**CREATIVE LAND & WATER ENGINEERING, LLC**
Environmental Scientist and Engineers

**Mailing address**
P.O. Box 584
Southborough, MA 01772

**Technical Office**
303 Worcester Road
Framingham, MA 01701

508-281-1694 (office)
774-454-0266 (cell)
508-281-1694 (Fax)
CLWEL@CREATIVE-Land-Water-Eng.com
WWW.CREATIVE-Land-Water-Eng.com

Effective, Affordable, and Sustainable Solutions for Land & Water Environment

May 8, 2018

To: Town of Wayland- Conservation Commission
Ms. Linda Hansen
41 Cochituate Road
Wayland, MA 01778

**Subject: 24 School Street – Mounding Calculations/Stormwater Review**

Dear Ms. Hansen and Commissioners:

The emailed documents are to address the review comments by Nover-Armstrong Associates, Inc. (NAA) dated March 9, 2018. The package includes documents and plan as listed in the following:

1. Response letter dated May 8, 2018 by Creative Land & Water Engineering, LLC (CLAWE)
   1a. Grading plan with soil test pits, monitoring wells, profile sections, and footprints of SAS and infiltration area marked **by Metrowest Engineering, Inc. (MWE)**
2. Slug Test and Groundwater Mounding Analysis Report, 24 School Street, Wayland, MA, revised May 7, 2018, by CLAWE
3. Drainage report, revised May 2018 by MWE
4. Site plan set (5 sheets), revised April 20, 2018 by MWE.
5. Watershed plans (existing and propsed), April 23, 2018 by MWE

Please feel free to contact us if you have any questions.

Sincerely,
Creative Land & Water Engineering, LLC
by


Desheng Wang, Ph.D., P.E.
Hydrogeologist and
Certified Wetland Scientist

cc: DEP NERO, Wetland Division, 205B Lowell Street, Wilmington, MA 01801
Chris D'Antonio, Chadwick Homes, LLC.
Mark Kablack, esq., M.A. Kablack & Associates, P.C.
Brian Nelson, Metrowest Engineering
Ruth McCawley Geoffroy, NAA

Wayland ZBA

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May 8, 2018

To: Town of Wayland- Conservation Commission
Ms. Linda Hansen
41 Cochituate Road
Wayland, MA 01778

**Subject: 24 School Street – Mounding Calculations/Stormwater Review**

Dear Ms. Hansen and Commissioners:

We received and reviewed the review comments on groundwater mounding calculations/stormwater by Nover-Armstrong Associates, Inc. (NAA) dated March 9, 2018. The groundwater mounding analysis has been updated to incorporate the recommendations in the review comment letter . This letter briefly addresses the comments in the same sequence as in the comment letter by NAA. To facilitate the next round review, we quoted the comments first in italic and then followed by our response in Bold.

- *The following information is necessary to fully review the mounding calculations: (1)*

  - *Revised drainage calculations and site / stormwater management system design;*

    **Response: MWE will provide a revised drainage design and report and plans consistent with the updated groundwater mounding calcs.**

  - *Superimpose property lines, MWs and SAS/infiltration structure over mounding report soils map;*

    **To be provided by MWE.**

  - *Soil boring logs; and*

    **Response: See attached soil boring logs in revised mounding report for the three monitoring wells.**

  - *Groundwater mounding results of combined SAS and stormwater infiltration system mounds.*

    **Response: The summary table showed the combined maximum groundwater mounding heights in the updated report. More plots along the long axis edge and field corner are provided in the revised analysis in the updated report.**

- *Groundwater elevations are seasonally higher in March/April than in January. ESHGW should be measured throughout March/April as monitoring wells are*

*currently in place. (2)*

**Response: As agreed on the phone working conference with NAA, the high groundwater measurement in March was used for the revised mounding analysis. See updated groundwater monitoring data in the report.**

- *The 100-year stormwater mound elevation is reported to be 7.48 feet above seasonal high groundwater (elevation 166.32). The mounding calculations identified that the stormwater infiltration system must be raised by two feet. No design is available to gauge the impact of this mound and what a redesigned drainage system will consist of. (3)*

**Response: The drainage system has been revised by MWE and the groundwater mounding analysis has been updated with the latest drainage data.**

- *The mounding calcs state that "the maximum height is only reference and does not need to be considered as it will be temporarily stored in the infiltration chambers." Revised drainage calculations must show that all of the volume claimed to be infiltrated during the 100-year storm is able to be stored within the infiltrators to confirm that the claims made in the mounding calcs will occur. (4)*

**Response: The infiltration has been designed with storage to store runoff for a 2-year storm event. Overflow path is provided for larger storm events.**

- *Mounding calcs show a recharge volume of 5,318 cu. ft. for the revised 100-year event. The September 2017 drainage calcs show the stormwater infiltration system with a greater recharge volume of 5,756 cu. ft. required for the same event. Without a drainage design and calculations, the mounding calcs cannot be confirmed. (5)*

**Response: Previous revision to the system caused this. The current revision is now consistent with the groundwater mounding. See MWE report. The latest 100-year recharge volume is 4344 cu ft.**

- *There seems to be conflicting saturated thicknesses (depth/thickness of aquifer) reported throughout the mounding calculations. For example, the hydraulic conductivity calculation sheet for MW-3, which is within the infiltration structure, shows the depth of aquifer at 8.0 ft.; Table 3 shows the aquifer thickness between EHGW and bottom of aquifer for MW-3 to be 16.14 ft.; and, the revised 100-year mound calculation initial saturated thickness for the infiltration structure is 15.9 ft. These different measurements, for what appears to be the same dimension, should be corrected or explained. (6)*

**Response: As we explained on our phone conference, the drilling information is limited. We used the bottom elevation at MW 1 as the bottom of aquifer as the well is located at the most upgradient location and under a normal condition, the aquifer would pitch towards the lower valley and with lower bottom elevation. However, the drilling had stopped at drilling restriction, which would likely be a larger boulder or stone to prevent drilling going further down. It would be adequate to use the drilling limit for groundwater monitoring and conservative to test the hydraulic conductivity. As a confirmation, this time, we also analyzed the stormwater recharge mounding using**

**the bottom of MW3 for the aquifer depth calculation. Both analyses showed satisfactory de-water condition for the infiltration chamber.**

- *Other parameters in the calculations should be explained including the stark difference in hydraulic conductivity for MW-1 and MW-2 under the SAS at 25.97 ft./day vs. MW-3, within the infiltration structure, which is almost 4 times less at 6.51 ft./day. Saturated thickness is integral to hydraulic conductivity (how fast ground water travels through the saturated soil) thus reducing the height of the groundwater mound. Depth of aquifer for MW- 1 is 13.2 ft. on the hydraulic conductivity calculation sheet as compared to MW-3 at 8.0 ft., both relatively close. Additionally, these two wells appear to be within the same Narragansett silt loam soil group. (7)*

**Response: All drilling and testing have limited reflection of the true site condition. As we explained above, the difference in well depth and hydraulic conductivities might be due to the ledge or large boulders and/or micro soil limitation in the specific drilling location. The macro site hydraulic conductivity would be normally better than a micro testing result as it would be less impacted by many micro limiting factors like large stone at the bottom of the testing pit. MW1 and MW2 showed a quite consistent condition, and the lesser hydraulic conductivity was used for the SAS mounding calculation and the MW3 hydraulic conductivity was used for the stormwater infiltration mounding analysis to be safe.**

- *The September 2017 drainage calculations identify that although both soil types identified on the site are hydrologic soil group (HSG) A; it is then reported that the soils will be considered HSG B because it is "more conservative." This assumption should be more fully evaluated as it may overestimate the pre-existing runoff rate and volume, requiring less mitigation in the post-development condition. (8)*

**Response: Field testing and evaluation showed HSG B soil condition. In the NRCS soil map, Narragansett was classified as HSG B soil in the Middlesex County soil map published in 1989. The websoil survey map changed the soil group to HSG A. However, the fieled soil elevation and percolation testing showed more consistent with HSG B soil. This is the reason HSG B was used in the analysis. Our phone conference reached an agreement on this.**

- *The infiltration system should empty in 72 hours, even in the 100 year event, as it must be available for subsequent storm events. (9)*

**Response: Agreed. The updated analysis and report reflect this agreement.**

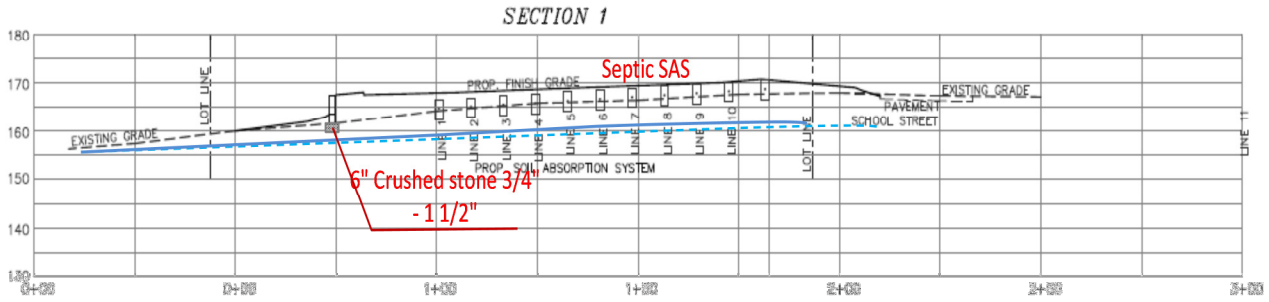
**In addition, as requested at our working phone conference, four profiles across septic SAS and the stormwater infiltration area are plotted to show that the groundwater movement and mounding will not be impacted by the retain wall or building foundation as there will be no basement for all the buildings, which will built on quite amount of fill above groundwater. See the profiles for details. As the retaining wall footing in some locations may get close the high water table, it should be checked in the field to make sure the retaining wall footing will be set at or slightly above the seasonal high groundwater table to assure the proper groundwater movement. To add a safety factor here, a 6" thick crushed stones is recommended as the subbase of the retaining wall to facilitate the water move, which would be equivalent to more than 3 ft sandy soil flow passing capacity.**

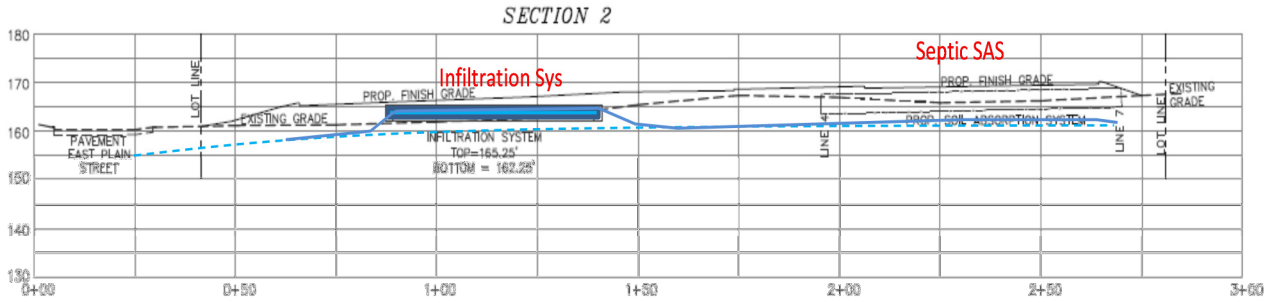
Please feel free to contact us if you have any questions.

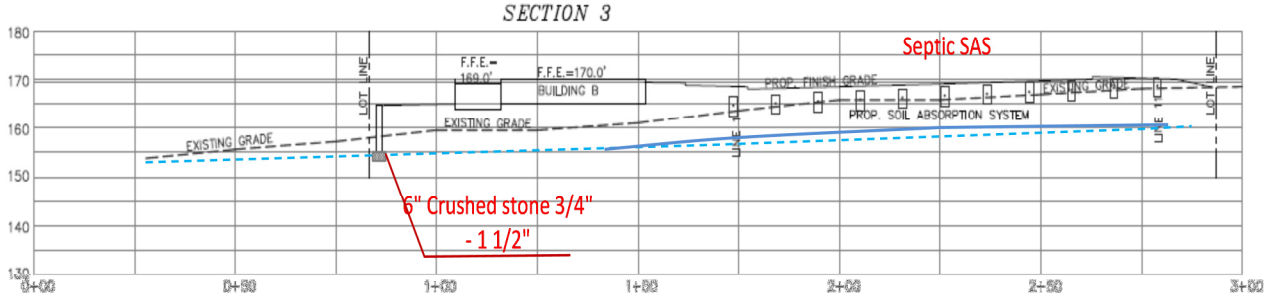
Sincerely,
Creative Land & Water Engineering, LLC
by

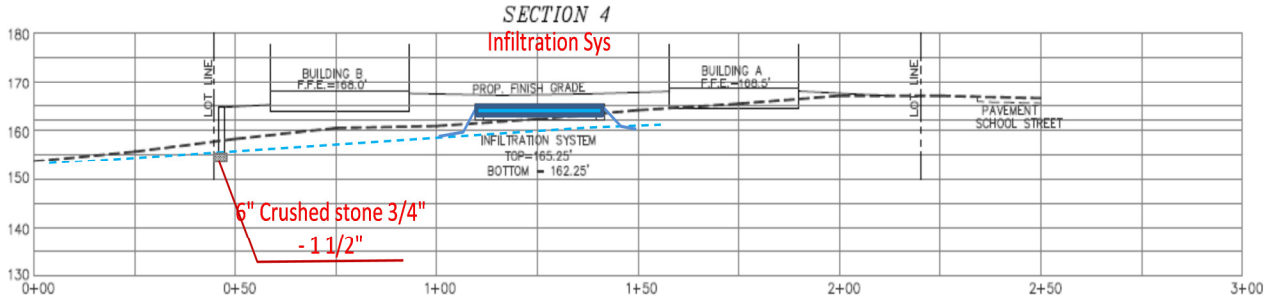

Desheng Wang, Ph.D., P.E.
Hydrogeologist and
Certified Wetland Scientist

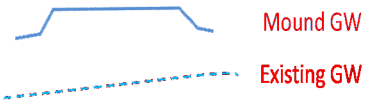
cc: DEP NERO, Wetland Division, 205B Lowell Street, Wilmington, MA 01801
Chris D'Antonio, Chadwick Homes, LLC.
Mark Kablack, esq., M.A. Kablack & Associates, P.C.
Brian Nelson, Metrowest Engineering




Grading Profiles

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 69050, PAGE 394.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE- AND BELOW-GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT-INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN-MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB-SURFACE UTILITIES AND MAN-MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.)

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG-SAFE BEFORE YOU DIG 811.

## ZONING:

### RESIDENCE ZONE 20,000 – 120' FRONT

MINIMUM LOT AREA= 20,000[15] S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= 30[2] FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= 15[3] FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198-702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198-702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198-702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198-703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198-705.1 OF THE ZONING BYLAW.

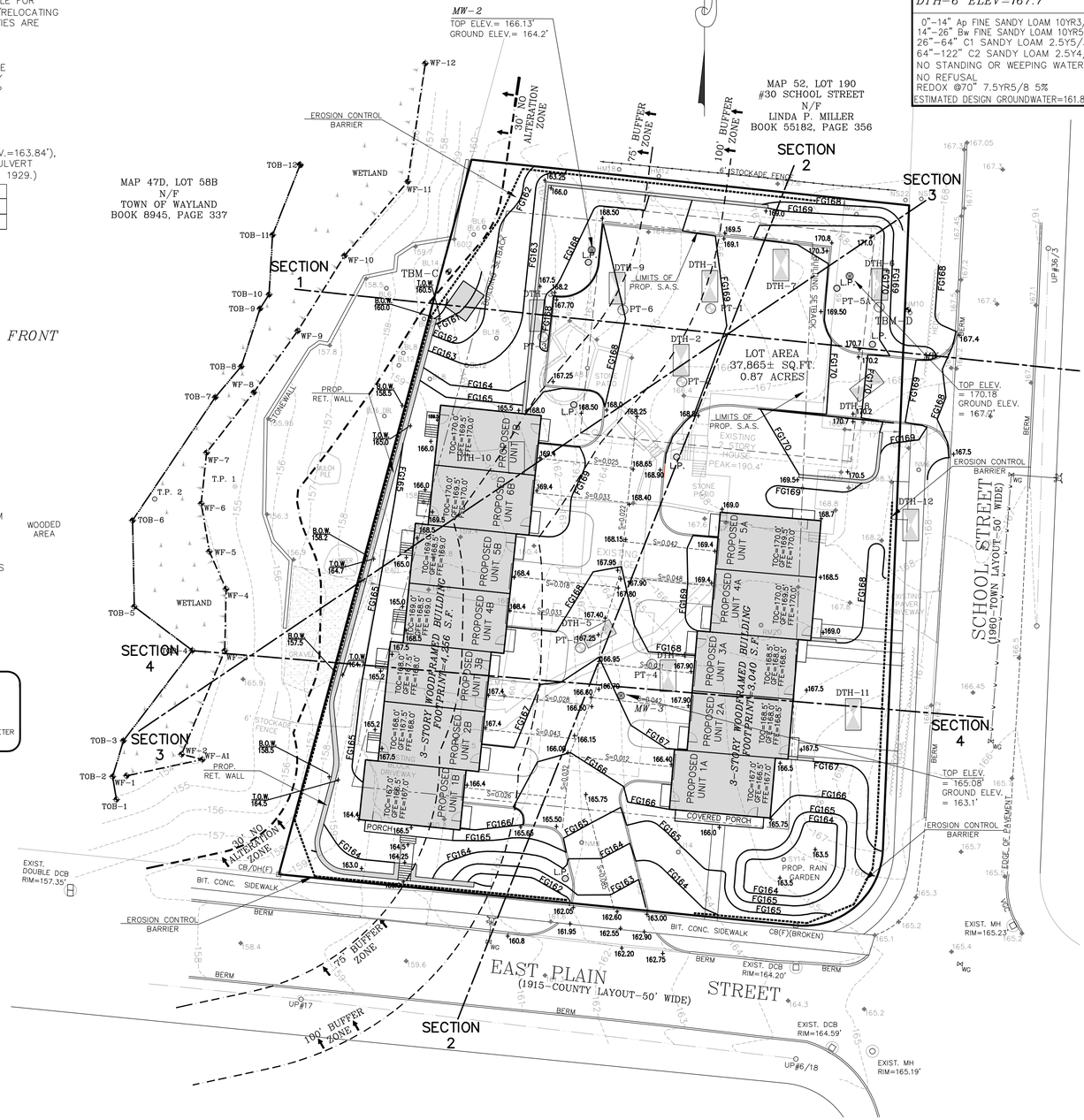
## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL
TREE LOCATION
TREE CODE — RO14 — TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| ⋈WG | WATER GATE |
| ⋈GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| +200.0 | EXISTING SPOT GRADE |
| ----200---- | EXISTING GRADING |
| ---------- | EXISTING OVERHEAD WIRE |




## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-1 ELEV=165.7' | DTH-2 ELEV=165.9' | DTH-3 ELEV=161.7' | DTH-4 ELEV=164.1' | DTH-5 ELEV=162.6' |
|---|---|---|---|---|
| 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-24" Bw FINE SANDY LOAM 10YR5/6<br>24"-62" C1 SANDY LOAM 2.5Y5/3<br>62"-126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"-22" Ap FINE SANDY LOAM 10YR3/3<br>22"-42" Bw FINE SANDY LOAM 10YR5/6<br>42"-96" C1 SANDY LOAM 2.5Y5/3<br>96"-118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-22" Bw FINE SANDY LOAM 10YR5/6<br>22"-84" C1 SANDY LOAM 2.5Y5/3<br>84"-110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"-20" FILL<br>20"-28" Ap FINE SANDY LOAM 10YR3/3<br>28"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-86" C1 SANDY LOAM 2.5Y5/4<br>86"-116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-34" Bw FINE SANDY LOAM 10YR5/6<br>34"-84" C1 SANDY LOAM 2.5Y5/4<br>84"-118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |
| DATE: JULY 31, 2014 | | | | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | | | | |
| INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH | | | | |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-6 ELEV=167.7' | DTH-7 ELEV=166.8' | DTH-8 ELEV=168.2' | DTH-9 ELEV=163.0' | DTH-10 ELEV=160.75' |
|---|---|---|---|---|
| 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-26" Bw FINE SANDY LOAM 10YR5/6<br>26"-64" C1 SANDY LOAM 2.5Y5/3<br>64"-122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-32" Bw FINE SANDY LOAM 10YR5/6<br>32"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-26" FILL<br>26"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-78" C1 SANDY LOAM 2.5Y5/4<br>78"-108" C2 LOAMY SAND 2.5Y5/3<br>108"-126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-46" Bc SANDY LOAM 2.5Y5/4<br>46"-98" C1 SANDY LOAM 2.5Y5/3<br>98"-118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>NO REFUSAL<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"-15" Ap FINE SANDY LOAM 10YR3/3<br>15"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-66" C1 LOAMY SAND 2.5Y5/3<br>66"-112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT-2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT-3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT-4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT-5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT-6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

| DTH-11 ELEV=166.0' | DTH-12 ELEV=168.2' |
|---|---|
| 0"-18" FILL<br>18"-30" Ap FINE SANDY LOAM 10YR3/3<br>30"-36" Bw FINE SANDY LOAM 10YR5/6<br>36"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"-54" FILL<br>58"-82" C1 SANDY LOAM 2.5Y4/4<br>82"-114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |
| DATE: AUGUST 21, 2014 | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | |
| INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH | |

## APPROXIMATE EARTHWORK CALCULATIONS:

TOTAL FILL= 4,571 C.Y.
TOTAL CUT= 106 C.Y.

NET EARTHWORK= 4,465 C.Y. (FILL)

EARTHWORK ACTIVITIES EXEMPTED BY BYLAW

INFILTRATION SYSTEM – 38 CUBIC YARDS (CUT)
GENERAL EARTHWORK – 68 CUBIC YARDS (CUT)
FOUNDATION BUILDING A – 286 CUBIC YARDS (FILL)
FOUNDATION BUILDING B – 1,380 CUBIC YARDS (FILL)
EXISTING HOUSE – 274 CUBIC YARDS (FILL)
DRIVEWAY – 740 CUBIC YARDS (FILL)
PROPOSED SEPTIC SYSTEM – 788 CUBIC YARDS (FILL)

EARTHWORK ACTIVITIES SUBJECT TO BYLAW

GENERAL EARTHWORK – 1,103 CUBIC YARDS (FILL)

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 4 10 20 ( METERS ) 30

## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

# PROPOSED GRADING PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626-0063*
*FAX: (508)875-6440*

| SHEET 2 OF 5 | | DATE: SEPTEMBER 6, 2017 |
|---|---|---|
| CALC'D BY: BTN | FIELD BK: 621 | CAD FILE: PROP_SITE_3_R7.dwg |
| DRAFTER: BTN | PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

**CREATIVE LAND & WATER ENGINEERING, LLC**
Environmental Scientist and Engineers
**Mailing address**
P.O. Box 584
Southborough, MA 01772
**Technical Office**
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CLWEL@CREATIVE-Land-Water-Eng.com
WWW.CREATIVE-Land-Water-Eng.com
Effective, Affordable, and Sustainable Solutions for Land & Water Environment

February 28, 2018
Revised March 1, 2018
2nd Revision May 7. 2018

**Slug Test and Groundwater Mounding Analysis Report**
**24 School Street, Wayland, MA**

A 12-unit 40B residential development is under review with Wayland ZBA and Wayland Conservation Commission. The project will use an on-site wastewater septic system and stormwater subsurface infiltration. The project will generate a daily design flow of 2860 gpd to the septic system under Title 5 310 CMR15.00. The Town expressed concern about the possible mutual impact between the stormwater infiltration system and the septic system. At public hearings and in their staff review comments, Wayland Conservation Commission requested that the applicant provide a detailed groundwater mounding analysis to assess and mitigate the mounding impact if any for septic leaching field and the stormwater subsurface infiltration area. This report provides the mounding analysis and supporting field testing data. Our goals are as follows:

1. Analyze the groundwater mounding distribution under both systems using reasonable and conservative parameters based on in-situ hydrogeological evaluation and testing.
2. Recommend modifications for the siting of the septic and stormwater systems if needed to avoid any impact to each system and to the environment.

The work includes field evaluation of the underlying aquifer and soil hydraulic conductivity; computer modeling of the groundwater mounding height and distribution in space and in time for design sewage flow and up to 100-year stormwater runoff recharge events. This analysis is updated to address the comments dated March 9, 2018 and to incorporate the recommendations from the working phone conference with the Town Consultant Nover-Armstrong Associates, Inc. (NAA). The results are presented in the following.

## Hydrogeological Evaluation

On December 4, 2017, three borings were sunk to monitor the water table and to conduct slug tests to determine the hydraulic conductivity of soil under the proposed septic leaching field and the stormwater infiltration area. On January 10, 2018 staff of Creative Land & Water Engineering, LLC performed slug tests in three monitoring wells, namely MW1 to MW3, to collect hydraulic conductivity data. The drilling and well and soil logs are attached for reference. The locations of drilling and monitoring wells are presented in the attached monitoring well plan.

Technical Drilling Services, Inc. drilled and installed the three wells using hollow stemmed auger mounted on a track ATV. See Figure 1 for location of the wells. In general, the diameter of the boring measures 6 inches, and the wells 2 inches. Bedrock or refusal was encountered from 15 feet to 25 feet. The soils are very sandy outwash material, except at the bottom of MW 3, where finer till material was observed. Details of the well profile are attached to the end of the report[1]. The NRCS soil map showed the site has Hinckley loam and Narragansett silt loam soil, which are rated as hydrological group A soils, very permeable soils. This is consistent with our onsite evaluation. See attached NRCS soil report for reference. The water tables in the three monitoring wells was monitored and presented in Table 1. On March 12, 2018, the site had the highest ground water table, which is consistent with soil evaluation information or higher than soil mottling at Well 3. We will use data from this testing for our mounding analysis. Given the topography, the aquifer bottom would be more likely as presented at MW 1. As MW 3 is located in the stormwater infiltration area, the shallower aquifer depth at MW 3 at the limit of drilling is also used for the mounding analysis for stormwater infiltration area as a conservative checking.

Table 1. Water Table Monitoring

| Monitoring well | Top of case, ft | Top of well, ft | Bottom of well | Ground elev., ft | Depth to water from TOW, ft | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 12/4/2017 | 1/10/2018 | 1/29/2018 | 2/9/2018 | 3/12/2018 |
| MW 1 | 170.18 | 169.97 | 142.7 | 167.7 | 11.9 | 14.12 | 11.81 | 12.02 | 9.77 |
| MW 2 | 166.13 | 165.69 | 146.2 | 164.2 | 9.57 | 11.12 | 9.67 | 9.8 | 8.65 |
| MW 3 | 165.08 | 164.91 | 148.1 | 163.1 | 6.76 | 8.85 | 6.07 | 6.19 | 4.77 |

| Monitoring well | Top of case, ft | Top of well, ft | Bottom of well | Ground elev., ft | Water Table Elev, ft | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 12/4/2017 | 1/10/2018 | 1/29/2018 | 2/9/2018 | 3/12/2018 |
| MW 1 | 170.18 | 169.97 | 142.7 | 167.7 | 158.07 | 155.85 | 158.16 | 157.95 | 160.2 |
| MW 2 | 166.13 | 165.69 | 146.2 | 164.2 | 156.12 | 154.57 | 156.02 | 155.89 | 157.04 |
| MW 3 | 165.08 | 164.91 | 148.1 | 163.1 | 158.15 | 156.06 | 158.84 | 158.72 | 160.14 |

| Monitoring well | Top of case, ft | Top of well, ft | Bottom of well | Ground elev., ft | Depth to water from GS, ft | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 12/4/2017 | 1/10/2018 | 1/29/2018 | 2/9/2018 | 3/12/2018 |
| MW 1 | 170.18 | 169.97 | 142.7 | 167.7 | 9.63 | 11.85 | 9.54 | 9.75 | 7.5 |
| MW 2 | 166.13 | 165.69 | 146.2 | 164.2 | 8.08 | 9.63 | 8.18 | 8.31 | 7.16 |
| MW 3 | 165.08 | 164.91 | 148.1 | 163.1 | 4.95 | 7.04 | 4.26 | 4.38 | 2.96 |

The monitored groundwater table is also compared with the soil evaluation results based on soil morphology by Metrowest Engineering (MWE). The comparison is presented in Table 1a, which shows that the water table measured on March 12, 2018 will be more conservative to use for the

[1] Based on the drill log, it appears that some large boulders or refusal were hit at MW 2 and MW 3 prior to each the bedrock.

mounding analysis.

Table 1a. Soil Evaluation Estimated High Groundwater - MetroWest v.s. MW measurements

| Test Pit | GSE, ft | EHGW | Location | Measured from MW | | Used for Mounding |
|---|---|---|---|---|---|---|
| DTH-1 | 165.7 | 159.87 | CN SAS | | | |
| DTH-2 | 165.9 | 159.23 | CS SAS | (MW1+ MW2)/2 | 158.62 | 160 |
| DTH-3 | 161.7 | 154.87 | CW SAS | | | |
| DTH-4 | 164.1 | <154 | Center STM Infil | | | |
| DTH-5 | 162.6 | 156.6 | NW STM infil | MW 3 | 160.14 | 160.14 |
| DTH-6 | 167.7 | 161.87 | NE SAS | MW 1 | 160.2 | |
| DTH-7 | 166.8 | <157.3 | NE SAS | | | |
| DTH-8 | 168.2 | 161.53 | SE SAS | | | |
| DTH-9 | 163 | 157.8 | NW SAS | MW 2 | 157.04 | |
| DTH-10 | 160.75 | 155.08 | SW off SAS | | | |
| DTH-11 | 166 | 161 | E off STM Infil | | | |
| DTH-12 | 168.2 | 161 | SE off SAS | | | |

There was no significant precipitation three days prior to the testing of hydraulic conductivity, to allow relative stable water table. A level TROLL was used to log data following standard test method ASTM 4044. In general, the following procedures were followed:

- Measure the initial water table;
- Slowly submerge the level TROLL until at least 1 foot below the water surface;
- Wait 5-10 minutes for the water level to stable; and
- Start logging, quickly drop into the well a metal rod or about 300 ml of water.

The data were then analyzed using the method presented in ASTM D5912 (Bouwer and Rice method). The data and detailed calculation sheets are in the Appendix. Table 2 is a summary of the results.

