# *HILLTOP LANDING SUBDIVISION*

*HILLTOP ROAD & MILLER ROAD, BRYANT, AR 72022*

# *DRAINAGE REPORT*

*FOR*
*City of Bryant, Saline County, AR*

October 2022

Owner & Developer: NXT GEN HOMES LLC.

By:

HOPE
CONSULTING
ENGINEERS • SURVEYORS

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# Narrative & Summary

## PROJECT TITLE

Hilltop Landing Subdivision

## PROJECT PROPERTY OWNER

Nxt Gen Homes LLC.

## PROJECT LOCATION

Hilltop Road and Miller Road, Bryant, AR

## PROJECT DESCRIPTION

The proposed sub divisional development is on Hilltop Road and Miller Road, Bryant, AR . Total development site area is 54.0 acres.

## DRAINAGE ANALYSIS

**On Site Drainage-** Rational method was used to determine the existing and proposed flows from proposed site. There will be four detention ponds to detain water from this development. Detailed drainage calculations considering the future expected development has been conducted to determine the required detention ponds and culvert dimensions. Summary of the calculations are below:

**Detention Pond-1**

- Pond is situated on the north east side of the property.
- Pre-development area 34.50 acres.
- Post-development area 36.28 acres.
- Pre-development runoff coefficient 0.47.
- Post-development runoff cumulative coefficient 0.65
- Pond has a bottom area of 15,480 sft with bottom elevation of 439.00'.
- One 42'' HDPE with 0.5% slope are proposed for outflow pipes.

**Peak flows for Pre and post development phase of onsite area have been tabulated below-**

| Period of time | Pre-development | Post-dev. Without detention | Post-dev. With detention |
|---|---|---|---|
| | Peak Flow (cfs) | Peak Flow (cfs) | Peak Flow (cfs) |
| 2-Year | 69.54 | 90.29 | 41.60 |
| 5-Year | 77.15 | 99.87 | 45.13 |
| 10-Year | 89.68 | 117.23 | 49.24 |
| 25-Year | 102.61 | 134.37 | 54.42 |
| 50-Year | 116.82 | 153.15 | 64.25 |
| 100-Year | 123.94 | 162.70 | 70.54 |

**Detention Pond-2**

- Pond is situated on the South-west side of the property.
- Pre-development area 7.2 acres.
- Post-development area 4.11 acres.
- Pre-development runoff coefficient 0.40.
- Post-development runoff cumulative coefficient 0.40
- Pond has a bottom area of 18,270 sft with bottom elevation of 511.00'.
- One 12'' HDPE with 9% slope are proposed for outflow pipes.

**Peak flows for Pre and post development phase of onsite area have been tabulated below-**

| Period of time | Pre-development | Post-dev. Without detention | Post-dev. With detention |
|---|---|---|---|
| | Peak Flow (cfs) | Peak Flow (cfs) | Peak Flow (cfs) |
| 2-Year | 12.77 | 6.629 | 0.387 |
| 5-Year | 14.20 | 7.333 | 0.462 |
| 10-Year | 16.42 | 8.607 | 0.613 |
| 25-Year | 18.77 | 9.865 | 0.773 |
| 50-Year | 21.35 | 11.24 | 0.959 |
| 100-Year | 22.64 | 11.95 | 1.059 |

**Detention Pond-3**

- Pond is situated on the south east side of the property.
- Pre-development area 2.25 acres.
- Post-development area 3.21 acres.
- Pre-development runoff coefficient 0.47.
- Post-development runoff cumulative coefficient 0.65
- Pond has a bottom area of 5,512 sft with bottom elevation of 495.00'.
- One 18'' HDPE with 7.47% slope are proposed for outflow pipes.

**Peak flows for Pre and post development phase of onsite area have been tabulated below-**

| Period of time | Pre-development | Post-dev. Without detention | Post-dev. With detention |
|---|---|---|---|
| | Peak Flow (cfs) | Peak Flow (cfs) | Peak Flow (cfs) |
| 2-Year | 5.039 | 9.942 | 2.797 |
| 5-Year | 5.635 | 11.12 | 3.269 |
| 10-Year | 6.430 | 12.69 | 3.910 |
| 25-Year | 7.337 | 14.48 | 4.642 |
| 50-Year | 8.326 | 16.43 | 5.424 |
| 100-Year | 8.825 | 17.40 | 5.810 |

**Detention Pond-4**

- Pond is situated on the West side of the property.
- Pre-development area 14.40 acres.
- Post-development area 13.97 acres.
- Pre-development runoff coefficient 0.47.
- Post-development runoff cumulative coefficient 0.65
- Pond has a bottom area of 3725.16 sft with bottom elevation of 508.00'.
- One 36" HDPE with 3.79% slope is proposed for outflow pipes.

**Peak flows for Pre and post development phase of onsite area have been tabulated below-**

| Period of time | Pre-development | Post-dev. Without detention | Post-dev. With detention |
|---|---|---|---|
| | Peak Flow (cfs) | Peak Flow (cfs) | Peak Flow (cfs) |
| 2-Year | 31.09 | 43.27 | 27.37 |
| 5-Year | 34.66 | 48.39 | 30.47 |
| 10-Year | 39.81 | 55.21 | 34.08 |
| 25-Year | 45.47 | 63.00 | 37.59 |
| 50-Year | 51.67 | 71.49 | 41.26 |
| 100-Year | 54.77 | 75.78 | 42.99 |

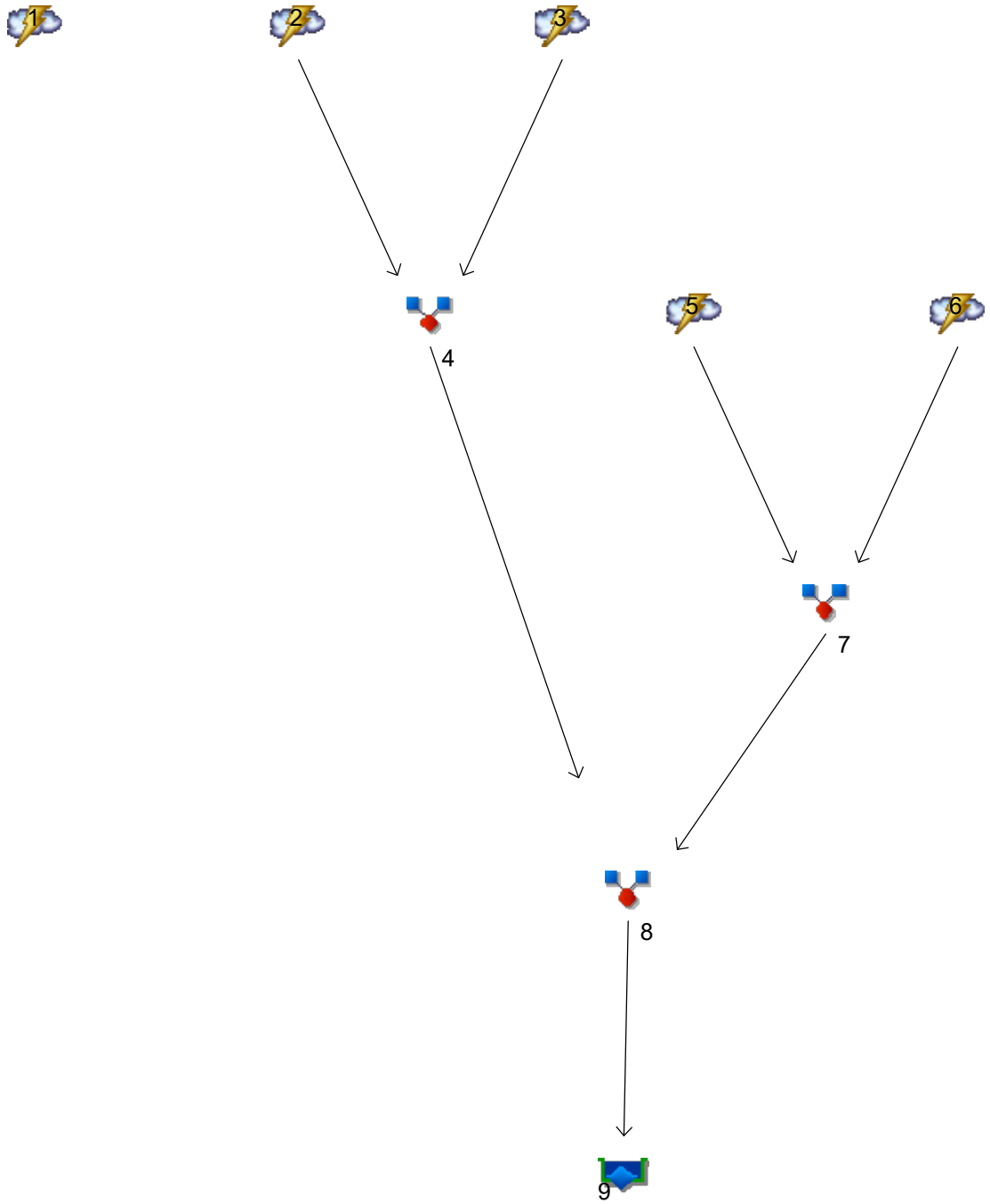
## CONCLUSION

From the onsite drainage calculation, it is seen that there is decrease in flow for all storm events due to the proposed detention ponds.

# Hydrograph Summary Report

# Watershed Model Schematic






## Legend

| Hyd. | Origin | Description |
|---|---|---|
| 1 | Rational | Pre Development |
| 2 | Rational | Post development-1a |
| 3 | Rational | post development-1b |
| 4 | Combine | combine-1 |
| 5 | Rational | post development-2a |
| 6 | Rational | post development-2b |
| 7 | Combine | combine-2 |
| 8 | Combine | <no description> |
| 9 | Reservoir | detention pond 1 |

# Multi-Hydrograph Plot



## Hyd. No. 1

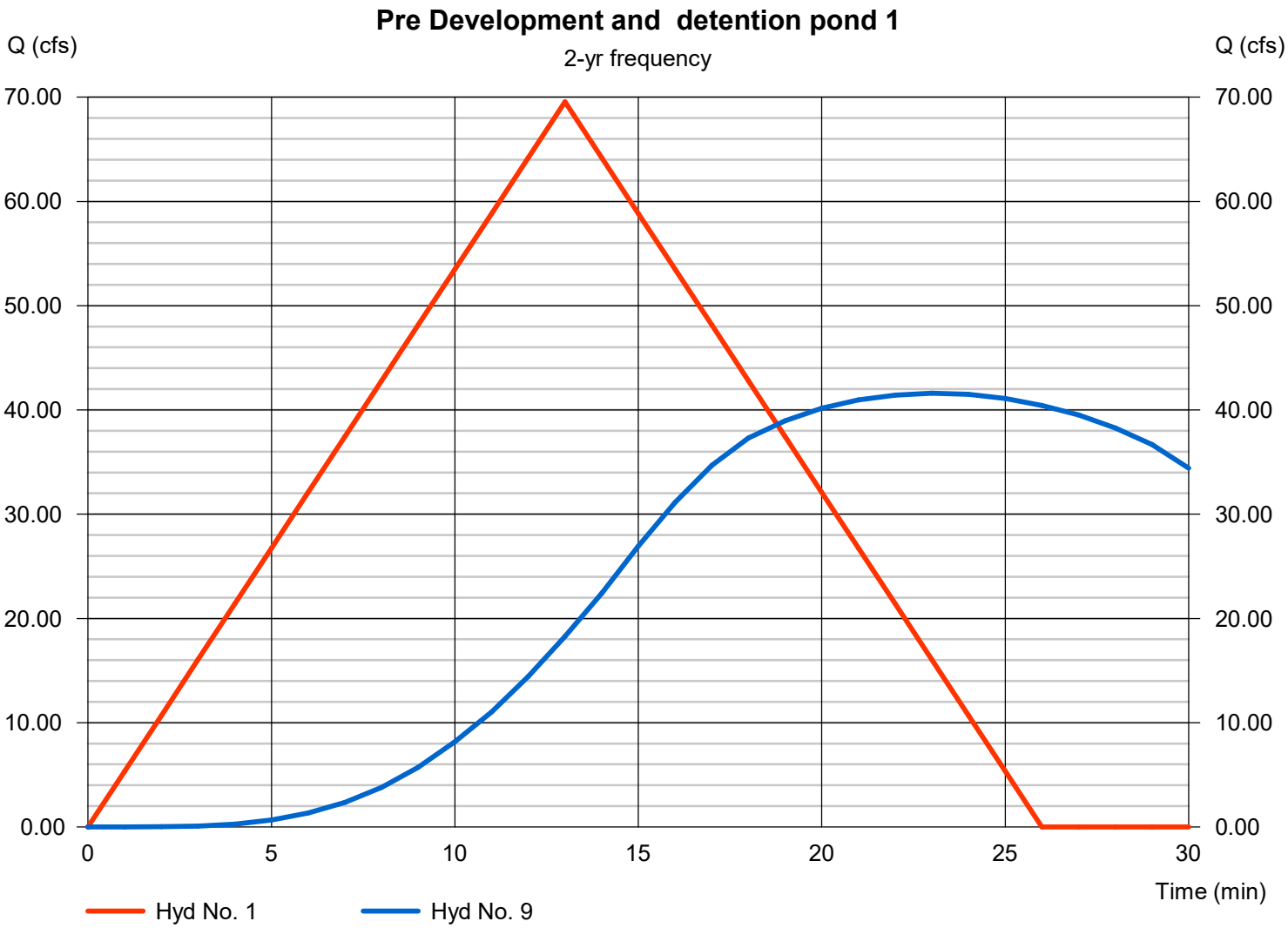
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 69.54 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 54,242 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 41.60 cfs |
| Time to peak | = | 23 min |
| Hyd. Volume | = | 81,225 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

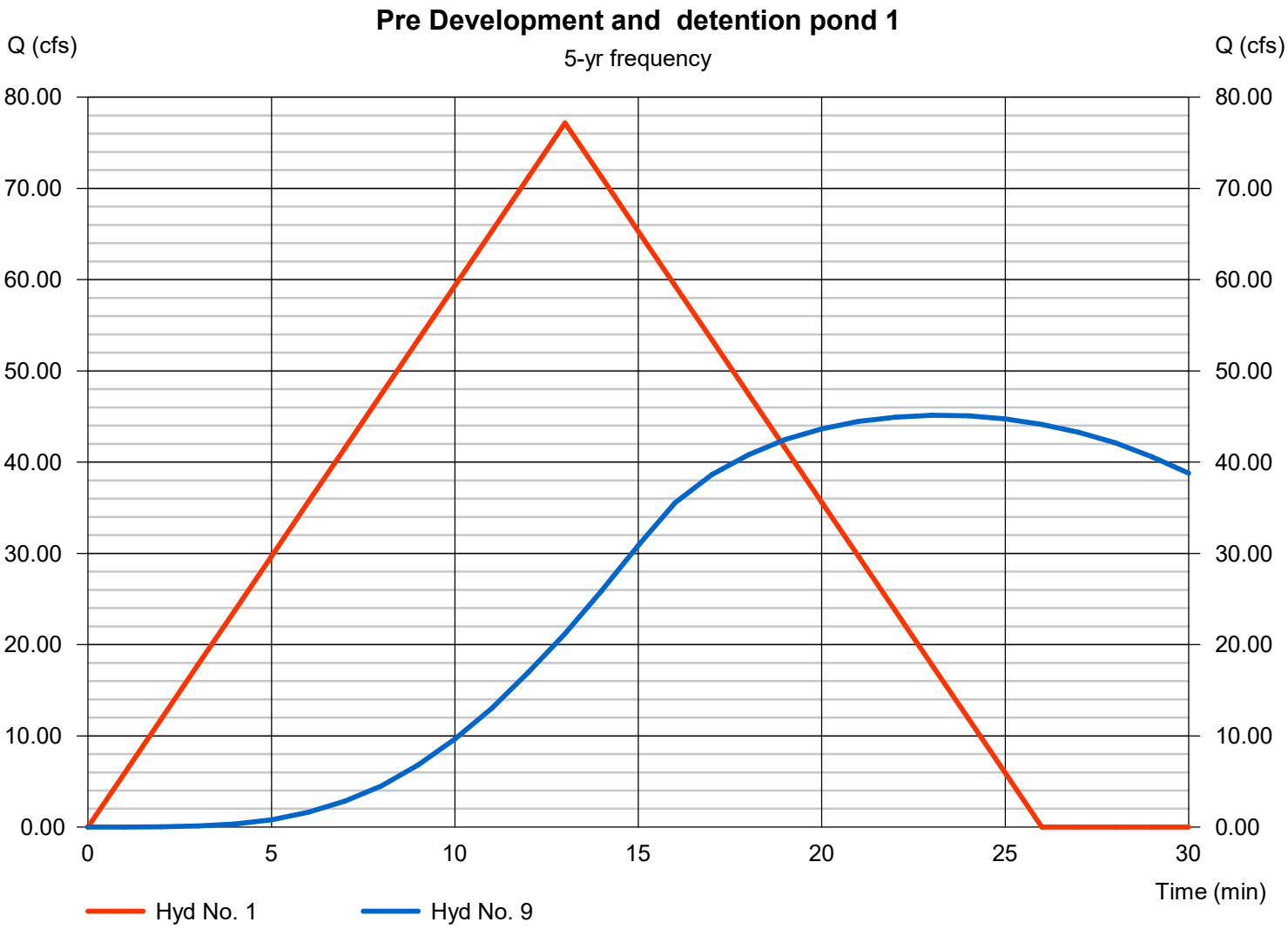
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 77.15 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 60,181 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 45.13 cfs |
| Time to peak | = | 23 min |
| Hyd. Volume | = | 89,848 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

