 |
| 6.90 | 860.00 | 71,234 | 66,524 | 206,216 |
| 7.90 | 861.00 | 74,999 | 73,101 | 279,317 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 60.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 60.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 853.10 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 92.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 1.00 | 0.00 | 0.00 | n/a |
| **N-Value** | = .024 | .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 (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 853.10 | 0.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.000 |
| 0.09 | 3 | 853.19 | 0.08 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.077 |
| 0.18 | 7 | 853.28 | 0.33 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.329 |
| 0.27 | 10 | 853.37 | 0.73 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.731 |
| 0.36 | 13 | 853.46 | 1.29 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 1.288 |
| 0.45 | 16 | 853.55 | 2.01 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.015 |
| 0.54 | 20 | 853.64 | 2.87 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 2.875 |
| 0.63 | 23 | 853.73 | 3.90 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3.896 |
| 0.72 | 26 | 853.82 | 5.04 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 5.041 |
| 0.81 | 29 | 853.91 | 6.35 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 6.346 |
| 0.90 | 33 | 854.00 | 7.77 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 7.768 |
| 1.00 | 352 | 854.10 | 9.55 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 9.547 |
| 1.10 | 671 | 854.20 | 11.46 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 11.46 |
| 1.20 | 990 | 854.30 | 13.52 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 13.52 |
| 1.30 | 1,309 | 854.40 | 15.79 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 15.79 |
| 1.40 | 1,629 | 854.50 | 18.13 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 18.13 |
| 1.50 | 1,948 | 854.60 | 20.66 ic | --- | --- | --- | --- | --- | --- | --- | --- | --- | 20.66 |
| 1.60 | 2,267 | 854.70 | 23.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 23.11 |
| 1.70 | 2,586 | 854.80 | 25.54 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 25.54 |
| 1.80 | 2,905 | 854.90 | 28.07 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 28.07 |
| 1.90 | 3,225 | 855.00 | 30.58 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 30.58 |
| 2.00 | 4,617 | 855.10 | 33.15 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 33.15 |
| 2.10 | 6,010 | 855.20 | 35.79 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 35.79 |
| 2.20 | 7,403 | 855.30 | 38.47 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 38.47 |
| 2.30 | 8,795 | 855.40 | 41.09 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 41.09 |
| 2.40 | 10,188 | 855.50 | 43.83 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 43.83 |
| 2.50 | 11,581 | 855.60 | 46.49 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 46.49 |
| 2.60 | 12,973 | 855.70 | 49.25 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 49.25 |
| 2.70 | 14,366 | 855.80 | 51.91 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 51.91 |
| 2.80 | 15,759 | 855.90 | 54.65 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 54.65 |
| 2.90 | 17,151 | 856.00 | 57.37 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 57.37 |
| 3.00 | 19,836 | 856.10 | 60.04 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 60.04 |
| 3.10 | 22,520 | 856.20 | 62.67 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 62.67 |
| 3.20 | 25,204 | 856.30 | 65.24 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 65.24 |

*Continues on next page...*

Existing Pond

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.30 | 27,888 | 856.40 | 67.84 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 67.84 |
| 3.40 | 30,573 | 856.50 | 70.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 70.35 |
| 3.50 | 33,257 | 856.60 | 72.77 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 72.77 |
| 3.60 | 35,941 | 856.70 | 75.26 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 75.26 |
| 3.70 | 38,625 | 856.80 | 77.54 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 77.54 |
| 3.80 | 41,310 | 856.90 | 79.84 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 79.84 |
| 3.90 | 43,994 | 857.00 | 81.99 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 81.99 |
| 4.00 | 48,081 | 857.10 | 84.04 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 84.04 |
| 4.10 | 52,168 | 857.20 | 86.03 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 86.03 |
| 4.20 | 56,255 | 857.30 | 87.87 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 87.87 |
| 4.30 | 60,342 | 857.40 | 89.53 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 89.53 |
| 4.40 | 64,429 | 857.50 | 91.07 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 91.07 |
| 4.50 | 68,516 | 857.60 | 92.42 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 92.42 |
| 4.60 | 72,603 | 857.70 | 93.53 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 93.53 |
| 4.70 | 76,690 | 857.80 | 94.39 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 94.39 |
| 4.80 | 80,777 | 857.90 | 94.90 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 94.90 |
| 4.90 | 84,864 | 858.00 | 94.87 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 94.87 |
| 5.00 | 90,347 | 858.10 | 92.96 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 92.96 |
| 5.10 | 95,829 | 858.20 | 97.89 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 97.89 |
| 5.20 | 101,312 | 858.30 | 102.57 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 102.57 |
| 5.30 | 106,795 | 858.40 | 107.05 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 107.05 |
| 5.40 | 112,278 | 858.50 | 111.35 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 111.35 |
| 5.50 | 117,760 | 858.60 | 115.49 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 115.49 |
| 5.60 | 123,243 | 858.70 | 119.49 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 119.49 |
| 5.70 | 128,726 | 858.80 | 123.36 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 123.36 |
| 5.80 | 134,209 | 858.90 | 127.11 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 127.11 |
| 5.90 | 139,692 | 859.00 | 130.76 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 130.76 |
| 6.00 | 146,344 | 859.10 | 134.30 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 134.30 |
| 6.10 | 152,996 | 859.20 | 137.75 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 137.75 |
| 6.20 | 159,649 | 859.30 | 141.12 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 141.12 |
| 6.30 | 166,301 | 859.40 | 144.41 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 144.41 |
| 6.40 | 172,954 | 859.50 | 147.62 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 147.62 |
| 6.50 | 179,606 | 859.60 | 150.77 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 150.77 |
| 6.60 | 186,258 | 859.70 | 153.85 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 153.85 |
| 6.70 | 192,911 | 859.80 | 156.88 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 156.88 |
| 6.80 | 199,563 | 859.90 | 159.84 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 159.84 |
| 6.90 | 206,216 | 860.00 | 162.76 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 162.76 |
| 7.00 | 213,526 | 860.10 | 165.62 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 165.62 |
| 7.10 | 220,836 | 860.20 | 168.43 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 168.43 |
| 7.20 | 228,146 | 860.30 | 171.20 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 171.20 |
| 7.30 | 235,456 | 860.40 | 173.92 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 173.92 |
| 7.40 | 242,766 | 860.50 | 176.60 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 176.60 |
| 7.50 | 250,076 | 860.60 | 179.24 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 179.24 |
| 7.60 | 257,386 | 860.70 | 181.84 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 181.84 |
| 7.70 | 264,697 | 860.80 | 184.40 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 184.40 |
| 7.80 | 272,007 | 860.90 | 186.93 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 186.93 |
| 7.90 | 279,317 | 861.00 | 189.43 oc | --- | --- | --- | --- | --- | --- | --- | --- | --- | 189.43 |