Table 2. Slug test summary

| | *Well Profile* | | | | *Slug used* | *Hydraulic Conductivity (ft/s)* |
|---|---|---|---|---|---|---|
| | *Depth to bottom (ft)* | *Depth to Water Table (ft)* | *Depth of Aquifer (ft)* | *Length of Screen (ft)* | | |
| *MW 1* | 25 | 14.12 | 13.15 | 20 | Metal | $3.01 \times 10^{-4}$ |
| *MW 2* | 18 | 11.12 | 8.37 | 15 | Metal | $3.60 \times 10^{-4}$ |
| *MW 3** | 15 | 8.85 | 7.96 | 10 | Metal | $7.54 \times 10^{-5}$ |

Note Only the screened length under water was used for analysis. *MW3 might be impacted by the limited drilling depth.
Soil logs at each monitoring well is presented in the attachment for reference.

**Groundwater Mounding Analysis**

Given that the onsite septic system has a daily design flow of 2860 gpd, per 310 CMR 15.202 (4) (g) and as required by the Town Board of Health and Conservation Commission, we calculated the groundwater mounding heights for the septic system leaching field (SAS area) in accordance with DEP technical guidance. A Hydrogeocycle Computer model using Hantush (1967) method was used to analyze the ground water mounding height and distribution under the SAS area and stormwater management infiltration area. Given that MA DEP requires 3 day dewatering of stormwater detention and infiltration area, we calculated the maximum and residual groundwater mounding heights 100-year storm events for the stormwater infiltration system. The goals of the analysis are

1) to show the bottom of SAS area will have at least 4 feet groundwater separation from the mounded groundwater table;

2) to show that the stormwater infiltration system will meet the DEP stormwater guidelines for the hydrogeological requirements under the following conditions:

    1. The stormwater infiltration shall have a minimum of 2 ft groundwater separation from the existing high groundwater
    2. The system will dewater in less than 72 hours (3 days) for up to 100-year storm events (i.e. the 3-day residual mounding height will be less than 2 ft). The maximum height is only a reference and does not need to be considered as it will be temporally stored in the infiltration chambers.
    3. As the 100-year storm is the worst condition, it would be adequate for smaller storm condition if the infiltration storage chambers can be dewatered in less than 3 days for a 100-year storm checked, i.e. below the bottom of the infiltration galley.
    4. If the above requirement has been met, the design for stormwater management is considered to satisfy the DEP stormwater management guidelines for the hydrogeological requirements.

The saturated aquifer parameters based on the boring and testing and the results of the analyses are presented in Tables 3 and detailed in the attached printouts. As we also know, the real mounding heights would be even smaller as we used the lowest hydraulic conductivity value tested and assumed that the water table is flat. Under a sloped water table condition, groundwater mounding would be lowered.

The updated groundwater mounding analysis renders the following conclusions:

1. The maximum mounding height under the SAS area is 0.27 ft and the extension of impact to the stormwater infiltration area will be about 0.12 ft while the impact of the stormwater infiltration mounding on the SAS will be very little 0.04 ft.

2. The stormwater infiltration will be dewatered in 3 days for up to 100year storm. For 2-year storm event, all runoff will be recharged. For 100-year storm, some water will be bypassed through overflow to prevent surcharge breakout.

**3.** Under 100-year storm condition, groundwater mounding would go above the proposed grade without adequate storage and overflow provided. As the observed high ground water table in this area is at 160.14 ft, therefore, the infiltration system bottom has been raised approximately 3 ft from 159 ft to 162.25 ft and spread over in a larger area to reduce the surcharge. The stormwater infiltration area is revised to 52 ft by 32 ft. The effective mounding height and 3-day residual mounding height was recalculated using the new dimensions as 2.95 ft and 1.75 ft under the worst assumption, respectively.

**4.** As we discussed above, the aquifer bottom would be likely as at the upgradient monitoring well MW 1. The more conservative shallower aquifer bottom is also used to confirm the mounding impact in the stormwater infiltration area. Both cases showed that the stormwater infiltration area will have 3-day residual mounding height less than 2 ft of the required groundwater separation in the DEP Stormwater Management guidelines for up to a 100-year storm event. Other grading and access way have been revised to reflect the new mounding height. See Table 3 for detailed information.

Table 3. Summary of Updated Mounding Analysis

| Parameters | 100-year Storm | | Wastewater |
|---|---|---|---|
| Recharge area | Infiltration-Norm | Infiltration-cons | SAS |
| Dimension, ft | 32x52 | 32x52 | 86 x 72 |
| Area, sq. ft | 1664 | 1664 | 6192 |
| Recharge Vol. Cu ft (per day or event) | 4344 | 4344 | 358.24 |
| Duration, day | 1 | 1 | 90 |
| Recharge rate, cu ft/day/sq. ft | 2.61 | 2.61 | 0.0579 |
| Dewater time, day | 3 | 3 | 90 |
| GW Separation, ft | 2.11 | 2.11 | 4 |
| Maximum mounding height, ft | 5.18 | 6.17 | 0.27 |
| **Estimated effective Max MH, ft** | **2.748** | **2.946** | **0.31** |
| **Impact mounding height by other systems, ft** | **0.12** | **0.12** | 0.04 |
| **Combined Mound height, ft** | **5.3** | **6.29** | **0.31** |
| 3-day residual height, ft | 1.24 | 1.75 | |
| 5-day residual height, ft | **0.65** | **0.93** | |
| Estimated effective 3d MH, ft | **1.24** | **1.75** | |
| Estimated effective 5d MH, ft | **0.65** | **0.93** | **0.24** |
| Bottom of stones, ft | **162.25** | **162.25** | **163.25 to 166** |
| Top of stones, ft | | | |
| EHGW, ft | **160.14** | **160.14** | **156.12 to 158.16 160** |
| Bottom aquifer, ft | **142.7** | **148.1** | **142.7** |
| 3 day elevation, ft | **158.25** | **160.22** | |
| Flood routing elev, ft | **162.888** | **163.09** | |
| Top of grade, ft | 167 | 167 | |
| Aquafer depth, ft | 17.44 | 12.04 | 17.3 |

**Summary and Conclusions**

1. Three boring holes were drilled and monitoring wells installed for collection of aquifer and soil data.
2. Saturated hydraulic conductivity was tested in each well.
3. Using the collected soil and water table data, the groundwater mounding under the SAS area and the infiltration area were analyzed.
4. The mounding analysis shows that the SAS area is adequately sized with adequate groundwater separation above the mounded groundwater for proper treatment.
5. The stormwater infiltration area was raised about 3 ft with a recharge area of 32 ft wide by 52 ft long. The infiltration area will have a dewatering time less than 72 hours (about 59 hours) that meets the DEP stormwater dewatering requirement of 72 hours.

If you have any questions regarding this study, please feel free to contact us.

Sincerely,

Creative Land & Water Engineering, LLC
by:


Desheng Wang, Ph.D., P.E.
Hydrogeological Engineer and,
Wetland Scientist

# Soil Log

Project #: J315-5 Project: Windsor Place
Date: 12/4/2017 Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc. Drilling Method: Hallow Stem Auger

**Boring: 1** MW 1

| Depth, ft | Soil texture | Note | Blow count |
|---|---|---|---|
| 0 | gravelly sand | | |
| 5 | | | |
| 7 | gravelly Loamy sand | | 60 for 2" |
| 10 | f. m. sand | | 45-28-40-41 |
| 12 | | | |
| | | water at 10' | 11-23-31-49 |
| 15 | fine m. sand | | |
| 17 | | | |
| 20 | fine silty sand | | 12-60/3" |
| 22 | | | |
| 25 | | | 60/2" |
| 25.33 | refusal | | |

# Soil Log

Project #: J315-5
Date: 12/4/2017

Project: Windsor Place
Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc.

Drilling Method: Hallow Stem Auger

**Boring: 2** MW 2

| Depth, ft | Soil texture | Note | Blow count |
|---|---|---|---|
| 0 | loam | | |
| 2 | | | |
| 5 | m. gr. Sand | | |
| | | water at 8' | |
| 10 | f. m. sand | | 18-37-38-42 |
| 12 | | | |
| 15 | fine m. sand | | |
| 17 | fine silty sand | | |
| 18 | refusal | | 60/2" |

# Soil Log

Project #: J315-5 Project: Windsor Place
Date: 12/4/2017 Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc. Drilling Method: Hallow Stem Auger

## Boring: 3 MW 3

| Depth, ft | Soil texture | Note | Blow count |
|---|---|---|---|
| 0 | loam | | |
| 2 | | | |
| 5 | fine m sand | | |
| | | water at 5' | |
| 10 | f. sil sand | | 29-21-28-27 |
| 12 | | | |
| 15 | refusal | | |

# MONITORING WELL PROFILE

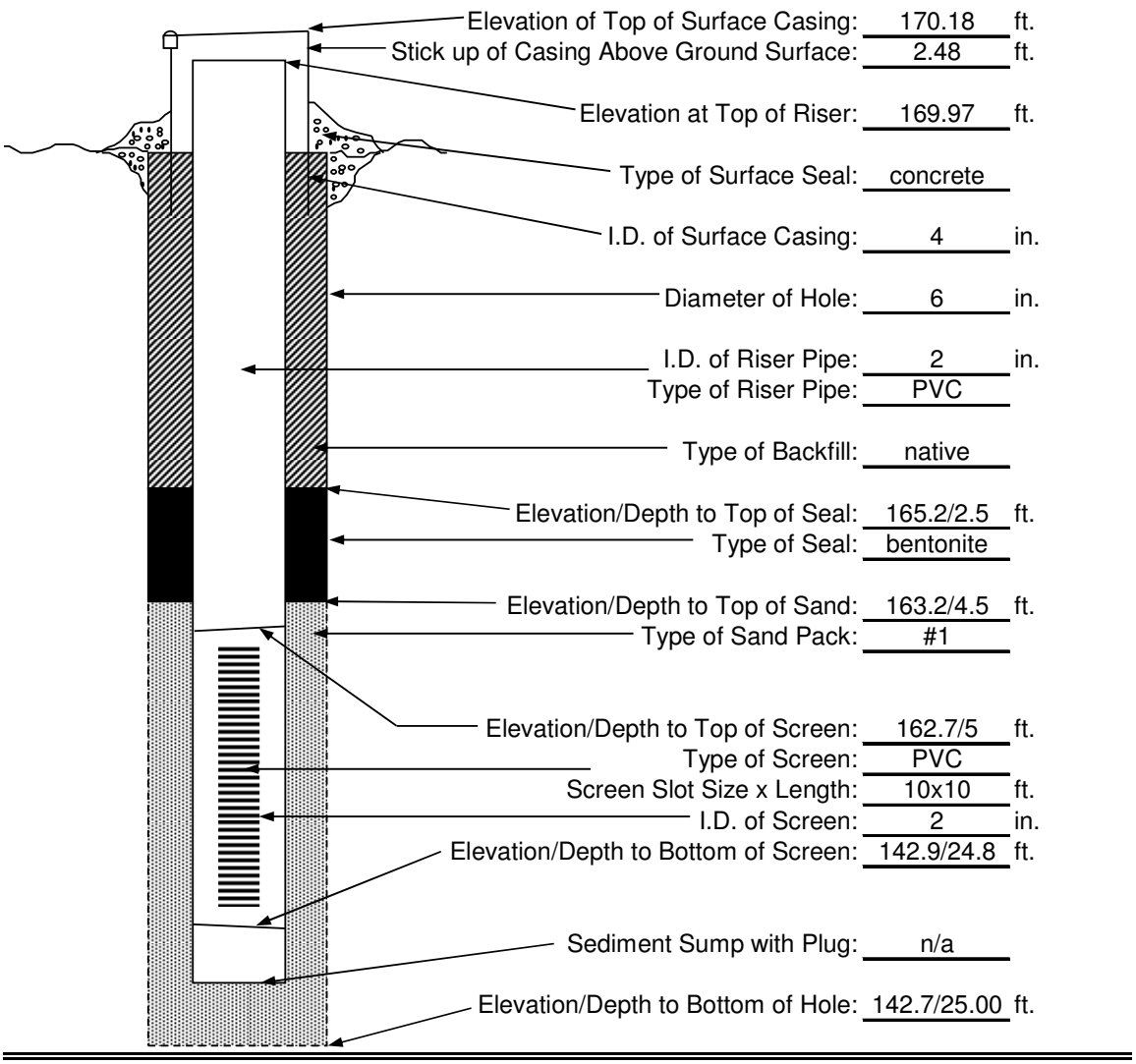
Project #: J315-5
Date: 12/4/2017

Project: Windsor Place
Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc.

Drilling Method: Hallow Stem Auger

**Boring: 1**



# MONITORING WELL PROFILE

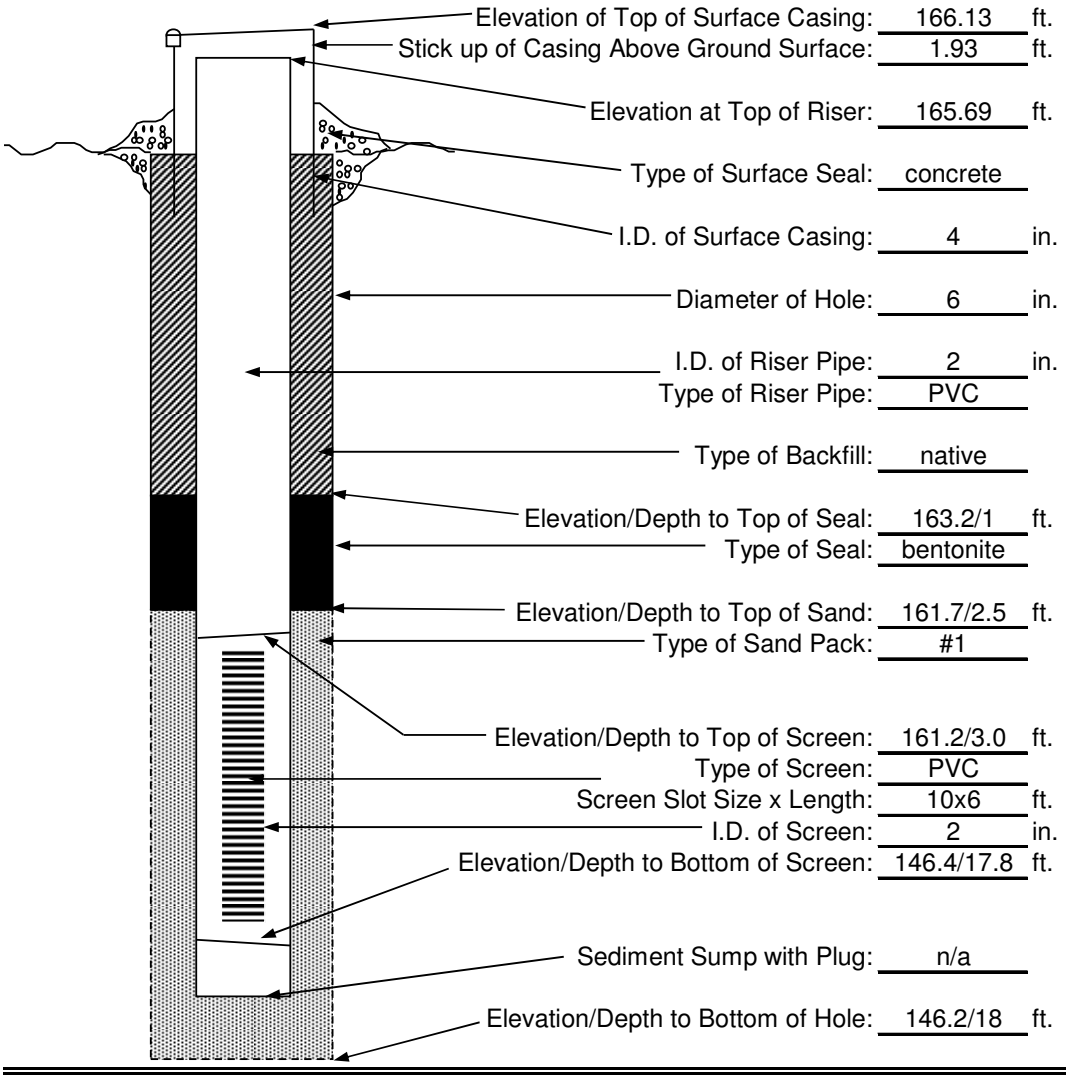
Project #: J315-5
Date: 12/4/2017

Project: Windsor Place
Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc.

Drilling Method: Hallow Stem Auger

**Boring: 2**



Elevation of Top of Surface Casing: 166.13 ft.
Stick up of Casing Above Ground Surface: 1.93 ft.
Elevation at Top of Riser: 165.69 ft.
Type of Surface Seal: concrete
I.D. of Surface Casing: 4 in.
Diameter of Hole: 6 in.
I.D. of Riser Pipe: 2 in.
Type of Riser Pipe: PVC
Type of Backfill: native
Elevation/Depth to Top of Seal: 163.2/1 ft.
Type of Seal: bentonite
Elevation/Depth to Top of Sand: 161.7/2.5 ft.
Type of Sand Pack: #1
Elevation/Depth to Top of Screen: 161.2/3.0 ft.
Type of Screen: PVC
Screen Slot Size x Length: 10x6 ft.
I.D. of Screen: 2 in.
Elevation/Depth to Bottom of Screen: 146.4/17.8 ft.
Sediment Sump with Plug: n/a
Elevation/Depth to Bottom of Hole: 146.2/18 ft.

# MONITORING WELL PROFILE

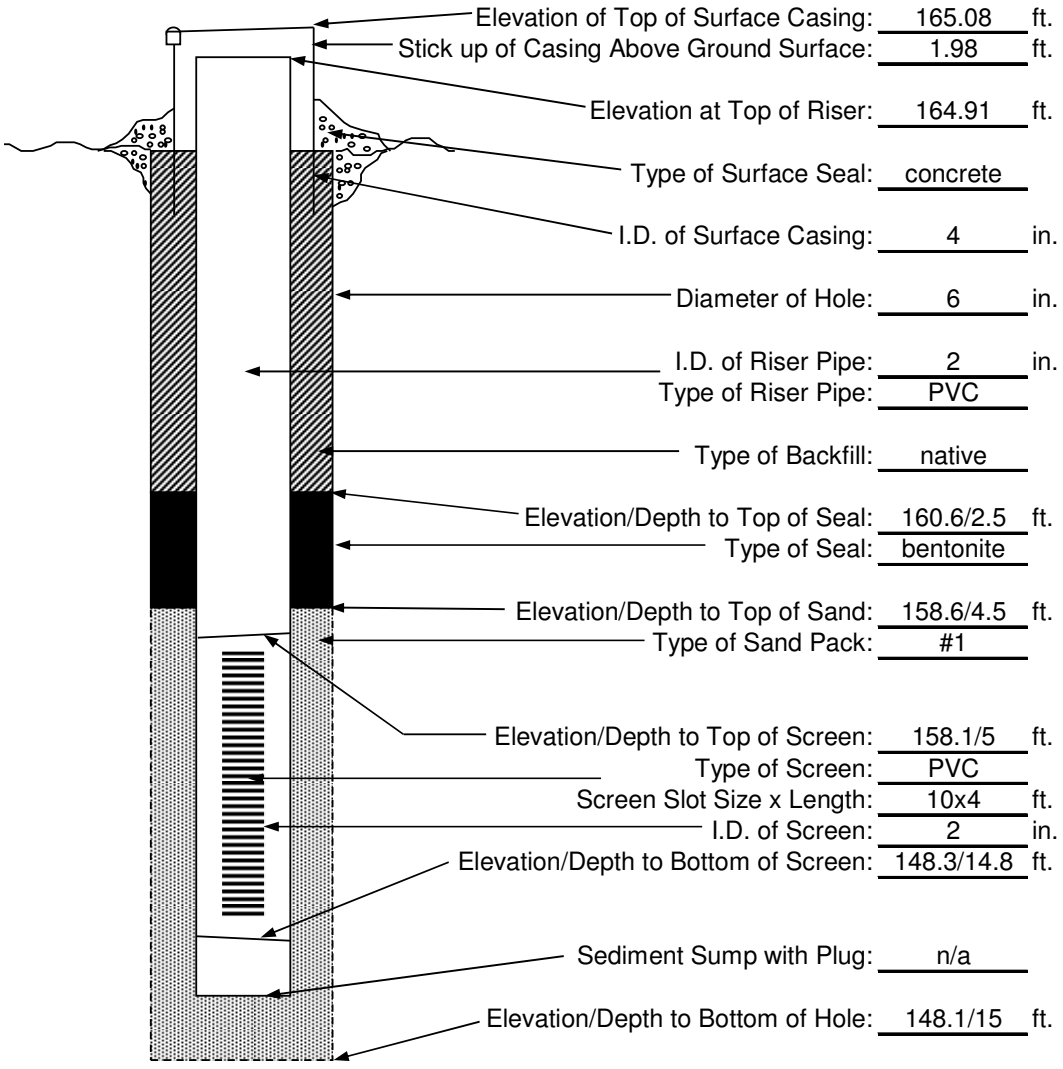
Project #: J315-5
Date: 12/4/2017

Project: Windsor Place
Location: 24 School Street, Wayland, MA

Driller: T & K Drilling, Inc.

Drilling Method: Hallow Stem Auger

**Boring: 3**



**Calculation Sheet for Hydraulic Conductivity using Bouwer & Rice 1976 Method**

**MW 1 (B1)**

Site: 24 School Street, Wayland, MA

Date: 1/10/2018

Performed by: wjc Checked by: dsw 2/5/2018

$K = r_c^2 \ln(Re/R)/(2Le)\ (1/t)\ \ln(H0/Ht)$

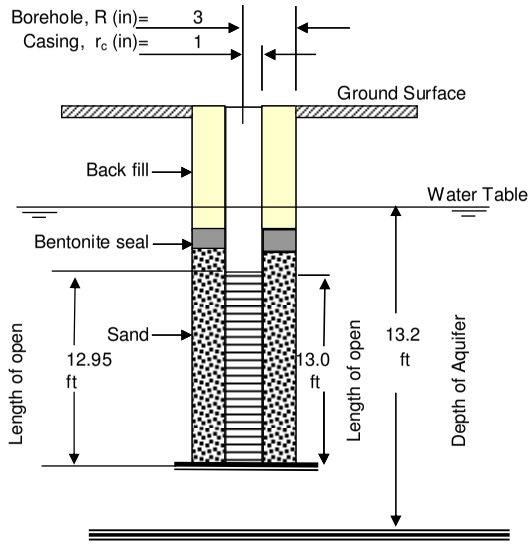
$r_c = [(1-n)r_a^2 + n\ R^2]^{0.5}$

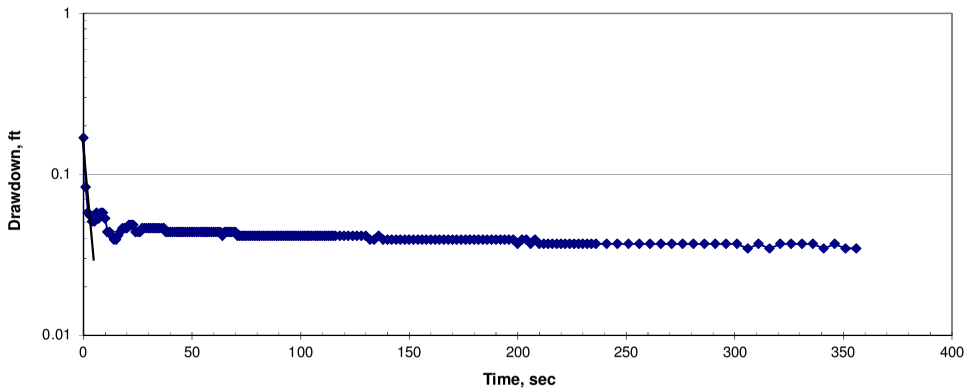
where,

| | |
|---|---|
| n is the short-term specific yield of the filter pack= | 0.2 |
| $r_a$ is uncorrected well casing radius= | 0.083 ft |
| R is borehole radius= | 0.25 ft |
| Ls is the total length of well screen = | 12.95 ft |
| Le is length of open aquifer = | 12.95 ft |
| Lw is depth of aquifer= | 13.15 ft |
| Re is the effective radial distance over which head is dissipated | |
| $r_c$ is corrected casing radius = | 0.083 ft |
| Le/R = | 51.8 |
| *Dimensionless number, C= | 2.75 |
| $\ln(Re/R)=(1.1/\ln(Lw/R)+C/(Le/R))^{-1}$ = | 3.02 |
| t1= | 0 sec |
| t2= | 3 sec |
| H1= | 0.1684 ft |
| H2= | 0.05537 ft |
| $(1/t)\ln(H0/Ht) = (1/(t2-t1)\ln(H1/H2)$= | 0.3708 |

**Hydraulic Conductivity, K= 3.01E-04 ft/s**

25.97 ft/day




References:


1. Applied Hydrogeology, C.W. Fetter, 3rd Edition.
2. ASTM Standard Test Method for (Analytical Procedure) Determining Hydraulic Conductivity of an Unconfined Aquifer by Overdamped Well Response to Instantaneous Change in Head (Slug), D5912-96
3. ASTM Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers, D4044-96

**Calculation Sheet for Hydraulic Conductivity using Bouwer & Rice 1976 Method**

**MW 2 (B2)**

Site: 24 School Street, Wayland, MA

Date: 1/10/2018

Performed by: wjc Checked by: dsw 2/5/2018

$K = r_c^2 \ln(Re/R)/(2Le)\ (1/t)\ \ln(H0/Ht)$

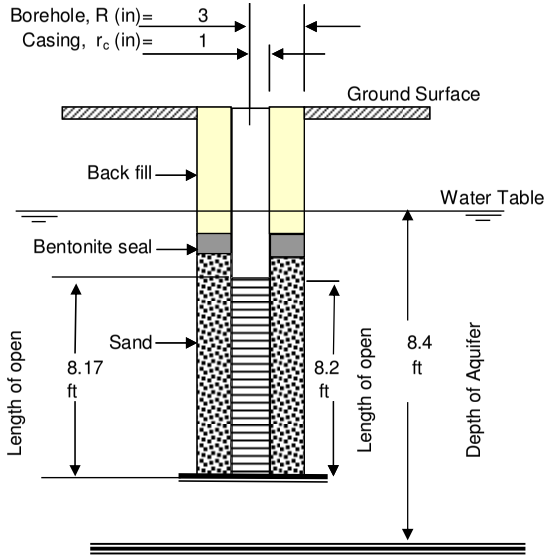
$r_c = [(1-n)r_a^2 + n\ R^2]^{0.5}$

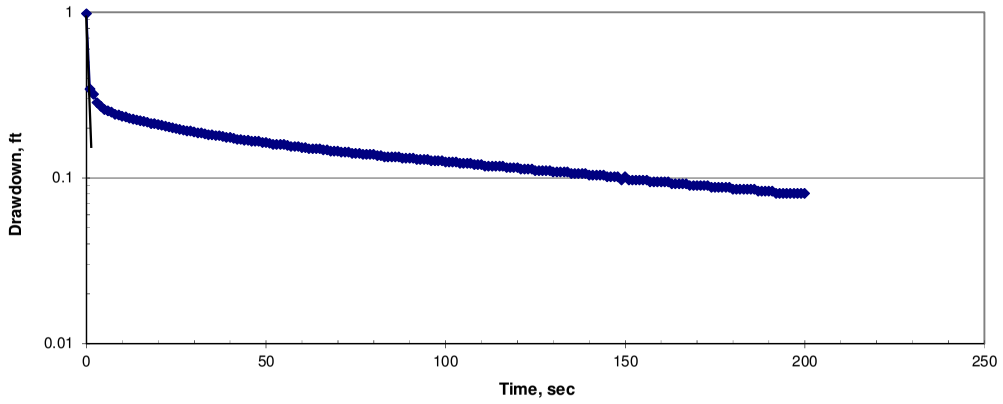
where,

| | | |
|---|---|---|
| n is the short-term specific yield of the filter pack= | 0.2 | |
| $r_a$ is uncorrected well casing radius= | 0.083 | ft |
| R is borehole radius= | 0.25 | ft |
| Ls is the total length of well screen = | 8.17 | ft |
| Le is length of open aquifer = | 8.17 | ft |
| Lw is depth of aquifer= | 8.37 | ft |
| Re is the effective radial distance over which head is dissipated | | |
| $r_c$ is corrected casing radius = | 0.083 | ft |
| Le/R = | 32.68 | |
| *Dimensionless number, C= | 2.18 | |
| $\ln(Re/R)=(1.1/\ln(Lw/R)+C/(Le/R))^{-1}$ = | 2.63 | |
| t1= | 0 | sec |
| t2= | 4 | sec |
| H1= | 0.978 | ft |
| H2= | 0.27 | ft |
| (1/t)ln(H0/Ht) = (1/(t2-t1)ln(H1/H2)= | 0.3218 | |

**Hydraulic Conductivity, K= 3.60E-04 ft/s**

31.09 ft/day




References: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3. ASTM Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers, D4044-96