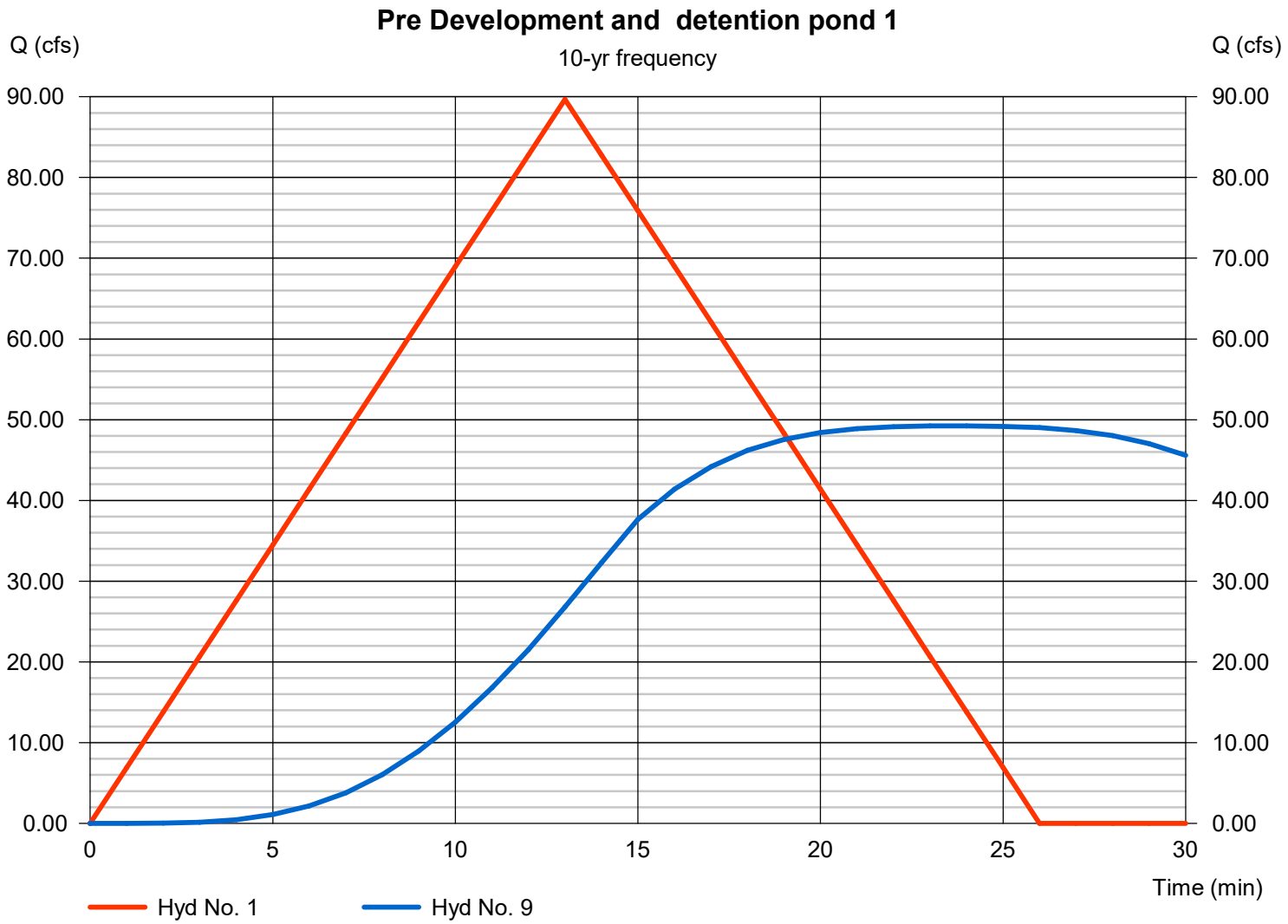
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 89.68 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 69,947 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 49.24 cfs |
| Time to peak | = | 24 min |
| Hyd. Volume | = | 105,468 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

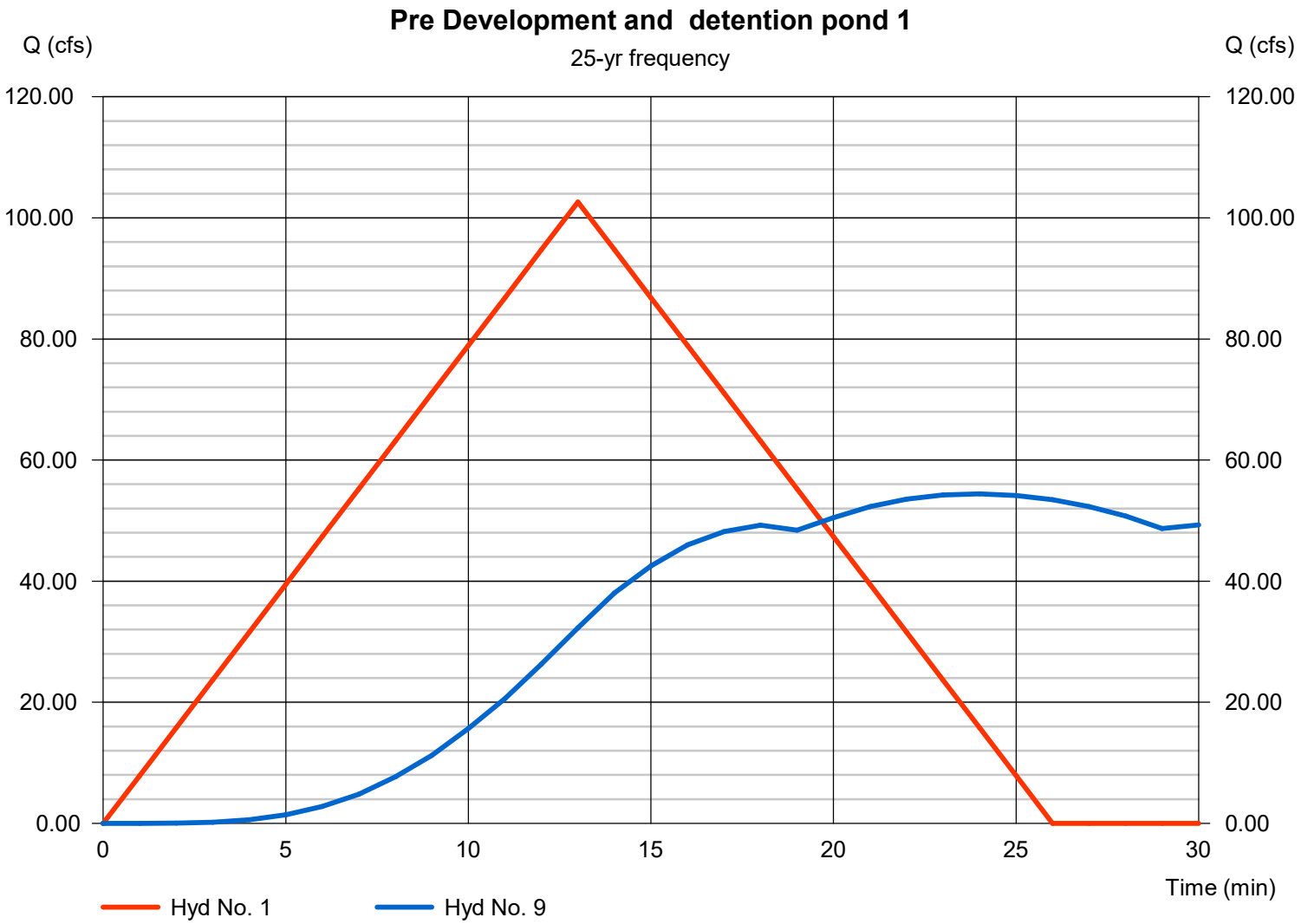
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 102.61 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 80,038 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 54.42 cfs |
| Time to peak | = | 24 min |
| Hyd. Volume | = | 120,893 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

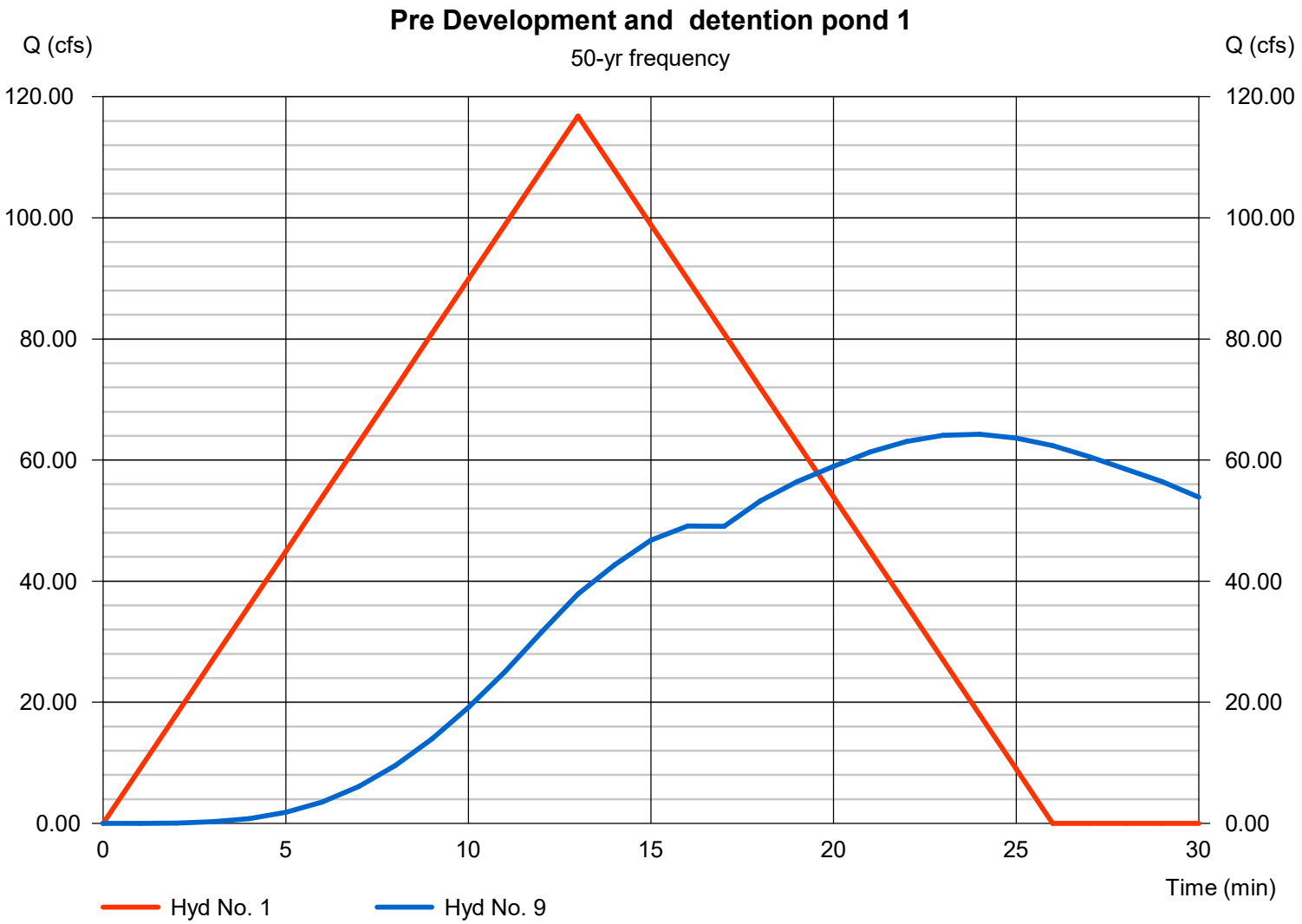
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 116.82 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 91,121 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 64.25 cfs |
| Time to peak | = | 24 min |
| Hyd. Volume | = | 137,798 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

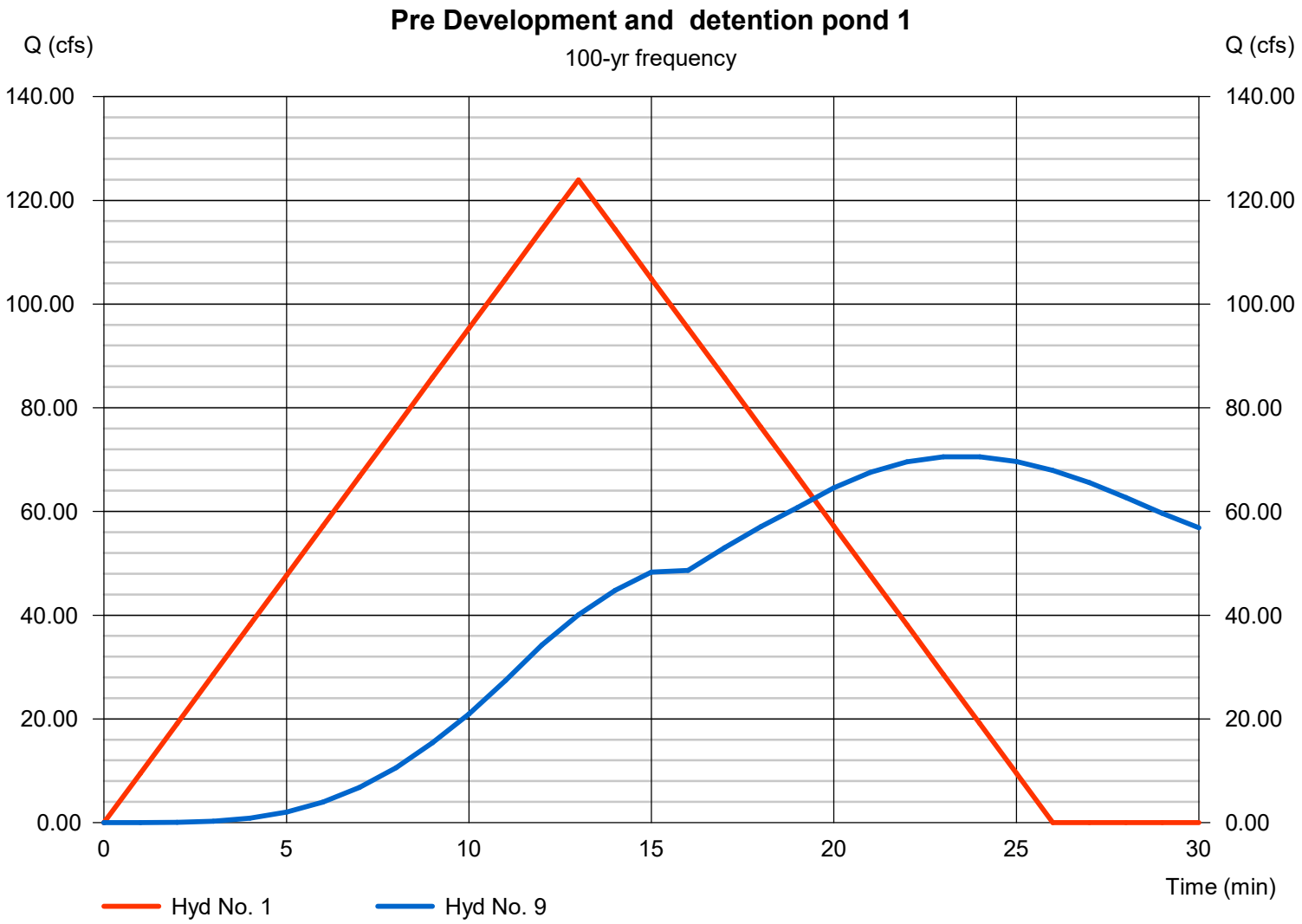
Pre Development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 123.94 cfs |
| Time to peak | = | 13 min |
| Hyd. Volume | = | 96,675 cuft |

## Hyd. No. 9

detention pond 1

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 70.54 cfs |
| Time to peak | = | 23 min |
| Hyd. Volume | = | 146,395 cuft |



# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 — Thursday, 10 / 6 / 2022

## Pond No. 2 - Detention Pond 1

### Pond Data

**Trapezoid** -Bottom L x W = 258.0 x 60.0 ft, Side slope = 3.00:1, Bottom elev. = 439.00 ft, Depth = 5.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 439.00 | 15,480 | 0 | 0 |
| 0.50 | 439.50 | 16,443 | 7,980 | 7,980 |
| 1.00 | 440.00 | 17,424 | 8,466 | 16,446 |
| 1.50 | 440.50 | 18,423 | 8,961 | 25,407 |
| 2.00 | 441.00 | 19,440 | 9,465 | 34,872 |
| 2.50 | 441.50 | 20,475 | 9,978 | 44,850 |
| 3.00 | 442.00 | 21,528 | 10,500 | 55,350 |
| 3.50 | 442.50 | 22,599 | 11,031 | 66,381 |
| 4.00 | 443.00 | 23,688 | 11,571 | 77,952 |
| 4.50 | 443.50 | 24,795 | 12,120 | 90,072 |
| 5.00 | 444.00 | 25,920 | 12,678 | 102,750 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 42.00 | Inactive | Inactive | 0.00 |
| **Span (in)** | = 42.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 439.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 215.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 0.50 | 0.00 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.60 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