...End

# Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 09 / 8 / 2016

## Pond No. 1 - Walled Pond

### Pond Data

**Contours -**User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 844.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 844.00 | 8,608 | 0 | 0 |
| 1.00 | 845.00 | 10,164 | 9,374 | 9,374 |
| 2.00 | 846.00 | 11,827 | 10,984 | 20,358 |
| 3.00 | 847.00 | 13,596 | 12,700 | 33,058 |
| 4.00 | 848.00 | 15,473 | 14,523 | 47,581 |
| 5.00 | 849.00 | 17,455 | 16,452 | 64,034 |
| 6.00 | 850.00 | 19,545 | 18,488 | 82,522 |
| 7.00 | 851.00 | 29,645 | 24,418 | 106,940 |
| 8.00 | 852.00 | 44,649 | 36,888 | 143,828 |
| 8.50 | 852.50 | 45,317 | 22,489 | 166,317 |
| 9.00 | 853.00 | 45,986 | 22,823 | 189,140 |
| 10.00 | 854.00 | 47,169 | 46,572 | 235,712 |
| 11.00 | 855.00 | 48,249 | 47,703 | 283,415 |
| 12.00 | 856.00 | 49,300 | 48,769 | 332,184 |
| 13.00 | 857.00 | 50,414 | 49,851 | 382,035 |
| 14.00 | 858.00 | 51,513 | 50,957 | 432,992 |
| 15.00 | 859.00 | 52,725 | 52,113 | 485,105 |
| 16.00 | 860.00 | 54,096 | 53,404 | 538,508 |
| 17.00 | 861.00 | 55,617 | 54,849 | 593,358 |
| 18.00 | 862.00 | 57,234 | 56,418 | 649,776 |
| 19.00 | 863.00 | 64,314 | 60,734 | 710,509 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 48.00 | 6.00 | 66.00 | 0.00 |
| **Span (in)** | = 96.00 | 6.00 | 66.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 852.19 | 852.50 | 854.50 | 0.00 |
| **Length (ft)** | = 461.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 0.30 | 0.00 | 0.00 | n/a |
| **N-Value** | = .015 | .015 | .015 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | Yes | Yes | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 16.00 | 60.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 860.50 | 862.54 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 2.60 | 3.33 | 3.33 |
| **Weir Type** | = 1 | Broad | --- | --- |
| **Multi-Stage** | = Yes | No | No | No |

**Exfil.(in/hr)** = 0.000 (by Contour)

**TW Elev. (ft)** = 0.00

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

### Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.00 | 0 | 844.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.10 | 937 | 844.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.20 | 1,875 | 844.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.30 | 2,812 | 844.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.40 | 3,750 | 844.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.50 | 4,687 | 844.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.60 | 5,625 | 844.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.70 | 6,562 | 844.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.80 | 7,499 | 844.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 0.90 | 8,437 | 844.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.00 | 9,374 | 845.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.10 | 10,473 | 845.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.20 | 11,571 | 845.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.30 | 12,669 | 845.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.40 | 13,768 | 845.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.50 | 14,866 | 845.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.60 | 15,965 | 845.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.70 | 17,063 | 845.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.80 | 18,161 | 845.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 1.90 | 19,260 | 845.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.00 | 20,358 | 846.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.10 | 21,628 | 846.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |

*Continues on next page...*

Walled Pond

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.20 | 22,898 | 846.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.30 | 24,168 | 846.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.40 | 25,438 | 846.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.50 | 26,708 | 846.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.60 | 27,978 | 846.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.70 | 29,248 | 846.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.80 | 30,518 | 846.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 2.90 | 31,788 | 846.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.00 | 33,058 | 847.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.10 | 34,510 | 847.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.20 | 35,963 | 847.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.30 | 37,415 | 847.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.40 | 38,867 | 847.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.50 | 40,320 | 847.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.60 | 41,772 | 847.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.70 | 43,224 | 847.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.80 | 44,677 | 847.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 3.90 | 46,129 | 847.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.00 | 47,581 | 848.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.10 | 49,226 | 848.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.20 | 50,872 | 848.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.30 | 52,517 | 848.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.40 | 54,162 | 848.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.50 | 55,807 | 848.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.60 | 57,453 | 848.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.70 | 59,098 | 848.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.80 | 60,743 | 848.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 4.90 | 62,388 | 848.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.00 | 64,034 | 849.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.10 | 65,882 | 849.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.20 | 67,731 | 849.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.30 | 69,580 | 849.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.40 | 71,429 | 849.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.50 | 73,278 | 849.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.60 | 75,126 | 849.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.70 | 76,975 | 849.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.80 | 78,824 | 849.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 5.90 | 80,673 | 849.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.00 | 82,522 | 850.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.10 | 84,964 | 850.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.20 | 87,405 | 850.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.30 | 89,847 | 850.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.40 | 92,289 | 850.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.50 | 94,731 | 850.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.60 | 97,173 | 850.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.70 | 99,614 | 850.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.80 | 102,056 | 850.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 6.90 | 104,498 | 850.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.00 | 106,940 | 851.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.10 | 110,629 | 851.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.20 | 114,317 | 851.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.30 | 118,006 | 851.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.40 | 121,695 | 851.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.50 | 125,384 | 851.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.60 | 129,073 | 851.60 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.70 | 132,761 | 851.70 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.80 | 136,450 | 851.80 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 7.90 | 140,139 | 851.90 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.00 | 143,828 | 852.00 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.05 | 146,077 | 852.05 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.10 | 148,326 | 852.10 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.15 | 150,575 | 852.15 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.20 | 152,824 | 852.20 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.25 | 155,072 | 852.25 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.30 | 157,321 | 852.30 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.35 | 159,570 | 852.35 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.40 | 161,819 | 852.40 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.45 | 164,068 | 852.45 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.50 | 166,317 | 852.50 | 0.00 | 0.00 | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.000 |
| 8.55 | 168,599 | 852.55 | 0.01 oc | 0.01 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.008 |
| 8.60 | 170,882 | 852.60 | 0.03 oc | 0.03 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.031 |
| 8.65 | 173,164 | 852.65 | 0.07 oc | 0.07 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.066 |