**Calculation Sheet for Hydraulic Conductivity using Bouwer & Rice 1976 Method**

**MW 3 (B3)**

Site: 24 School Street, Wayland, MA

Date: 1/10/2018

Performed by: wjc Checked by: dsw 2/5/2018

$K = r^2_c \ln(Re/R)/(2Le)\ (1/t)\ \ln(H0/Ht)$

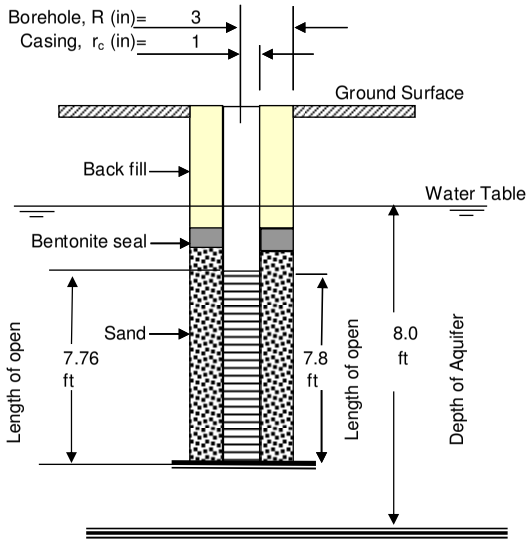
$r_c = [(1-n)r_a^2 + n\ R^2]^{0.5}$

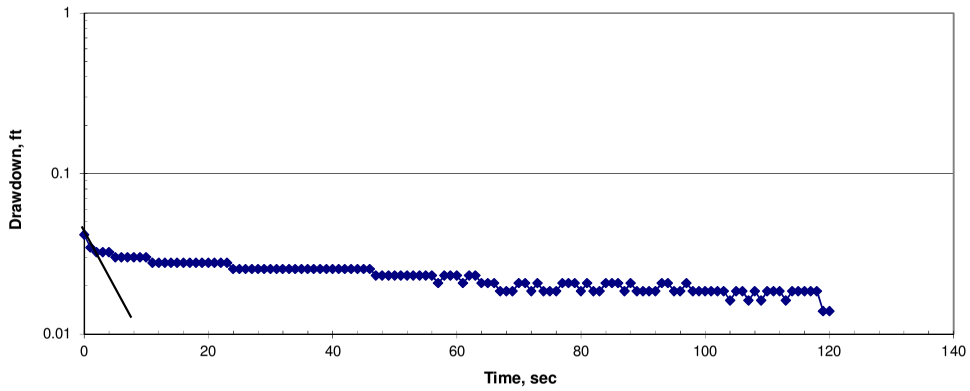
where,

| | | |
|---|---|---|
| n is the short-term specific yield of the filter pack= | 0.2 | |
| $r_a$ is uncorrected well casing radius= | 0.083 | ft |
| R is borehole radius= | 0.25 | ft |
| Ls is the total length of well screen = | 7.76 | ft |
| Le is length of open aquifer = | 7.76 | ft |
| Lw is depth of aquifer= | 7.96 | ft |
| Re is the effective radial distance over which head is dissipated | | |
| $r_c$ is corrected casing radius = | 0.083 | ft |
| Le/R = | 31.04 | |
| *Dimensionless number, C= | 2.13 | |
| $\ln(Re/R)=(1.1/\ln(Lw/R)+C/(Le/R))^{-1}$ = | 2.59 | |
| t1= | 0 | sec |
| t2= | 5 | sec |
| H1= | 0.041526 | ft |
| H2= | 0.02999 | ft |
| (1/t)ln(H0/Ht) = (1/(t2-t1)ln(H1/H2)= | 0.0651 | |

**Hydraulic Conductivity, K= 7.54E-05 ft/s**

6.51 ft/day

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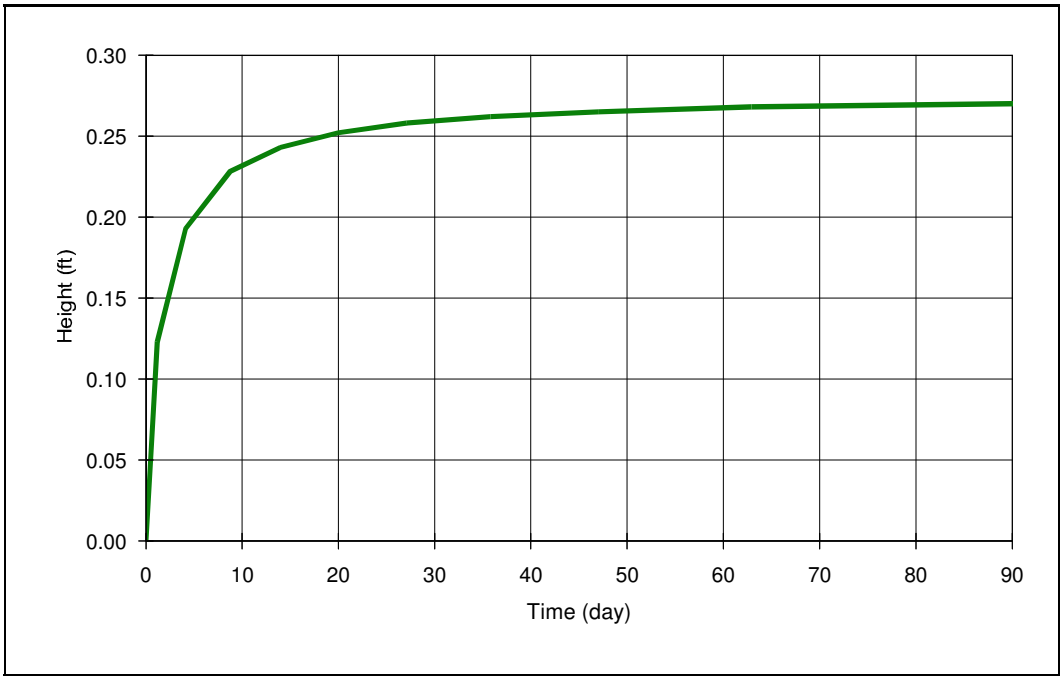
3. ASTM Standard Test Method for (Field Procedure) for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers, D4044-96

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School Street - SAS

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 9:52:19 PM

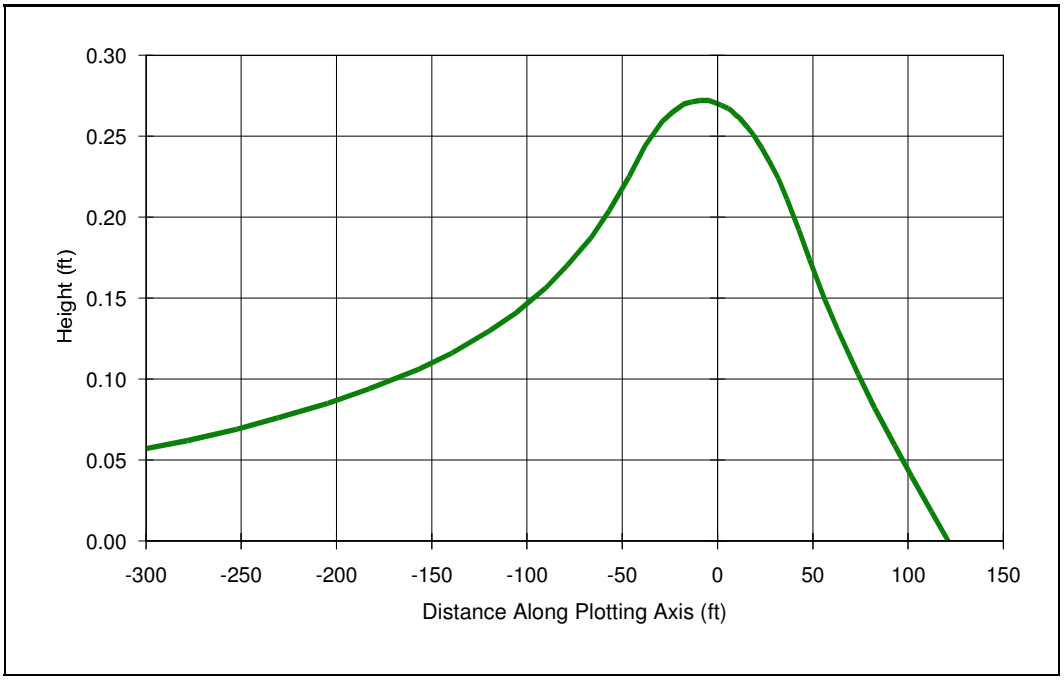
INPUT PARAMETERS

Application rate: 0.0579 c.ft/day/sq. ft
Duration of application: 90 day
Total simulation time: 90 day
Fillable porosity: 0.26
Hydraulic conductivity: 25.97 ft/day
Initial saturated thickness: 17.3 ft
Length of application area: 86 ft
Width of application area: 72 ft
Constant head boundary used at: 121 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 32266.51 cft

MODEL RESULTS

| Time (day) | Mound Height (ft) |
|---|---|
| 0 | 0 |
| 1 | 0.12 |
| 4 | 0.19 |
| 9 | 0.23 |
| 14 | 0.24 |
| 20 | 0.25 |
| 27 | 0.26 |
| 36 | 0.26 |
| 47 | 0.26 |
| 63 | 0.27 |
| 90 | 0.27 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School Street - SAS

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 9:53:18 PM

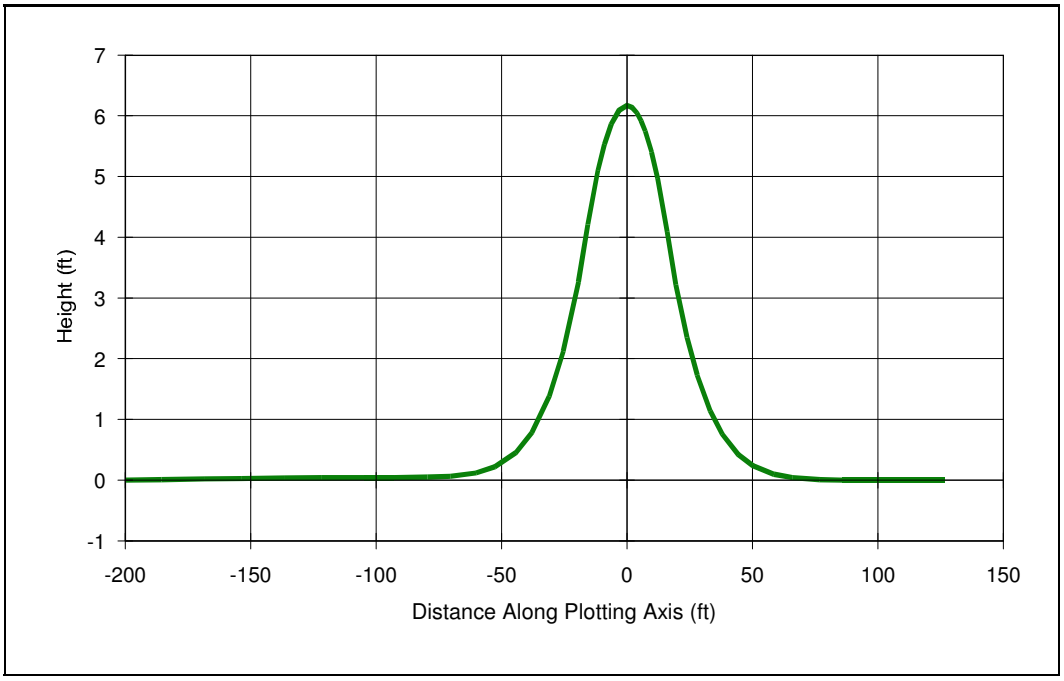
INPUT PARAMETERS

Application rate: 0.0579 c.ft/day/sq. ft
Duration of application: 90 days
Fillable porosity: 0.26
Hydraulic conductivity: 25.97 ft/day
Initial saturated thickness: 17.3 ft
Length of application area: 86 ft
Width of application area: 72 ft
Constant head boundary used at: 121 ft
Plotting axis from Y-Axis: 0 degrees
Edge of recharge area:
positive X: 0 ft
positive Y: 43 ft
Total volume applied: 32266.51 c.ft

MODEL RESULTS

| X (ft) | Y (ft) | Plot Axis (ft) | Mound Height (ft) |
|---|---|---|---|
| 0 | -300 | -300 | 0.06 |
| 0 | -252.3 | -252 | 0.07 |
| 0 | -204.6 | -205 | 0.08 |
| 0 | -156.9 | -157 | 0.11 |
| 0 | -119.4 | -119 | 0.13 |
| 0 | -90.3 | -90 | 0.16 |
| 0 | -66.5 | -67 | 0.19 |
| 0 | -46.5 | -46 | 0.22 |
| 0 | -29.1 | -29 | 0.26 |
| 0 | -17.4 | -17 | 0.27 |
| 0 | -9.4 | -9 | 0.27 |
| 0 | 0 | 0 | 0.27 |
| 0 | 3.8 | 4 | 0.27 |
| 0 | 7 | 7 | 0.27 |
| 0 | 11.7 | 12 | 0.26 |
| 0 | 18.7 | 19 | 0.25 |
| 0 | 26.8 | 27 | 0.24 |
| 0 | 36.4 | 36 | 0.21 |
| 0 | 48.1 | 48 | 0.17 |
| 0 | 63.3 | 63 | 0.13 |
| 0 | 82.5 | 83 | 0.08 |
| 0 | 101.8 | 102 | 0.04 |
| 0 | 121 | 121 | 0 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 10:04:54 PM

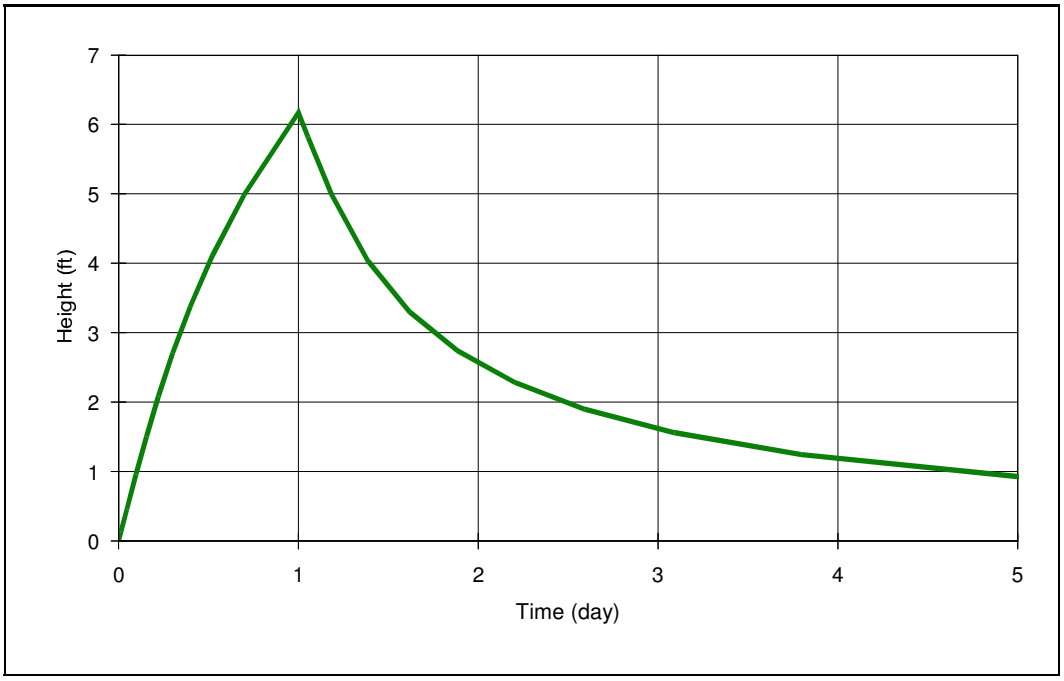
INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 days
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Plotting axis from Y-Axis: 90 degrees
Edge of recharge area:
positive X: 16 ft
positive Y: 0 ft
Total volume applied: 4343.04 c.ft

MODEL RESULTS

| X (ft) | Y (ft) | Plot Axis (ft) | Mound Height (ft) |
|---|---|---|---|
| -200 | 0 | -200 | 0 |
| -168.2 | 0 | -168 | 0.02 |
| -136.4 | 0 | -136 | 0.04 |
| -104.6 | 0 | -105 | 0.04 |
| -79.6 | 0 | -80 | 0.05 |
| -60.2 | 0 | -60 | 0.12 |
| -44.4 | 0 | -44 | 0.45 |
| -31 | 0 | -31 | 1.38 |
| -19.4 | 0 | -19 | 3.26 |
| -11.6 | 0 | -12 | 5.1 |
| -6.3 | 0 | -6 | 5.86 |
| 0 | 0 | 0 | 6.17 |
| 4 | 0 | 4 | 6.04 |
| 7.3 | 0 | 7 | 5.75 |
| 12.2 | 0 | 12 | 4.97 |
| 19.5 | 0 | 20 | 3.22 |
| 27.9 | 0 | 28 | 1.73 |
| 37.9 | 0 | 38 | 0.76 |
| 50.1 | 0 | 50 | 0.24 |
| 65.9 | 0 | 66 | 0.04 |
| 85.9 | 0 | 86 | 0 |
| 106 | 0 | 106 | 0 |
| 126 | 0 | 126 | 0 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 10:10:24 PM

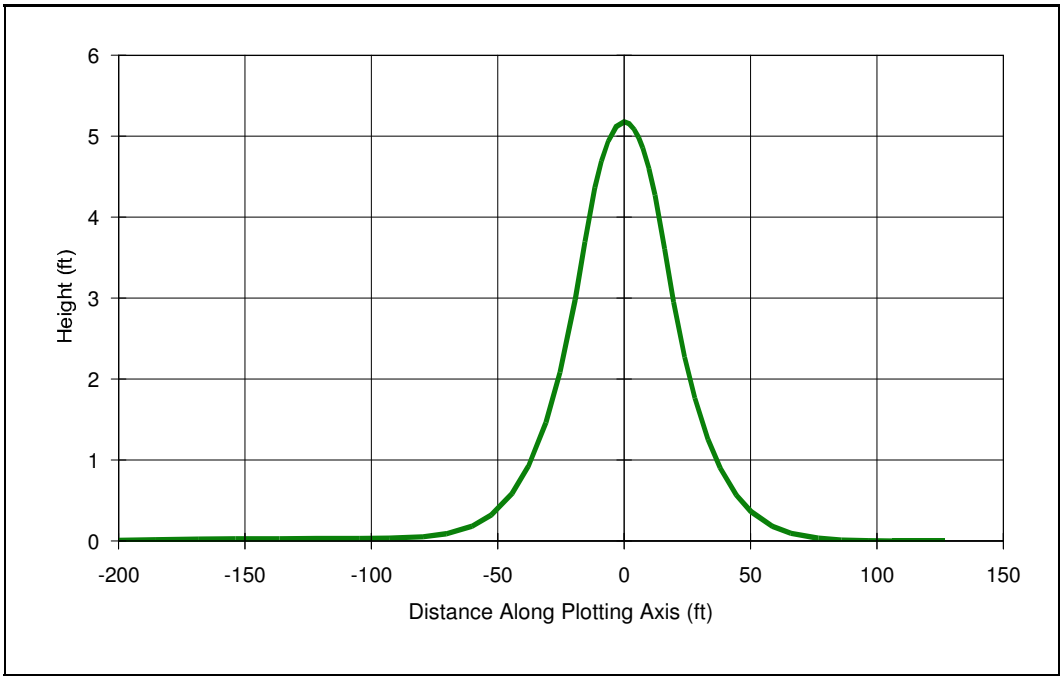
INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 4343.04 cft

MODEL RESULTS

| Time (day) | Mound Height (ft) |
|---|---|
| 0 | 0 |
| 0 | 0.13 |
| 0 | 0.46 |
| 0.1 | 0.96 |
| 0.2 | 1.51 |
| 0.2 | 2.08 |
| 0.3 | 2.7 |
| 0.4 | 3.37 |
| 0.5 | 4.12 |
| 0.7 | 4.99 |
| 1 | 6.17 |
| 1.1 | 5.82 |
| 1.2 | 5 |
| 1.4 | 4.03 |
| 1.6 | 3.3 |
| 1.9 | 2.74 |
| 2.2 | 2.28 |
| 2.6 | 1.9 |
| 3.1 | 1.56 |
| 3.8 | 1.25 |
| 5 | 0.93 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2 DX

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 10:14:43 PM

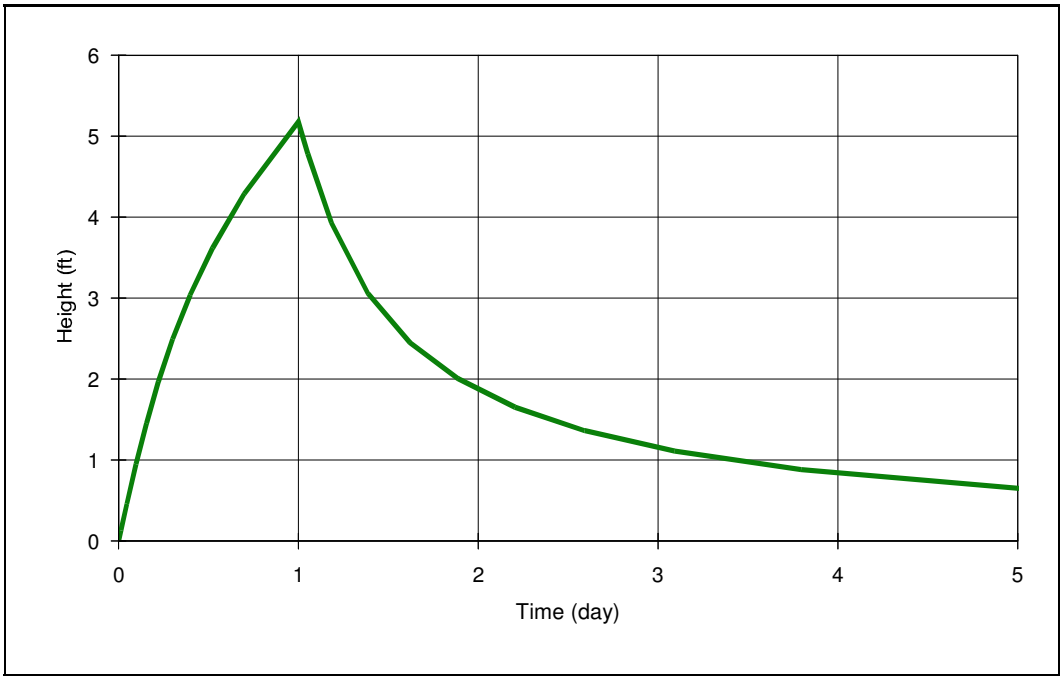
INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 days
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 17.44 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Plotting axis from Y-Axis: 90 degrees
Edge of recharge area:
positive X: 16 ft
positive Y: 0 ft
Total volume applied: 4343.04 c.ft

MODEL RESULTS

| X (ft) | Y (ft) | Plot Axis (ft) | Mound Height (ft) |
|---|---|---|---|
| -200 | 0 | -200 | 0.01 |
| -168.2 | 0 | -168 | 0.02 |
| -136.4 | 0 | -136 | 0.03 |
| -104.6 | 0 | -105 | 0.03 |
| -79.6 | 0 | -80 | 0.05 |
| -60.2 | 0 | -60 | 0.18 |
| -44.4 | 0 | -44 | 0.59 |
| -31 | 0 | -31 | 1.46 |
| -19.4 | 0 | -19 | 2.98 |
| -11.6 | 0 | -12 | 4.37 |
| -6.3 | 0 | -6 | 4.94 |
| 0 | 0 | 0 | 5.18 |
| 4 | 0 | 4 | 5.08 |
| 7.3 | 0 | 7 | 4.86 |
| 12.2 | 0 | 12 | 4.27 |
| 19.5 | 0 | 20 | 2.95 |
| 27.9 | 0 | 28 | 1.76 |
| 37.9 | 0 | 38 | 0.9 |
| 50.1 | 0 | 50 | 0.36 |
| 65.9 | 0 | 66 | 0.1 |
| 85.9 | 0 | 86 | 0.01 |
| 106 | 0 | 106 | 0 |
| 126 | 0 | 126 | 0 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2 D

ANALYST: Desheng Wang

DATE: 5/6/2018 TIME: 10:15:22 PM

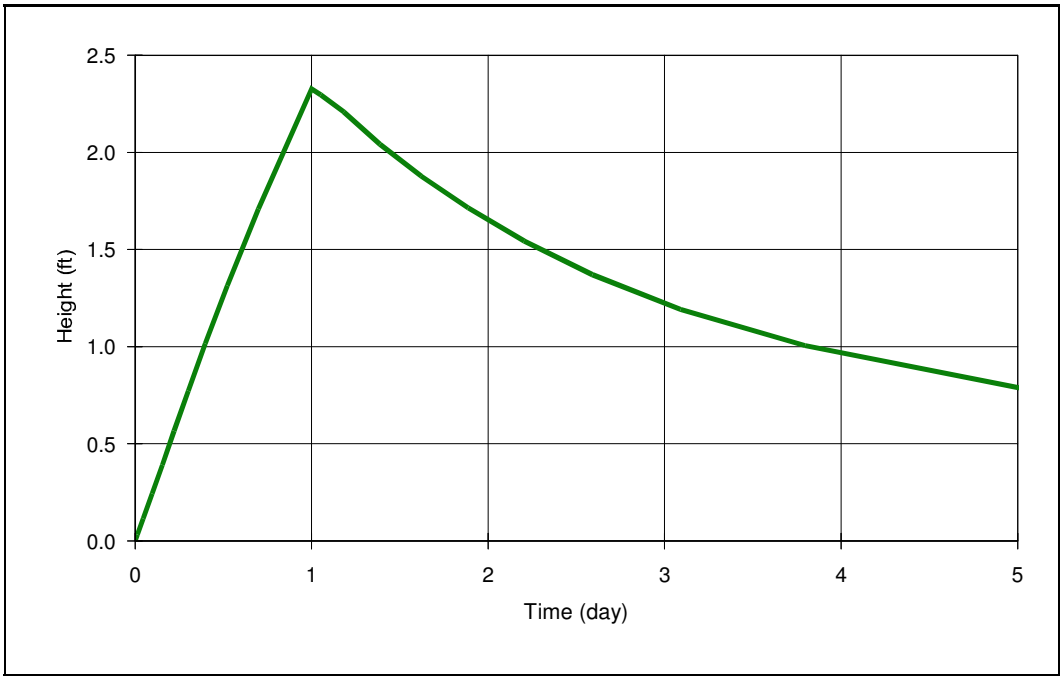
INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 17.44 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 4343.04 cft

MODEL RESULTS

| Time (day) | Mound Height (ft) |
|---|---|
| 0 | 0 |
| 0 | 0.13 |
| 0 | 0.46 |
| 0.1 | 0.95 |
| 0.2 | 1.45 |
| 0.2 | 1.97 |
| 0.3 | 2.5 |
| 0.4 | 3.04 |
| 0.5 | 3.62 |
| 0.7 | 4.29 |
| 1 | 5.18 |
| 1.1 | 4.78 |
| 1.2 | 3.93 |
| 1.4 | 3.05 |
| 1.6 | 2.45 |
| 1.9 | 2 |
| 2.2 | 1.65 |
| 2.6 | 1.36 |
| 3.1 | 1.11 |
| 3.8 | 0.88 |
| 5 | 0.65 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2

ANALYST: Desheng Wang

DATE: 5/7/2018 TIME: 11:57:08 AM

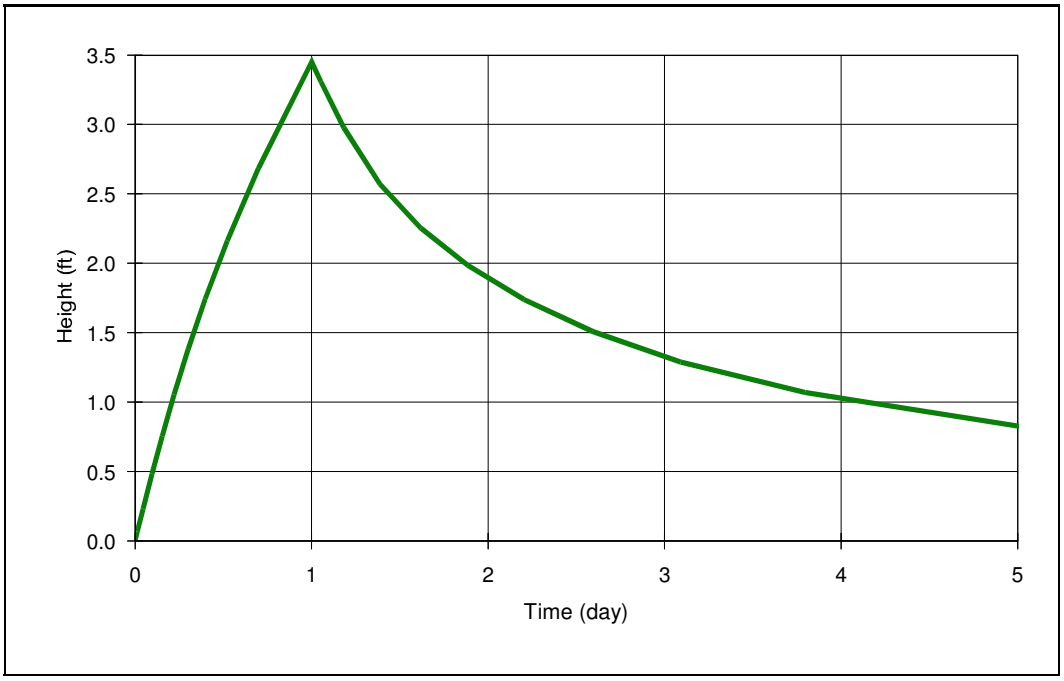
INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Groundwater mounding @
X coordinate: 15.99 ft at corner
Y coordinate: 25.99 ft
Total volume applied: 4343.04 cft

MODEL RESULTS

| Time (day) | Mound Height (ft) |
|---|---|
| 0 | 0 |
| 0 | 0.03 |
| 0 | 0.12 |
| 0.1 | 0.24 |
| 0.2 | 0.39 |
| 0.2 | 0.57 |
| 0.3 | 0.77 |
| 0.4 | 1.02 |
| 0.5 | 1.31 |
| 0.7 | 1.71 |
| 1 | 2.33 |
| 1.1 | 2.3 |
| 1.2 | 2.21 |
| 1.4 | 2.04 |
| 1.6 | 1.88 |
| 1.9 | 1.71 |
| 2.2 | 1.54 |
| 2.6 | 1.37 |
| 3.1 | 1.19 |
| 3.8 | 1 |
| 5 | 0.79 |

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)




COMPANY: CLAWE

PROJECT: 24 School St Wayland- STM 100yr -rev 2

ANALYST: Desheng Wang

DATE: 5/7/2018 TIME: 12:09:40 PM

INPUT PARAMETERS

Application rate: 2.61 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.26
Hydraulic conductivity: 6.51 ft/day
Initial saturated thickness: 12.04 ft
Length of application area: 52 ft
Width of application area: 32 ft
Constant head boundary used at: 126 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 25.99 ft at long axis edge
Total volume applied: 4343.04 cft

MODEL RESULTS

| Time (day) | Mound Height (ft) |
|---|---|
| 0 | 0 |
| 0 | 0.07 |
| 0 | 0.23 |
| 0.1 | 0.48 |
| 0.2 | 0.76 |
| 0.2 | 1.05 |
| 0.3 | 1.38 |
| 0.4 | 1.74 |
| 0.5 | 2.16 |
| 0.7 | 2.68 |
| 1 | 3.45 |
| 1.1 | 3.31 |
| 1.2 | 2.98 |
| 1.4 | 2.57 |
| 1.6 | 2.25 |
| 1.9 | 1.98 |
| 2.2 | 1.74 |
| 2.6 | 1.51 |
| 3.1 | 1.29 |
| 3.8 | 1.07 |
| 5 | 0.83 |