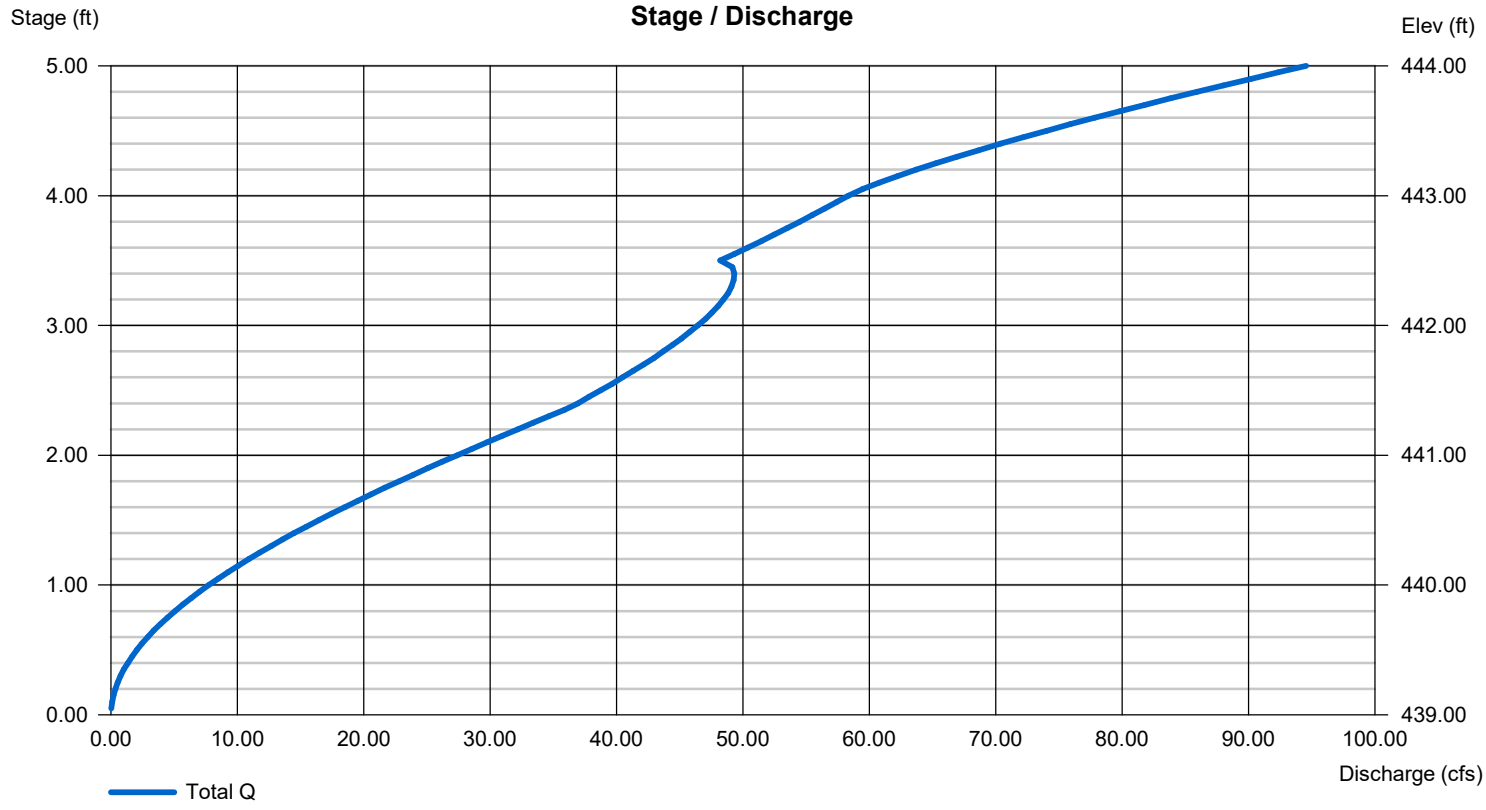
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 6.00 | Inactive | Inactive | 0.00 |
| **Crest El. (ft)** | = 443.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = Rect | --- | --- | --- |
| **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).



# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 69.54 | 1 | 13 | 54,242 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 60.00 | 1 | 15 | 53,998 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 5.960 | 1 | 15 | 5,364 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 65.96 | 1 | 15 | 59,362 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 18.19 | 1 | 15 | 16,367 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 6.149 | 1 | 15 | 5,534 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 24.33 | 1 | 15 | 21,901 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 90.29 | 1 | 15 | 81,262 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 41.60 | 1 | 23 | 81,225 | 8 | 441.67 | 48,360 | detention pond B |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 77.15 | 1 | 13 | 60,181 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 66.36 | 1 | 15 | 59,728 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 6.592 | 1 | 15 | 5,933 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 72.96 | 1 | 15 | 65,661 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 20.11 | 1 | 15 | 18,103 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 6.801 | 1 | 15 | 6,121 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 26.92 | 1 | 15 | 24,225 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 99.87 | 1 | 15 | 89,885 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 45.13 | 1 | 23 | 89,848 | 8 | 441.90 | 53,237 | detention pond B |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 89.68 | 1 | 13 | 69,947 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 77.90 | 1 | 15 | 70,107 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 7.738 | 1 | 15 | 6,964 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 85.63 | 1 | 15 | 77,071 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 23.61 | 1 | 15 | 21,249 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 7.983 | 1 | 15 | 7,185 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 31.59 | 1 | 15 | 28,434 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 117.23 | 1 | 15 | 105,505 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 49.24 | 1 | 24 | 105,468 | 8 | 442.34 | 62,868 | detention pond B |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 102.61 | 1 | 13 | 80,038 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 89.29 | 1 | 15 | 80,357 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 8.869 | 1 | 15 | 7,982 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 98.15 | 1 | 15 | 88,339 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 27.06 | 1 | 15 | 24,356 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 9.151 | 1 | 15 | 8,235 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 36.21 | 1 | 15 | 32,591 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 134.37 | 1 | 15 | 120,930 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 54.42 | 1 | 24 | 120,893 | 8 | 442.80 | 73,230 | detention pond B |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 116.82 | 1 | 13 | 91,121 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 101.77 | 1 | 15 | 91,590 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 10.11 | 1 | 15 | 9,098 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 111.88 | 1 | 15 | 100,688 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 30.85 | 1 | 15 | 27,761 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 10.43 | 1 | 15 | 9,387 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 41.27 | 1 | 15 | 37,147 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 153.15 | 1 | 15 | 137,835 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 64.25 | 1 | 24 | 137,798 | 8 | 443.22 | 83,213 | detention pond B |

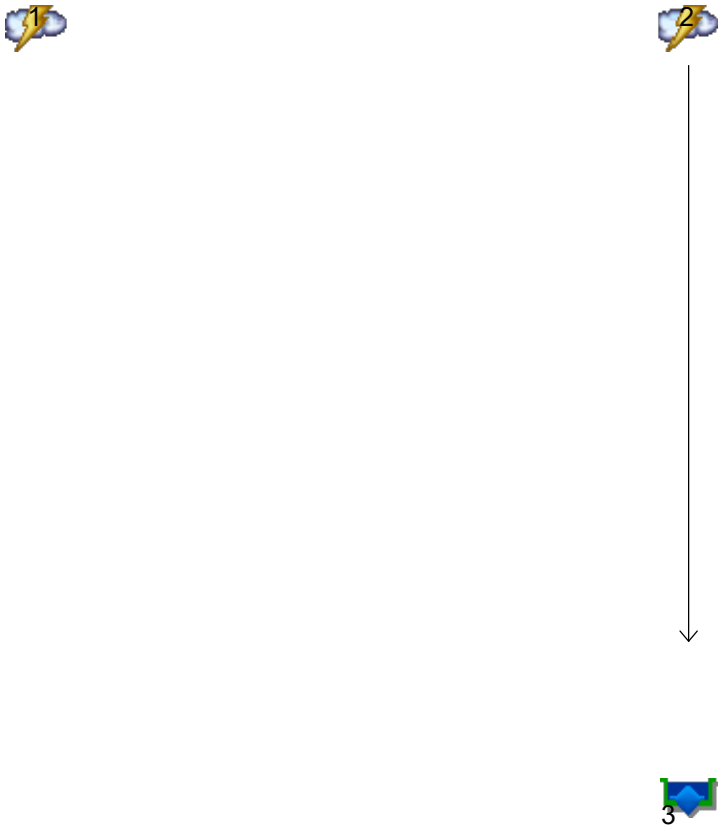
# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 123.94 | 1 | 13 | 96,675 | ------ | ------ | ------ | Pre Development |
| 2 | Rational | 108.11 | 1 | 15 | 97,303 | ------ | ------ | ------ | Post development-1a |
| 3 | Rational | 10.74 | 1 | 15 | 9,665 | ------ | ------ | ------ | post development-1b |
| 4 | Combine | 118.85 | 1 | 15 | 106,968 | 2, 3 | ------ | ------ | combine-1 |
| 5 | Rational | 32.77 | 1 | 15 | 29,492 | ------ | ------ | ------ | post development-2a |
| 6 | Rational | 11.08 | 1 | 15 | 9,972 | ------ | ------ | ------ | post development-2b |
| 7 | Combine | 43.85 | 1 | 15 | 39,464 | 5, 6 | ------ | ------ | combine-2 |
| 8 | Combine | 162.70 | 1 | 15 | 146,433 | 4, 7 | ------ | ------ | <no description> |
| 9 | Reservoir | 70.54 | 1 | 23 | 146,395 | 8 | 443.40 | 87,762 | detention pond B |

# Watershed Model Schematic






## Legend

| Hyd. | Origin | Description |
|---|---|---|
| 1 | Rational | Pre development |
| 2 | Rational | Post development |
| 3 | Reservoir | detention pond |

# Multi-Hydrograph Plot



## Hyd. No. 1

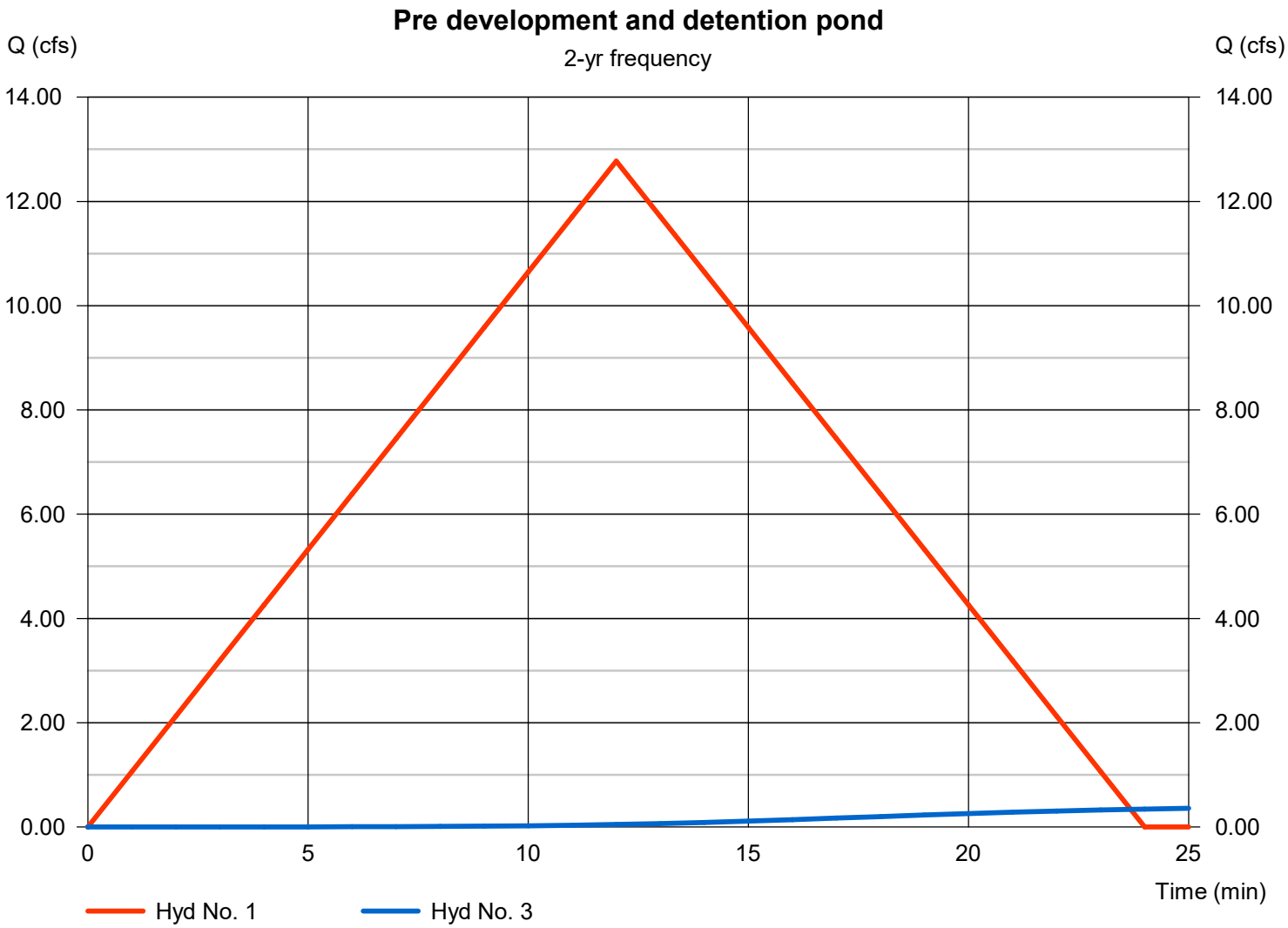
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 12.77 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 9,197 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.39 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 5,573 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

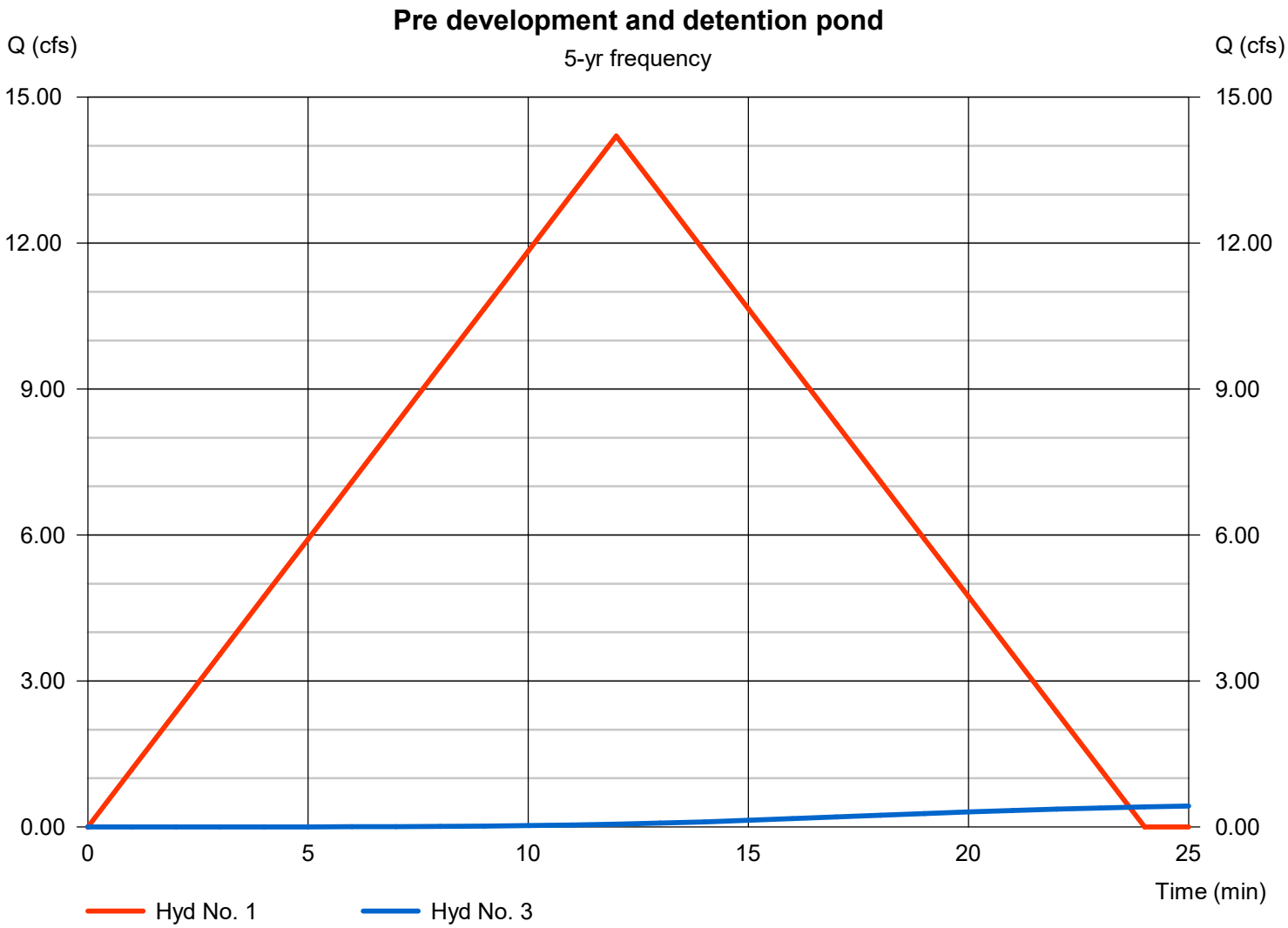
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 14.20 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 10,226 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.46 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 6,203 cuft |