*Continues on next page...*

Walled Pond

## Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8.70 | 175,446 | 852.70 | 0.11 oc | 0.11 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.114 |
| 8.75 | 177,729 | 852.75 | 0.17 oc | 0.17 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.167 |
| 8.80 | 180,011 | 852.80 | 0.23 oc | 0.23 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.230 |
| 8.85 | 182,293 | 852.85 | 0.30 oc | 0.30 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.298 |
| 8.90 | 184,576 | 852.90 | 0.36 oc | 0.36 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.363 |
| 8.95 | 186,858 | 852.95 | 0.43 oc | 0.43 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.425 |
| 9.00 | 189,140 | 853.00 | 0.47 ic | 0.47 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.473 |
| 9.10 | 193,797 | 853.10 | 0.56 ic | 0.56 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.559 |
| 9.20 | 198,455 | 853.20 | 0.63 ic | 0.63 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.634 |
| 9.30 | 203,112 | 853.30 | 0.70 ic | 0.70 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.701 |
| 9.40 | 207,769 | 853.40 | 0.76 ic | 0.76 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.762 |
| 9.50 | 212,426 | 853.50 | 0.82 ic | 0.82 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.819 |
| 9.60 | 217,083 | 853.60 | 0.87 ic | 0.87 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.871 |
| 9.70 | 221,740 | 853.70 | 0.92 ic | 0.92 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.921 |
| 9.80 | 226,397 | 853.80 | 0.97 ic | 0.97 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 0.969 |
| 9.90 | 231,055 | 853.90 | 1.01 ic | 1.01 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.014 |
| 10.00 | 235,712 | 854.00 | 1.06 ic | 1.06 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.057 |
| 10.10 | 240,482 | 854.10 | 1.10 ic | 1.10 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.098 |
| 10.20 | 245,252 | 854.20 | 1.14 ic | 1.14 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.138 |
| 10.30 | 250,023 | 854.30 | 1.18 ic | 1.18 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.177 |
| 10.40 | 254,793 | 854.40 | 1.22 ic | 1.21 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.214 |
| 10.50 | 259,563 | 854.50 | 1.25 ic | 1.25 ic | 0.00 | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.250 |
| 10.60 | 264,334 | 854.60 | 1.41 ic | 1.29 ic | 0.12 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.406 |
| 10.70 | 269,104 | 854.70 | 1.77 ic | 1.32 ic | 0.45 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 1.771 |
| 10.80 | 273,874 | 854.80 | 2.39 ic | 1.35 ic | 1.03 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 2.388 |
| 10.90 | 278,645 | 854.90 | 3.08 ic | 1.39 ic | 1.70 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 3.084 |
| 11.00 | 283,415 | 855.00 | 4.01 ic | 1.42 ic | 2.59 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 4.006 |
| 11.10 | 288,292 | 855.10 | 5.19 ic | 1.45 ic | 3.74 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 5.188 |
| 11.20 | 293,169 | 855.20 | 6.66 ic | 1.48 ic | 5.18 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 6.660 |
| 11.30 | 298,046 | 855.30 | 8.08 ic | 1.51 ic | 6.57 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 8.082 |
| 11.40 | 302,923 | 855.40 | 10.14 ic | 1.54 ic | 8.60 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 10.14 |
| 11.50 | 307,799 | 855.50 | 12.05 ic | 1.56 ic | 10.49 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 12.05 |
| 11.60 | 312,676 | 855.60 | 14.18 ic | 1.57 ic | 12.61 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 14.18 |
| 11.70 | 317,553 | 855.70 | 15.94 ic | 1.58 ic | 14.36 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 15.94 |
| 11.80 | 322,430 | 855.80 | 18.49 ic | 1.59 ic | 16.89 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 18.49 |
| 11.90 | 327,307 | 855.90 | 21.28 ic | 1.60 ic | 19.68 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 21.28 |
| 12.00 | 332,184 | 856.00 | 23.53 ic | 1.61 ic | 21.92 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 23.53 |
| 12.10 | 337,169 | 856.10 | 26.75 ic | 1.62 ic | 25.13 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 26.75 |
| 12.20 | 342,154 | 856.20 | 30.21 ic | 1.62 ic | 28.59 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 30.21 |
| 12.30 | 347,139 | 856.30 | 32.95 ic | 1.63 ic | 31.31 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 32.94 |
| 12.40 | 352,124 | 856.40 | 35.81 ic | 1.64 ic | 34.17 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 35.81 |
| 12.50 | 357,109 | 856.50 | 39.85 ic | 1.64 ic | 38.21 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 39.85 |
| 12.60 | 362,094 | 856.60 | 43.00 ic | 1.65 ic | 41.35 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 43.00 |
| 12.70 | 367,079 | 856.70 | 47.42 ic | 1.65 ic | 45.76 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 47.41 |
| 12.80 | 372,064 | 856.80 | 50.84 ic | 1.66 ic | 49.17 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 50.83 |
| 12.90 | 377,050 | 856.90 | 54.36 ic | 1.67 ic | 52.68 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 54.35 |
| 13.00 | 382,035 | 857.00 | 59.24 ic | 1.67 ic | 57.57 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 59.24 |
| 13.10 | 387,130 | 857.10 | 62.99 ic | 1.68 ic | 61.31 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 62.99 |
| 13.20 | 392,226 | 857.20 | 66.82 ic | 1.69 ic | 65.13 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 66.82 |
| 13.30 | 397,322 | 857.30 | 72.07 ic | 1.69 ic | 70.38 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 72.07 |
| 13.40 | 402,418 | 857.40 | 76.08 ic | 1.70 ic | 74.38 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 76.07 |
| 13.50 | 407,513 | 857.50 | 80.14 ic | 1.71 ic | 78.43 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 80.14 |
| 13.60 | 412,609 | 857.60 | 85.66 ic | 1.71 ic | 83.94 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 85.65 |
| 13.70 | 417,705 | 857.70 | 89.83 ic | 1.72 ic | 88.11 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 89.82 |
| 13.80 | 422,801 | 857.80 | 94.04 ic | 1.72 ic | 92.31 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 94.03 |
| 13.90 | 427,896 | 857.90 | 99.67 oc | 1.72 ic | 97.94 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 99.67 |
| 14.00 | 432,992 | 858.00 | 103.92 oc | 1.73 ic | 102.19 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 103.92 |
| 14.10 | 438,203 | 858.10 | 109.55 oc | 1.73 ic | 107.83 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 109.55 |
| 14.20 | 443,415 | 858.20 | 113.80 oc | 1.73 ic | 112.07 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 113.80 |
| 14.30 | 448,626 | 858.30 | 118.03 oc | 1.73 ic | 116.30 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 118.03 |
| 14.40 | 453,837 | 858.40 | 123.56 oc | 1.73 ic | 121.82 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 123.56 |
| 14.50 | 459,048 | 858.50 | 128.99 oc | 1.73 ic | 127.26 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 128.99 |
| 14.60 | 464,260 | 858.60 | 133.09 oc | 1.74 ic | 131.36 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 133.09 |
| 14.70 | 469,471 | 858.70 | 138.34 oc | 1.74 ic | 136.60 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 138.33 |
| 14.80 | 474,682 | 858.80 | 143.43 oc | 1.74 ic | 141.69 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 143.43 |
| 14.90 | 479,893 | 858.90 | 147.30 oc | 1.74 ic | 145.55 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 147.30 |
| 15.00 | 485,105 | 859.00 | 152.12 oc | 1.75 ic | 150.37 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 152.12 |
| 15.10 | 490,445 | 859.10 | 156.75 oc | 1.75 ic | 155.00 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 156.75 |
| 15.20 | 495,785 | 859.20 | 162.05 oc | 1.75 ic | 160.30 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 162.05 |
| 15.30 | 501,126 | 859.30 | 166.20 oc | 1.75 ic | 164.44 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 166.20 |
| 15.40 | 506,466 | 859.40 | 170.81 oc | 1.76 ic | 169.06 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 170.81 |
| 15.50 | 511,807 | 859.50 | 174.46 oc | 1.77 ic | 172.69 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 174.45 |