United States Department of Agriculture

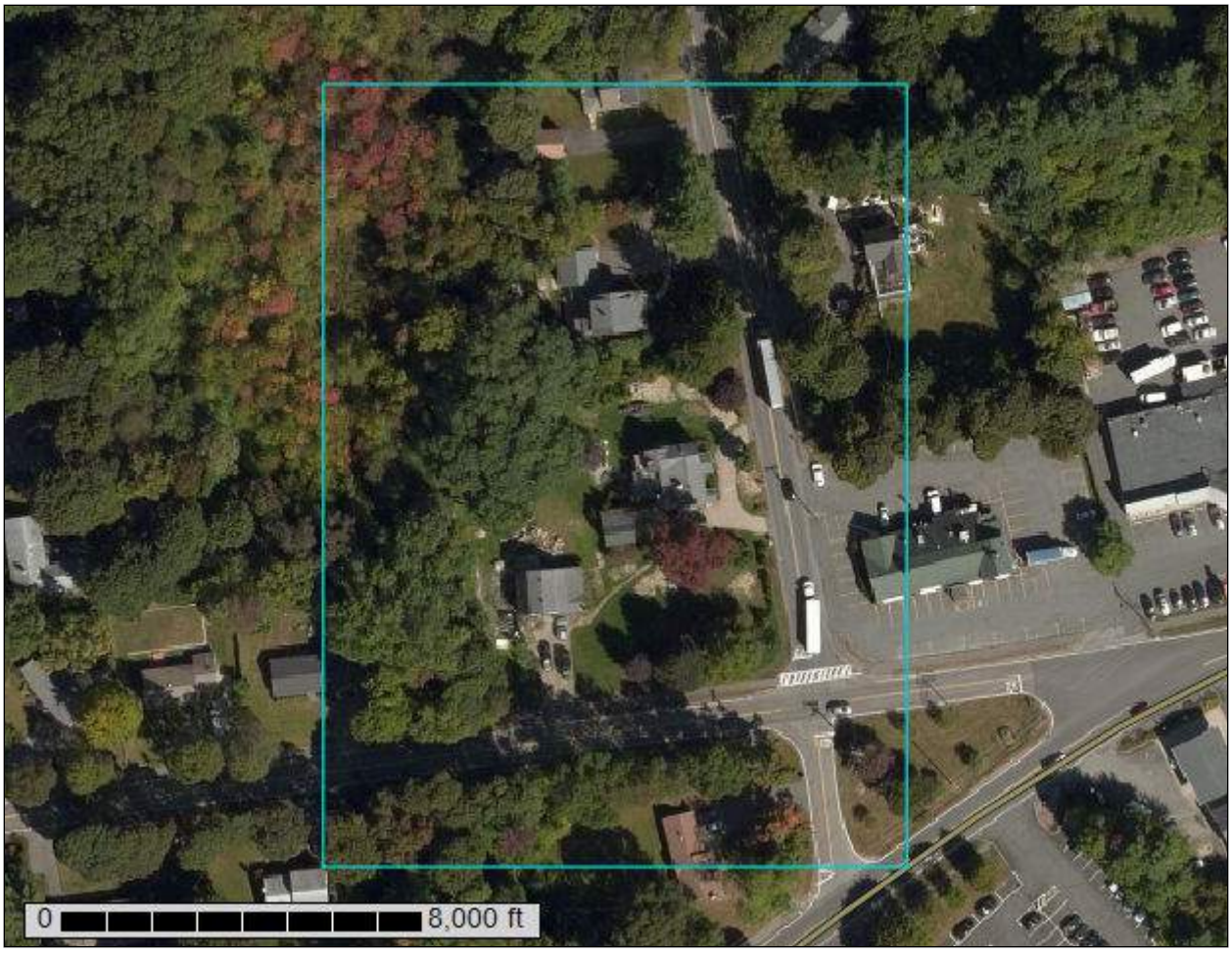
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for Middlesex County, Massachusetts

## 24 School Street, Wayland, MA




February 28, 2018

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# Contents

# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

# Custom Soil Resource Report
## Soil Map


Map Scale: 1:957 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

## MAP LEGEND

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

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 17, Oct 6, 2017

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 51A | Swansea muck, 0 to 1 percent slopes | 1.3 | 25.7% |
| 52A | Freetown muck, 0 to 1 percent slopes | 0.1 | 2.2% |
| 251B | Haven silt loam, 3 to 8 percent slopes | 0.1 | 1.3% |
| 253C | Hinckley loamy sand, 8 to 15 percent slopes | 0.9 | 18.9% |
| 415B | Narragansett silt loam, 3 to 8 percent slopes | 2.1 | 41.6% |
| 602 | Urban land | 0.2 | 4.1% |
| 624B | Haven-Urban land complex, 0 to 8 percent slopes | 0.3 | 6.0% |
| **Totals for Area of Interest** | | **5.0** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# Middlesex County, Massachusetts

## 51A—Swansea muck, 0 to 1 percent slopes

### Map Unit Setting

*National map unit symbol:* 2trl2
*Elevation:* 0 to 1,140 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* Farmland of unique importance

### Map Unit Composition

*Swansea and similar soils:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Swansea

#### Setting

*Landform:* Bogs, swamps
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

#### Typical profile

*Oa1 - 0 to 24 inches:* muck
*Oa2 - 24 to 34 inches:* muck
*Cg - 34 to 79 inches:* coarse sand

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Very poorly drained
*Runoff class:* Negligible
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 in/hr)
*Depth to water table:* About 0 to 6 inches
*Frequency of flooding:* Rare
*Frequency of ponding:* Frequent
*Available water storage in profile:* Very high (about 16.5 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 8w
*Hydrologic Soil Group:* B/D
*Hydric soil rating:* Yes

### Minor Components

#### Freetown

*Percent of map unit:* 10 percent
*Landform:* Bogs, swamps
*Landform position (three-dimensional):* Dip

*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Whitman**

*Percent of map unit:* 5 percent
*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Scarboro**

*Percent of map unit:* 5 percent
*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Base slope, tread, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

## 52A—Freetown muck, 0 to 1 percent slopes

**Map Unit Setting**

*National map unit symbol:* 2t2q9
*Elevation:* 0 to 1,110 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* Farmland of unique importance

**Map Unit Composition**

*Freetown and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Freetown**

**Setting**

*Landform:* Bogs, depressions, depressions, kettles, marshes, swamps
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Tread, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Highly decomposed organic material

**Typical profile**

*Oe - 0 to 2 inches:* mucky peat
*Oa - 2 to 79 inches:* muck

**Properties and qualities**

*Slope:* 0 to 1 percent
*Percent of area covered with surface fragments:* 0.0 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Very poorly drained
*Runoff class:* Negligible
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.14 to 14.17 in/hr)
*Depth to water table:* About 0 to 6 inches
*Frequency of flooding:* Rare
*Frequency of ponding:* Frequent
*Available water storage in profile:* Very high (about 19.2 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 5w
*Hydrologic Soil Group:* B/D
*Hydric soil rating:* Yes

**Minor Components**

**Swansea**

*Percent of map unit:* 5 percent
*Landform:* Bogs, depressions, depressions, kettles, marshes, swamps
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Tread, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Whitman**

*Percent of map unit:* 5 percent
*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Scarboro**

*Percent of map unit:* 5 percent
*Landform:* Depressions, drainageways
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Base slope, tread, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

## 251B—Haven silt loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 990d
*Elevation:* 100 to 1,000 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Haven and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Haven

#### Setting

*Landform:* Terraces, plains
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread, rise
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Friable loamy eolian deposits over loose sandy glaciofluvial deposits

#### Typical profile

*H1 - 0 to 2 inches:* silt loam
*H2 - 2 to 20 inches:* silt loam
*H3 - 20 to 32 inches:* very fine sandy loam
*H4 - 32 to 65 inches:* stratified coarse sand to sand to fine sand

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 18 to 36 inches to strongly contrasting textural stratification
*Natural drainage class:* Well drained
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Low (about 4.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

**Minor Components**

**Merrimac**

*Percent of map unit:* 9 percent
*Landform:* Terraces, plains
*Landform position (two-dimensional):* Shoulder
*Landform position (three-dimensional):* Tread, rise
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Scio**

*Percent of map unit:* 5 percent
*Landform:* Depressions, terraces
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* No

**Unnamed**

*Percent of map unit:* 1 percent

## 253C—Hinckley loamy sand, 8 to 15 percent slopes

**Map Unit Setting**

*National map unit symbol:* 2svm9
*Elevation:* 0 to 1,480 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Hinckley and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Hinckley**

**Setting**

*Landform:* Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
*Landform position (two-dimensional):* Shoulder, toeslope, footslope, backslope
*Landform position (three-dimensional):* Crest, head slope, nose slope, side slope, riser
*Down-slope shape:* Convex, concave, linear
*Across-slope shape:* Concave, linear, convex
*Parent material:* Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

**Typical profile**

*Oe - 0 to 1 inches:* moderately decomposed plant material
*A - 1 to 8 inches:* loamy sand
*Bw1 - 8 to 11 inches:* gravelly loamy sand
*Bw2 - 11 to 16 inches:* gravelly loamy sand
*BC - 16 to 19 inches:* very gravelly loamy sand
*C - 19 to 65 inches:* very gravelly sand

**Properties and qualities**

*Slope:* 8 to 15 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Excessively drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Salinity, maximum in profile:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water storage in profile:* Low (about 3.1 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 4e
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

**Minor Components**

**Merrimac**

*Percent of map unit:* 5 percent
*Landform:* Eskers, kames, outwash plains, outwash terraces, moraines
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope
*Landform position (three-dimensional):* Side slope, head slope, nose slope, crest, riser
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Windsor**

*Percent of map unit:* 5 percent
*Landform:* Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
*Landform position (two-dimensional):* Shoulder, backslope, footslope, toeslope
*Landform position (three-dimensional):* Nose slope, side slope, crest, head slope, riser
*Down-slope shape:* Convex, concave, linear
*Across-slope shape:* Concave, linear, convex
*Hydric soil rating:* No

**Sudbury**

*Percent of map unit:* 5 percent
*Landform:* Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
*Landform position (two-dimensional):* Backslope, footslope
*Landform position (three-dimensional):* Base slope, tread

*Down-slope shape:* Concave, linear
*Across-slope shape:* Linear, concave
*Hydric soil rating:* No

## 415B—Narragansett silt loam, 3 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* vqrp
*Elevation:* 0 to 1,000 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Narragansett and similar soils:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Narragansett

#### Setting

*Landform:* Ground moraines
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Friable loamy eolian deposits and/or friable silty eolian deposits over loose sandy glaciofluvial deposits derived from metamorphic rock and/or friable sandy basal till derived from metamorphic rock

#### Typical profile

*H1 - 0 to 2 inches:* slightly decomposed plant material
*H2 - 2 to 7 inches:* silt loam
*H3 - 7 to 35 inches:* silt loam
*H4 - 35 to 60 inches:* very gravelly loamy sand
*H5 - 60 to 65 inches:* very gravelly loamy sand

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 18 to 35 inches to strongly contrasting textural stratification
*Natural drainage class:* Well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Moderate (about 6.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

**Minor Components**

**Canton**

*Percent of map unit:* 10 percent
*Landform:* Hills
*Landform position (two-dimensional):* Backslope, toeslope
*Landform position (three-dimensional):* Side slope, base slope
*Down-slope shape:* Linear
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Haven**

*Percent of map unit:* 10 percent
*Landform:* Terraces, plains
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread, rise
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

## 602—Urban land

**Map Unit Setting**

*National map unit symbol:* 9950
*Elevation:* 0 to 3,000 feet
*Mean annual precipitation:* 32 to 50 inches
*Mean annual air temperature:* 45 to 50 degrees F
*Frost-free period:* 110 to 200 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Urban land:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Urban Land**

**Setting**

*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Excavated and filled land

**Minor Components**

**Rock outcrop**
*Percent of map unit:* 5 percent
*Landform:* Ledges
*Landform position (two-dimensional):* Summit
*Landform position (three-dimensional):* Head slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave

**Udorthents, wet substratum**
*Percent of map unit:* 5 percent
*Hydric soil rating:* No

**Udorthents, loamy**
*Percent of map unit:* 5 percent
*Hydric soil rating:* No

## 624B—Haven-Urban land complex, 0 to 8 percent slopes

**Map Unit Setting**
*National map unit symbol:* 9956
*Elevation:* 0 to 1,000 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**
*Haven and similar soils:* 40 percent
*Urban land:* 40 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Haven**

**Setting**
*Landform:* Terraces, plains
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread, rise
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Friable loamy eolian deposits over loose sandy glaciofluvial deposits

**Typical profile**
*H1 - 0 to 2 inches:* silt loam
*H2 - 2 to 20 inches:* silt loam
*H3 - 20 to 32 inches:* very fine sandy loam
*H4 - 32 to 65 inches:* stratified coarse sand to sand to fine sand

**Properties and qualities**

*Slope:* 0 to 8 percent
*Depth to restrictive feature:* 18 to 36 inches to strongly contrasting textural stratification
*Natural drainage class:* Well drained
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Low (about 4.3 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* A
*Hydric soil rating:* No

## Description of Urban Land

**Setting**

*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Parent material:* Excavated and filled land

## Minor Components

**Tisbury**

*Percent of map unit:* 10 percent
*Landform:* Terraces, plains
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Tread, dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* No

**Hinckley**

*Percent of map unit:* 5 percent
*Landform:* Eskers, ridges, terraces
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Merrimac**

*Percent of map unit:* 5 percent
*Landform:* Terraces, plains
*Landform position (two-dimensional):* Shoulder
*Landform position (three-dimensional):* Tread, rise
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

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# ***Revised Hydrologic Analysis:***
# *Proposed Site Redevelopment*
# *24 School Street*
# *Wayland, MA*

*Prepared for:* ***Windsor Place, LLC***
***73 Pelham Island Road***
***Wayland, MA 01778***

*Prepared by:* ***MetroWest Engineering, Inc.***
***75 Franklin Street***
***Framingham, MA 01702***
***(508) 626-0063***

***Original Submittal: September, 2017***
***Revised: May 2018***

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**Hydrologic Analysis (Revised May 2018)**
**Proposed Site Redevelopment**
**24 School Street, Wayland MA**

## Introduction

The project site is located on the northerly side of East Plain Street at the intersection of East Plain Street and School Street. The locus is shown on *Figure One: Locus Map, 24 School Street, Wayland MA.*

The subject parcel (Assessors' Map 52, Lot 189) has an area of 37,865 square feet (0.87 acres). The property is improved with a two-story house, a one-story barn, a detached garage, and a patio. The lot consists of mostly gravel, landscaped and lawn areas with moderate topographic relief across the site. The site slopes from higher elevations near School Street to the southwest with a maximum elevation differential on site of approximately ten-feet. A wetland is located west of the property and a portion of the lot falls within the 100' buffer zone.

According to the NRCS Soil Survey, the southerly portion of the lot consists of Narragansett Silt Loam (415B) soil series and are classified within hydrologic soil group A. Narragansett soils are a well drained glacial till that exhibit moderately high to high infiltration rates when saturated. The northerly portion of the site consists of Hinckley loamy sand soil group (253C). Hinckley soils are a very well-drained soil with good hydraulic conductivity. Runoff curve numbers for Hydrologic Soil Group B were used for the analysis based on soil conditions observed during field testing and the inconsistencies between hydrologic soil group and soil descriptions in the soil survey.

An on-site soil evaluation program consisting of twelve deep test holes was conducted on July 21 and August 21, 2014. DTH-1, 2, 3, 6, 7, 9, and 10 were all conducted on the north side of the lot. Results revealed the A horizon consisting of fine sandy loam at a depth of roughly 12 inches, the B horizon consisting of fine sandy loam to a depth of roughly 24 inches, with C horizons consisting of sandy loam at 60 inches and 120 inches respectively.

DTH-4 and 5 were conducted on the south side of the lot. DTH-4 had the A horizon at 28 inches, with the first 20 inches being fill. The B horizon consisted of fine sandy loam and had a depth of 40 inches. The C horizons consisted of sandy loam and were found at 86 and 116 inches respectively. DTH-5's A horizon consisting of fine sandy loam was found at 16 inches. The B horizon consisting of fine sandy loam was found at 34 inches. The C horizons consisting of sandy loam were found at 84 and 117 inches respectively.

DTH-11 and 12 were conducted on the east side of the lot. DTH-11 has fill to a depth 18 inches, with the A horizon of fine sandy loam at 30 inches, the B horizon of fine sandy loam at 36 inches, and the C horizons of sandy loam at 58 and 128 inches respectively. DTH-12 has fill to a depth of 54 inches, bypassing the A and B horizons, the C horizons of sandy loam were found at 82 and 114 inches respectively.

No refusal was observed in any of the test pits. Redoximorphic features were found in 10 of the 12 test pits at depths of 5 to 7 feet. The groundwater elevations varied from 155-feet to 162-feet.

The site redevelopment program includes the construction of two new multifamily dwellings, paved parking areas, storm water management system and supporting utilities. See site plans for details regarding the proposed development.

The property presently contains 8,780 square feet of impervious area. Redevelopment of the property will increase the amount of impervious area by adding 11,283 square feet for a total of 20,063 square feet.

**Drainage Approach**

There are presently no controls in place to manage stormwater runoff rates or volumes. Stormwater runoff drains to the west and south to abutting properties and into East Plain Street. The goal of the proposed stormwater management system is to reduce runoff rates and volumes for all design storms compared to the existing condition and to promote groundwater recharge using a subsurface infiltration system and a rain garden.

The proposed subsurface infiltration system will be located under the parking lot between the two structures. The system will consist of 84 precast concrete infiltration galleys surrounded by two feet of double washed, crushed stone. The infiltration system will collect runoff from Post-Development Basin 4, which consists of the parking area and a portion of the proposed roof structures. The proposed infiltration system is designed to completely contain and recharge runoff from storms up to the 10-year storm. The proposed rain garden will collect and store runoff from Post-Development Basin 3A which consists of the easterly portion of the roof of Building A and the surrounding lawn and landscaped areas. The storm water management system will significantly reduce runoff rates and volumes from the subject parcel for all storm events.

Overall reductions in runoff rates and volumes can be found in the Model Results section of this report and detailed hydrologic analysis and basin models can be found in Appendix A.

**Hydrologic Analysis**

A hydrologic analysis of the project has been performed to establish pre-development conditions, assess post-development impacts and evaluate the effectiveness of the proposed drainage infiltration systems. The analysis employs an SCS TR-55 hydrologic computer model and analyzes design storms with return periods of 2, 10, 25 and 100-years. An SCS Type 3 24-hour rainfall distribution pattern is used for the theoretical design storm. Time of concentration values were determined by the LAG Method or manually entered at five minutes for watersheds having relatively small areas or hydraulic lengths to allow for the use of a three-minute time interval for all hydrograph computations. Precipitation rates of 3.20, 4.73, 5.95 and 8.45-inches were used for the 2, 10, 25 and 100-year storm events respectively. Runoff curve numbers for Hydrologic Soil Group B were used for the analysis based on soil conditions observed during field

testing and the inconsistencies between hydrologic soil group and soil descriptions in the soil survey.

Existing Conditions

The existing conditions model analyzes the site as three drainage basins; Existing Conditions Basins One, Two, and Three.

Existing Conditions Basin 1 (E.C.B.-1) has an area of 15,276 square feet and flows in a southwesterly direction to Design Point A located at the west side of the property.

Existing Conditions Basin 2 (E.C.B.-2) has an area of 2,901 square feet and flows in a northeasterly direction to Design Point B located at the northeast side of the property.

Existing Conditions Basin 3 (E.C.B.-3) has an area of 19,688 square feet and flows in a southwesterly direction to Design Point C located at the southwest corner of the property.

The Existing Conditions Basins are shown on Figure Two, *Existing Conditions Watershed Delineation Plan* and information for all Existing Conditions Basins is listed on the plan and below.

*Existing Conditions Basin 1 (E.C.B.-1)*

Area = 15,276 square feet
Impervious Area = 2,205 square feet, curve number = 98.0
Lawn area (good condition) = 13,071 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 66.4
Basin slope = 5.2%
Hydraulic length = 189 feet
Time of concentration = 5.4 minutes (LAG Method)

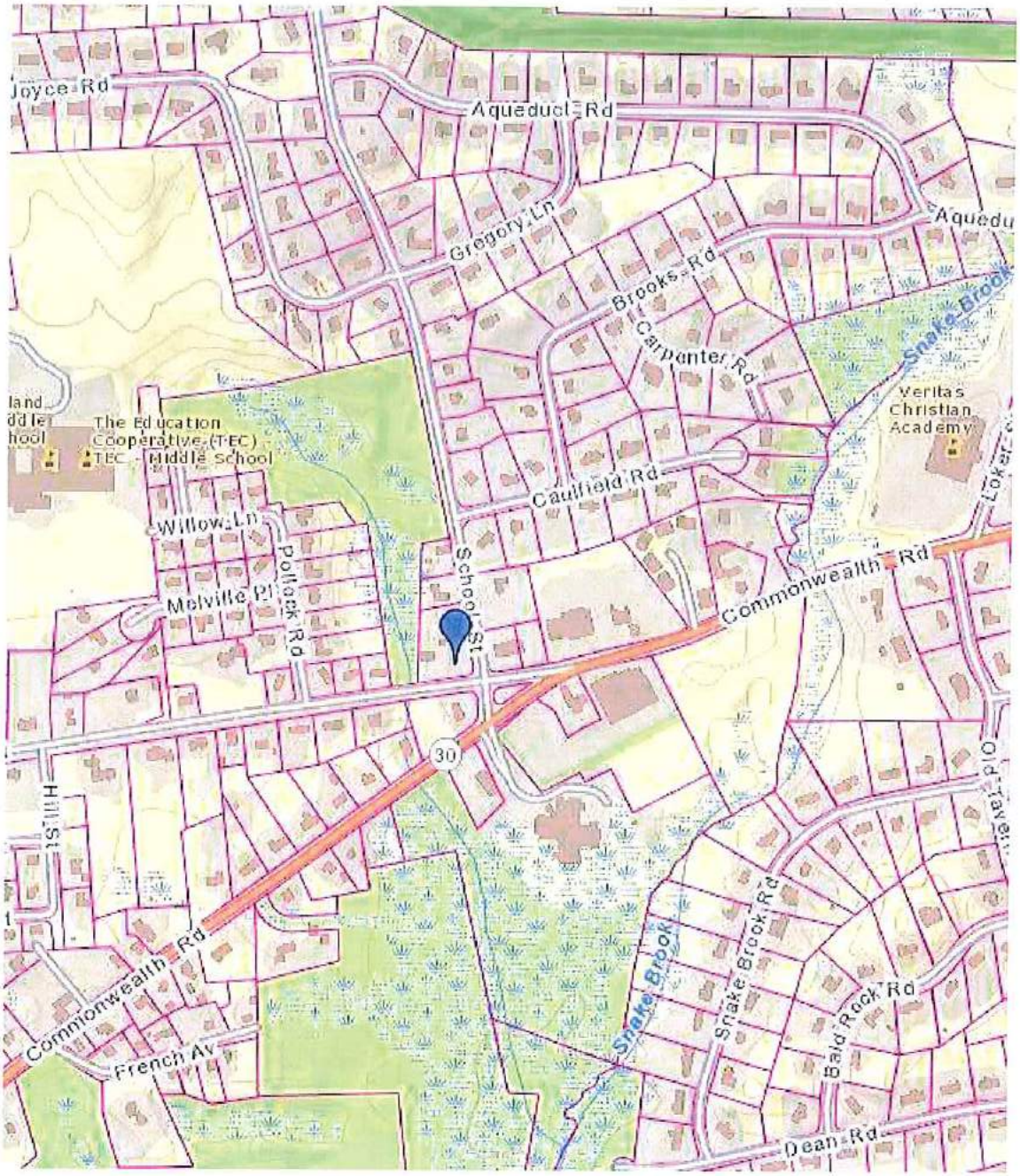
*Existing Conditions Basin 2 (E.C.B.-2)*

Area = 2,901 square feet
Impervious Area = 1,460 square feet, curve number = 98.0
Lawn area (good condition) = 1,440 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 79.8
Basin slope = 1.9%
Hydraulic length = 68 feet
Time of concentration = 5 minutes (Manually Entered)

*Existing Conditions Basin 3 (E.C.B.-3)*

Area = 19,688 square feet
Impervious Area = 5,115 square feet, curve number = 98.0
Lawn area (good condition) = 14,573 square feet, curve number = 61.0

**Figure One: Locus Map, 24 School Street, Wayland MA**



## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 31869, PAGE 55.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE- AND BELOW-GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT-INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN-MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB-SURFACE UTILITIES AND MAN-MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0526F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.)

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

## LEGEND

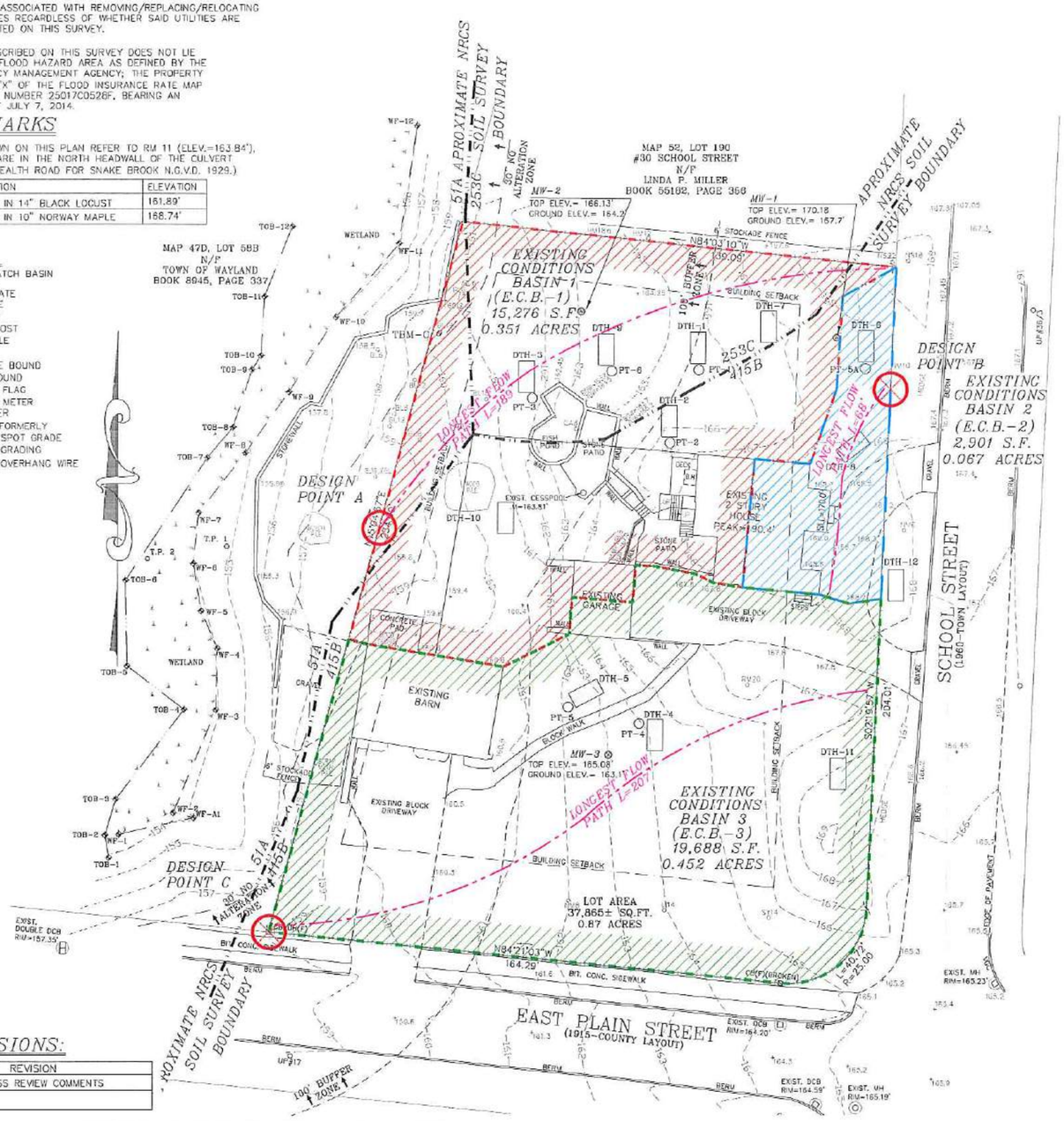
| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| MH | MANHOLE |
| WG | WATER GATE |
| GG | GAS GATE |
| HYD | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| +200.0 | EXISTING SPOT GRADE |
| 200 | EXISTING GRADING |
| | EXISTING OVERHANG WIRE |

## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL: TREE LOCATION; 0004; TREE CODE; TREE DIAMETER

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG-SAFE BEFORE YOU DIG 811.




## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 11/04/17 | ADDRESS REVIEW COMMENTS |
| | | |
| | | |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-1 ELEV=165.7' | DTH-2 ELEV=165.9' | DTH-3 ELEV=161.7' | DTH-4 ELEV=164.1' | DTH-5 ELEV=162.6' |
|---|---|---|---|---|
| 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-24" Bw FINE SANDY LOAM 10YR5/6<br>24"-62" C1 SANDY LOAM 2.5Y5/3<br>62"-126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"-22" Ap FINE SANDY LOAM 10YR3/3<br>22"-42" Bw FINE SANDY LOAM 10YR5/6<br>42"-96" C1 SANDY LOAM 2.5Y5/3<br>96"-118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-22" Bw FINE SANDY LOAM 10YR5/6<br>22"-84" C1 SANDY LOAM 2.5Y5/3<br>84"-110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @62" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"-20" FILL<br>20"-28" Ap FINE SANDY LOAM 10YR3/3<br>28"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-86" C1 SANDY LOAM 2.5Y5/4<br>86"-116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-34" Bw FINE SANDY LOAM 10YR5/6<br>34"-84" C1 SANDY LOAM 2.5Y5/4<br>84"-118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |
| DATE: JULY 31, 2014 | | | | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | | | | |
| INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH | | | | |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-6 ELEV=167.7' | DTH-7 ELEV=166.8' | DTH-8 ELEV=168.2' | DTH-9 ELEV=163.0' | DTH-10 ELEV=160.75' |
|---|---|---|---|---|
| 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-26" Bw FINE SANDY LOAM 10YR5/6<br>26"-64" C1 SANDY LOAM 2.5Y5/3<br>64"-122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-32" Bw FINE SANDY LOAM 10YR5/6<br>32"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-26" FILL<br>26"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-78" C1 SANDY LOAM 2.5Y5/4<br>78"-108" C2 LOAMY SAND 2.5Y5/3<br>108"-128" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-46" Bc SANDY LOAM 2.5Y5/4<br>46"-98" C1 SANDY LOAM 2.5Y5/3<br>98"-118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108'<br>WATER WEEPING @88"<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"-15" Ap FINE SANDY LOAM 10YR3/3<br>15"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-66" C1 LOAMY SAND 2.5Y5/3<br>66"-112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | WSP. |
|---|---|---|---|---|---|
| PT-1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT-2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT-3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT-4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT-5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | WSP. |
|---|---|---|---|---|---|
| PT-5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT-6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

| DTH-11 ELEV=166.0' | DTH-12 ELEV=168.2' |
|---|---|
| 0"-18" FILL<br>18"-30" Ap FINE SANDY LOAM 10YR3/3<br>30"-36" Bw FINE SANDY LOAM 10YR5/6<br>36"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-126" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"-54" FILL<br>54"-82" C1 SANDY LOAM 2.5Y4/4<br>82"-114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.6' |
| DATE: AUGUST 21, 2014 | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | |
| INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH | |

## USDA SOIL CLASSIFICATION

| SOIL NUMBER | SOIL SERIES | HYDROLOGIC SOIL GROUP |
|---|---|---|
| 51A | SWANSEA MUCK | B/D |
| 253C | HINCKLEY LOAMY SAND | A |
| 415B | NARRAGANSETT SILT LOAM | B |

HYDROLOCIC SOIL GROUP B USED FOR ANALSYIS

SOILS ON SITE ARE SANDY LOAM TEXTURES AND CLASSIFIED WITHIN HYDROLOGIC SOIL GROUP B.