# Multi-Hydrograph Plot

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

## Hyd. No. 1

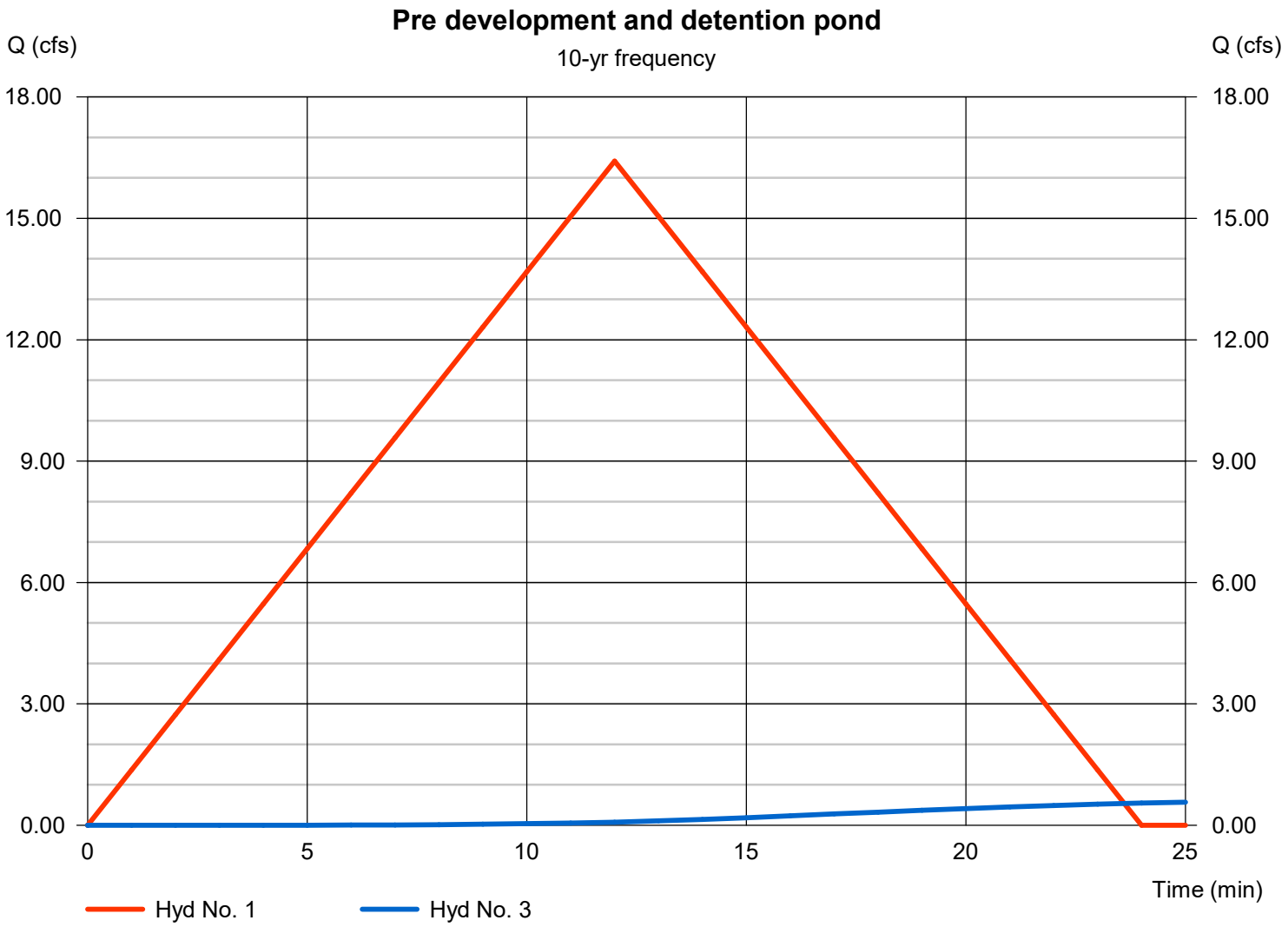
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 16.42 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 11,819 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.61 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 7,345 cuft |



# Multi-Hydrograph Plot

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

## Hyd. No. 1

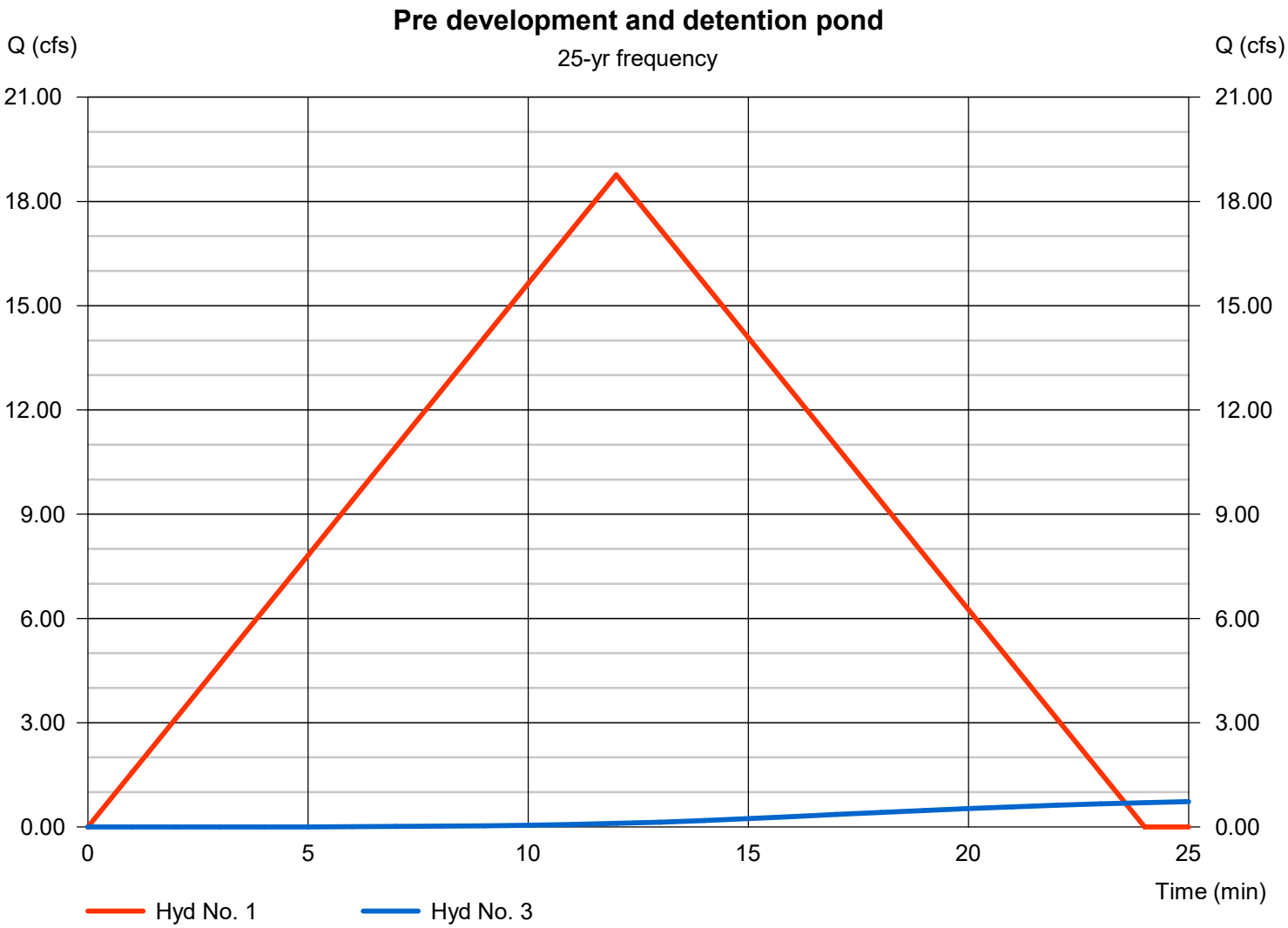
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 18.77 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 13,512 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.77 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 8,475 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

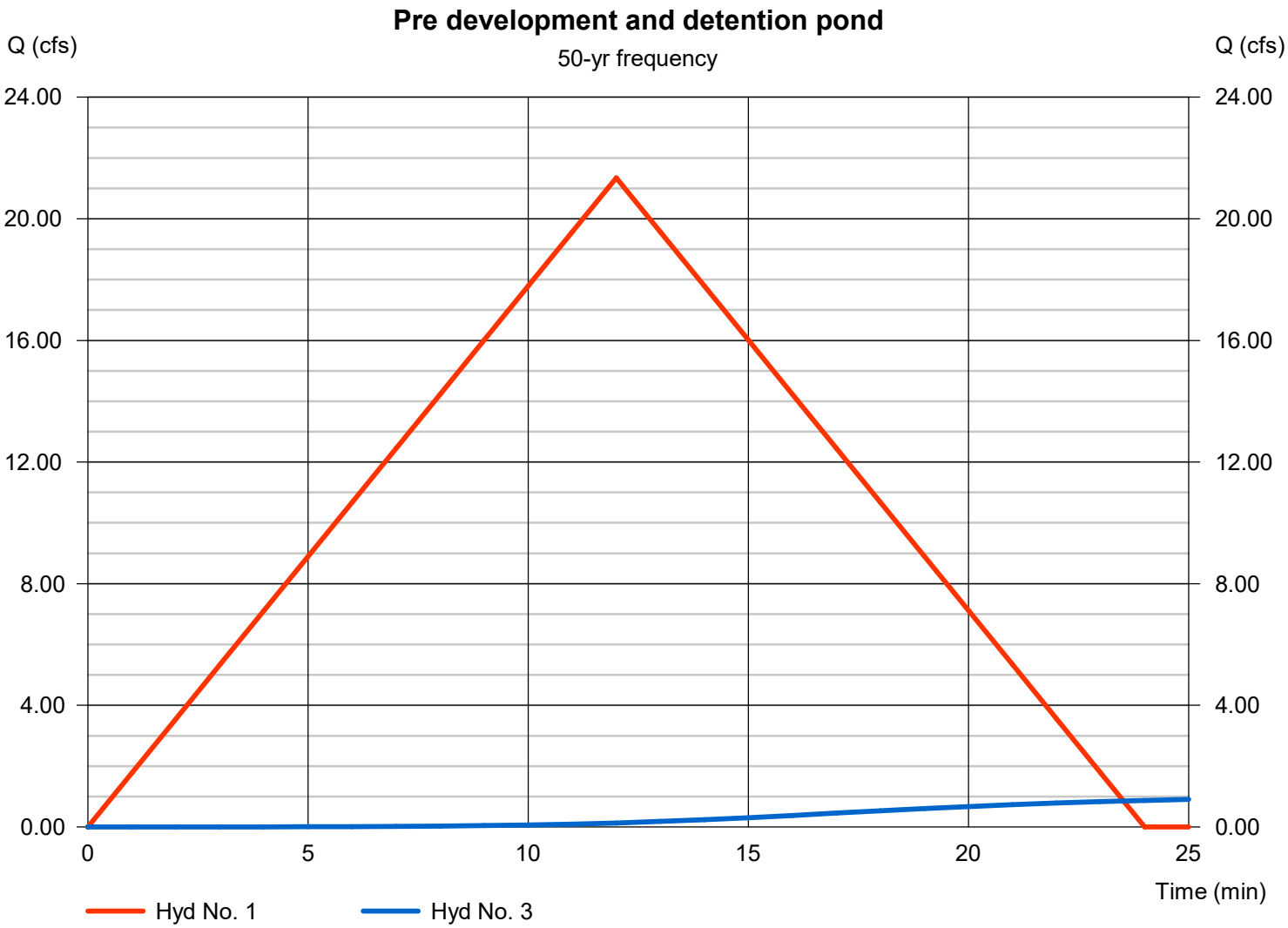
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 21.35 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 15,370 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 0.96 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 9,713 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

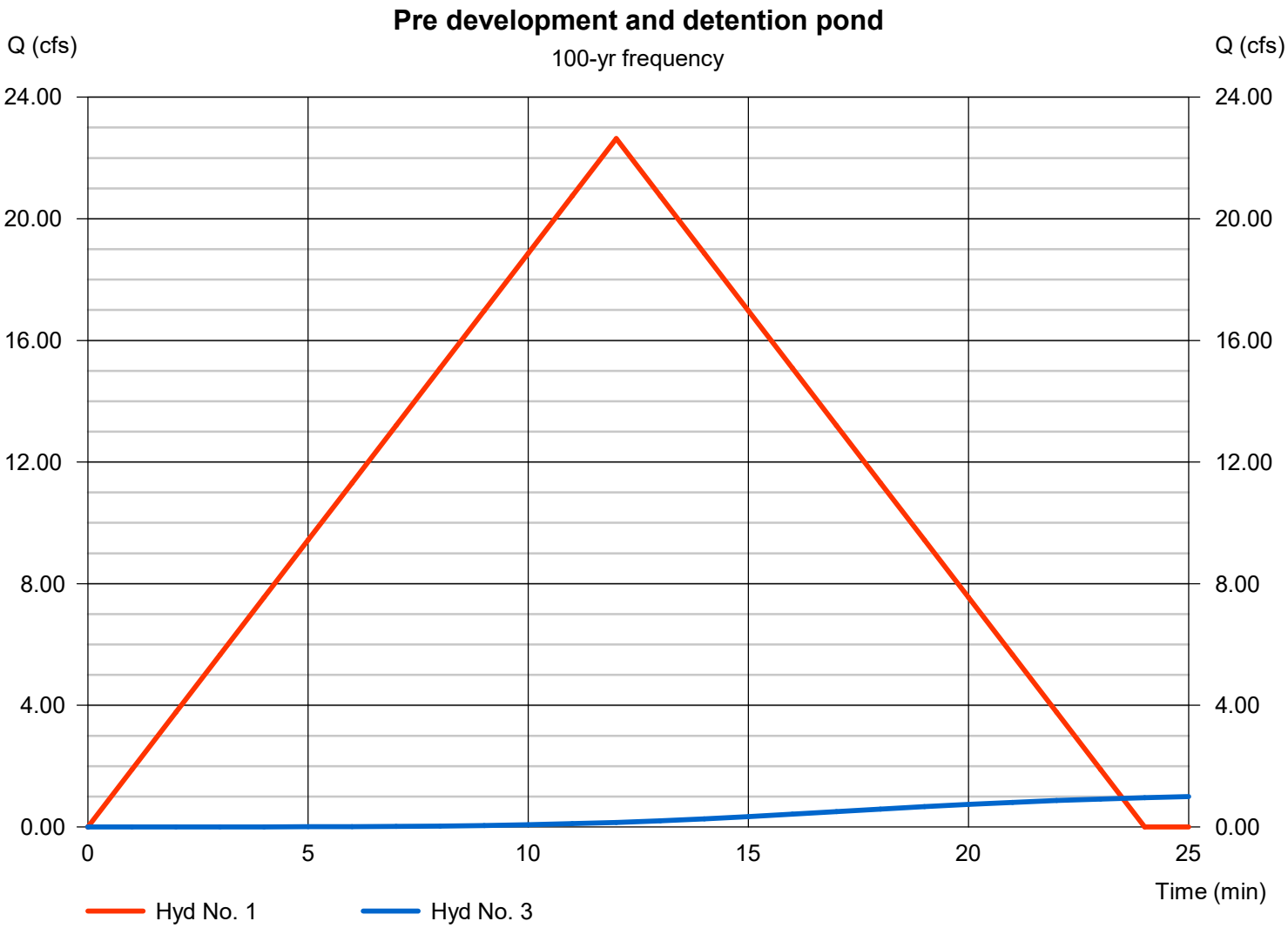
Pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 22.64 cfs |
| Time to peak | = | 12 min |
| Hyd. Volume | = | 16,299 cuft |

## Hyd. No. 3

detention pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 1.06 cfs |
| Time to peak | = | 29 min |
| Hyd. Volume | = | 10,343 cuft |



# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 10 / 6 / 2022

## Pond No. 1 - Detention Pond 2

### Pond Data

**Trapezoid** -Bottom L x W = 145.0 x 126.0 ft, Side slope = 3.00:1, Bottom elev. = 511.00 ft, Depth = 2.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 511.00 | 18,270 | 0 | 0 |
| 0.20 | 511.20 | 18,597 | 3,687 | 3,687 |
| 0.40 | 511.40 | 18,926 | 3,752 | 7,439 |
| 0.60 | 511.60 | 19,259 | 3,818 | 11,257 |
| 0.80 | 511.80 | 19,594 | 3,885 | 15,142 |
| 1.00 | 512.00 | 19,932 | 3,953 | 19,095 |
| 1.20 | 512.20 | 20,273 | 4,020 | 23,115 |
| 1.40 | 512.40 | 20,617 | 4,089 | 27,204 |
| 1.60 | 512.60 | 20,964 | 4,158 | 31,362 |
| 1.80 | 512.80 | 21,313 | 4,228 | 35,590 |
| 2.00 | 513.00 | 21,666 | 4,298 | 39,888 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 12.00 | Inactive | Inactive | 0.00 |
| **Span (in)** | = 12.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 511.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 64.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 9.00 | 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 |

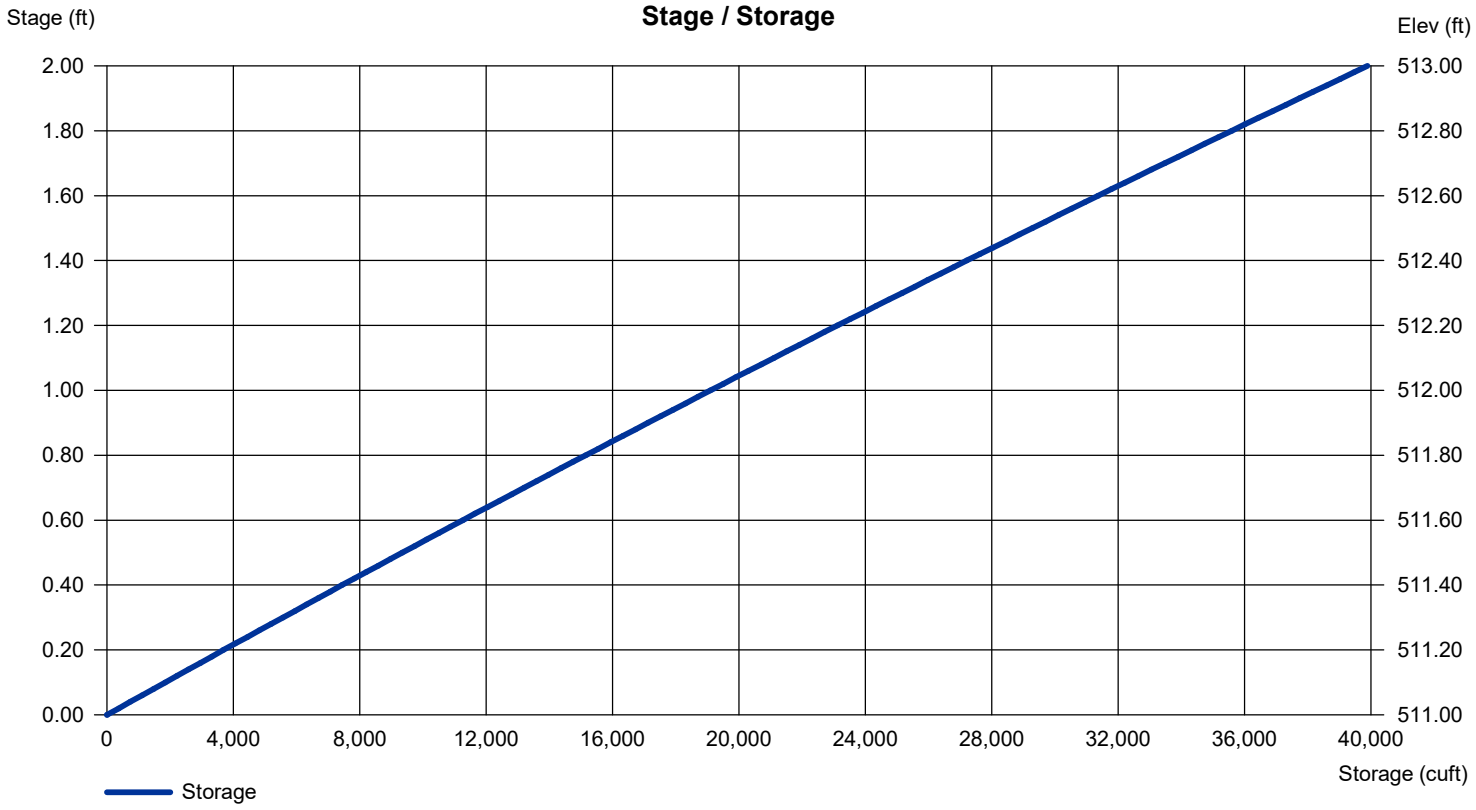
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 6.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 512.00 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = Rect | --- | --- | --- |
| **Multi-Stage** | = No | No | No | No |

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

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

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



# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 12.77 | 1 | 12 | 9,197 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 6.629 | 1 | 15 | 5,966 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 0.387 | 1 | 29 | 5,573 | 2 | 511.31 | 5,693 | detention pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 14.20 | 1 | 12 | 10,226 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 7.333 | 1 | 15 | 6,599 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 0.462 | 1 | 29 | 6,203 | 2 | 511.34 | 6,272 | detention pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 16.42 | 1 | 12 | 11,819 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 8.607 | 1 | 15 | 7,746 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 0.613 | 1 | 29 | 7,345 | 2 | 511.39 | 7,310 | detention pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 18.77 | 1 | 12 | 13,512 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 9.865 | 1 | 15 | 8,879 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 0.773 | 1 | 29 | 8,475 | 2 | 511.45 | 8,325 | detention pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 21.35 | 1 | 12 | 15,370 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 11.24 | 1 | 15 | 10,120 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 0.959 | 1 | 29 | 9,713 | 2 | 511.50 | 9,427 | detention pond |

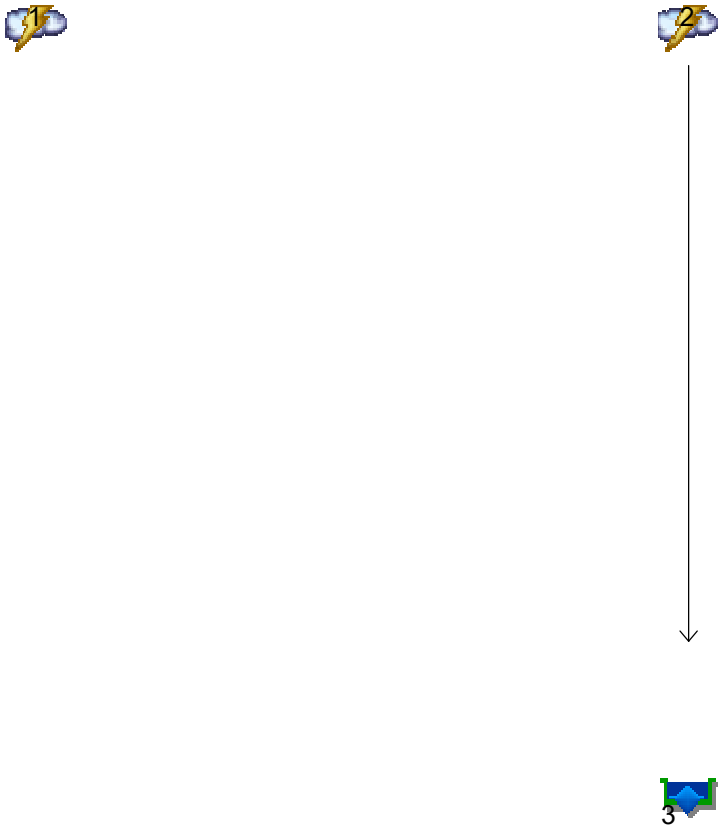
# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 22.64 | 1 | 12 | 16,299 | ------ | ------ | ------ | Pre development |
| 2 | Rational | 11.95 | 1 | 15 | 10,751 | ------ | ------ | ------ | Post development |
| 3 | Reservoir | 1.059 | 1 | 29 | 10,343 | 2 | 511.53 | 9,983 | detention pond |

# Watershed Model Schematic





# Multi-Hydrograph Plot



## Hyd. No. 1

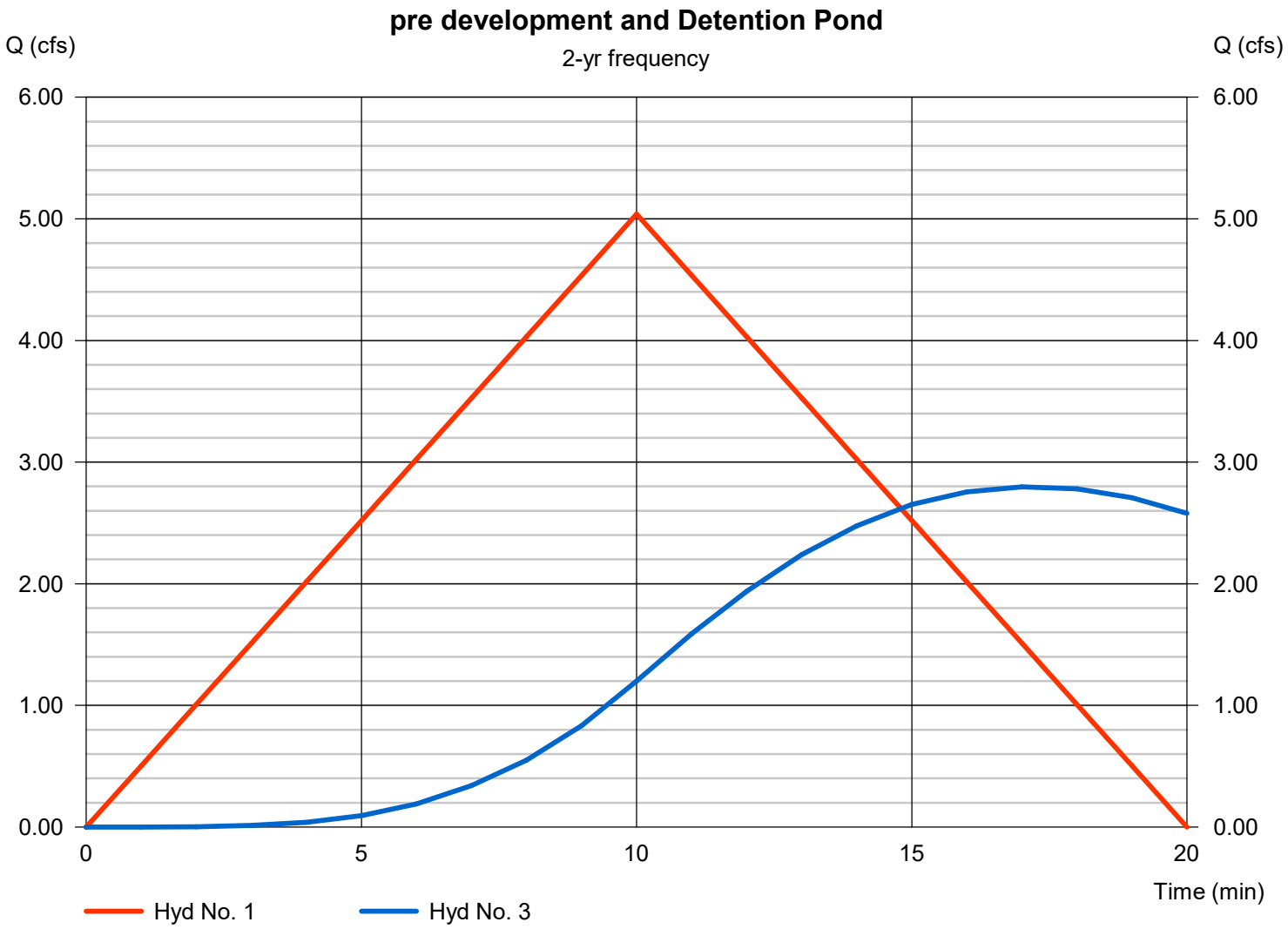
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 5.039 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 3,023 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 2.80 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 5,925 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

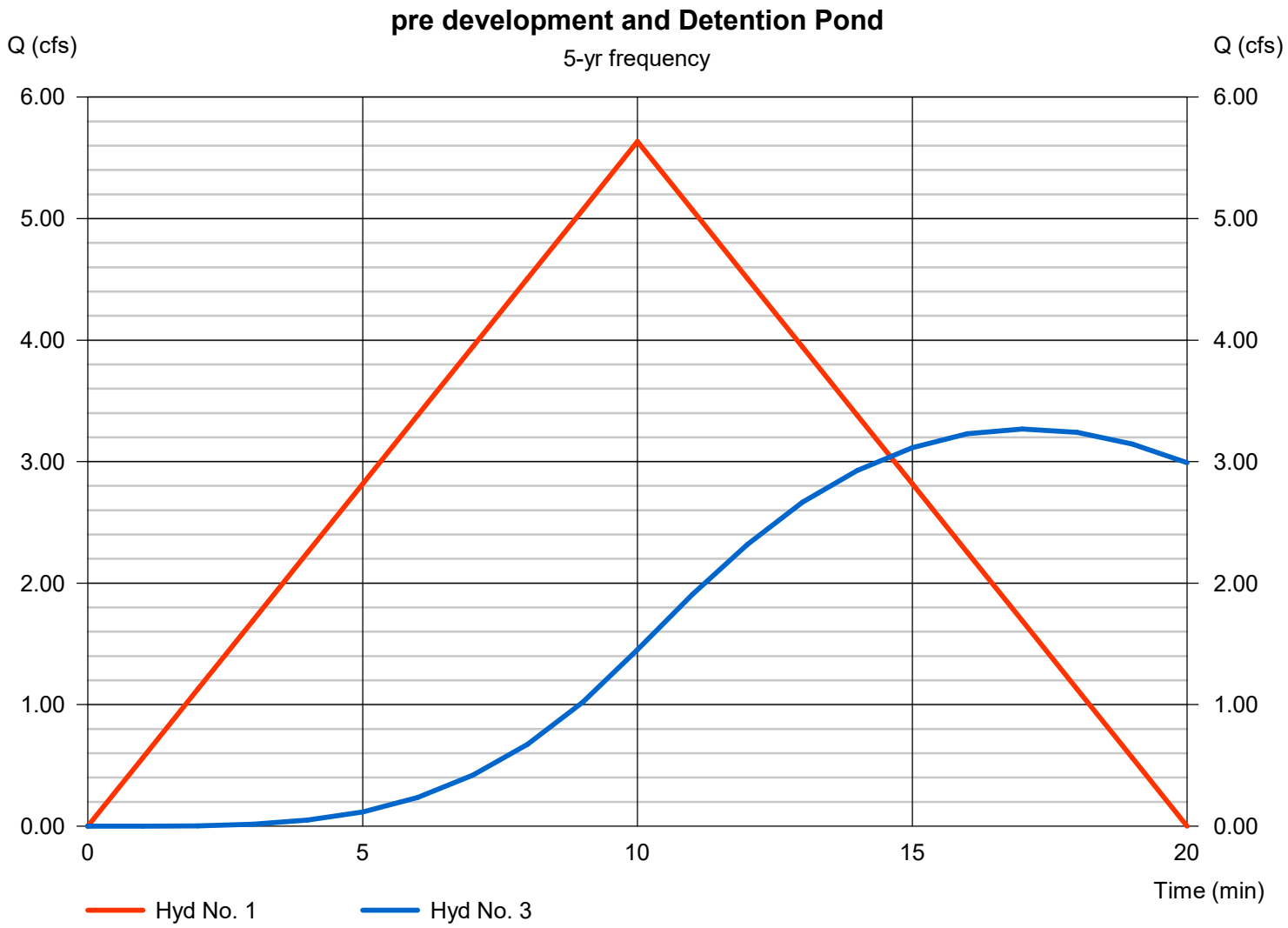
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 5.635 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 3,381 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 3.27 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 6,630 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