*Continues on next page...*

Walled Pond

## Stage / Storage / Discharge Table

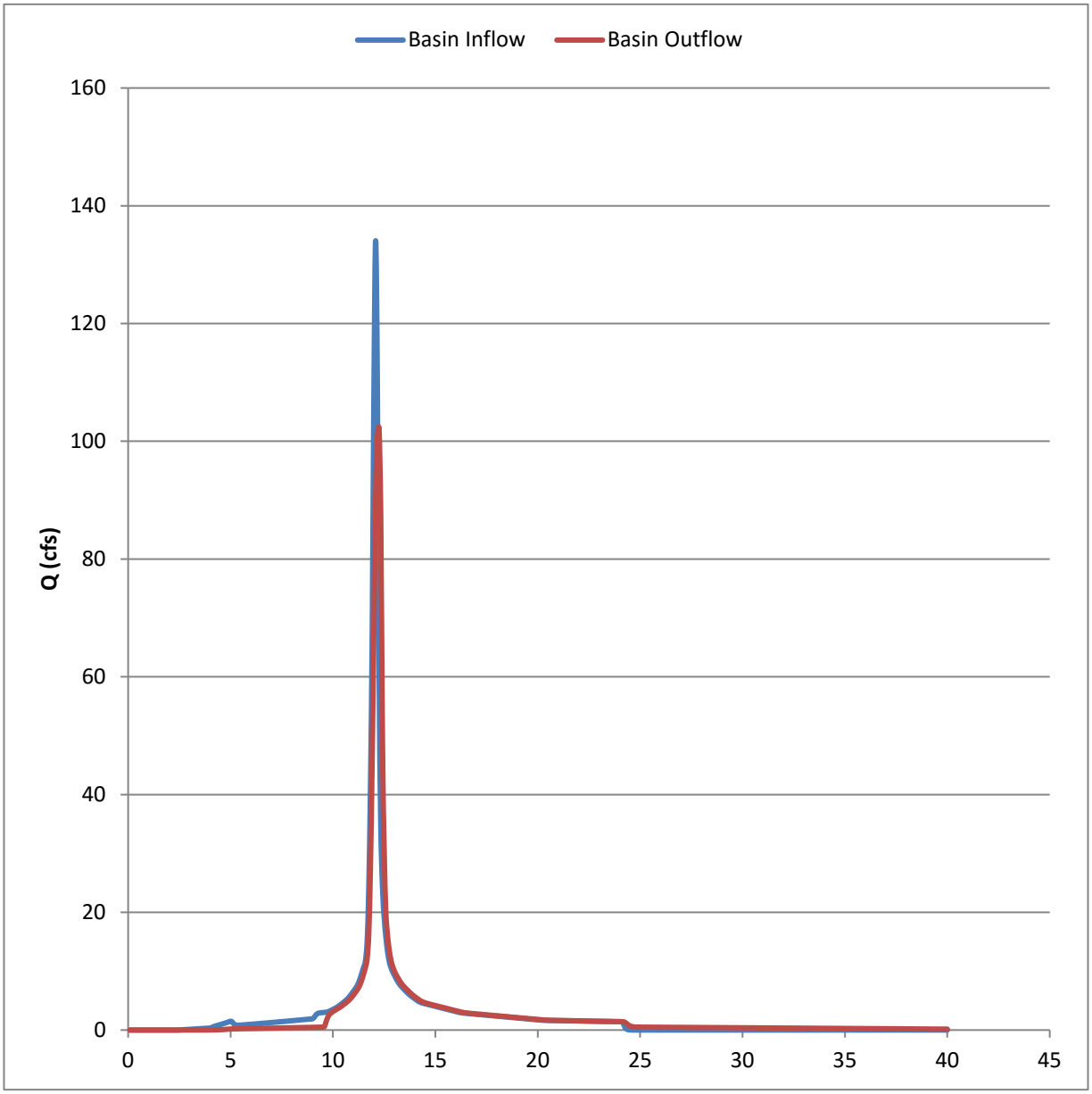
| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | PrfRsr cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | User cfs | Total cfs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.60 | 517,147 | 859.60 | 178.87 oc | 1.77 ic | 177.10 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 178.87 |
| 15.70 | 522,487 | 859.70 | 182.32 oc | 1.78 ic | 180.54 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 182.31 |
| 15.80 | 527,828 | 859.80 | 185.83 oc | 1.67 ic | 184.16 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 185.83 |
| 15.90 | 533,168 | 859.90 | 188.90 oc | 1.68 ic | 187.22 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 188.90 |
| 16.00 | 538,508 | 860.00 | 191.38 oc | 1.70 ic | 189.68 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 191.38 |
| 16.10 | 543,993 | 860.10 | 194.80 oc | 1.70 ic | 193.10 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 194.80 |
| 16.20 | 549,478 | 860.20 | 198.17 oc | 1.71 ic | 196.46 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 198.17 |
| 16.30 | 554,963 | 860.30 | 201.48 oc | 1.72 ic | 199.76 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 201.47 |
| 16.40 | 560,448 | 860.40 | 204.73 oc | 1.73 ic | 203.00 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 204.73 |
| 16.50 | 565,933 | 860.50 | 207.94 oc | 1.73 ic | 206.20 ic | --- | 0.00 | 0.00 | --- | --- | --- | --- | 207.93 |
| 16.60 | 571,418 | 860.60 | 212.77 oc | 1.73 ic | 209.35 ic | --- | 1.68 | 0.00 | --- | --- | --- | --- | 212.76 |
| 16.70 | 576,903 | 860.70 | 216.46 oc | 1.74 ic | 209.96 ic | --- | 4.76 | 0.00 | --- | --- | --- | --- | 216.45 |
| 16.80 | 582,388 | 860.80 | 220.55 oc | 1.74 ic | 210.07 ic | --- | 8.75 | 0.00 | --- | --- | --- | --- | 220.55 |
| 16.90 | 587,873 | 860.90 | 225.04 oc | 1.73 ic | 209.83 ic | --- | 13.47 | 0.00 | --- | --- | --- | --- | 225.03 |
| 17.00 | 593,358 | 861.00 | 229.85 oc | 1.73 ic | 209.28 ic | --- | 18.84 | 0.00 | --- | --- | --- | --- | 229.84 |
| 17.10 | 598,999 | 861.10 | 234.92 oc | 1.72 ic | 208.43 ic | --- | 24.76 | 0.00 | --- | --- | --- | --- | 234.92 |
| 17.20 | 604,641 | 861.20 | 240.23 oc | 1.71 ic | 207.31 ic | --- | 31.20 | 0.00 | --- | --- | --- | --- | 240.23 |
| 17.30 | 610,283 | 861.30 | 245.73 oc | 1.70 ic | 205.91 ic | --- | 38.12 | 0.00 | --- | --- | --- | --- | 245.73 |
| 17.40 | 615,925 | 861.40 | 251.42 oc | 1.69 ic | 204.24 ic | --- | 45.48 | 0.00 | --- | --- | --- | --- | 251.42 |
| 17.50 | 621,567 | 861.50 | 257.26 oc | 1.67 ic | 202.31 ic | --- | 53.27 | 0.00 | --- | --- | --- | --- | 257.26 |
| 17.60 | 627,209 | 861.60 | 263.23 oc | 1.65 ic | 200.12 ic | --- | 61.46 | 0.00 | --- | --- | --- | --- | 263.23 |
| 17.70 | 632,850 | 861.70 | 269.32 oc | 1.63 ic | 197.66 ic | --- | 70.02 | 0.00 | --- | --- | --- | --- | 269.32 |
| 17.80 | 638,492 | 861.80 | 275.51 oc | 1.61 ic | 194.94 ic | --- | 78.96 | 0.00 | --- | --- | --- | --- | 275.51 |
| 17.90 | 644,134 | 861.90 | 281.78 oc | 1.59 ic | 191.96 ic | --- | 88.24 | 0.00 | --- | --- | --- | --- | 281.78 |
| 18.00 | 649,776 | 862.00 | 288.14 oc | 1.56 ic | 188.70 ic | --- | 97.88 | 0.00 | --- | --- | --- | --- | 288.14 |
| 18.10 | 655,849 | 862.10 | 294.53 oc | 1.53 ic | 185.17 ic | --- | 107.83 | 0.00 | --- | --- | --- | --- | 294.53 |
| 18.20 | 661,922 | 862.20 | 300.97 oc | 1.50 ic | 181.37 ic | --- | 118.10 | 0.00 | --- | --- | --- | --- | 300.97 |
| 18.30 | 667,996 | 862.30 | 307.43 oc | 1.47 ic | 177.30 ic | --- | 128.66 | 0.00 | --- | --- | --- | --- | 307.43 |
| 18.40 | 674,069 | 862.40 | 313.90 oc | 1.43 ic | 172.94 ic | --- | 139.53 | 0.00 | --- | --- | --- | --- | 313.90 |
| 18.50 | 680,142 | 862.50 | 320.37 oc | 1.39 ic | 168.30 ic | --- | 150.68 | 0.00 | --- | --- | --- | --- | 320.37 |
| 18.60 | 686,216 | 862.60 | 320.03 oc | 1.43 ic | 172.59 ic | --- | 124.66 ic | 2.29 | --- | --- | --- | --- | 300.97 |
| 18.70 | 692,289 | 862.70 | 319.71 oc | 1.46 ic | 176.75 ic | --- | 127.59 ic | 9.97 | --- | --- | --- | --- | 315.77 |
| 18.80 | 698,363 | 862.80 | 319.39 oc | 1.49 ic | 180.81 ic | --- | 130.46 ic | 20.66 | --- | --- | --- | --- | 333.42 |
| 18.90 | 704,436 | 862.90 | 319.30 oc | 1.52 ic | 184.50 ic | --- | 133.27 ic | 33.67 | --- | --- | --- | --- | 352.96 |
| 19.00 | 710,509 | 863.00 | 322.13 oc | 1.53 ic | 184.58 ic | --- | 136.02 ic | 48.67 | --- | --- | --- | --- | 370.80 |

...End

# Cabelas Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 102.19 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 12:10 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 871.41 |
| | | | Max Storage | = | 107,120 $Ft^3$ |
| | | | Date | = | 6/2/2016 |