## EXISTING CONDITIONS BASIN PROPERTIES:

### EXISTING CONDITIONS BASIN 1 (E.C.B.-1)

TOTAL BASIN AREA = 15,276 S.F. (0.351 ACRES)
HYDRAULIC LENGTH = 189 FEET
CHANGE IN ELEVATION = 9.8 FEET
BASIN SLOPE = 0.052 (5.2%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 2,205 S.F. (0.051 ACRES) | 98 | 0.051 | 5.000 |
| LAWN AREA (GOOD COND.) = 13,071 S.F. (0.300 ACRES) | 61 | 0.300 | 18.300 |
| | | SUM 0.351 | SUM 23.300 |

WEIGHTED CURVE NUMBER ($C_N$) = (23.300/0.351) = 66.4

### EXISTING CONDITIONS BASIN 2 (E.C.B.-2)

TOTAL BASIN AREA = 2,901 S.F. (0.067 ACRES)
HYDRAULIC LENGTH = 68 FEET
CHANGE IN ELEVATION = 1.3 FEET
BASIN SLOPE = 0.019 (1.9%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 1,460 S.F. (0.034 ACRES) | 98 | 0.034 | 3.332 |
| LAWN AREA (GOOD COND.) = 1,440 S.F. (0.033 ACRES) | 61 | 0.033 | 2.013 |
| | | SUM 0.067 | SUM 5.345 |

WEIGHTED CURVE NUMBER ($C_N$) = (5.345/0.067) = 79.8

### EXISTING CONDITIONS BASIN 3 (E.C.B.-3)

TOTAL BASIN AREA = 19,688 S.F. (0.452 ACRES)
HYDRAULIC LENGTH = 207 FEET
CHANGE IN ELEVATION = 8.8 FEET
BASIN SLOPE = 0.042 (4.2%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 5,115 S.F. (0.117 ACRES) | 98 | 0.117 | 11.466 |
| LAWN AREA (GOOD COND.) = 14,573 S.F. (0.334 ACRES) | 61 | 0.334 | 20.374 |
| | | SUM 0.452 | SUM 31.840 |

WEIGHTED CURVE NUMBER ($C_N$) = (31.840/0.452) = 70.4

EXISTING CONDITIONS - TOTAL IMPERVIOUS AREA = 8,780 S.F.
EXISTING CONDITIONS - TOTAL LAWN AREA = 29,085 S.F.

FOR METROWEST ENGINEERING, INC. DATE
ROBERT A. GEMMA, P.E.(CIVIL) # 31967
P.L.S. # 37046

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 5 10 20 ( METERS ) 30

# FIGURE TWO

## EXISTING CONDITIONS WATERSHED DELINEATION PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS

PREPARED FOR:
CHADWICK HOMES
73 PELHAM ISLAND ROAD
WAYLAND, MA 01778

PROPERTY OF:
LINDA C. KNOWLES &
GARY W. RIDGE
24 SCHOOL STREET
WAYLAND, MA 01778

ENGINEERS & SURVEYORS:
MWE
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
FRAMINGHAM, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440

| | | |
|---|---|---|
| SHEET 1 OF 1 | | DATE: DECEMBER 19, 2016 |
| CALC'D BY: RAG | FIELD BK: 821 | CAD FILE: EC_HYDRO_RI.dwg |
| DRAFTER: | PROJECT: WY_SCH | DWG FILE: SK121916_RI.dwg |

Hydrologic soil group B
Weighted Curve Number = 70.4
Basin slope = 4.2%
Hydraulic length = 207 feet
Time of concentration = 5.8 minutes (LAG Method)

Proposed Conditions

The proposed condition model analyzes the site as five Post-Development drainage basins, Post-Development Basins One through Four (including Basin 3A).

Post-Development Basin 1 (P.D.B.-1) has an area of 5,991 square feet and flows west to Design Point A located at the west of the property.

Post-Development Basin 2 (P.D.B.-2) has an area of 1,877 square feet and flows north to Design Point B located at the northeastern side of the property.

Post-Development Basin 3 (P.D.B.-3) has an area of 7,081 square feet and flows west to design point C located at the southwest corner of the property.

Post-Development Basin 3A (P.D.B.-3A) has an area of 5,856 square feet and flows into the proposed stone trench on the easterly side of Building A.

Post-Development Basin 4 (P.D.B.-4) has an area of 17,059 square feet and flows to the Proposed Infiltration System located at the center of the property.

The Proposed Conditions Basins are shown on Figure Three, *The Post Development Watershed Delineation Plan* and information for all Post Development Basins is listed on the plan and shown below.

*Post-Development Basin 1 (P.D.B.-1)*

Area = 5,991 square feet
Impervious area = 857 square feet; curve number = 98.0
Lawn area (good condition) = 3,815 square feet, curve number = 61.0
Landscaped area (good condition) = 1,323 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 66.4
Basin slope = 4.4%
Hydraulic length = 222 feet
Time of concentration = 6.7 minutes (LAG Method)

*Post-Development Basin 2 (P.D.B.-2)*

Area = 1,877 square feet
Impervious area = 356 square feet; curve number = 98.0
Lawn area (good condition) = 880 square feet, curve number = 61.0
Landscaped area (good condition) = 640 square feet, curve number = 61.0

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 31869, PAGE 55.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE- AND BELOW-GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT-INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN-MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB-SURFACE UTILITIES AND MAN-MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

LOT 52B
N/F
OF WAYLAND
945, PAGE 837

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG-SAFE BEFORE YOU DIG 811.

## ZONING:

*RESIDENCE ZONE 20,000 – 120' FRONT*

MINIMUM LOT AREA= 20,000[1] S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= 30[2] FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= 15[3] FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198-702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198-702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198-702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198-703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198-705.1 OF THE ZONING BYLAW.

## EXISTING TREE DESCRIPTION LEGEND

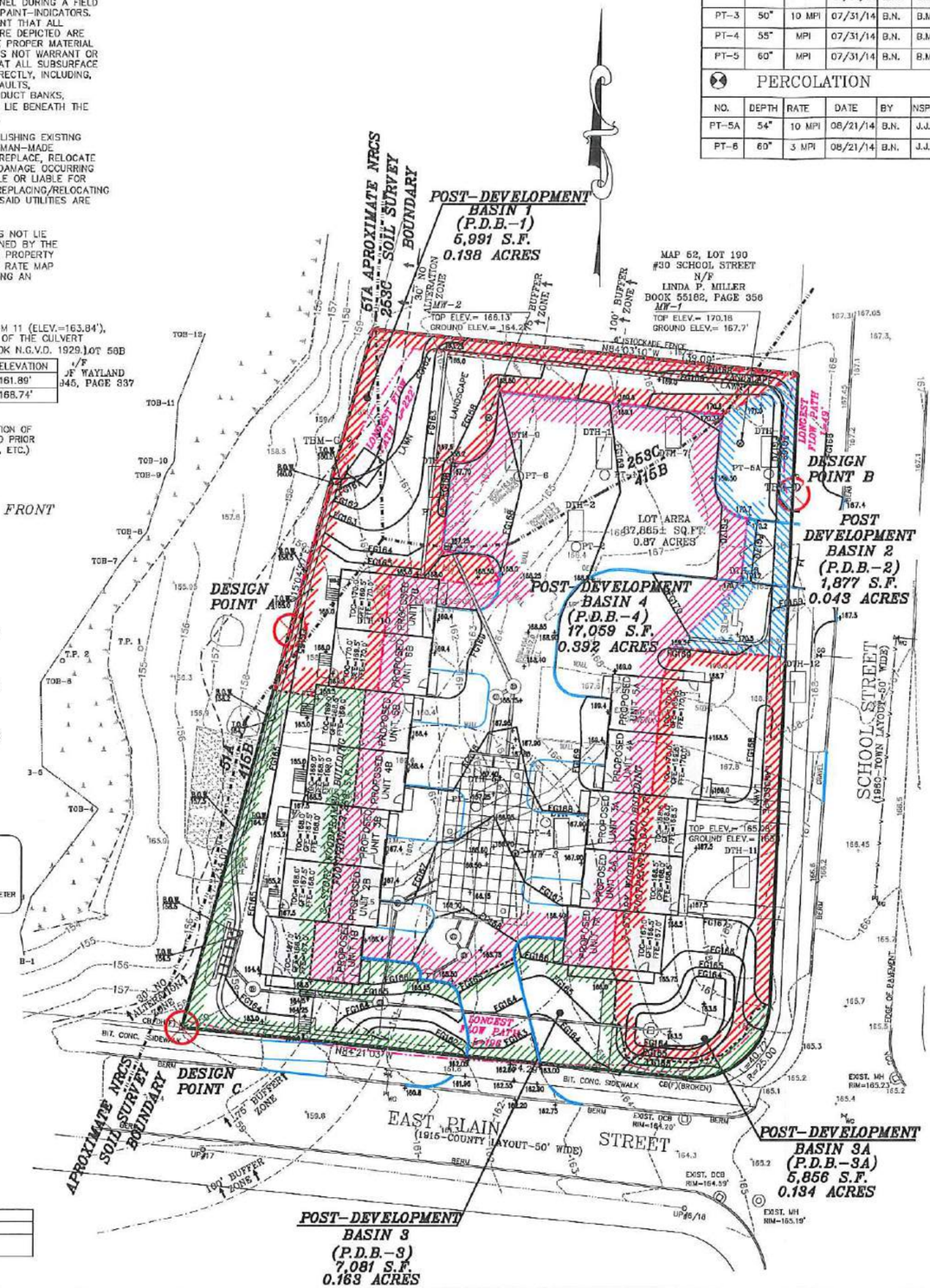
| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL
TREE LOCATION
TREE CODE – 0104 – TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| WG | WATER GATE |
| GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| +200.0 | EXISTING SPOT GRADE |
| ----200---- | EXISTING GRADING |
| | EXISTING OVERHANG WIRE |

| No. | DATE | REVISION |
|---|---|---|
| 2 | 07/29/15 | ADD TOP OF BANK |
| 3 | 11/01/15 | ADD ELEVATION DATUM REFERENCE REVISE WF#11, WF#12 |




## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT-2 | 66" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT-3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT-4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT-5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT-6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-1 ELEV=165.7' | DTH-2 ELEV=165.9' | DTH-3 ELEV=161.7' | DTH-4 ELEV=164.1' | DTH-5 ELEV=162.6' |
|---|---|---|---|---|
| 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-24" Bw FINE SANDY LOAM 10YR5/6<br>24"-62" C1 SANDY LOAM 2.5Y5/3<br>62"-126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"-22" Ap FINE SANDY LOAM 10YR3/3<br>22"-42" Bw FINE SANDY LOAM 10YR5/6<br>42"-96" C1 SANDY LOAM 2.5Y5/3<br>96"-118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-22" Bw FINE SANDY LOAM 10YR5/6<br>22"-84" C1 SANDY LOAM 2.5Y5/3<br>84"-110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"-20" FILL<br>20"-28" Ap FINE SANDY LOAM 10YR3/3<br>28"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-88" C1 SANDY LOAM 2.5Y5/4<br>88"-116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-34" Bw FINE SANDY LOAM 10YR5/6<br>34"-84" C1 SANDY LOAM 2.5Y5/4<br>84"-118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/6<br>ESTIMATED DESIGN GROUNDWATER=156.6' |
| DATE: JULY 31, 2014 | | | | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | | | | |
| INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH | | | | |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-6 ELEV=167.7' | DTH-7 ELEV=166.8' | DTH-8 ELEV=168.2' | DTH-9 ELEV=163.0' | DTH-10 ELEV=160.75' |
|---|---|---|---|---|
| 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-26" Bw FINE SANDY LOAM 10YR5/6<br>26"-64" C1 SANDY LOAM 2.5Y5/3<br>64"-122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-32" Bw FINE SANDY LOAM 10YR5/6<br>32"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-26" FILL<br>26"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-78" C1 SANDY LOAM 2.5Y5/4<br>78"-108" C2 LOAMY SAND 2.5Y5/3<br>108"-126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-46" Bc SANDY LOAM 2.5Y5/4<br>46"-98" C1 SANDY LOAM 2.5Y5/3<br>98"-116" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>WATER WEEPING @88"<br>REDOX SEEN @62" NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"-15" Ap FINE SANDY LOAM 10YR3/3<br>15"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-66" C1 LOAMY SAND 2.5Y5/3<br>66"-112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

| DTH-11 ELEV=166.0' | DTH-12 ELEV=168.2' |
|---|---|
| 0"-18" FILL<br>18"-30" Ap FINE SANDY LOAM 10YR3/3<br>30"-36" Bw FINE SANDY LOAM 10YR5/6<br>36"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"-54" FILL<br>58"-82" C1 SANDY LOAM 2.5Y4/4<br>82"-114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |
| DATE: AUGUST 21, 2014 | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | |
| INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH | |

PROPOSED CONDITIONS – TOTAL IMPERVIOUS AREA = 20,063 S.F.
PROPOSED CONDITIONS – TOTAL LAWN AREA = 10,402 S.F.
PROPOSED CONDITIONS – TOTAL LANDSCAPED AREA = 7,403 S.F.

## POST-DEVELOPMENT BASIN PROPERTIES:

### POST-DEVELOPMENT BASIN 1 (P.D.B.-1)

TOTAL BASIN AREA = 5,991 S.F. (0.138 ACRES)
HYDRAULIC LENGTH = 222 FEET
CHANGE IN ELEVATION = 9.7 FEET
BASIN SLOPE = 0.044 (4.4%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 857 S.F. (0.020 ACRES) | 98 | 0.020 | 1.960 |
| LAWN AREA (GOOD COND.) = 3,815 S.F. (0.087 ACRES) | 61 | 0.087 | 5.307 |
| LANDSCAPED AREA (GOOD COND.) = 1,323 S.F. (0.031 ACRES) | 61 | 0.031 | 1.891 |
| | | SUM 0.138 | SUM 9.158 |

WEIGHTED CURVE NUMBER ($C_N$) = (9.158/0.138) = 66.4

### POST-DEVELOPMENT BASIN 2 (P.D.B.-2)

TOTAL BASIN AREA = 1,877 S.F. (0.043 ACRES)
HYDRAULIC LENGTH = 49 FEET
CHANGE IN ELEVATION = 0.5 FEET
BASIN SLOPE = 0.010 (1.0%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 356 S.F. (0.008 ACRES) | 98 | 0.008 | 0.784 |
| LAWN AREA (GOOD COND.) = 880 S.F. (0.020 ACRES) | 61 | 0.020 | 1.220 |
| LANDSCAPED AREA (GOOD COND.)= 640 S.F. (0.015 ACRES) | 61 | 0.015 | 0.915 |
| | | SUM 0.043 | SUM 2.919 |

WEIGHTED CURVE NUMBER ($C_N$) = (2.919/0.043) = 67.9

### POST-DEVELOPMENT BASIN 3 (P.D.B.-3)

TOTAL BASIN AREA = 7,081 S.F. (0.163 ACRES)
HYDRAULIC LENGTH = 196 FEET
CHANGE IN ELEVATION = 7.5 FEET
BASIN SLOPE = 0.038 (3.8%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 2,745 S.F. (0.063 ACRES) | 98 | 0.063 | 6.174 |
| LAWN AREA (GOOD COND.) = 2,391 S.F. (0.055 ACRES) | 61 | 0.055 | 3.355 |
| LANDSCAPED AREA (GOOD COND.)= 1,946 S.F. (0.045 ACRES) | 61 | 0.045 | 2.745 |
| | | SUM 0.163 | SUM 12.274 |

WEIGHTED CURVE NUMBER ($C_N$) = (12.274/0.163) = 75.3

### POST-DEVELOPMENT BASIN 3A (P.D.B.-3A)

TOTAL BASIN AREA = 5,856 S.F. (0.133 ACRES)
HYDRAULIC LENGTH = N.A.
CHANGE IN ELEVATION = N.A.
BASIN SLOPE = N.A.

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 1,960 S.F. (0.045 ACRES) | 98 | 0.045 | 4.410 |
| LAWN AREA (GOOD COND.) = 1,914 S.F. (0.044 ACRES) | 61 | 0.044 | 2.684 |
| LANDSCAPED AREA (GOOD COND.) = 1,983 S.F. (0.045 ACRES) | 61 | 0.045 | 2.684 |
| | | SUM 0.134 | SUM 9.778 |

WEIGHTED CURVE NUMBER ($C_N$) = (9.778/0.133) = 73.5

### POST-DEVELOPMENT BASIN 4 (P.D.B.-4)

TOTAL BASIN AREA = 17,059 S.F. (0.392 ACRES)
HYDRAULIC LENGTH = N.A.
CHANGE IN ELEVATION = N.A.
BASIN SLOPE = N.A.

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 14,145 S.F. (0.325 ACRES) | 98 | 0.325 | 31.850 |
| LAWN AREA (GOOD COND.) = 1,402 S.F. (0.032 ACRES) | 61 | 0.032 | 1.952 |
| LANDSCAPED AREA (GOOD COND.) = 1,511 S.F. (0.035 ACRES) | 61 | 0.035 | 2.135 |
| | | SUM 0.392 | SUM 35.937 |

WEIGHTED CURVE NUMBER ($C_N$) = (35.937/0.392) = 91.7

## USDA SOIL CLASSIFICATION

| SOIL NUMBER | SOIL SERIES | HYDROLOGIC SOIL GROUP |
|---|---|---|
| 51A | SWANSEA MUCK | B/D |
| 253C | HINCKLEY LOAMY SAND | A |
| 415B | NARRAGANSETT SILT LOAM | B |

*HYDROLOGIC SOIL GROUP B USED FOR ANALSYIS*

SOILS ON SITE ARE SANDY LOAM TEXTURES AND CLASSIFIED WITHIN HYDROLOGIC SOIL GROUP B.

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. CEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
5 0 5 10 20 ( METERS ) 30

# FIGURE THREE

## POST-DEVELOPMENT WATERSHED DELINEATION PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*


ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626-0063*
*FAX: (508)876-6440*


| SHEET 1 OF 1 | | DATE: APRIL 23, 2018 |
|---|---|---|
| CALC'D BY: RAG | FIELD BK: 621 | CAD FILE: PD_HYDRO.dwg |
| DRAFTER: | PROJECT: WY_SCH | DWG FILE: SK042318.dwg |

Hydrologic soil group B
Weighted Curve Number = 67.9
Basin slope = 1.0%
Hydraulic length = 49 feet
Time of concentration = 5.0 minutes (Manually Entered)

*Post-Development Basin 3 (P.D.B.-3)*

Area = 7,081 square feet
Impervious area = 2,745 square feet; curve number = 98.0
Lawn area (good condition) = 2,391 square feet, curve number = 61.0
Landscaped area (good condition) = 1,946 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 75.3
Basin slope = 3.8%
Hydraulic length = 196 feet
Time of concentration = 5.0 minutes (Manually Entered)

*Post-Development Basin 3A (P.D.B.-3A)*

Area = 5,856 square feet
Impervious area = 2,745 square feet; curve number = 98.0
Lawn area (good condition) = 1,914 square feet, curve number = 61.0
Landscaped area (good condition) = 1,983 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 73.5
Basin slope = n.a.
Hydraulic length = n.a.
Time of concentration = 5.0 minutes (Manually Entered)

*Post-Development Basin 4 (P.D.B.-4)*

Area = 17,059 square feet
Impervious area = 14,145 square feet; curve number = 98.0
Lawn area (good condition) = 1,402 square feet, curve number = 61.0
Landscaped area (good condition) = 1,511 square feet, curve number = 61.0
Hydrologic soil group B
Weighted Curve Number = 91.7
Basin slope = n.a.
Hydraulic length = n.a.
Time of concentration = 5.0 minutes (Manually Entered)

### *Drain Infiltration Systems*

*Proposed Infiltration System 1*

| | |
|---|---|
| Basic geometry: | 32.0 feet wide by 52.0 feet long |
| System type: | Shea Leaching Galleys; 360 gallons each |
| | Use 84 Galleys; 4-feet long by 4.5-feet wide by 3.0-feet high |
| | Surrounded by two feet of double washed, crushed stone |
| Infiltration rate: | 1.02 inches per hour over 1,664 square foot bed |

*Proposed Rain Garden*

| | |
|---|---|
| Basic geometry: | Irregular shaped basin |
| System type: | Constructed basin approximately 1.5-feet deep |
| | Total Storage approximately 742 cubic feet |
| Infiltration rate: | 1.02 inches per hour over 450 square foot bed area |

The proposed condition model analyzes the infiltration system using a reservoir-analysis method. Consistent with DEP stormwater management standards, design infiltration rates are based on the Rawls table for soils with sandy loam and loamy sand textures.

**Model Results**

The model results for the design points A, B and C are shown in Tables one through ten below:

**Table 1: Comparison of Pre and Post-Development Peak Runoff Rates at Design Point A**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-1 | 0.19 c.f.s. | 0.54 c.f.s. | 0.86 c.f.s. | 1.59 c.f.s. |
| P.D.B.-1 | 0.08 c.f.s. | 0.21 c.f.s. | 0.34 c.f.s. | 0.63 c.f.s. |
| Difference | -0.11 c.f.s. | -0.33 c.f.s. | -0.52 c.f.s. | -0.96 c.f.s. |

**Table 2: Comparison of Pre and Post-Development Runoff Volumes at Design Point A**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-1 | 789 c.f. | 1,881 c.f. | 2,913 c.f. | 5,287 c.f. |
| P.D.B.-1 | 310 c.f. | 740 c.f. | 1,145 c.f. | 2,079 c.f. |
| Difference | -479 c.f. | -1,141 c.f. | -1,768 c.f. | -3,208 c.f. |

**Table 3: Comparison of Pre and Post Development Peak Runoff Rates at Design Point B**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-2 | 0.09 c.f.s. | 0.18 c.f.s. | 0.25 c.f.s. | 0.40 c.f.s. |
| P.D.B.-2 | 0.03 c.f.s. | 0.07 c.f.s. | 0.11 c.f.s. | 0.20 c.f.s. |
| Difference | -0.06 c.f.s. | -0.11 c.f.s. | -0.14 c.f.s. | -0.20 c.f.s. |

**Table 4: Comparison of Pre and Post-Development Runoff Volumes at Design Point B**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-2 | 317 c.f. | 602 c.f. | 847 c.f. | 1,374 c.f. |
| P.D.B.-2 | 107 c.f. | 246 c.f. | 377 c.f. | 674 c.f. |
| Difference | -210 c.f. | -356 c.f. | -470 c.f. | -700 c.f. |

**Table 5: Comparison of Pre and Post Development Peak Runoff Rates at Design Point C**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-3 | 0.35 c.f.s. | 0.85 c.f.s. | 1.29 c.f.s. | 2.26 c.f.s. |
| P.D.B.-3 + overflow | 0.18 c.f.s. | 0.59 c.f.s. | 1.13 c.f.s. | 2.97 c.f.s. |
| Difference | -0.17 c.f.s. | -0.27 c.f.s. | -0.16 c.f.s. | 0.71 c.f.s. |

**Table 6: Comparison of Pre and Post-Development Runoff Volumes at Design Point C**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| E.C.B.-3 | 1,304 c.f. | 2,875 c.f. | 4,311 c.f. | 7,539 c.f. |
| P.D.B.-3 + overflow | 672 c.f. | 2,761 c.f. | 4,916 c.f. | 9,778 c.f. |
| Difference | -632 c.f. | -114 c.f. | 605 c.f. | 2,239 c.f. |

**Table 7: Comparison of Total Pre and Post Development Peak Runoff Rates Leaving the Project Site**

| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| Total Existing | 0.64 c.f.s. | 1.57 c.f.s. | 2.41 c.f.s. | 4.26 c.f.s. |
| Total Proposed | 0.28 c.f.s. | 0.74 c.f.s. | 1.50 c.f.s. | 3.79 c.f.s. |
| Difference | -0.36 c.f.s. | -0.83 c.f.s. | -0.91 c.f.s. | -0.47 c.f.s. |

**Table 8: Comparison of Total Pre and Post-Development Runoff Volumes Leaving the Project Site**

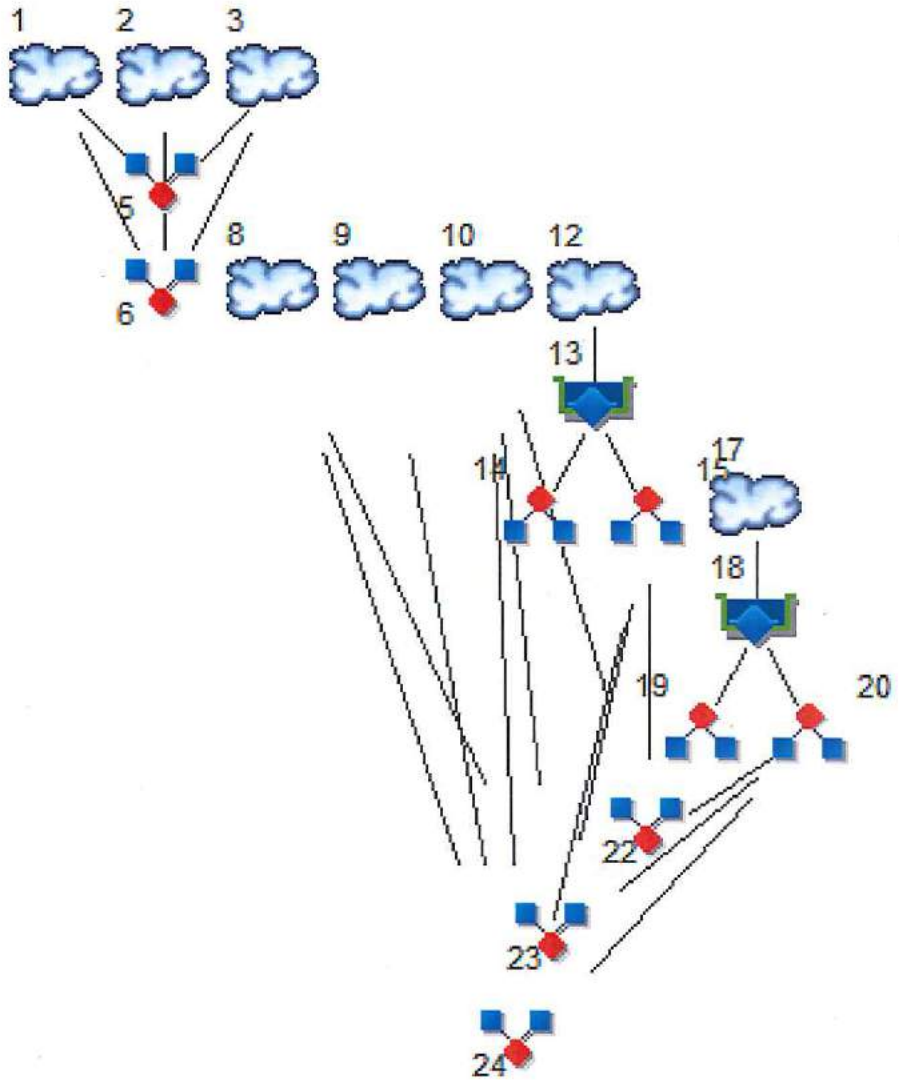
| Drainage Basin | 2-year storm | 10-year storm | 25-year storm | 100-year storm |
|---|---|---|---|---|
| Total Existing | 2,410 c.f. | 5,358 c.f. | 8,071 c.f. | 14,200 c.f. |
| Total Proposed | 1,088 c.f. | 3,747 c.f. | 6,438 c.f. | 12,531 c.f. |
| Difference | -1,322 c.f. | -1,611 c.f. | -1,633 c.f. | -1,669 c.f. |

## Conclusion

The results provided in Tables One through Eight demonstrate that the project, with the stormwater controls in place, will result in an overall decrease both in peak runoff rates and total runoff volume discharged from the project site. The project will impact neither the municipal stormwater drainage system or abutting properties.

Additionally, a portion of the proposed roof and the majority of driveway surfaces will be collected and recharged. The stormwater management system as designed is consistent with MADEP Stormwater Management Policy and accepted design practice.