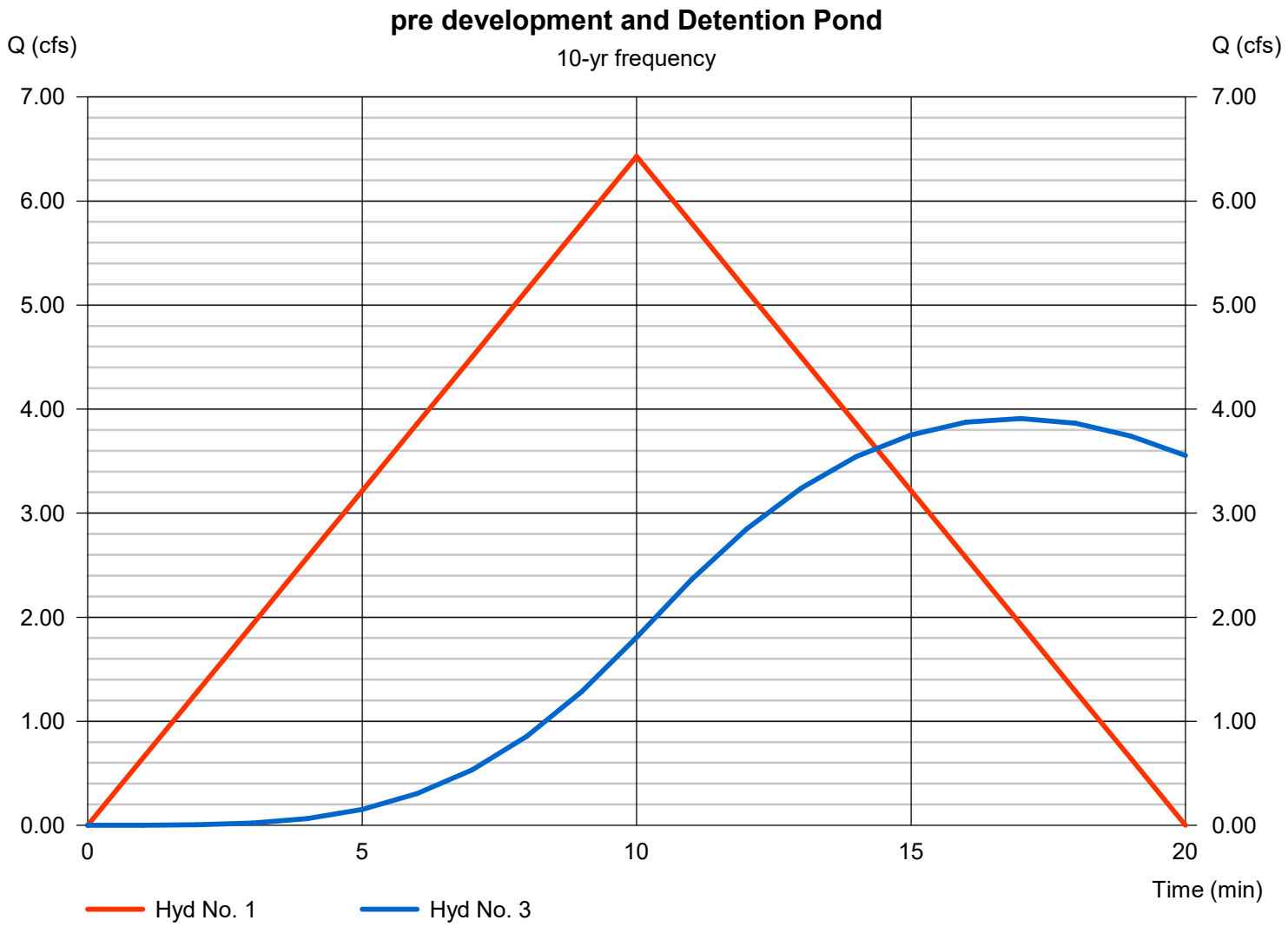
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 6.430 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 3,858 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 3.91 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 7,571 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

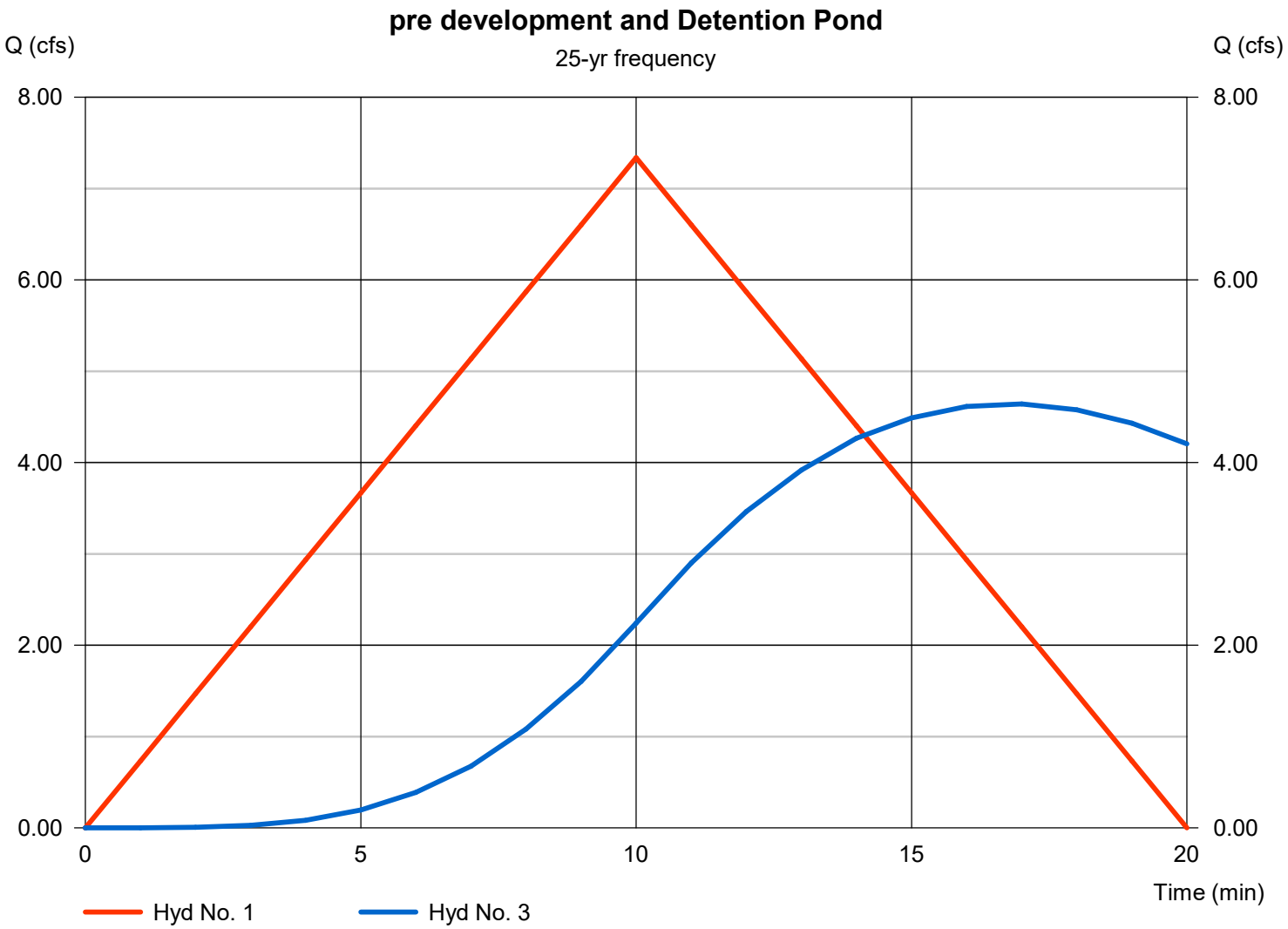
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 7.337 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 4,402 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 4.64 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 8,645 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

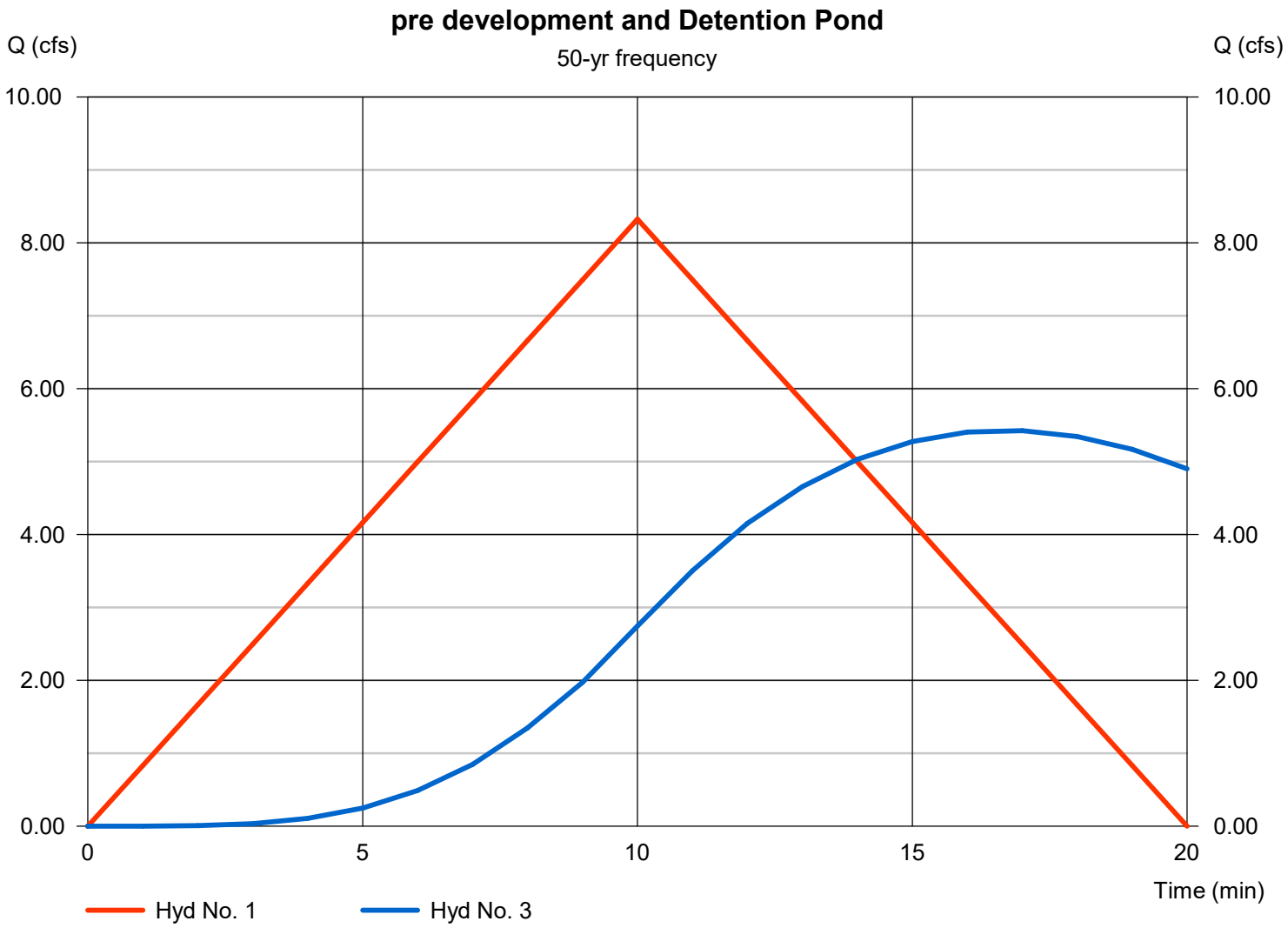
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 8.326 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 4,995 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 5.42 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 9,816 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

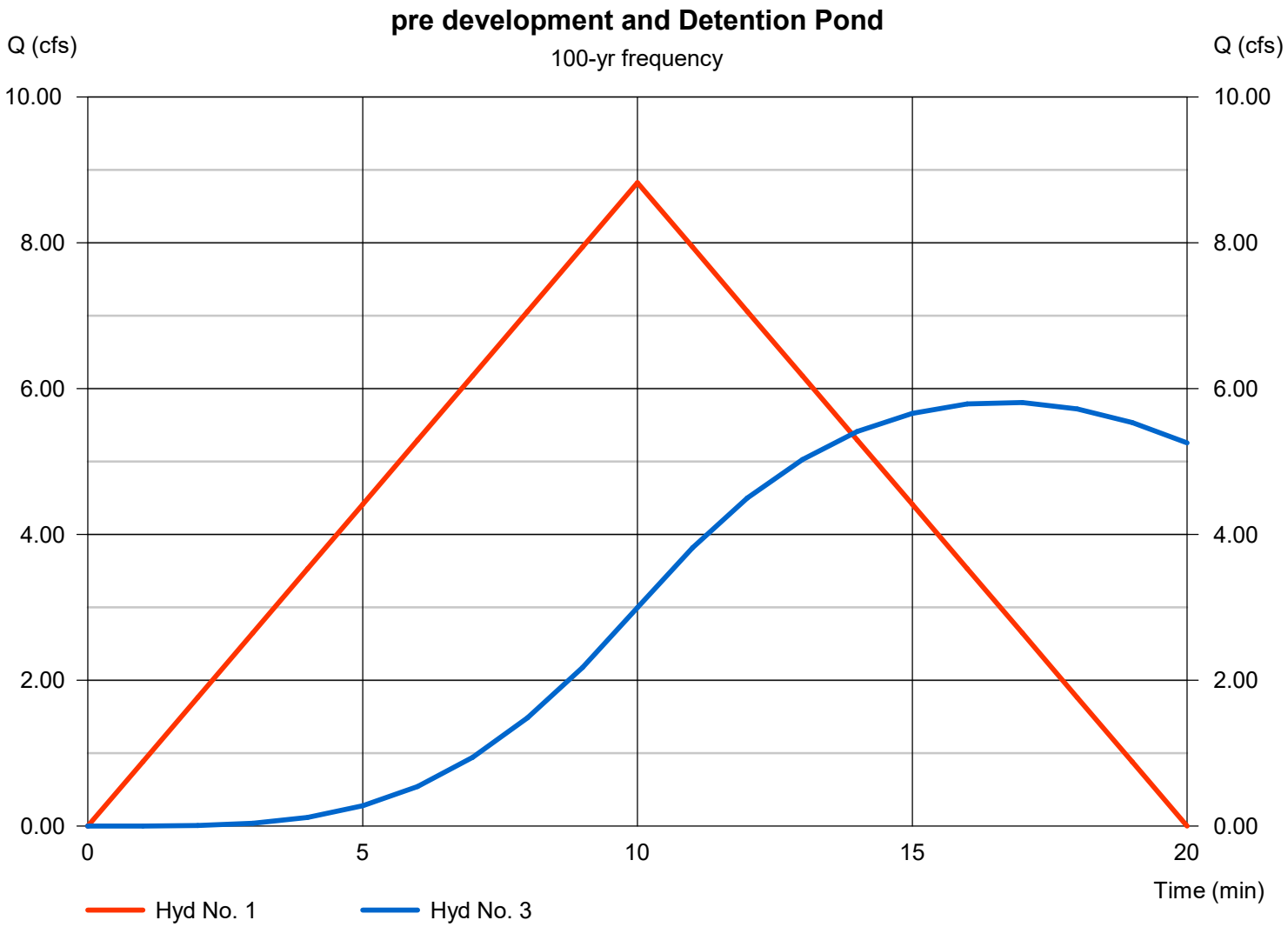
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 8.825 cfs |
| Time to peak | = | 10 min |
| Hyd. Volume | = | 5,295 cuft |

## Hyd. No. 3

Detention Pond

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 5.81 cfs |
| Time to peak | = | 17 min |
| Hyd. Volume | = | 10,406 cuft |



# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 — Thursday, 03 / 2 / 2023

## Pond No. 1 - Detention Pond -3

### Pond Data

**Trapezoid -**Bottom L x W = 106.0 x 52.0 ft, Side slope = 3.00:1, Bottom elev. = 495.00 ft, Depth = 2.50 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 495.00 | 5,512 | 0 | 0 |
| 0.25 | 495.25 | 5,751 | 1,408 | 1,408 |
| 0.50 | 495.50 | 5,995 | 1,468 | 2,876 |
| 0.75 | 495.75 | 6,243 | 1,530 | 4,406 |
| 1.00 | 496.00 | 6,496 | 1,592 | 5,998 |
| 1.25 | 496.25 | 6,753 | 1,656 | 7,654 |
| 1.50 | 496.50 | 7,015 | 1,721 | 9,375 |
| 1.75 | 496.75 | 7,281 | 1,787 | 11,162 |
| 2.00 | 497.00 | 7,552 | 1,854 | 13,016 |
| 2.25 | 497.25 | 7,827 | 1,922 | 14,938 |
| 2.50 | 497.50 | 8,107 | 1,992 | 16,930 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 18.00 | 0.00 | 0.00 | 0.00 |
| **Span (in)** | = 18.00 | 0.00 | 0.00 | 0.00 |
| **No. Barrels** | = 1 | 0 | 0 | 0 |
| **Invert El. (ft)** | = 495.00 | 0.00 | 0.00 | 0.00 |
| **Length (ft)** | = 33.00 | 0.00 | 0.00 | 0.00 |
| **Slope (%)** | = 7.47 | 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 |