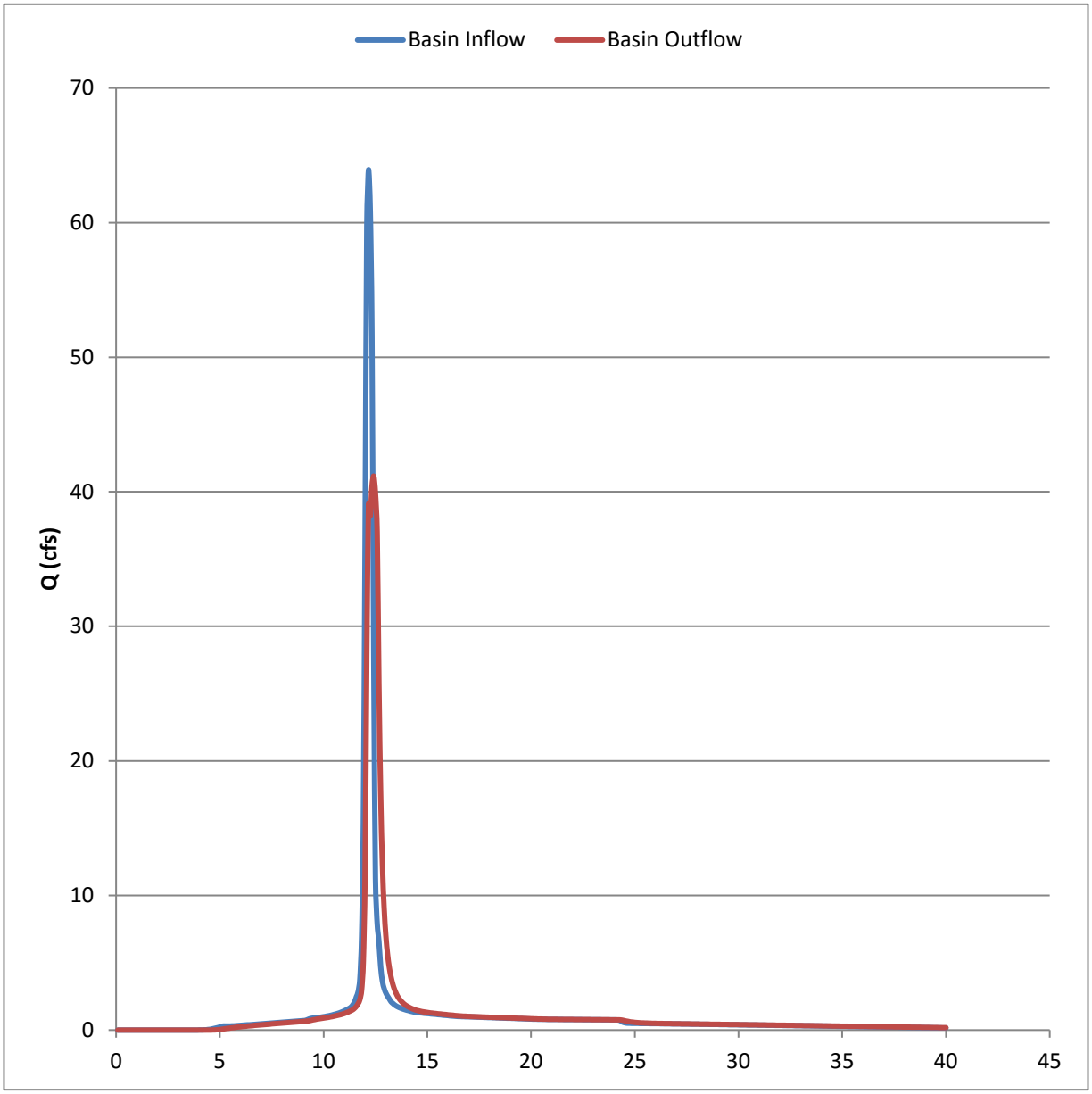
Notes:



# Existing Pond

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 41.16 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 12:25 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 866.25 |
| | | | Max Storage | = | 42,017 $Ft^3$ |
| | | | Date | = | 6/2/2016 |

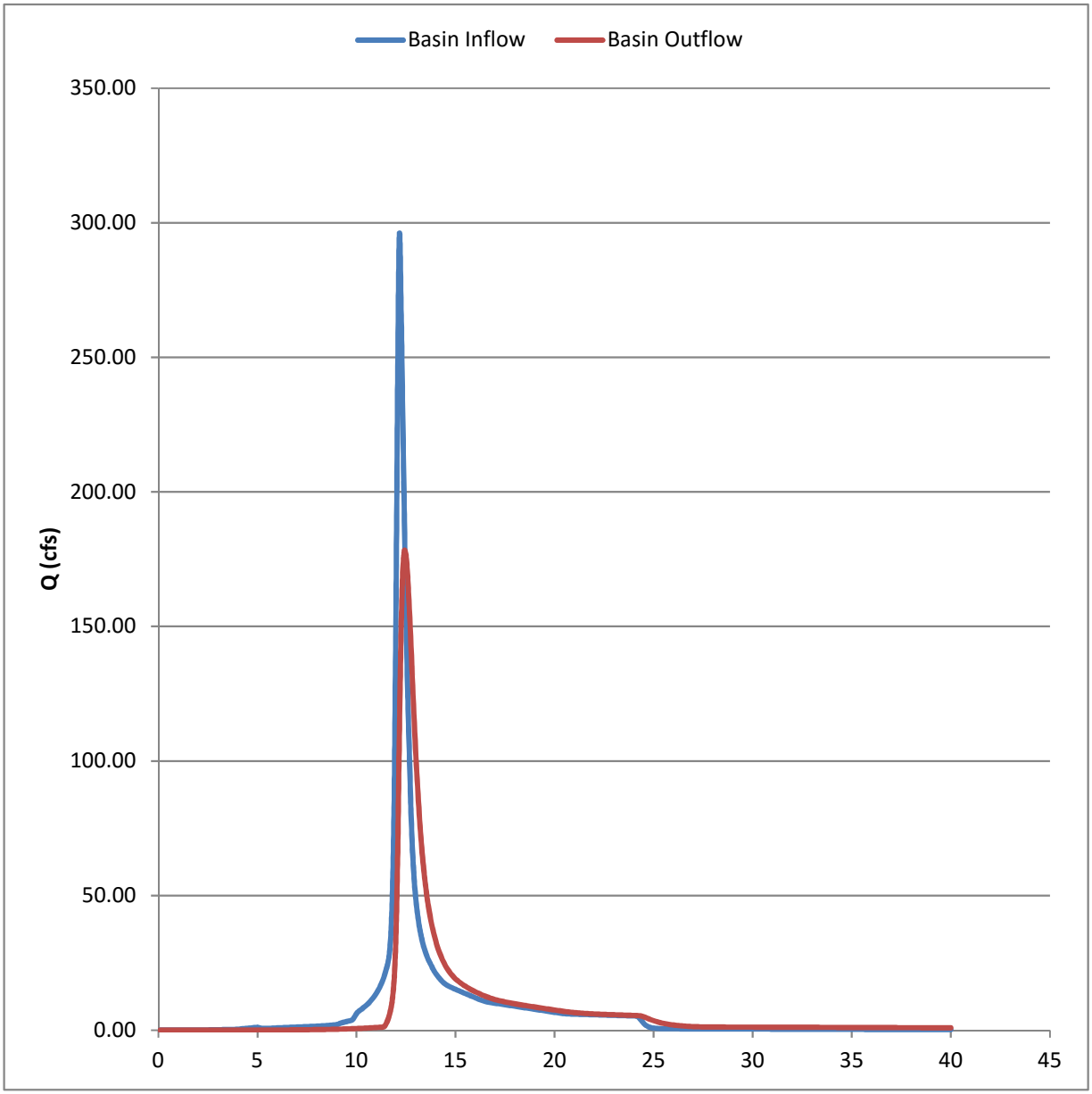
Notes:



# Primary Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 178.22 |
| Storm Frequency | = | 50 yrs | Time to Peak | = | 12:25 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 859.66 |
| | | | Max Storage | = | 520,447 $Ft^3$ |
| | | | Date | = | 9/8/2016 |

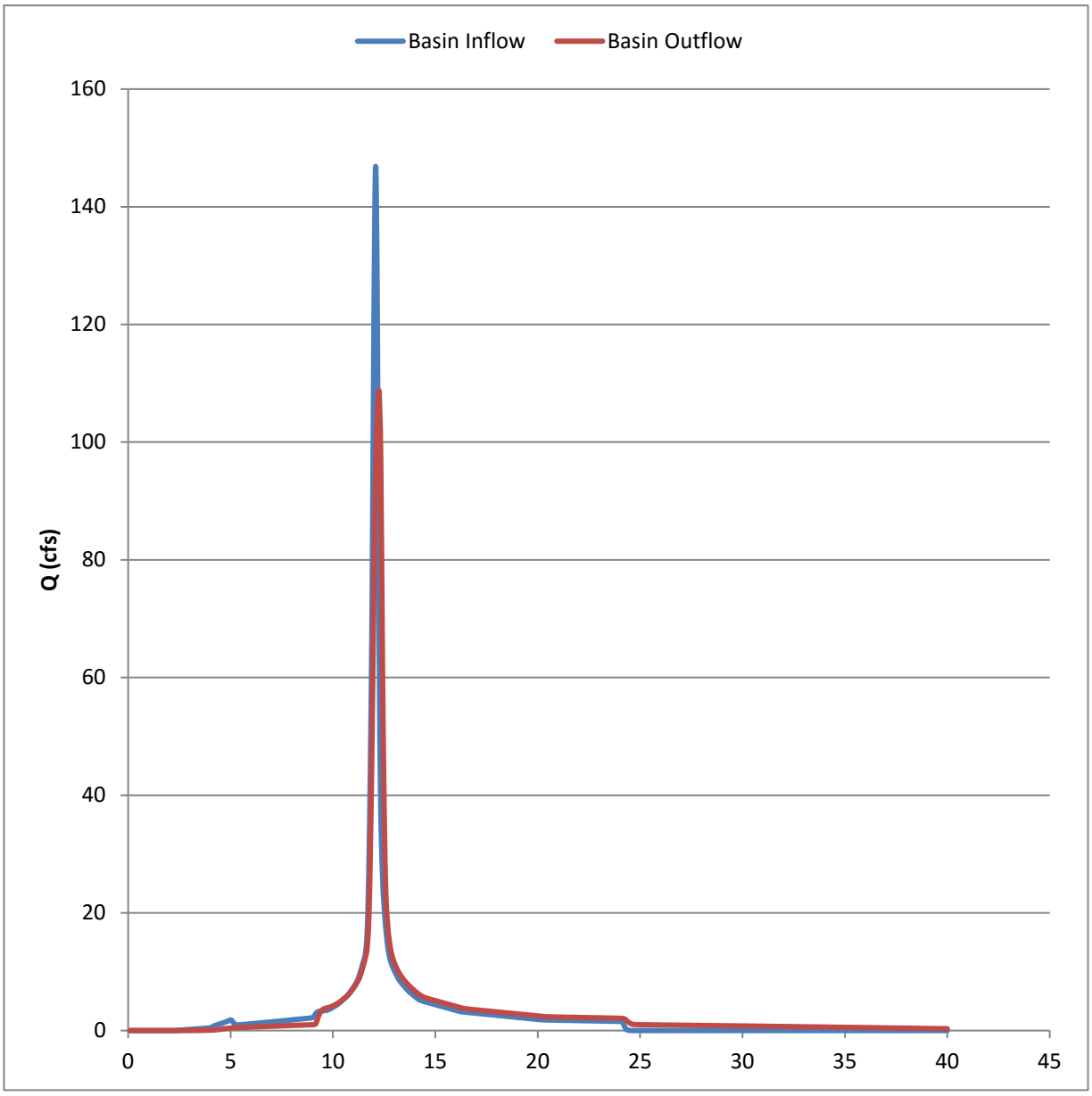
Notes:



# Cabelas Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 108.61 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:10 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 871.84 |
| | | | Max Storage | = | 114,387 $Ft^3$ |
| | | | Date | = | 6/2/2016 |

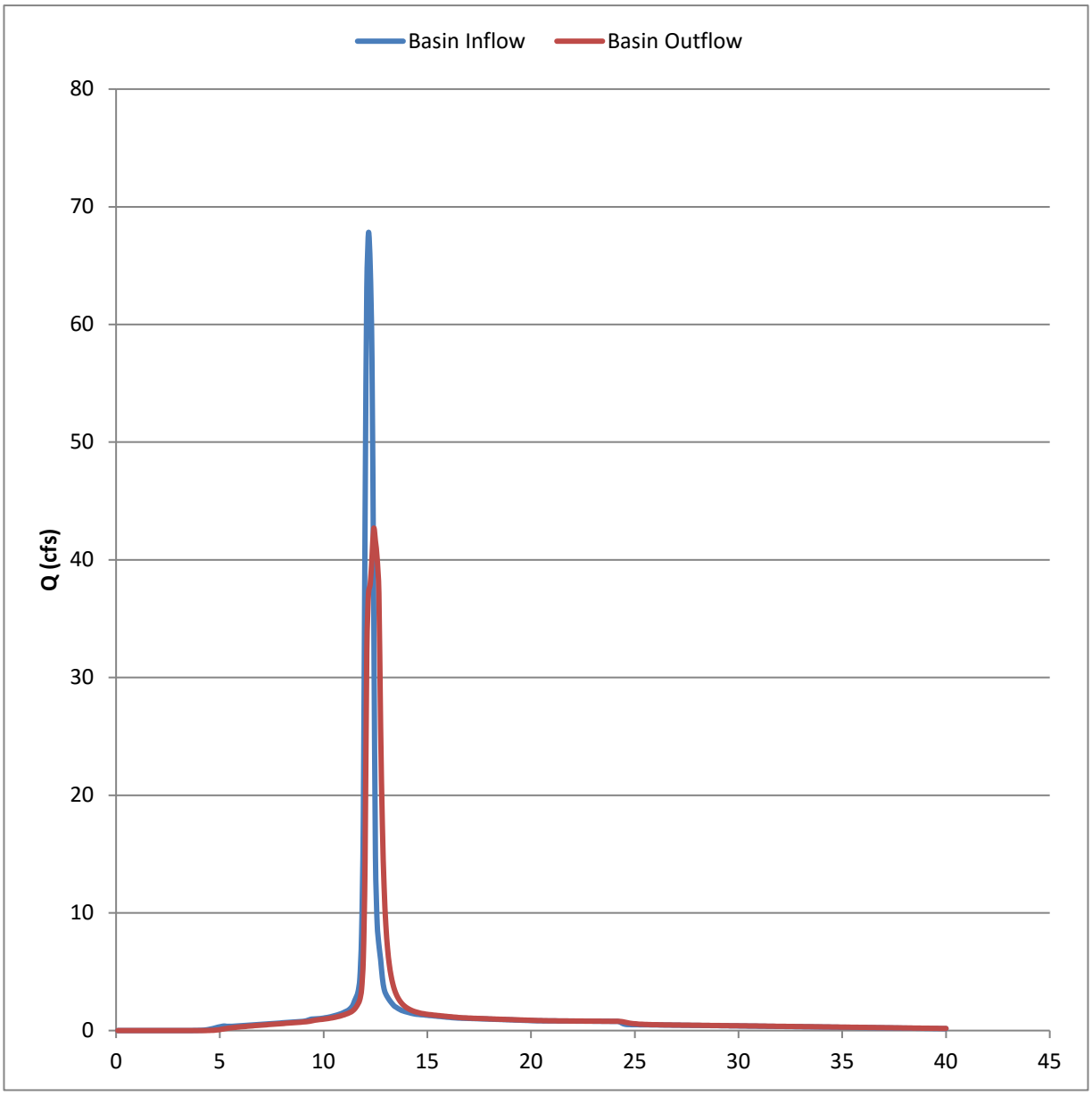
Notes:



# Existing Pond

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 42.67 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:25 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 866.53 |
| | | | Max Storage | = | 49,766 $Ft^3$ |
| | | | Date | = | 6/2/2016 |

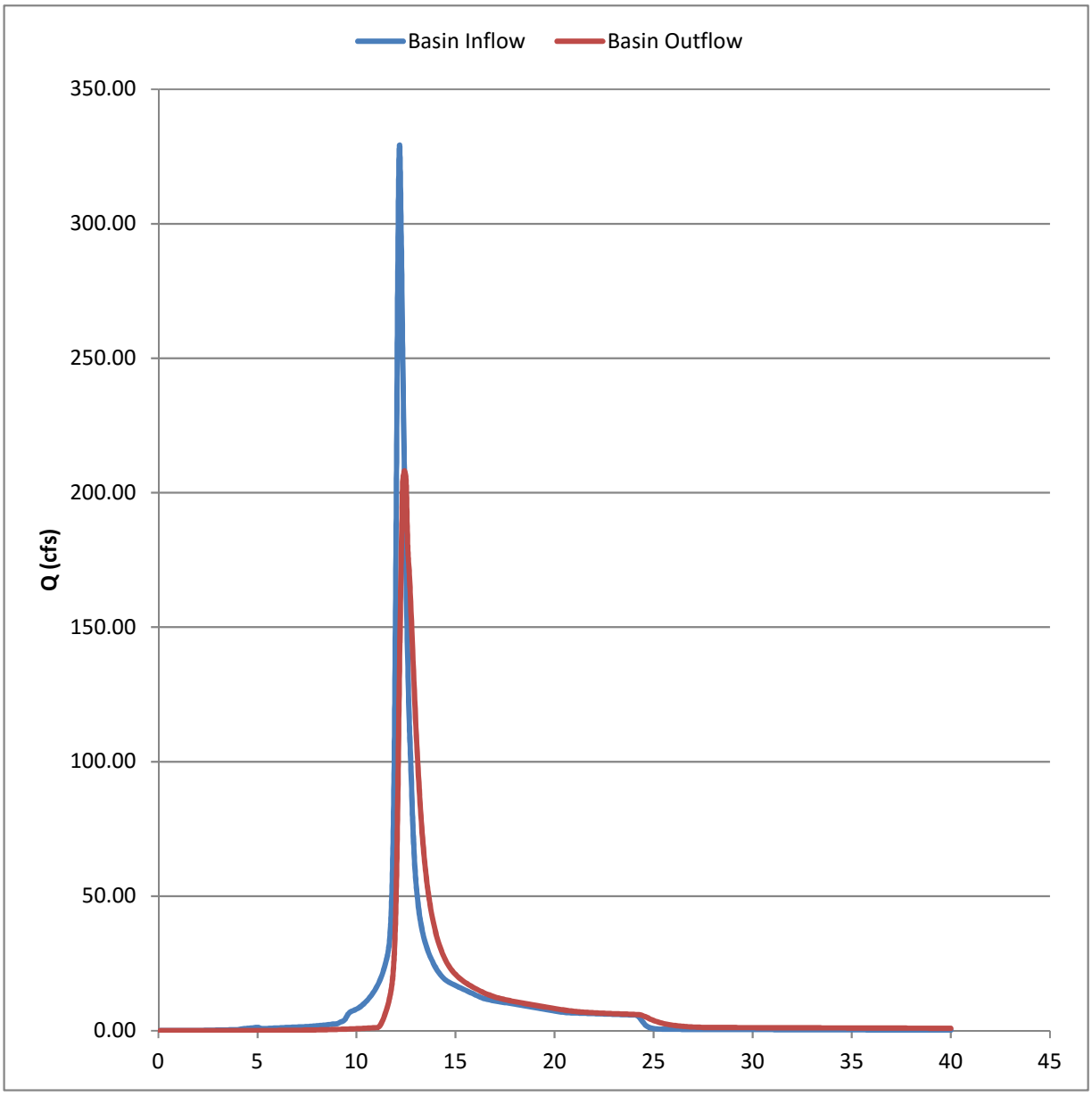
Notes:



# Primary Basin

| | | | | | |
|---|---|---|---|---|---|
| Hydrograph Type | = | Reservoir | Peak Discharge | = | 208.15 |
| Storm Frequency | = | 100 yrs | Time to Peak | = | 12:25 hrs |
| Time Interval | = | 6 min | | | |
| | | | Max Elevation | = | 860.11 |
| | | | Max Storage | = | 544,737 $Ft^3$ |
| | | | Date | = | 9/8/2016 |

Notes:



# HY-8 Culvert Analysis Report

## Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20.05 cfs

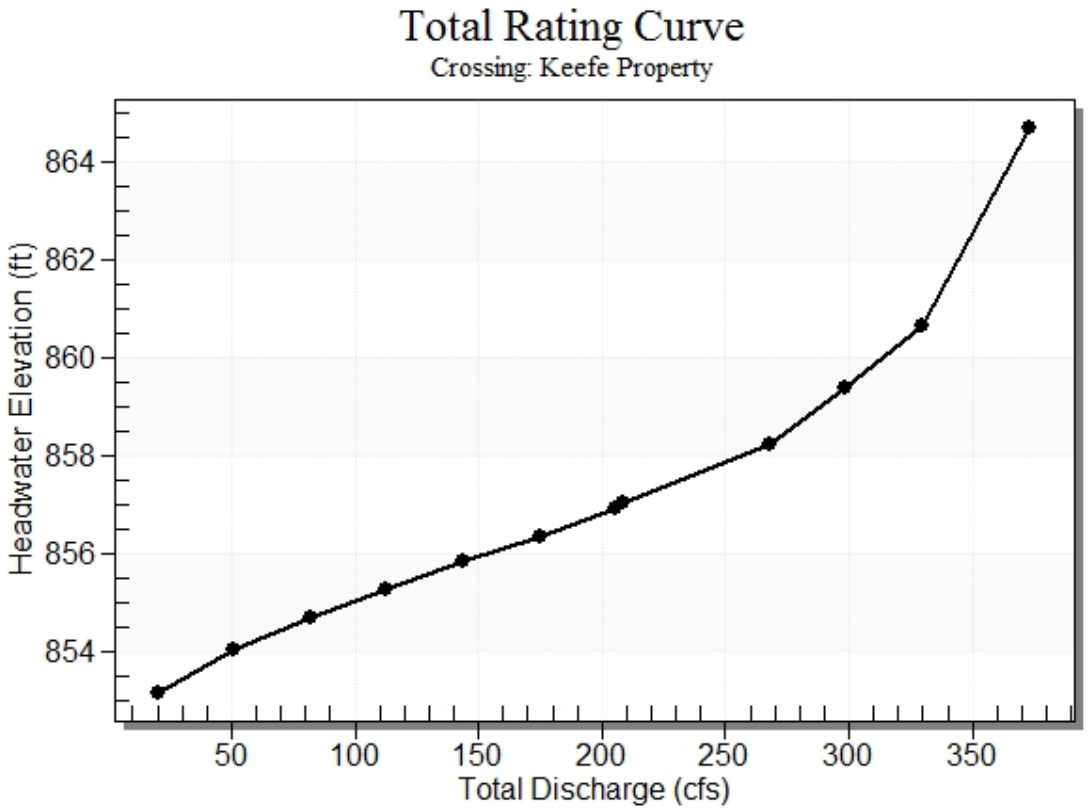
Design Flow: 208.15 cfs (100 yr Basin Outflow)