# Appendix A:
# Hydrologic Assessment




**Legend**

| Hyd. | Origin | Description |
|---|---|---|
| 1 | SCS Runoff | E.C.B.-1 |
| 2 | SCS Runoff | E.C.B.-2 |
| 3 | SCS Runoff | E.C.B.-3 |
| 5 | Combine | Flow to Wetlands |
| 6 | Combine | Total Existing |
| 8 | SCS Runoff | P.D.B.-1 |
| 9 | SCS Runoff | P.D.B.-2 |
| 10 | SCS Runoff | P.D.B.-3 |
| 12 | SCS Runoff | P.D.B.3A |
| 13 | Reservoir | Rain Garden |
| 14 | Diversion1 | Infiltration |
| 15 | Diversion2 | Overflow |
| 17 | SCS Runoff | P.D.B.-4 |
| 18 | Reservoir | Infiltration System |
| 19 | Diversion1 | Infiltration |
| 20 | Diversion2 | Overflow |
| 22 | Combine | Design Point C |
| 23 | Combine | Post Dev. Flow to Wetlands |
| 24 | Combine | Total Proposed |

## 2-Year Storm, Pre and Post-Development

# Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 0.19 | 3 | 726 | 789 | --- | ------ | ------ | E.C.B.-1 |
| 2 | SCS Runoff | 0.09 | 3 | 726 | 317 | --- | ------ | ------ | E.C.B.-2 |
| 3 | SCS Runoff | 0.35 | 3 | 726 | 1,304 | --- | ------ | ------ | E.C.B.-3 |
| 5 | Combine | 0.55 | 3 | 726 | 2,093 | 1, 3, | ------ | ------ | Flow to Wetlands |
| 6 | Combine | 0.64 | 3 | 726 | 2,410 | 1, 2, 3, | ------ | ------ | Total Existing |
| 8 | SCS Runoff | 0.08 | 3 | 726 | 310 | --- | ------ | ------ | P.D.B.-1 |
| 9 | SCS Runoff | 0.03 | 3 | 726 | 107 | --- | ------ | ------ | P.D.B.-2 |
| 10 | SCS Runoff | 0.18 | 3 | 726 | 616 | --- | ------ | ------ | P.D.B.-3 |
| 12 | SCS Runoff | 0.13 | 3 | 726 | 457 | --- | ------ | ------ | P.D.B.3A |
| 13 | Reservoir | 0.01 | 3 | 843 | 443 | 12 | 164.12 | 209 | Rain Garden |
| 14 | Diversion1 | 0.01 | 3 | 843 | 443 | 13 | ------ | ------ | Infiltration |
| 15 | Diversion2 | 0.00 | 3 | 1221 | 0 | 13 | ------ | ------ | Overflow |
| 17 | SCS Runoff | 0.91 | 3 | 726 | 3,098 | --- | ------ | ------ | P.D.B.-4 |
| 18 | Reservoir | 0.06 | 3 | 843 | 3,094 | 17 | 163.81 | 1,657 | Infiltration System |
| 19 | Diversion1 | 0.05 | 3 | 843 | 3,039 | 18 | ------ | ------ | Infiltration |
| 20 | Diversion2 | 0.01 | 3 | 843 | 55 | 18 | ------ | ------ | Overflow |
| 22 | Combine | 0.18 | 3 | 726 | 672 | 10, 15, 20, | ------ | ------ | Design Point C |
| 23 | Combine | 0.25 | 3 | 726 | 982 | 8, 10, 15, 20, | ------ | ------ | Post Dev. Flow to Wetlands |
| 24 | Combine | 0.28 | 3 | 726 | 1,088 | 8, 9, 10, 15, 20, | ------ | ------ | Total Proposed |

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

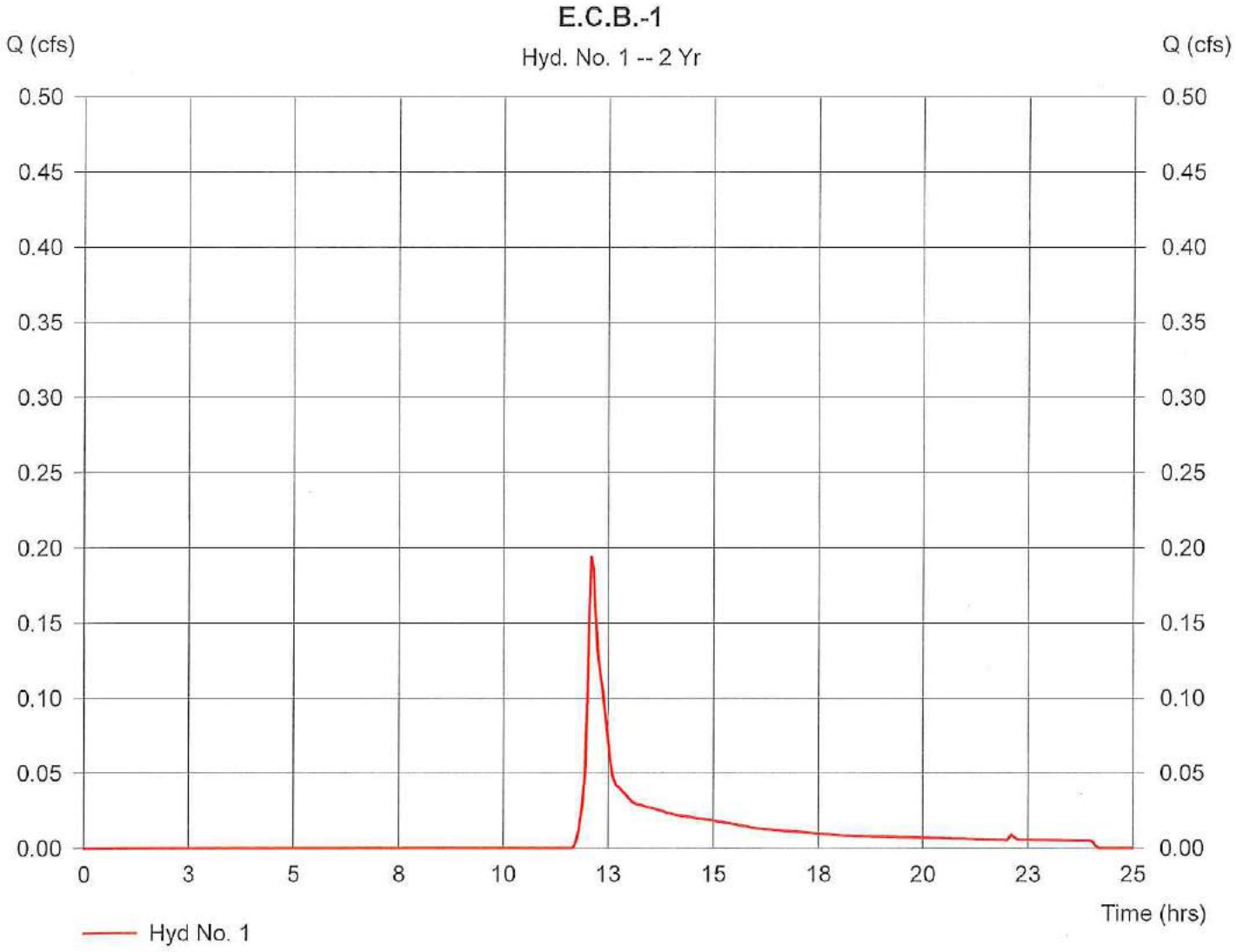
Monday, May 7 2018, 8:27 PM

## Hyd. No. 1

E.C.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.19 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.35 ac | Curve number | = 66.4 |
| Basin Slope | = 5.2 % | Hydraulic length | = 189 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.407852 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 789 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

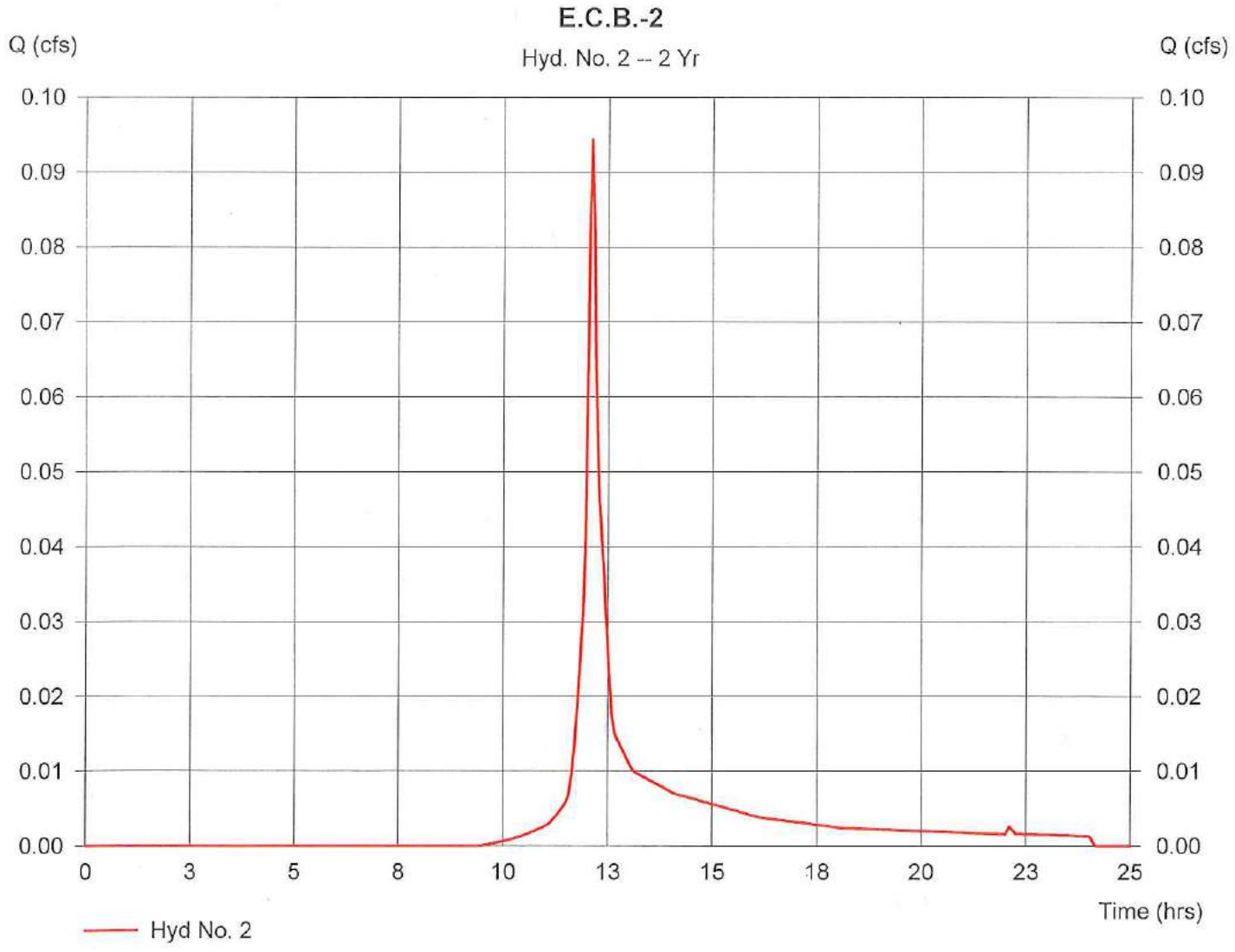
Monday, May 7 2018, 8:27 PM

## Hyd. No. 2

E.C.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.09 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.07 ac | Curve number | = 79.8 |
| Basin Slope | = 1.9 % | Hydraulic length | = 68 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 317 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

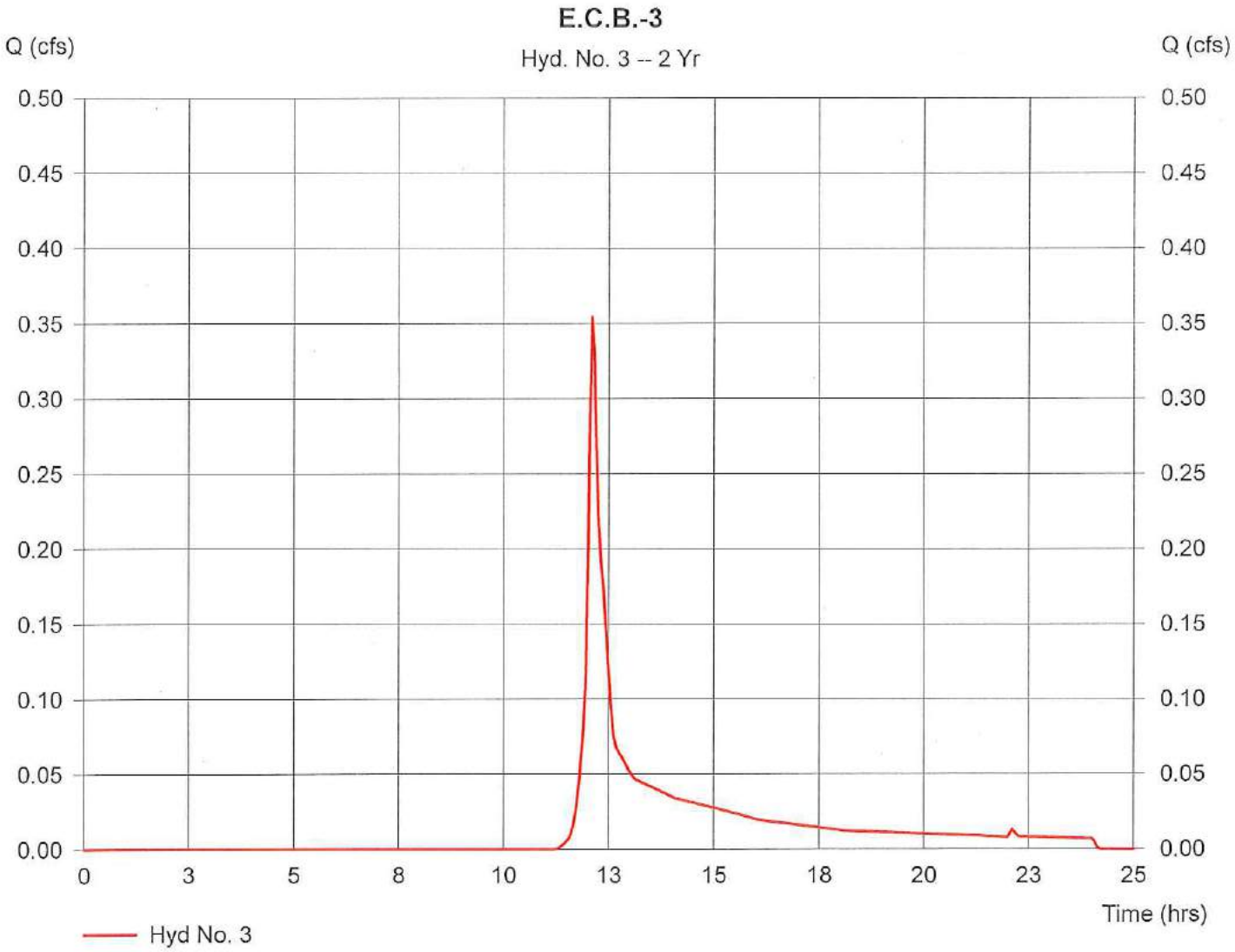
Monday, May 7 2018, 8:27 PM

## Hyd. No. 3

E.C.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.35 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.45 ac | Curve number | = 70.4 |
| Basin Slope | = 4.2 % | Hydraulic length | = 207 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.817464 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,304 cuft



# Hydrograph Plot

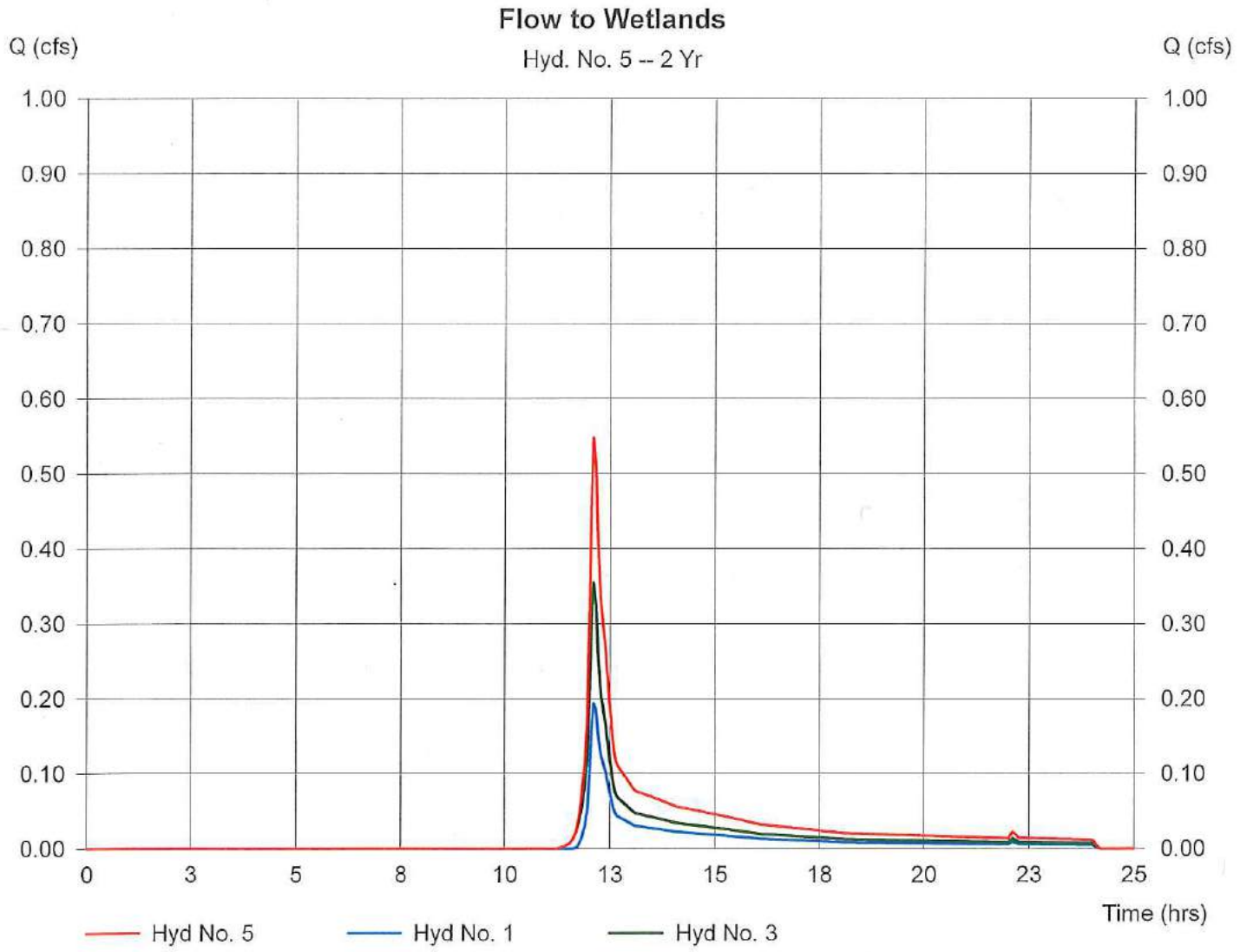


## Hyd. No. 5

Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.55 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 3 | | |

Hydrograph Volume = 2,093 cuft



# Hydrograph Plot

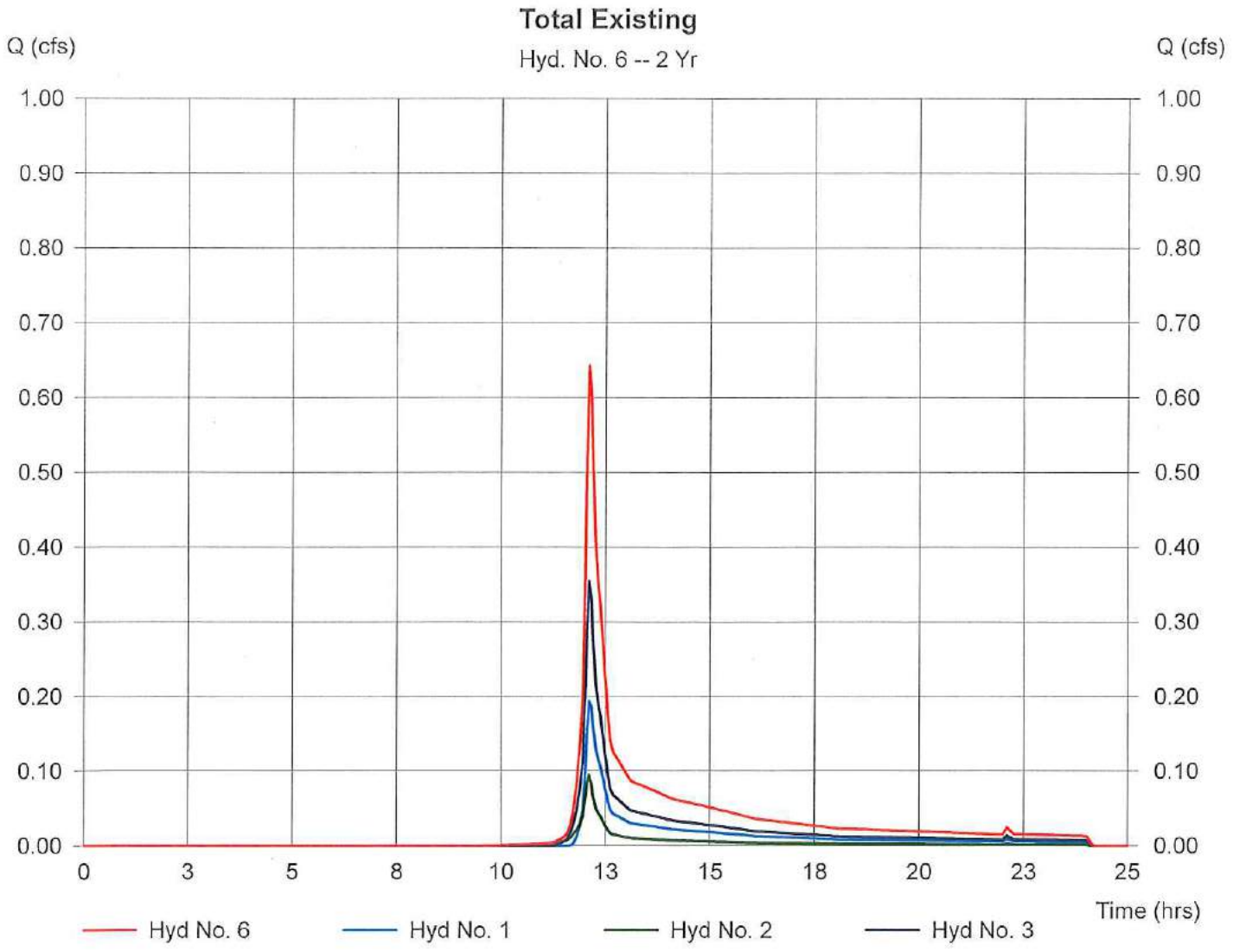


## Hyd. No. 6

Total Existing

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.64 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 2, 3 | | |

Hydrograph Volume = 2,410 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

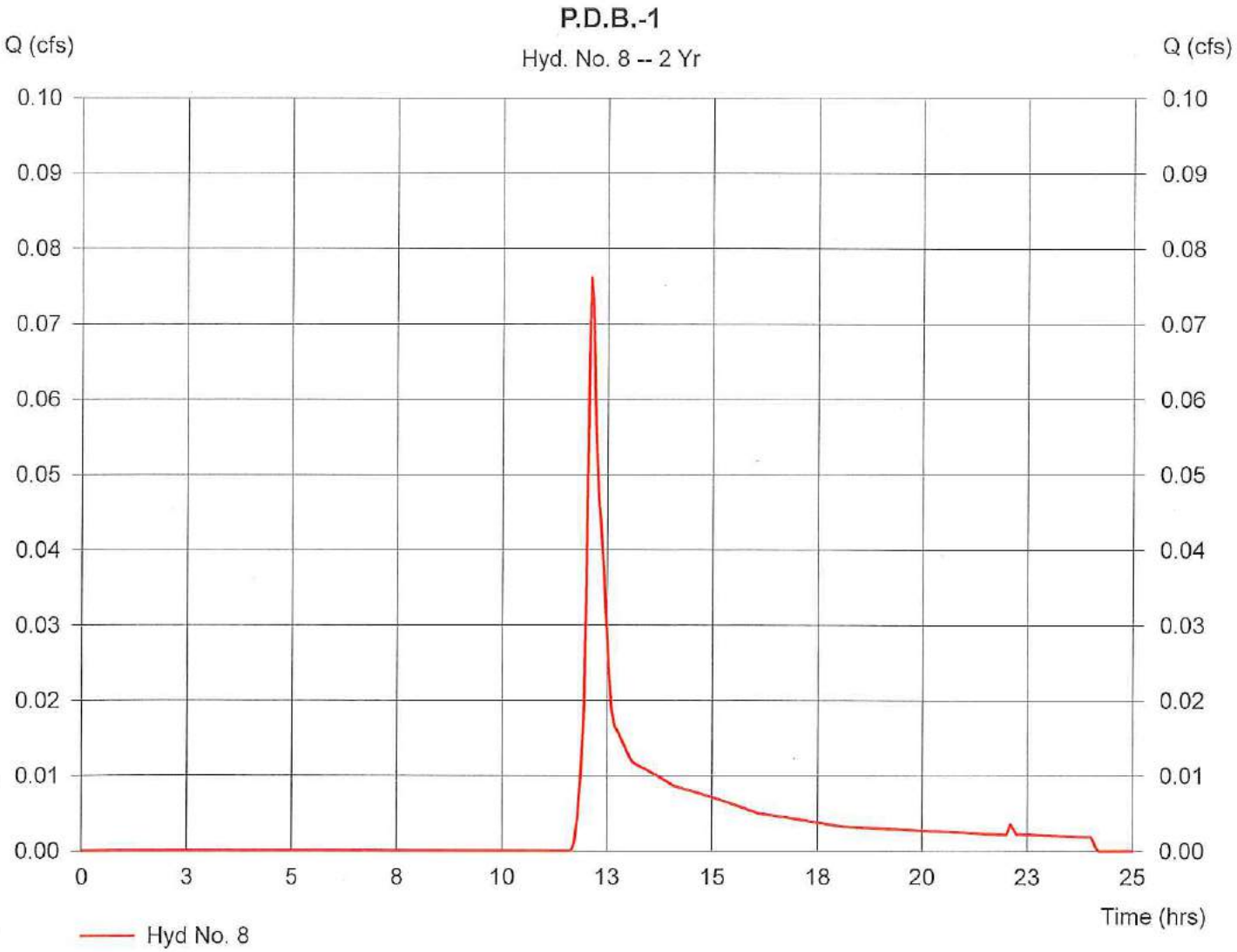
Monday, May 7 2018, 8:27 PM

## Hyd. No. 8

P.D.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.08 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.14 ac | Curve number | = 66.4 |
| Basin Slope | = 4.4 % | Hydraulic length | = 222 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 6.686719 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 310 cuft



# Hydrograph Plot

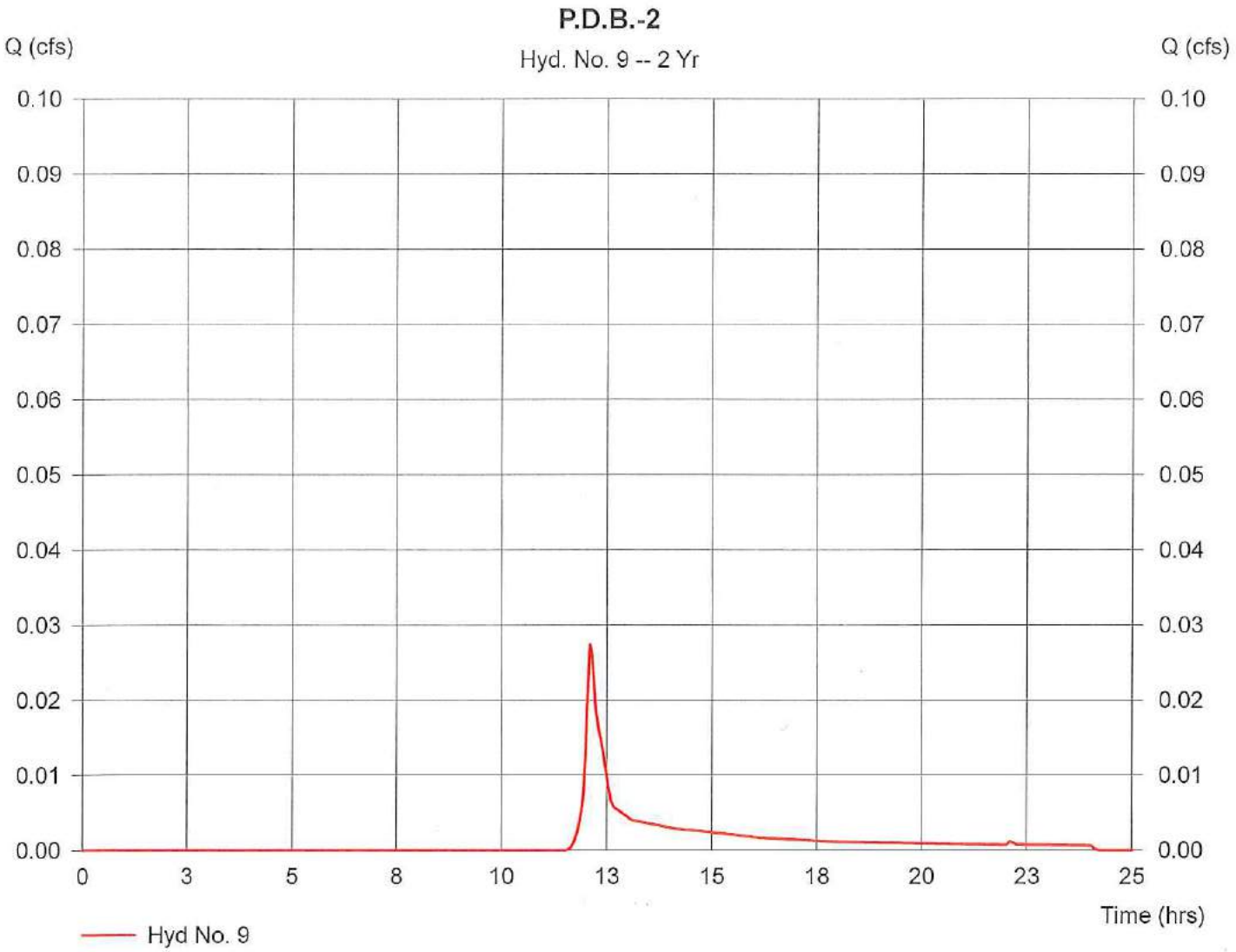


## Hyd. No. 9

P.D.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.03 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.04 ac | Curve number | = 67.9 |
| Basin Slope | = 1.0 % | Hydraulic length | = 49 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 107 cuft