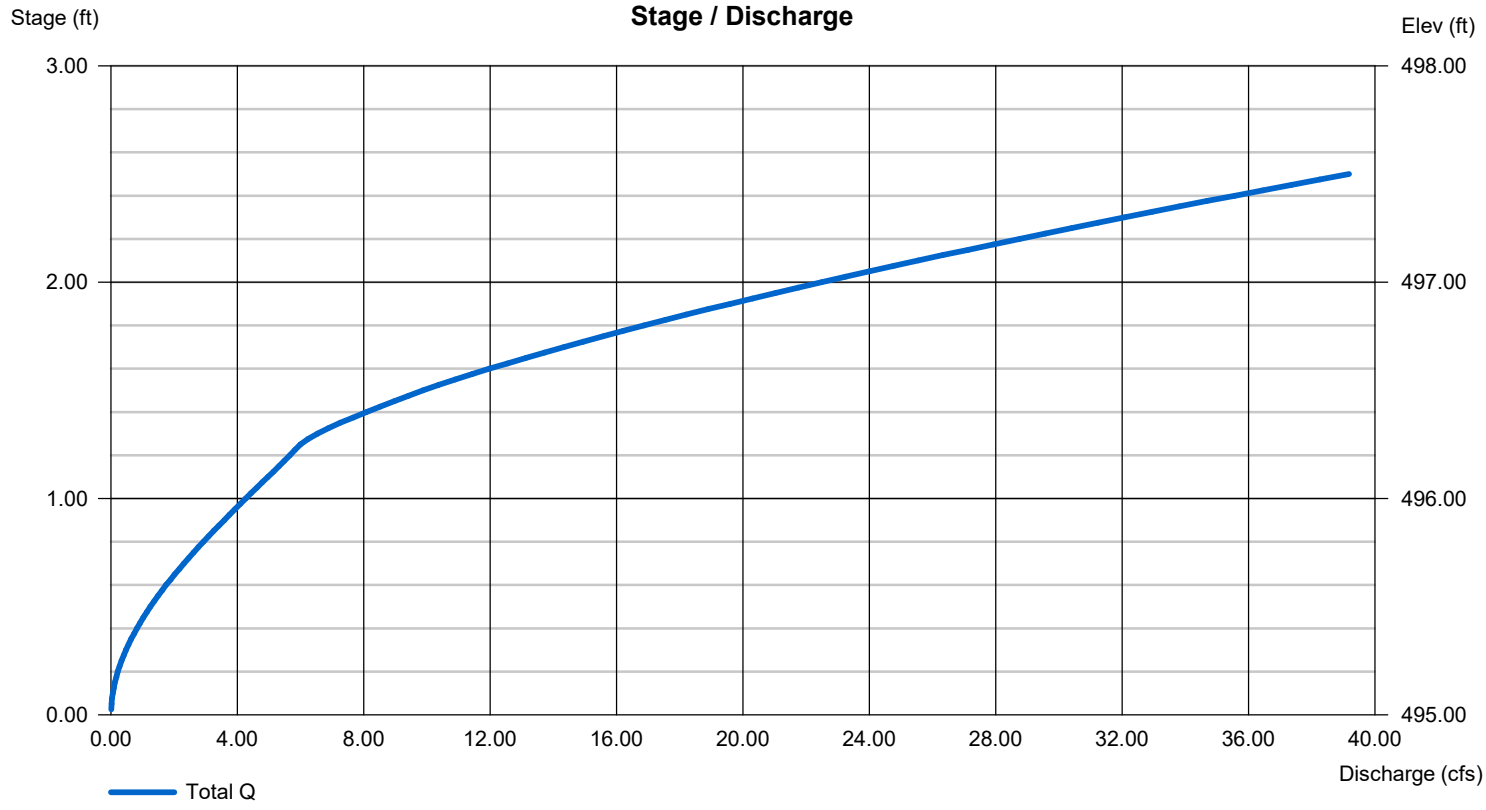
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | = 6.00 | 0.00 | 0.00 | 0.00 |
| **Crest El. (ft)** | = 496.25 | 0.00 | 0.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = Rect | --- | --- | --- |
| **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).



# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 5.039 | 1 | 10 | 3,023 | ------ | ------ | ------ | pre development |
| 2 | Rational | 9.942 | 1 | 10 | 5,965 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 2.797 | 1 | 17 | 5,925 | 2 | 495.78 | 4,598 | Detention Pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 5.635 | 1 | 10 | 3,381 | ------ | ------ | ------ | pre development |
| 2 | Rational | 11.12 | 1 | 10 | 6,671 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 3.269 | 1 | 17 | 6,630 | 2 | 495.85 | 5,064 | Detention Pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 6.430 | 1 | 10 | 3,858 | ------ | ------ | ------ | pre development |
| 2 | Rational | 12.69 | 1 | 10 | 7,612 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 3.910 | 1 | 17 | 7,571 | 2 | 495.95 | 5,674 | Detention Pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 7.337 | 1 | 10 | 4,402 | ------ | ------ | ------ | pre development |
| 2 | Rational | 14.48 | 1 | 10 | 8,686 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 4.642 | 1 | 17 | 8,645 | 2 | 496.05 | 6,359 | Detention Pond |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 8.326 | 1 | 10 | 4,995 | ------ | ------ | ------ | pre development |
| 2 | Rational | 16.43 | 1 | 10 | 9,856 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 5.424 | 1 | 17 | 9,816 | 2 | 496.17 | 7,100 | Detention Pond |

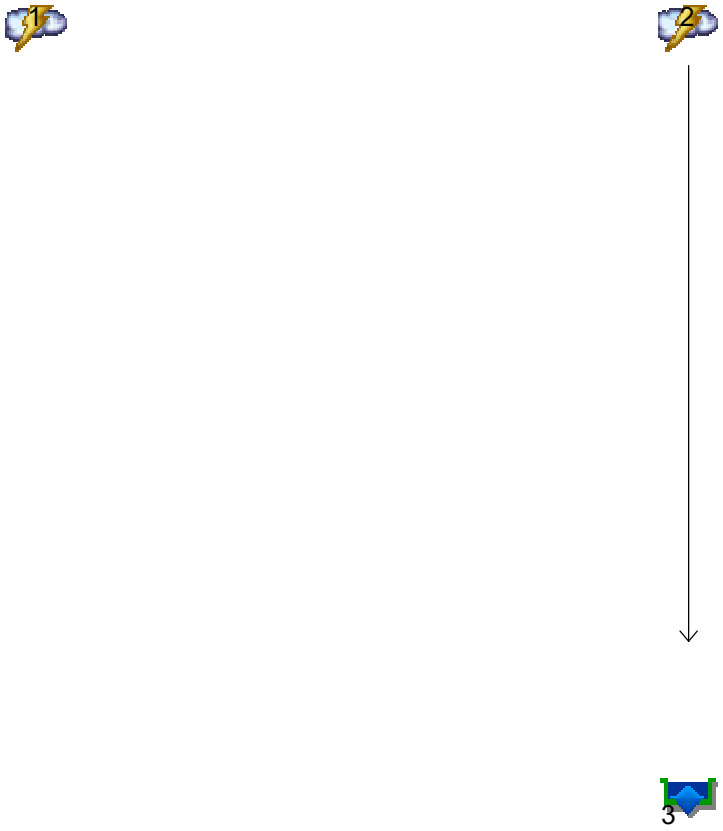
# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 8.825 | 1 | 10 | 5,295 | ------ | ------ | ------ | pre development |
| 2 | Rational | 17.41 | 1 | 10 | 10,447 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 5.810 | 1 | 17 | 10,406 | 2 | 496.22 | 7,475 | Detention Pond |

# Watershed Model Schematic






## Legend

| Hyd. | Origin | Description |
|---|---|---|
| 1 | Rational | pre development |
| 2 | Rational | post development |
| 3 | Reservoir | Reservior |

# Multi-Hydrograph Plot



## Hyd. No. 1

pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 31.09 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 20,519 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 27.37 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 25,949 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

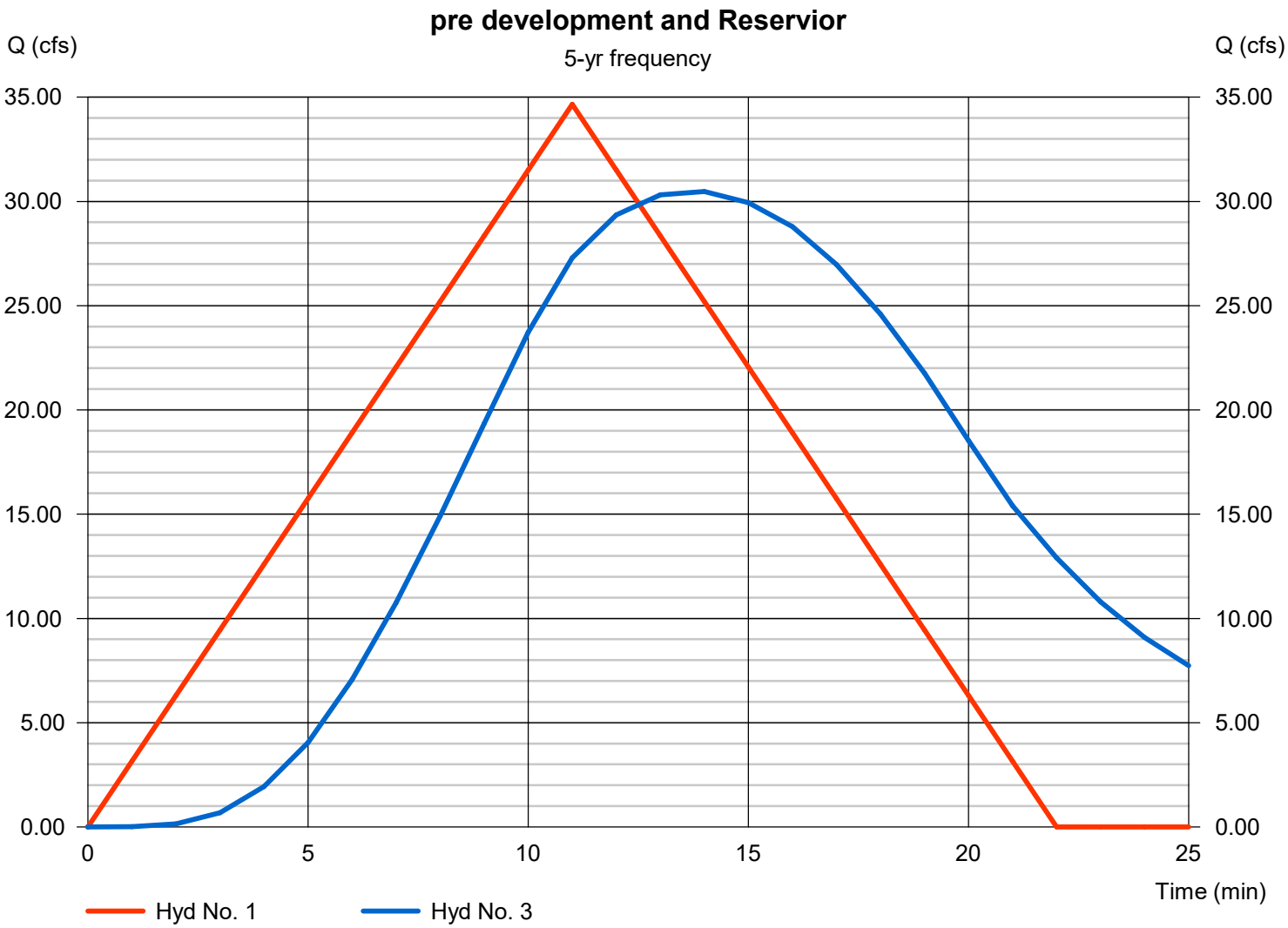
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 34.66 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 22,873 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 30.47 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 29,019 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

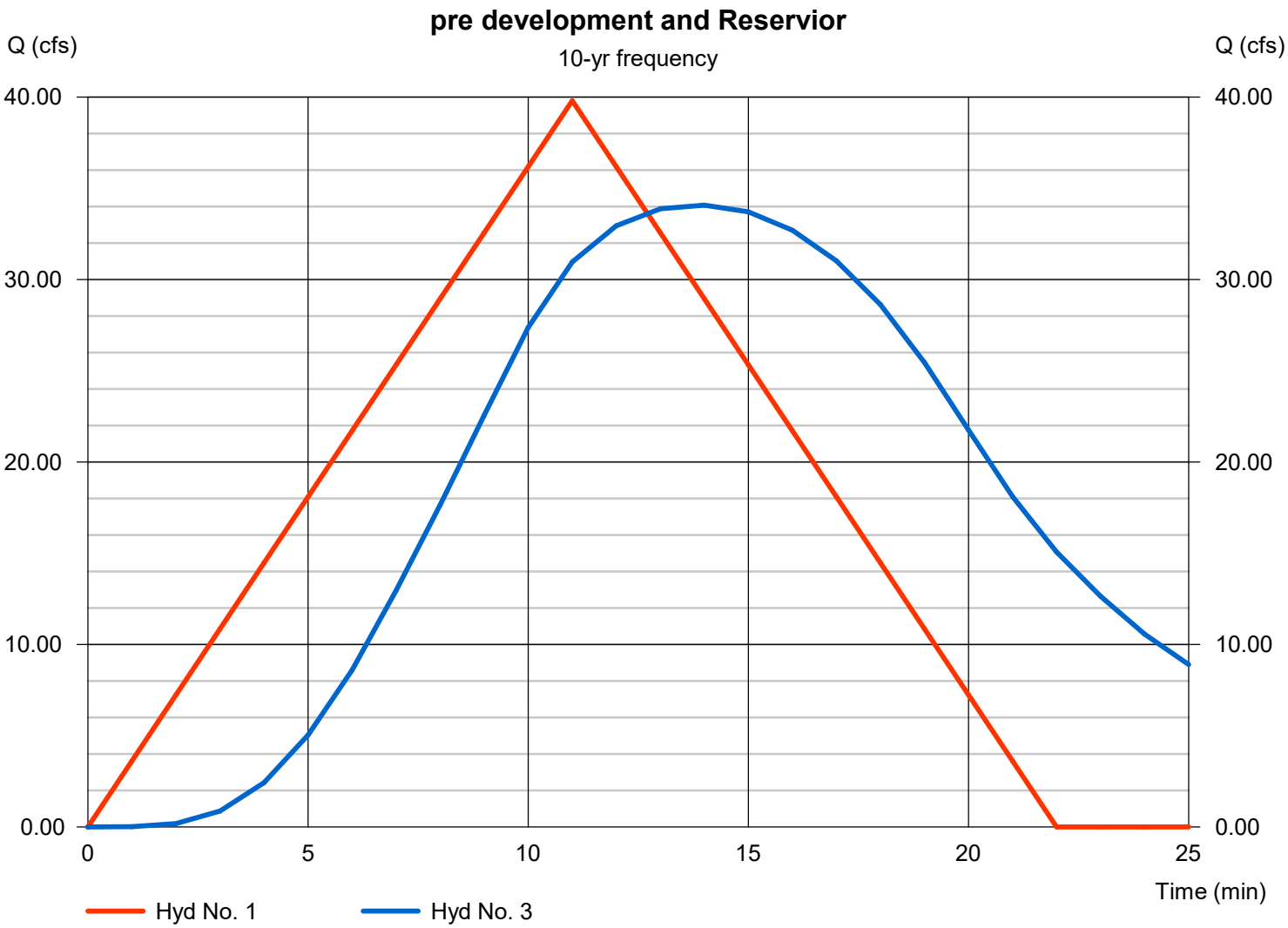
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 39.81 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 26,276 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 34.08 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 33,115 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

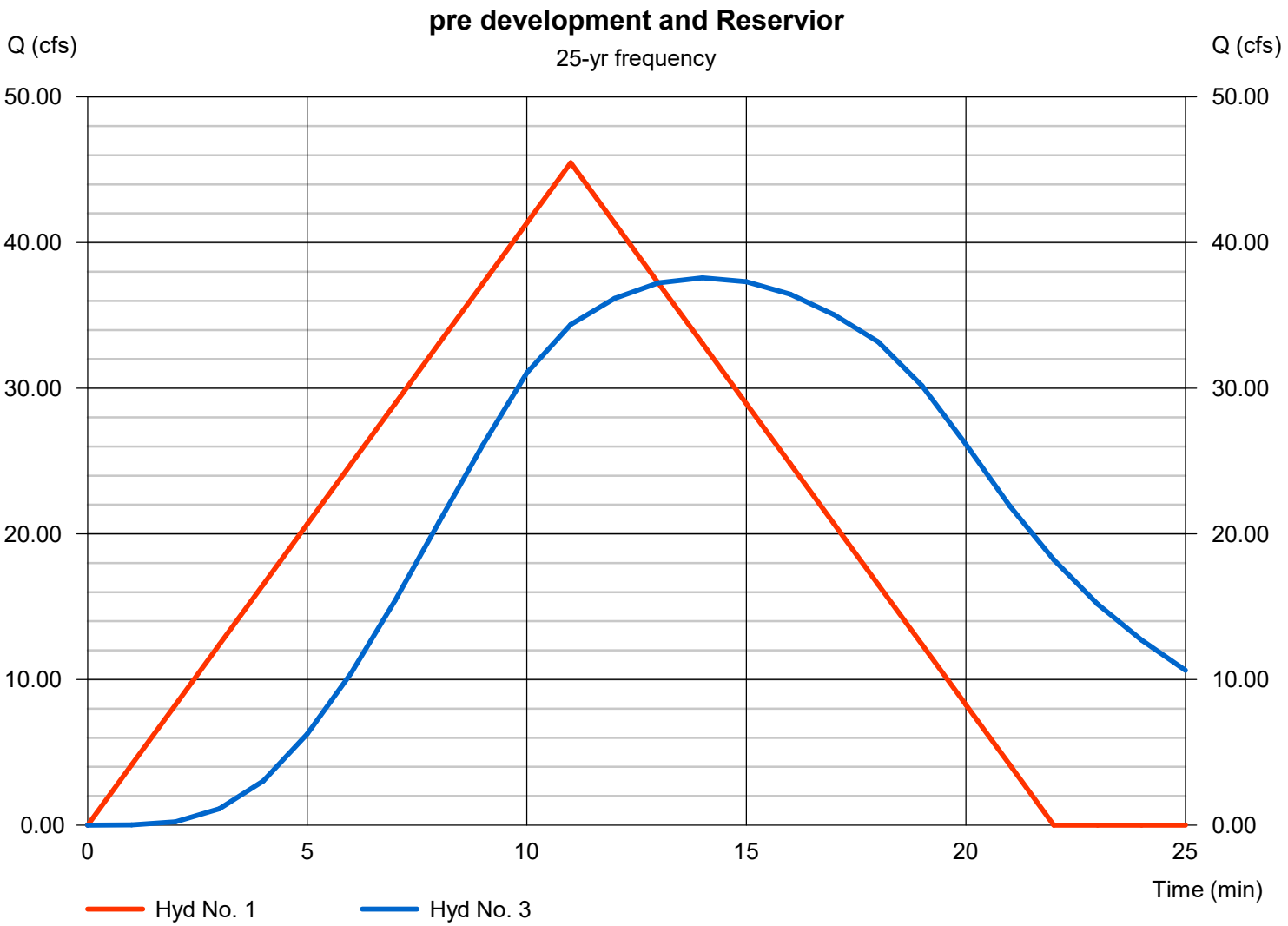
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 45.47 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 30,012 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 37.59 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 37,790 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