Maximum Flow: 329.42 cfs (100 yr Basin Inflow)

### Table 1 - Summary of Culvert Flows at Crossing: Keefe Property

| Headwater Elevation (ft) | Total Discharge (cfs) | 4'x8' Box Discharge (cfs) | Roadway Discharge (cfs) | Iterations |
|---|---|---|---|---|
| 853.18 | 20.05 | 20.05 | 0.00 | 1 |
| 854.04 | 50.99 | 50.99 | 0.00 | 1 |
| 854.71 | 81.92 | 81.92 | 0.00 | 1 |
| 855.29 | 112.86 | 112.86 | 0.00 | 1 |
| 855.83 | 143.80 | 143.80 | 0.00 | 1 |
| 856.36 | 174.74 | 174.74 | 0.00 | 1 |
| 856.91 | 205.67 | 205.67 | 0.00 | 1 |
| 857.02 | 208.15 | 208.15 | 0.00 | 1 |
| 858.24 | 267.55 | 267.55 | 0.00 | 1 |
| 859.40 | 298.48 | 298.48 | 0.00 | 1 |
| 860.64 | 329.42 | 329.42 | 0.00 | 1 |
| 862.54 | 373.32 | 373.32 | 0.00 | Overtopping |

### Rating Curve Plot for Crossing: Keefe Property



## Table 2 - Culvert Summary Table: 4'x8' Box

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20.05 | 20.05 | 853.18 | 0.993 | 0.0* | 1-JS1t | 0.565 | 0.580 | 0.650 | 0.650 | 3.853 | 7.706 |
| 50.99 | 50.99 | 854.04 | 1.850 | 0.0* | 1-JS1t | 1.055 | 1.081 | 1.233 | 1.233 | 5.169 | 10.338 |
| 81.92 | 81.92 | 854.71 | 2.519 | 0.643 | 1-JS1t | 1.448 | 1.482 | 1.737 | 1.737 | 5.897 | 11.794 |
| 112.86 | 112.86 | 855.29 | 3.103 | 1.370 | 1-JS1t | 1.799 | 1.835 | 2.207 | 2.207 | 6.393 | 12.786 |
| 143.80 | 143.80 | 855.83 | 3.644 | 2.160 | 1-S2n | 2.126 | 2.157 | 2.126 | 2.658 | 8.456 | 13.524 |
| 174.74 | 174.74 | 856.36 | 4.174 | 3.019 | 5-S2n | 2.437 | 2.456 | 2.437 | 3.098 | 8.962 | 14.103 |
| 205.67 | 205.67 | 856.91 | 4.718 | 3.952 | 5-S2n | 2.737 | 2.738 | 2.737 | 3.529 | 9.392 | 14.572 |
| 208.15 | 208.15 | 857.02 | 4.762 | 4.832 | 7-M1t | 2.761 | 2.760 | 3.563 | 3.563 | 7.303 | 14.606 |
| 267.55 | 267.55 | 858.24 | 5.924 | 6.046 | 4-FFf | 3.313 | 3.263 | 4.000 | 4.374 | 8.361 | 15.293 |
| 298.48 | 298.48 | 859.40 | 6.616 | 7.209 | 4-FFf | 3.592 | 3.510 | 4.000 | 4.790 | 9.328 | 15.578 |
| 329.42 | 329.42 | 860.64 | 7.379 | 8.451 | 4-FFf | 4.000 | 3.748 | 4.000 | 5.204 | 10.294 | 15.826 |

* Full Flow Headwater elevation is below inlet invert.

**********

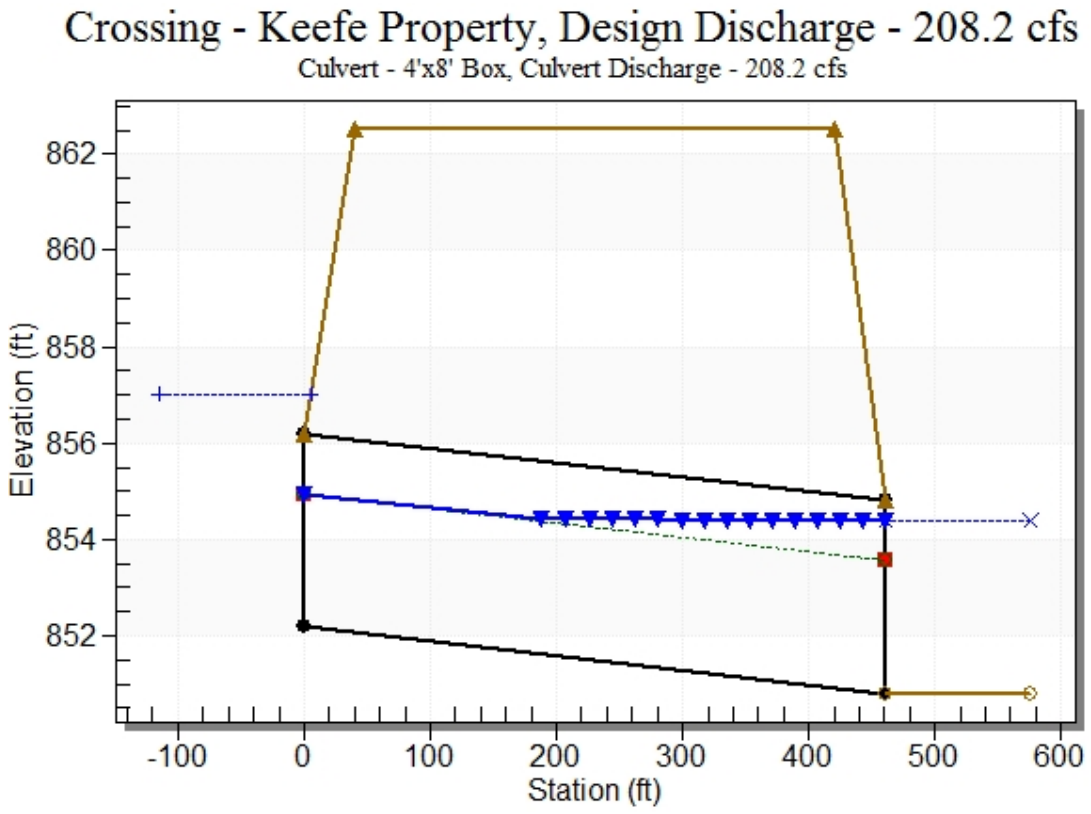
Straight Culvert

Inlet Elevation (invert): 852.19 ft, Outlet Elevation (invert): 850.81 ft

Culvert Length: 461.00 ft, Culvert Slope: 0.0030

**********

## Water Surface Profile Plot for Culvert: 4'x8' Box



### Site Data - 4'x8' Box

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 852.19 ft

Outlet Station: 461.00 ft

Outlet Elevation: 850.81 ft

Number of Barrels: 1

### Culvert Data Summary - 4'x8' Box

Barrel Shape: Concrete Box

Barrel Span: 8.00 ft

Barrel Rise: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall

Inlet Depression: NONE

### Tailwater Channel Data - Keefe Property

Tailwater Channel Option: Rectangular Channel

Bottom Width: 4.00 ft

Channel Slope: 0.0100

Channel Manning's n: 0.0120

Channel Invert Elevation: 850.81 ft

### Roadway Data for Crossing: Keefe Property

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 60.00 ft

Crest Elevation: 862.54 ft

Roadway Surface: Paved

Roadway Top Width: 380.00 ft