# Hydrograph Plot

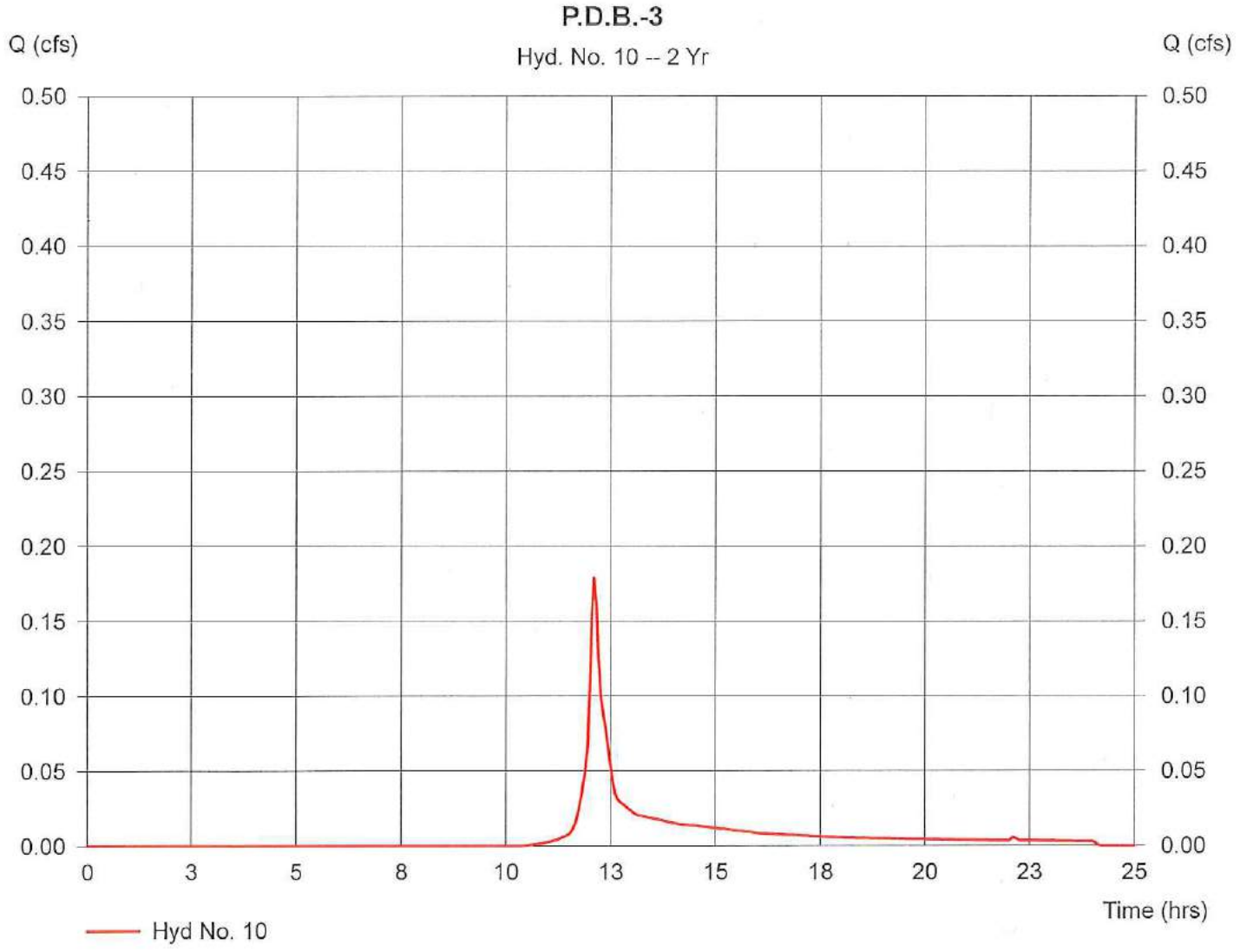


## Hyd. No. 10

P.D.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.18 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.16 ac | Curve number | = 75.3 |
| Basin Slope | = 3.8 % | Hydraulic length | = 196 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 616 cuft



# Hydrograph Plot

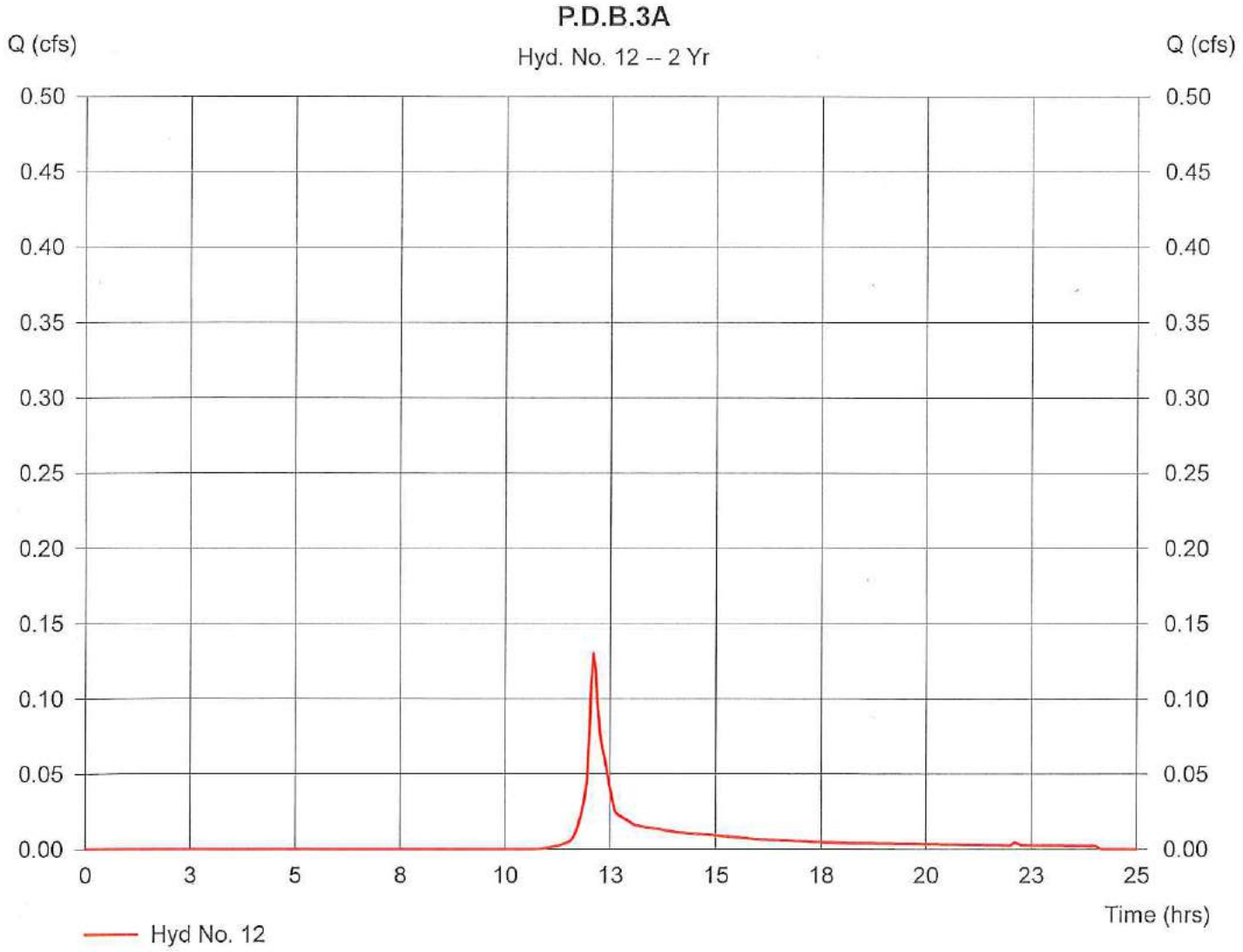


## Hyd. No. 12

P.D.B.3A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.13 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.13 ac | Curve number | = 73.5 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 457 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

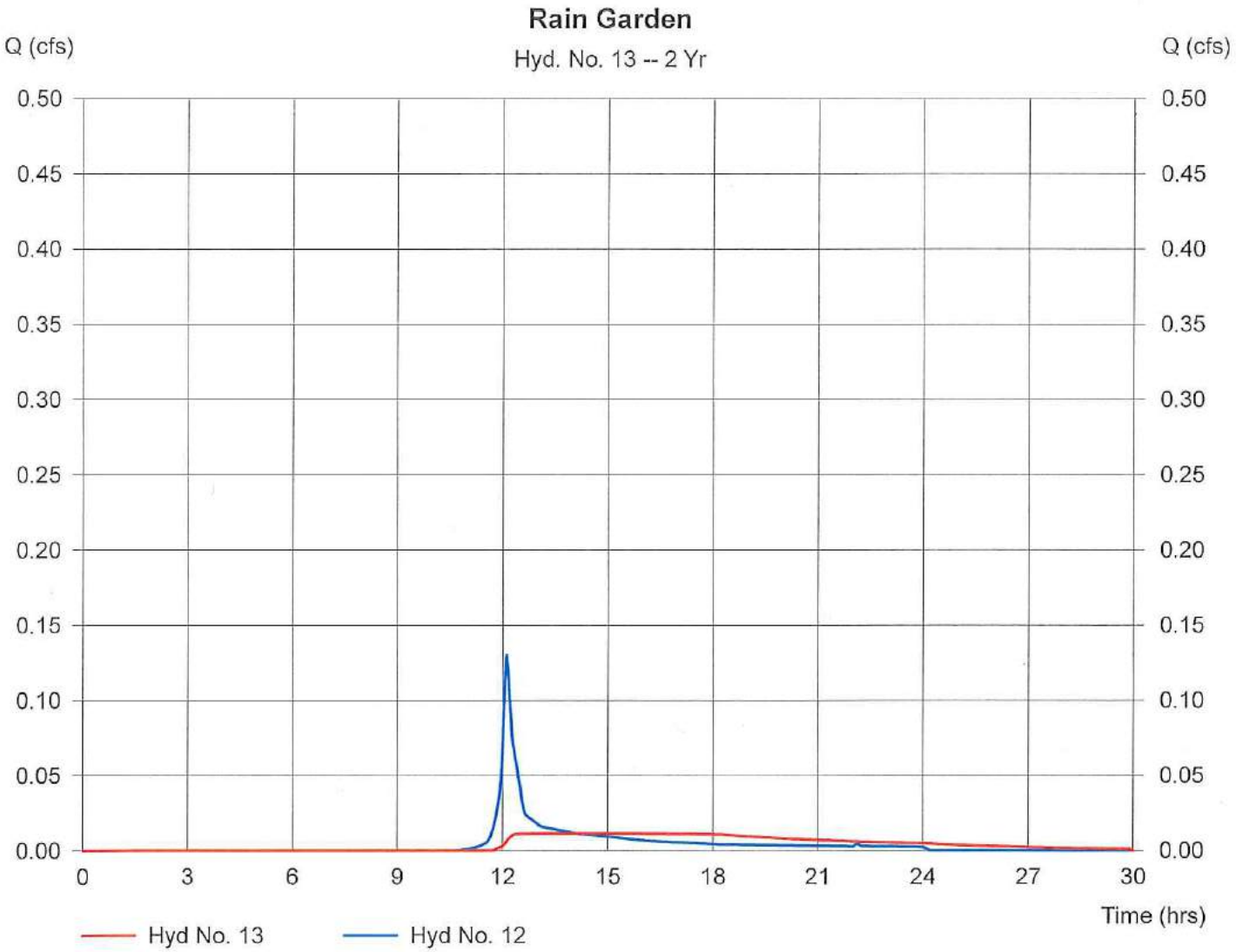
## Hyd. No. 13

Rain Garden

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.01 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 12 | Max. Elevation | = 164.12 ft |
| Reservoir name | = Rain Garden | Max. Storage | = 209 cuft |

Storage Indication method used.

Hydrograph Volume = 443 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve — Monday, May 7 2018, 8:27 PM

## Pond No. 5 - Rain Garden

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 163.50 | 140 | 0 | 0 |
| 0.50 | 164.00 | 448 | 147 | 147 |
| 1.00 | 164.50 | 591 | 260 | 407 |
| 1.50 | 165.00 | 748 | 335 | 742 |

### Culvert / Orifice Structures

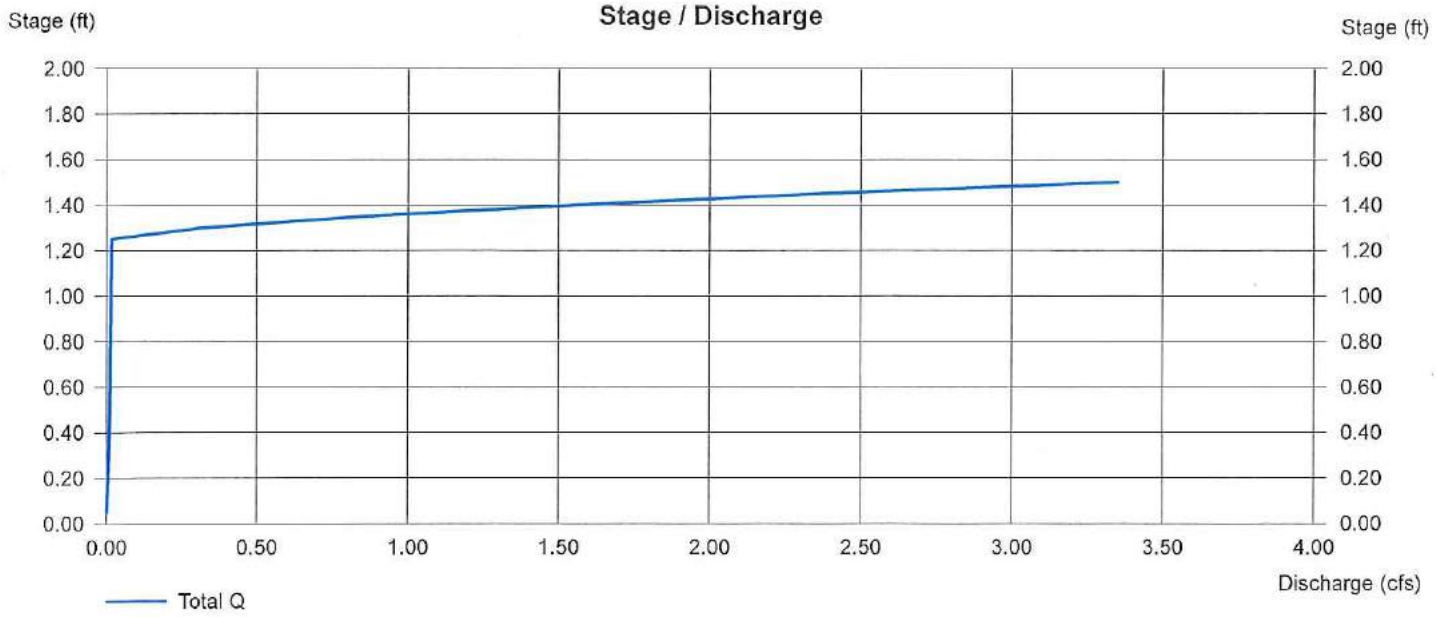
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Crest Len (ft) | = 8.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 164.75 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 3.33 | 0.00 | 0.00 | 0.00 |
| Weir Type | = Rect | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

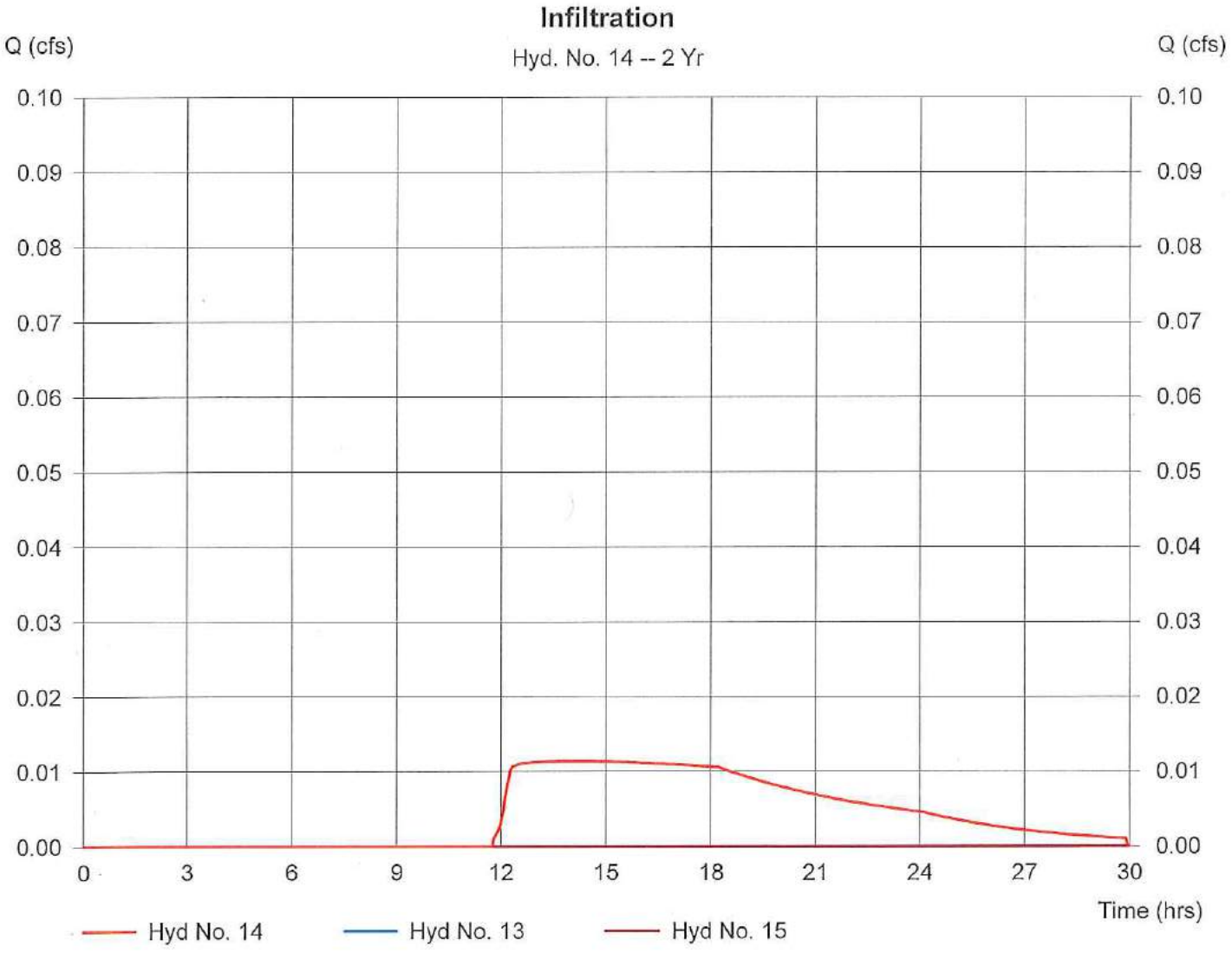


## Hyd. No. 14

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.01 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 15 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 443 cuft



# Hydrograph Plot

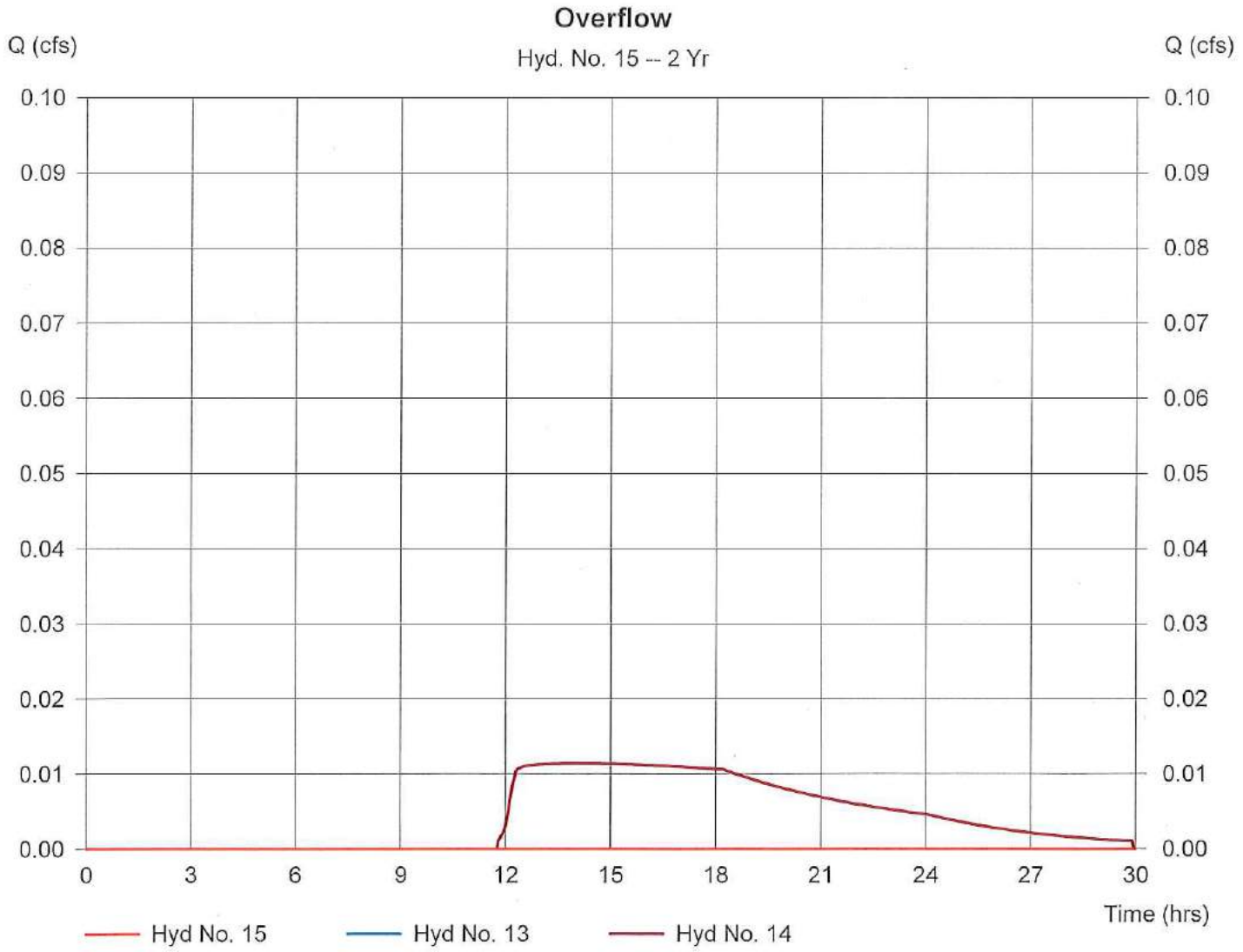


## Hyd. No. 15

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.00 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 14 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 0 cuft



# Hydrograph Plot

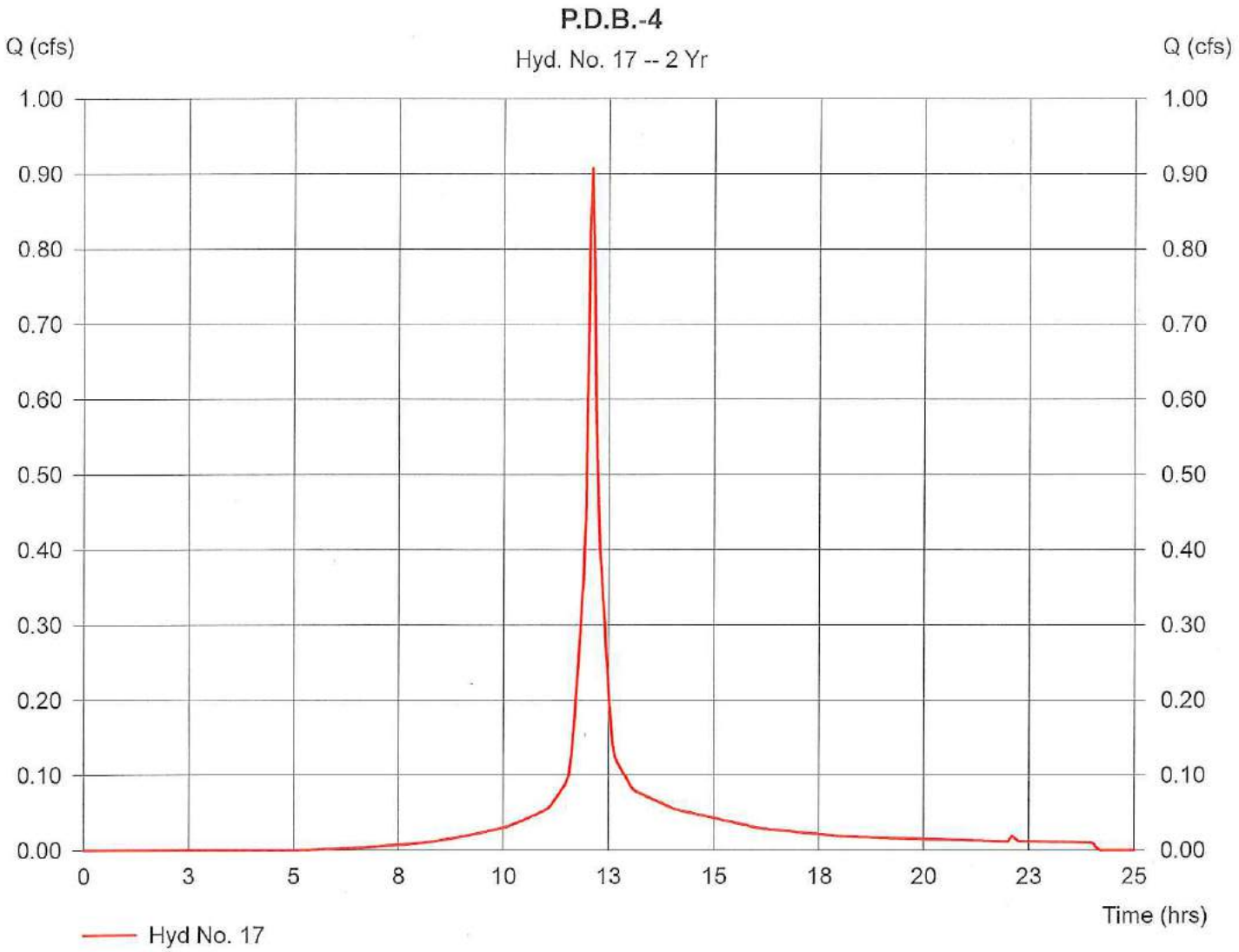


## Hyd. No. 17

P.D.B.-4

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.91 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Drainage area | = 0.39 ac | Curve number | = 91.7 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 3.20 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 3,098 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

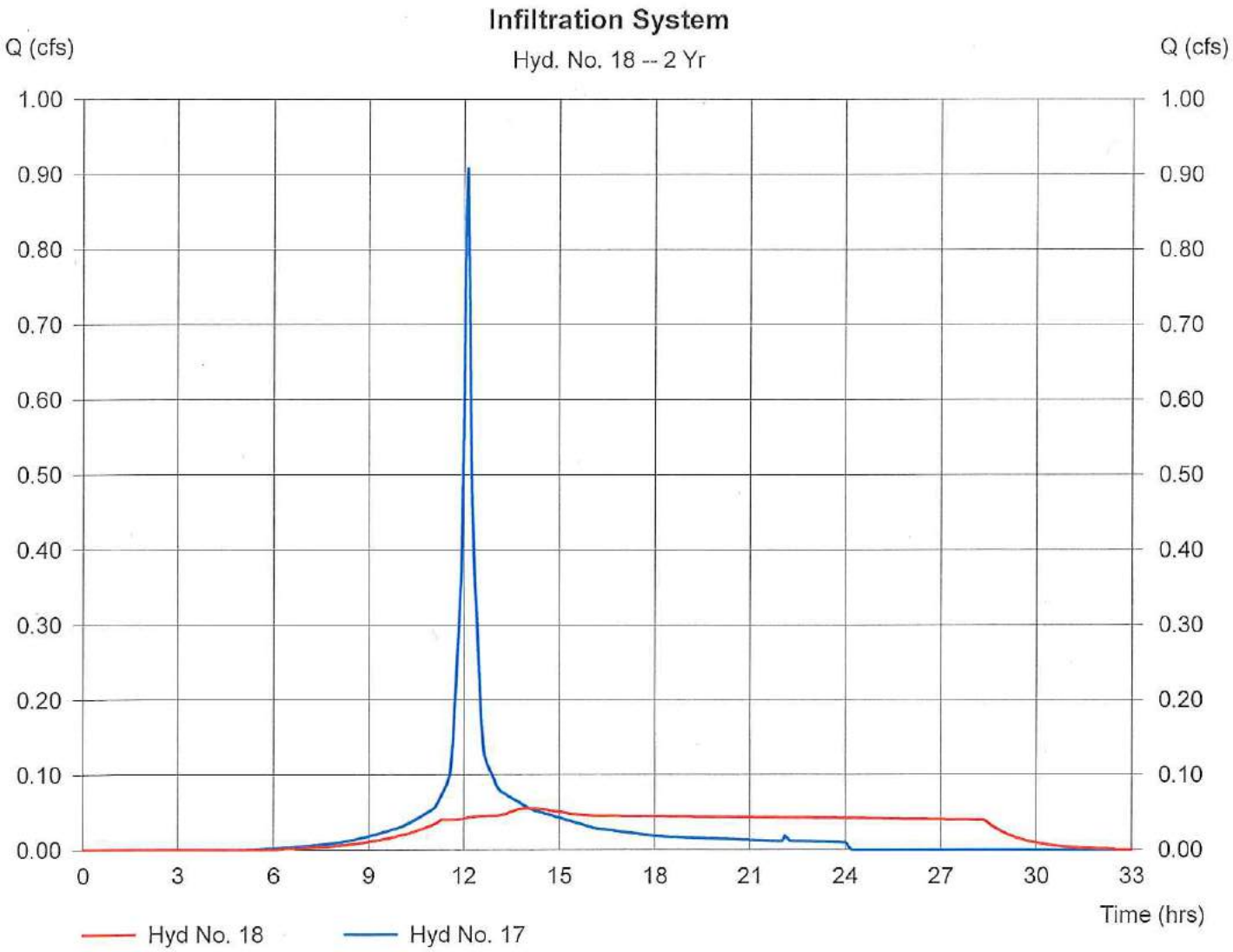
## Hyd. No. 18

Infiltration System

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.06 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 17 | Max. Elevation | = 163.81 ft |
| Reservoir name | = Infiltration System | Max. Storage | = 1,657 cuft |

Storage Indication method used.