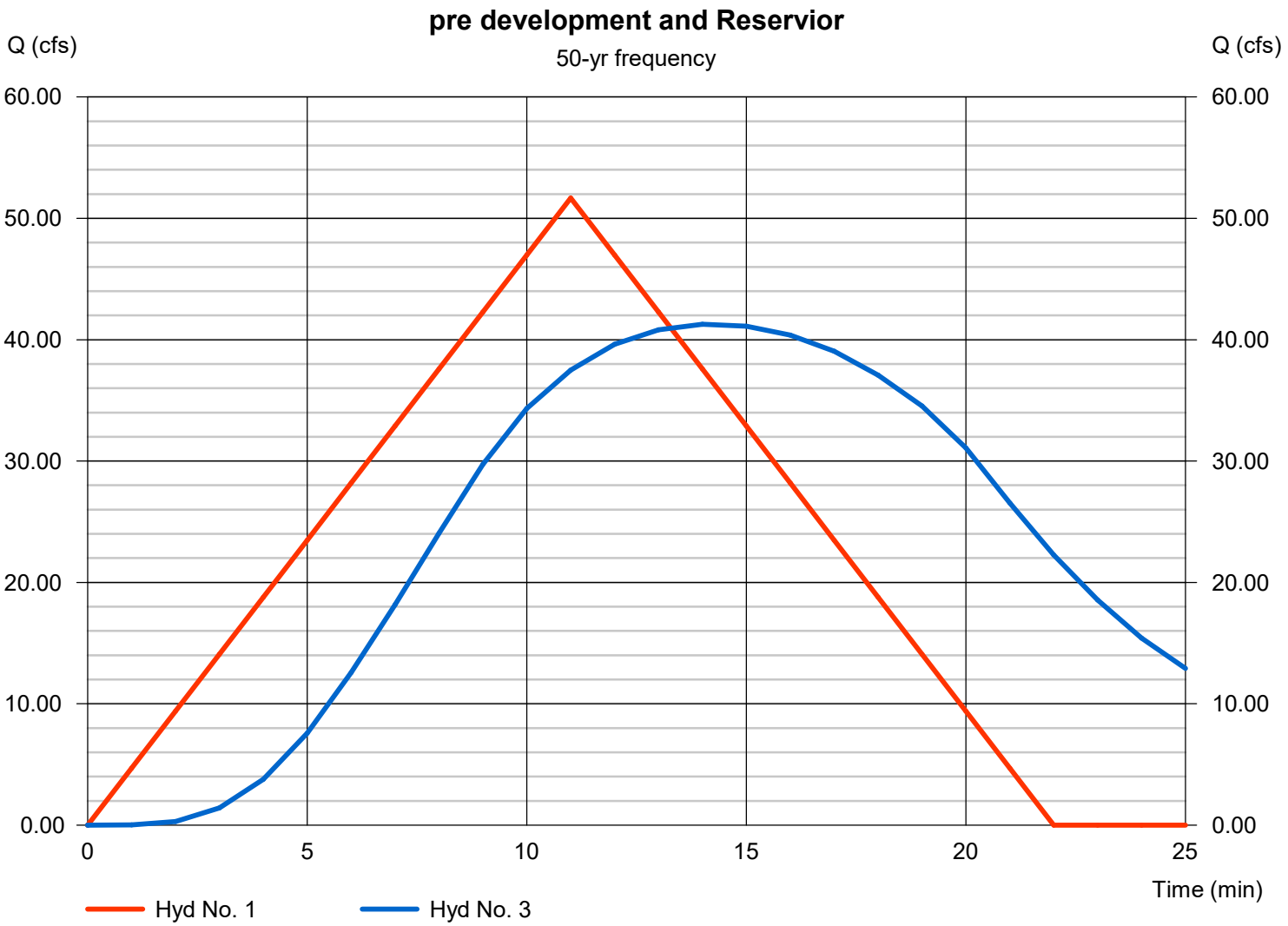
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 51.67 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 34,102 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 41.26 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 42,883 cuft |



# Multi-Hydrograph Plot



## Hyd. No. 1

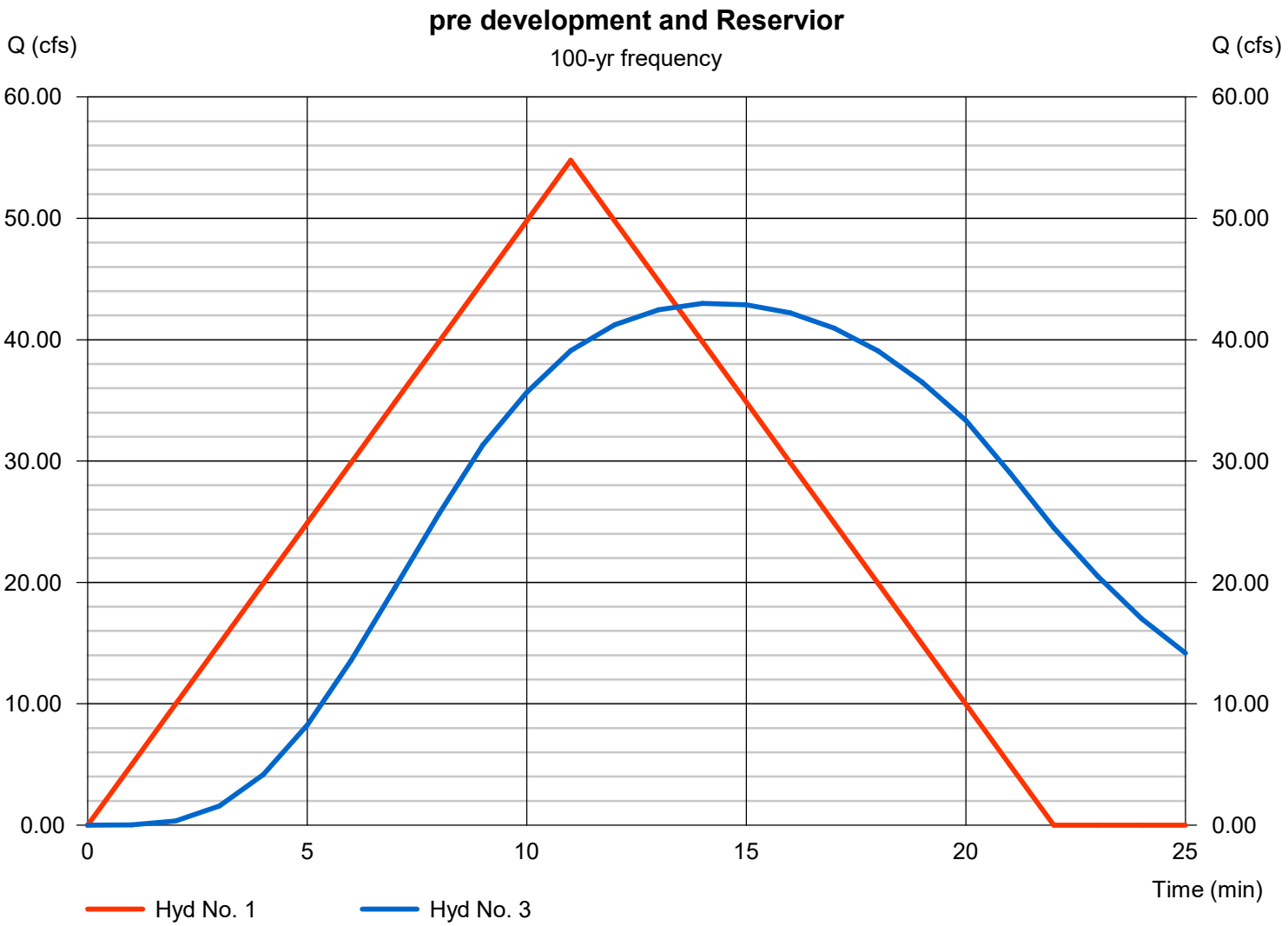
pre development

| | | |
|---|---|---|
| Hydrograph type | = | Rational |
| Peak discharge | = | 54.77 cfs |
| Time to peak | = | 11 min |
| Hyd. Volume | = | 36,151 cuft |

## Hyd. No. 3

Reservior

| | | |
|---|---|---|
| Hydrograph type | = | Reservoir |
| Peak discharge | = | 42.99 cfs |
| Time to peak | = | 14 min |
| Hyd. Volume | = | 45,453 cuft |



# Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Tuesday, 02 / 14 / 2023

## Pond No. 1 - Detention Pond -4

### Pond Data

**Trapezoid** -Bottom L x W = 74.0 x 50.3 ft, Side slope = 3.00:1, Bottom elev. = 508.00 ft, Depth = 5.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 508.00 | 3,725 | 0 | 0 |
| 0.50 | 508.50 | 4,107 | 1,957 | 1,957 |
| 1.00 | 509.00 | 4,507 | 2,153 | 4,110 |
| 1.50 | 509.50 | 4,925 | 2,357 | 6,468 |
| 2.00 | 510.00 | 5,361 | 2,571 | 9,038 |
| 2.50 | 510.50 | 5,815 | 2,793 | 11,832 |
| 3.00 | 511.00 | 6,287 | 3,025 | 14,857 |
| 3.50 | 511.50 | 6,777 | 3,265 | 18,122 |
| 4.00 | 512.00 | 7,285 | 3,515 | 21,637 |
| 4.50 | 512.50 | 7,811 | 3,773 | 25,410 |
| 5.00 | 513.00 | 8,355 | 4,041 | 29,451 |

### Culvert / Orifice Structures

| | [A] | [B] | [C] | [PrfRsr] |
|---|---|---|---|---|
| **Rise (in)** | = 36.00 | Inactive | Inactive | 0.00 |
| **Span (in)** | = 36.00 | 24.00 | 24.00 | 0.00 |
| **No. Barrels** | = 1 | 1 | 1 | 0 |
| **Invert El. (ft)** | = 508.00 | 511.00 | 513.00 | 0.00 |
| **Length (ft)** | = 86.00 | 0.50 | 0.00 | 0.00 |
| **Slope (%)** | = 3.79 | 0.01 | 0.00 | n/a |
| **N-Value** | = .013 | .013 | .013 | n/a |
| **Orifice Coeff.** | = 0.50 | 0.60 | 0.60 | 0.60 |
| **Multi-Stage** | = n/a | No | No | No |

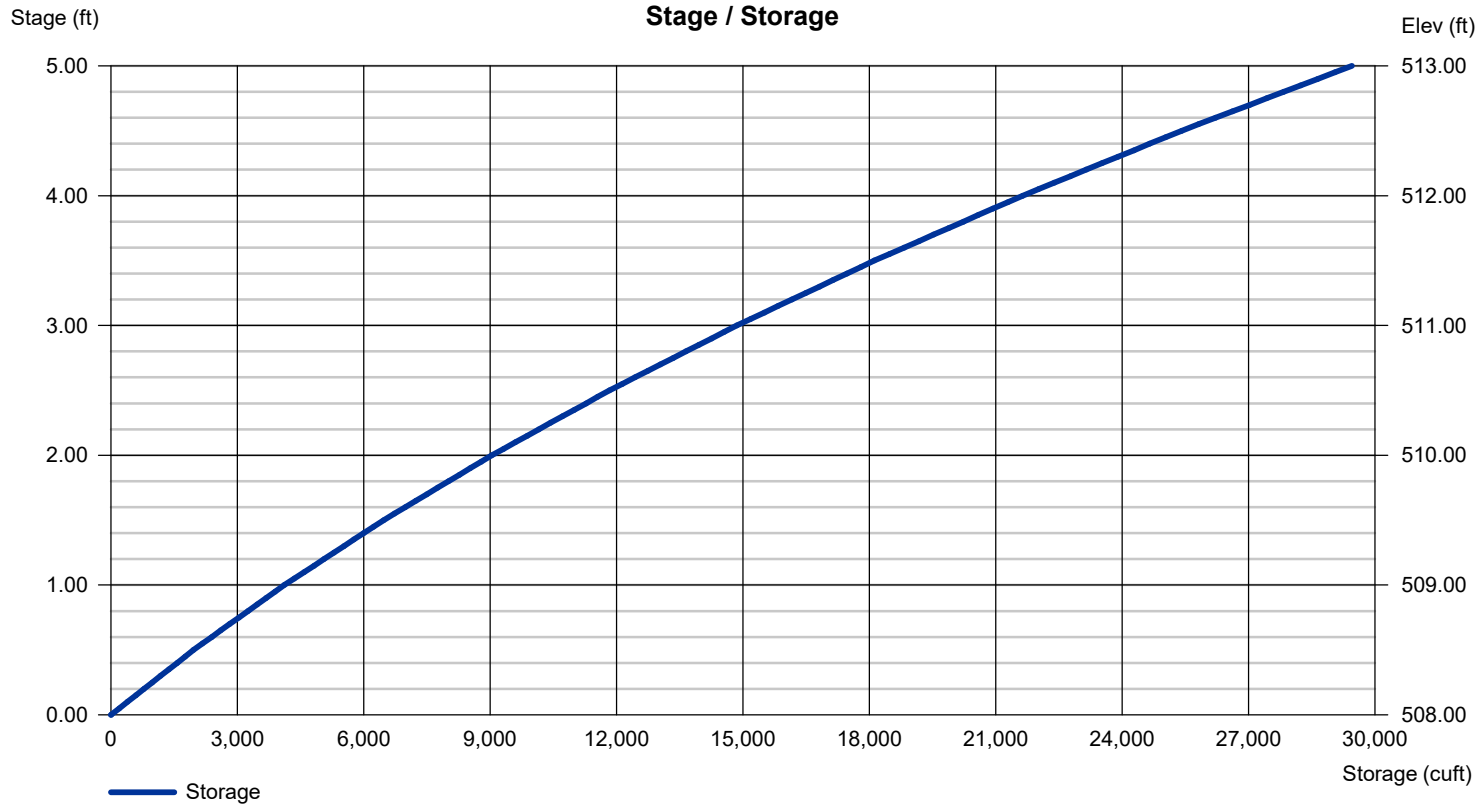
### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| **Crest Len (ft)** | Inactive | 5.00 | Inactive | 0.00 |
| **Crest El. (ft)** | = 512.00 | 512.00 | 511.00 | 0.00 |
| **Weir Coeff.** | = 3.33 | 3.33 | 3.33 | 3.33 |
| **Weir Type** | = Rect | Rect | Rect | --- |
| **Multi-Stage** | = No | No | No | No |

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

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

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



# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 31.09 | 1 | 11 | 20,519 | ------ | ------ | ------ | pre development |
| 2 | Rational | 43.27 | 1 | 10 | 25,961 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 27.37 | 1 | 14 | 25,949 | 2 | 510.44 | 11,523 | Reservior |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 34.66 | 1 | 11 | 22,873 | ------ | ------ | ------ | pre development |
| 2 | Rational | 48.39 | 1 | 10 | 29,031 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 30.47 | 1 | 14 | 29,019 | 2 | 510.65 | 12,716 | Reservior |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 39.81 | 1 | 11 | 26,276 | ------ | ------ | ------ | pre development |
| 2 | Rational | 55.21 | 1 | 10 | 33,127 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 34.08 | 1 | 14 | 33,115 | 2 | 510.93 | 14,413 | Reservior |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 45.47 | 1 | 11 | 30,012 | ------ | ------ | ------ | pre development |
| 2 | Rational | 63.00 | 1 | 10 | 37,802 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 37.59 | 1 | 14 | 37,790 | 2 | 511.26 | 16,533 | Reservior |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 51.67 | 1 | 11 | 34,102 | ------ | ------ | ------ | pre development |
| 2 | Rational | 71.49 | 1 | 10 | 42,895 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 41.26 | 1 | 14 | 42,883 | 2 | 511.62 | 18,945 | Reservior |

# Hydrograph Summary Report

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

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to Peak (min) | Hyd. volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Total strge used (cuft) | Hydrograph Description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Rational | 54.77 | 1 | 11 | 36,151 | ------ | ------ | ------ | pre development |
| 2 | Rational | 75.78 | 1 | 10 | 45,465 | ------ | ------ | ------ | post development |
| 3 | Reservoir | 42.99 | 1 | 14 | 45,453 | 2 | 511.80 | 20,214 | Reservior |