Hydrograph Volume = 3,094 cuft



# Pond Report



## Pond No. 1 - Infiltration System

### Pond Data

Bottom LxW = 52.0 x 32.0 ft  Side slope = 0.0:1  Bottom elev. = 162.25 ft  Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft)* | Total storage (cuft)* (*64.00% voids applied) |
|---|---|---|---|---|
| 0.00 | 162.25 | 1,664 | 0 | 0 |
| 0.15 | 162.40 | 1,664 | 160 | 160 |
| 0.30 | 162.55 | 1,664 | 160 | 319 |
| 0.45 | 162.70 | 1,664 | 160 | 479 |
| 0.60 | 162.85 | 1,664 | 160 | 639 |
| 0.75 | 163.00 | 1,664 | 160 | 799 |
| 0.90 | 163.15 | 1,664 | 160 | 958 |
| 1.05 | 163.30 | 1,664 | 160 | 1,118 |
| 1.20 | 163.45 | 1,664 | 160 | 1,278 |
| 1.35 | 163.60 | 1,664 | 160 | 1,438 |
| 1.50 | 163.75 | 1,664 | 160 | 1,597 |
| 1.65 | 163.90 | 1,664 | 160 | 1,757 |
| 1.80 | 164.05 | 1,664 | 160 | 1,917 |
| 1.95 | 164.20 | 1,664 | 160 | 2,077 |
| 2.10 | 164.35 | 1,664 | 160 | 2,236 |
| 2.25 | 164.50 | 1,664 | 160 | 2,396 |
| 2.40 | 164.65 | 1,664 | 160 | 2,556 |
| 2.55 | 164.80 | 1,664 | 160 | 2,716 |
| 2.70 | 164.95 | 1,664 | 160 | 2,875 |
| 2.85 | 165.10 | 1,664 | 160 | 3,035 |
| 3.00 | 165.25 | 1,664 | 160 | 3,195 |

### Culvert / Orifice Structures

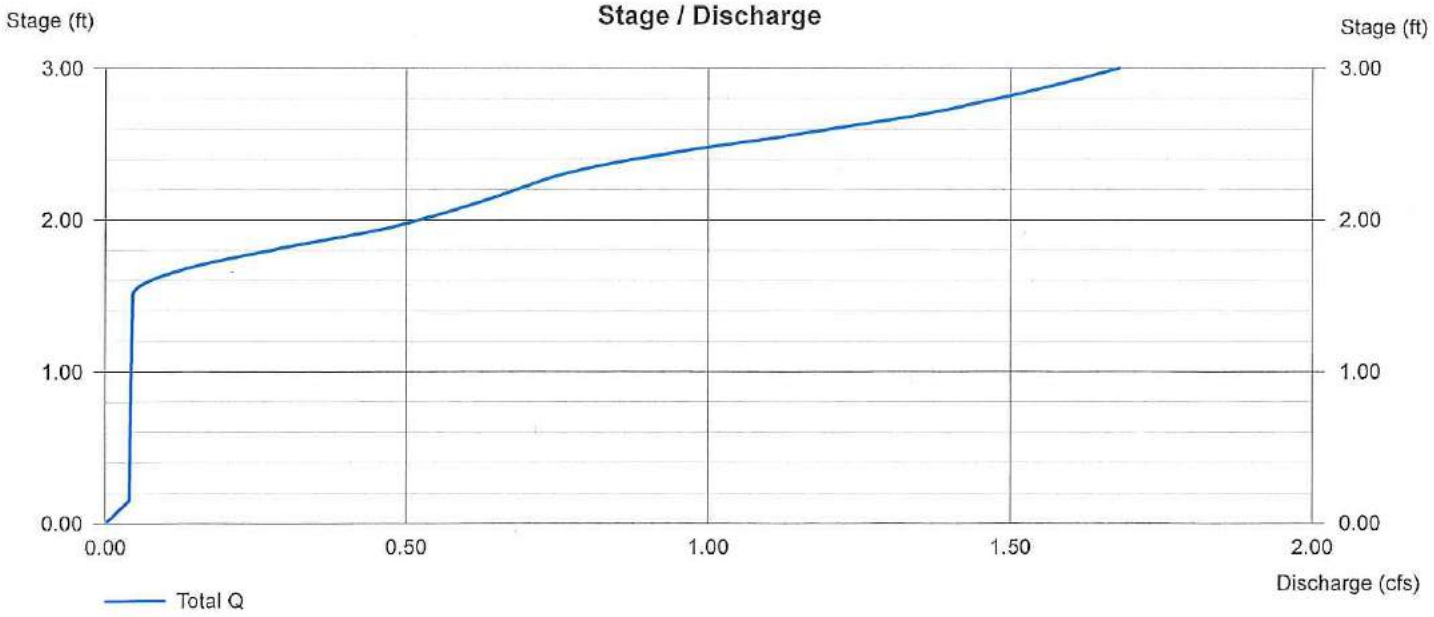
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| Span (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| No. Barrels | = 1 | 1 | 0 | 0 |
| Invert El. (ft) | = 163.75 | 164.50 | 0.00 | 0.00 |
| Length (ft) | = 50.00 | 50.00 | 0.00 | 0.00 |
| Slope (%) | = 2.00 | 2.00 | 0.00 | 0.00 |
| N-Value | = .013 | .013 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.60 | 0.00 | 0.00 |
| 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 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

**Exfiltration** = 1.020 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

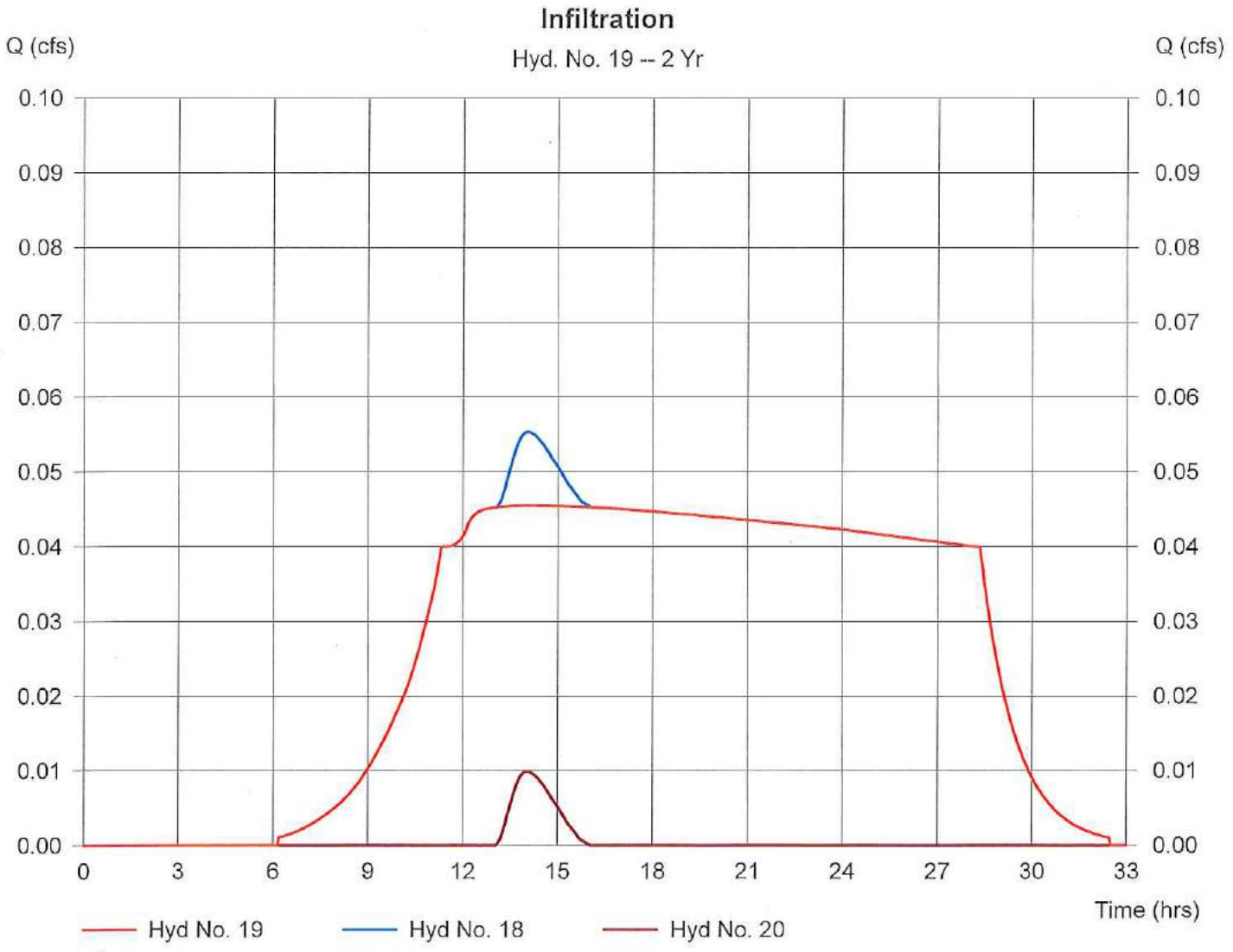


## Hyd. No. 19

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.05 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 20 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 3,039 cuft



# Hydrograph Plot

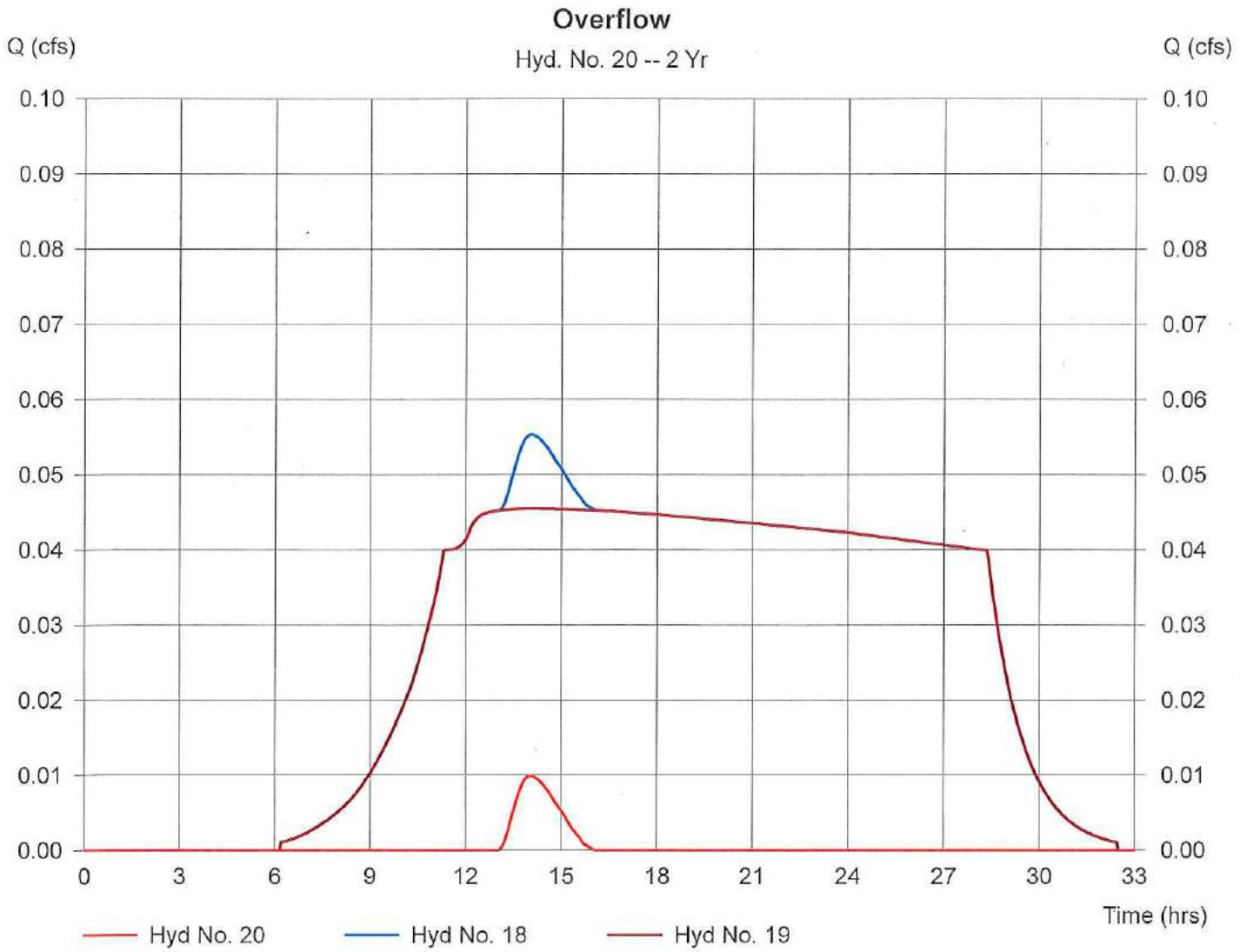


## Hyd. No. 20

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.01 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 19 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 55 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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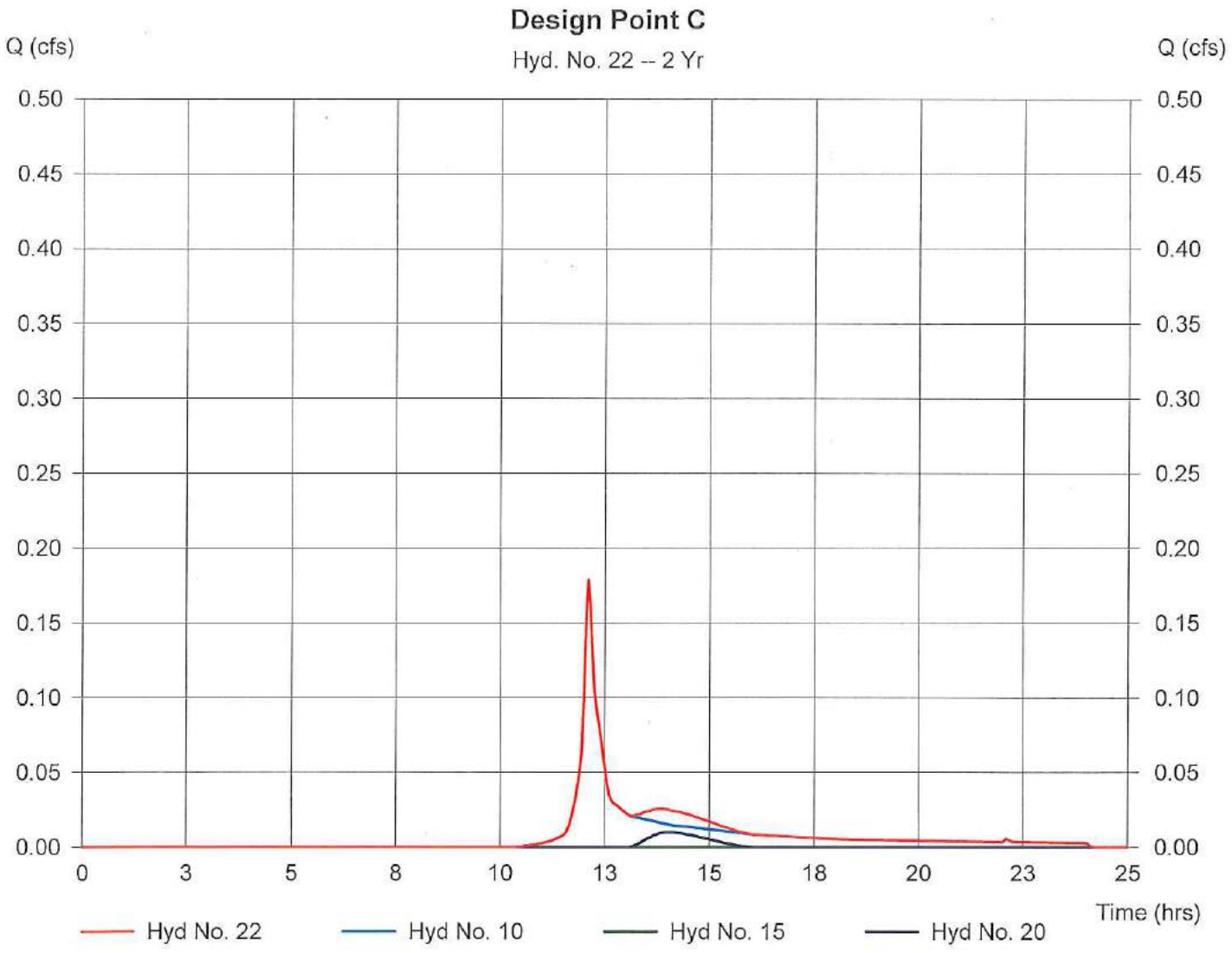
## Hyd. No. 22

Design Point C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.18 cfs |
| Storm frequency | = 2 yrs | Time interval | = 3 min |
| Inflow hyds. | = 10, 15, 20 | | |

Hydrograph Volume = 672 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

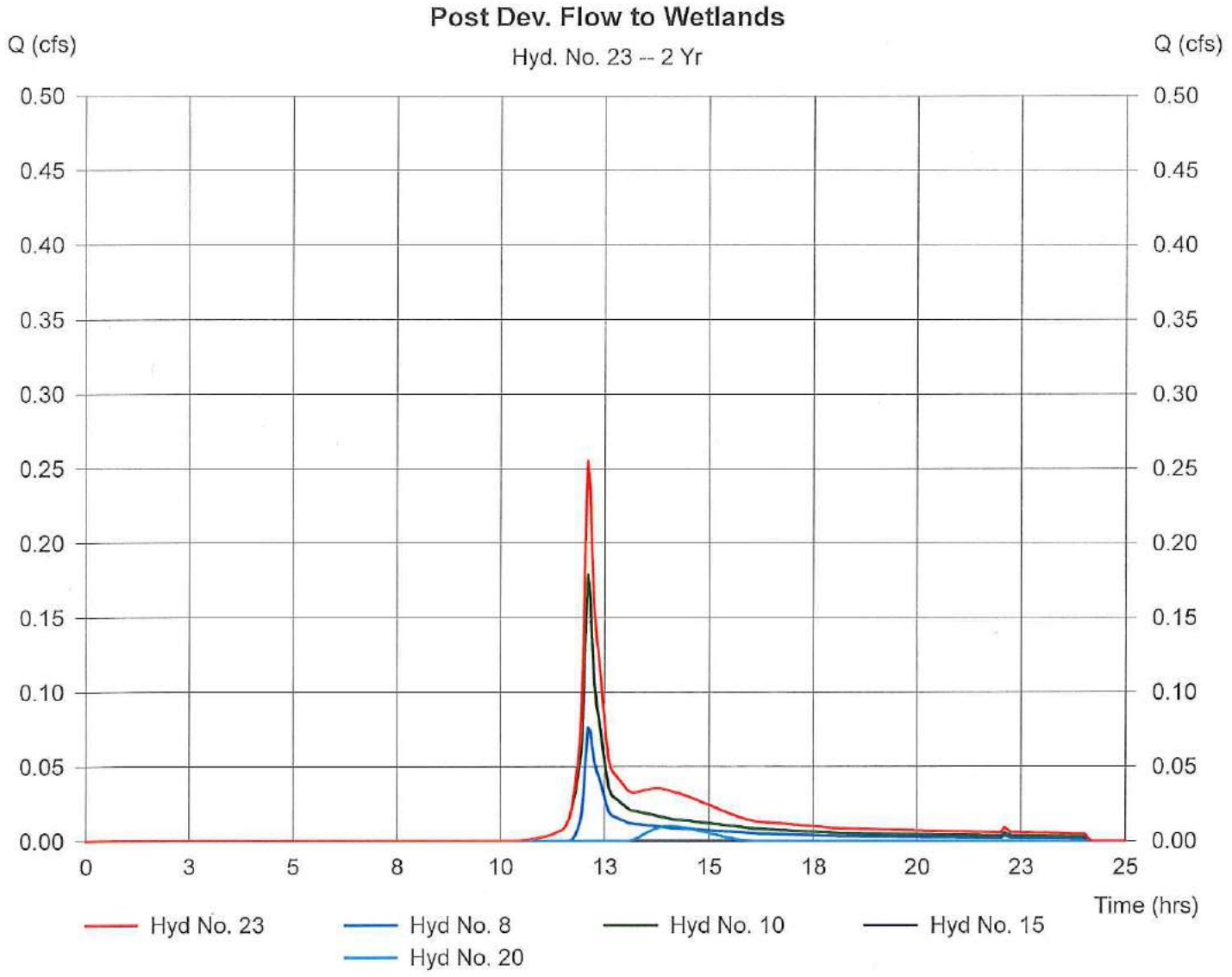
## Hyd. No. 23

Post Dev. Flow to Wetlands

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 8, 10, 15, 20

Peak discharge = 0.25 cfs
Time interval = 3 min

Hydrograph Volume = 982 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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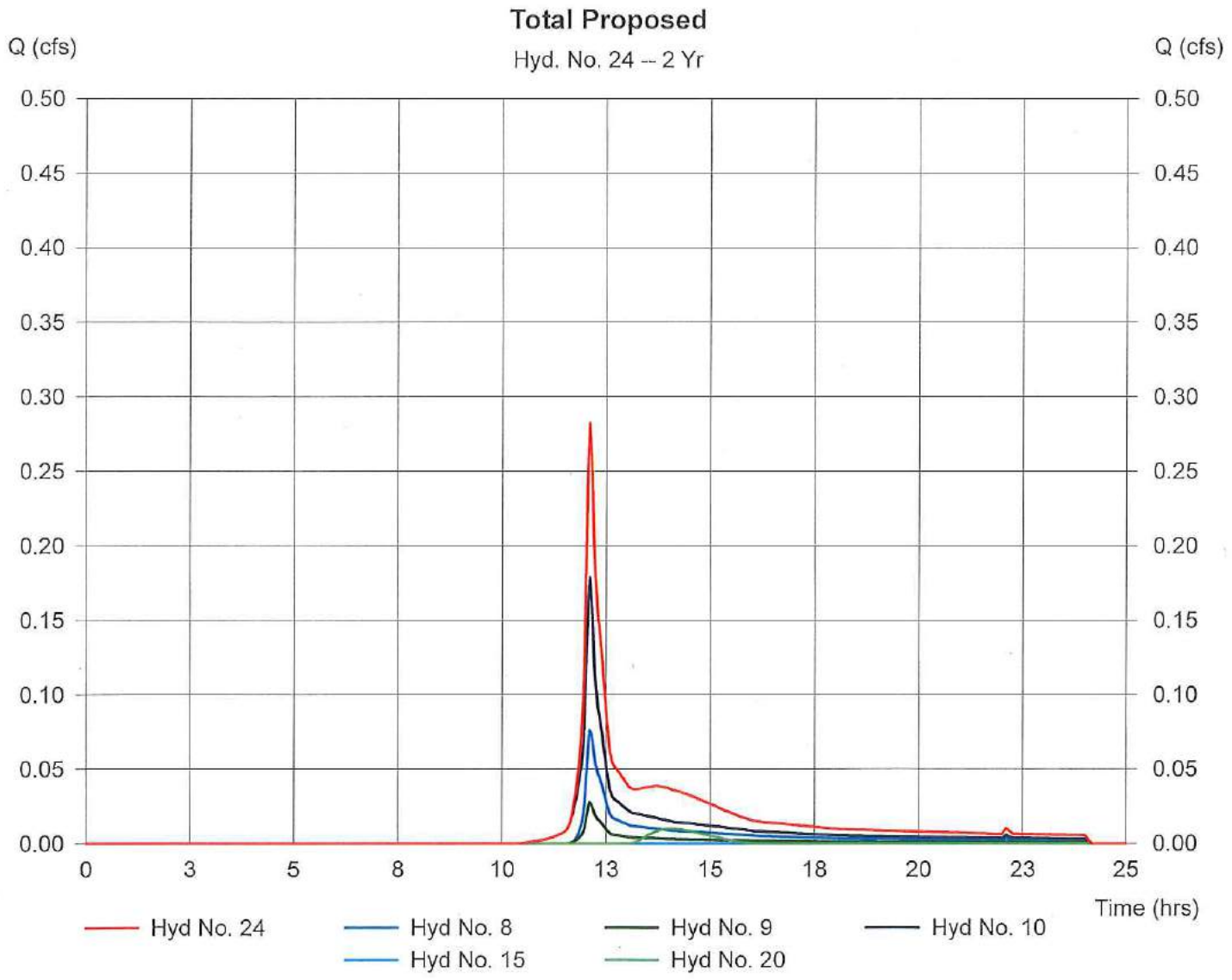
## Hyd. No. 24

Total Proposed

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 8, 9, 10, 15, 20

Peak discharge = 0.28 cfs
Time interval = 3 min

Hydrograph Volume = 1,088 cuft



# 10-Year Storm, Pre and Post-Development

# Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 0.54 | 3 | 726 | 1,881 | ---- | ------ | ------ | E.C.B.-1 |
| 2 | SCS Runoff | 0.18 | 3 | 726 | 602 | ---- | ------ | ------ | E.C.B.-2 |
| 3 | SCS Runoff | 0.85 | 3 | 726 | 2,875 | ---- | ------ | ------ | E.C.B.-3 |
| 5 | Combine | 1.39 | 3 | 726 | 4,756 | 1, 3, | ------ | ------ | Flow to Wetlands |
| 6 | Combine | 1.57 | 3 | 726 | 5,358 | 1, 2, 3, | ------ | ------ | Total Existing |
| 8 | SCS Runoff | 0.21 | 3 | 726 | 740 | ---- | ------ | ------ | P.D.B.-1 |
| 9 | SCS Runoff | 0.07 | 3 | 726 | 246 | ---- | ------ | ------ | P.D.B.-2 |
| 10 | SCS Runoff | 0.38 | 3 | 726 | 1,252 | ---- | ------ | ------ | P.D.B.-3 |
| 12 | SCS Runoff | 0.29 | 3 | 726 | 955 | ---- | ------ | ------ | P.D.B.3A |
| 13 | Reservoir | 0.02 | 3 | 915 | 941 | 12 | 164.70 | 542 | Rain Garden |
| 14 | Diversion1 | 0.02 | 3 | 915 | 941 | 13 | ------ | ------ | Infiltration |
| 15 | Diversion2 | 0.00 | 3 | 915 | 0 | 13 | ------ | ------ | Overflow |
| 17 | SCS Runoff | 1.45 | 3 | 726 | 5,061 | ---- | ------ | ------ | P.D.B.-4 |
| 18 | Reservoir | 0.49 | 3 | 744 | 5,057 | 17 | 164.21 | 2,089 | Infiltration System |
| 19 | Diversion1 | 0.05 | 3 | 744 | 3,548 | 18 | ------ | ------ | Infiltration |
| 20 | Diversion2 | 0.44 | 3 | 744 | 1,510 | 18 | ------ | ------ | Overflow |
| 22 | Combine | 0.59 | 3 | 741 | 2,761 | 10, 15, 20, | ------ | ------ | Design Point C |
| 23 | Combine | 0.70 | 3 | 738 | 3,501 | 8, 10, 15, 20, | ------ | ------ | Post Dev. Flow to Wetlands |
| 24 | Combine | 0.74 | 3 | 738 | 3,747 | 8, 9, 10, 15, 20, | ------ | ------ | Total Proposed |

# Hydrograph Plot

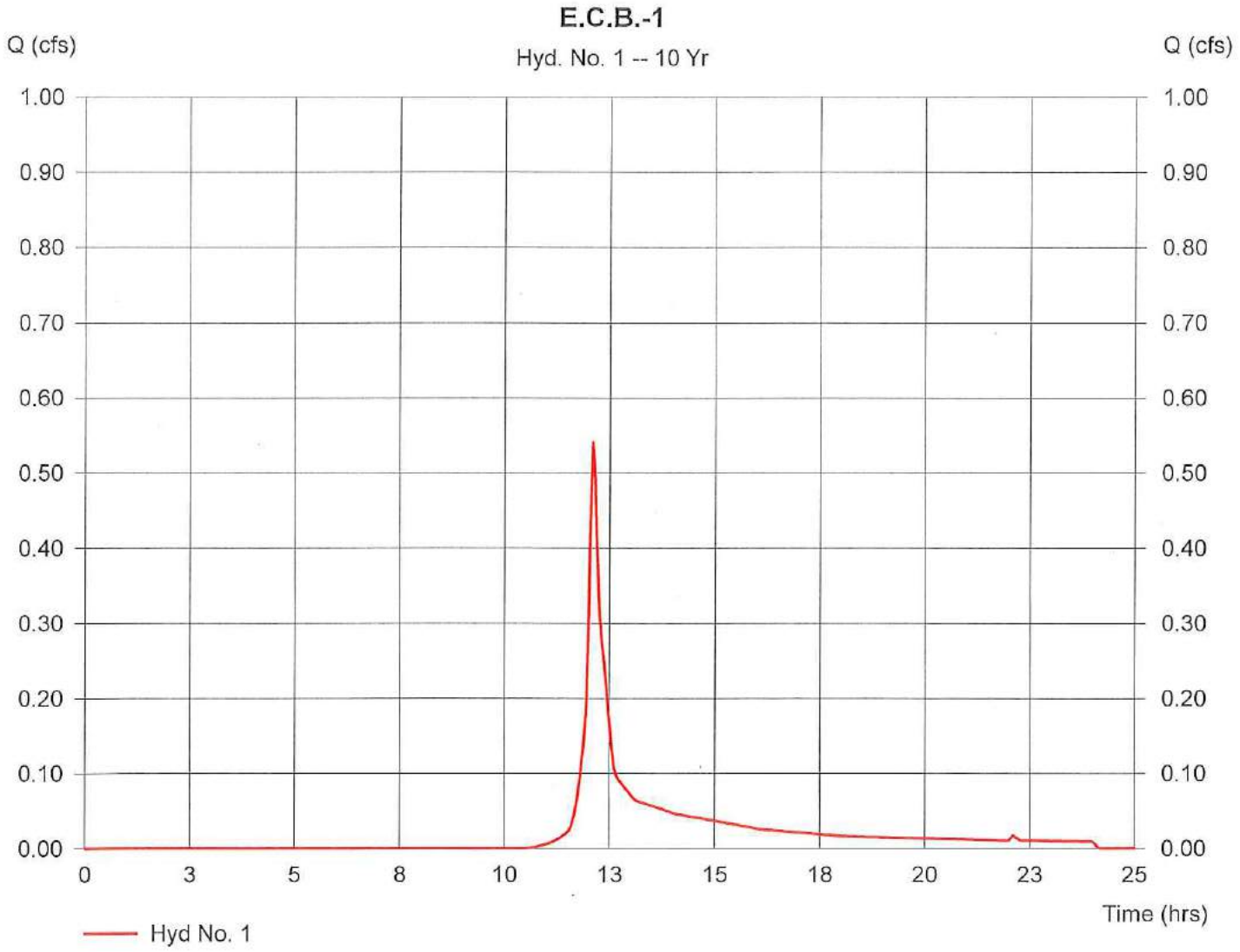


## Hyd. No. 1

E.C.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.54 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.35 ac | Curve number | = 66.4 |
| Basin Slope | = 5.2 % | Hydraulic length | = 189 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.407852 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,881 cuft



# Hydrograph Plot

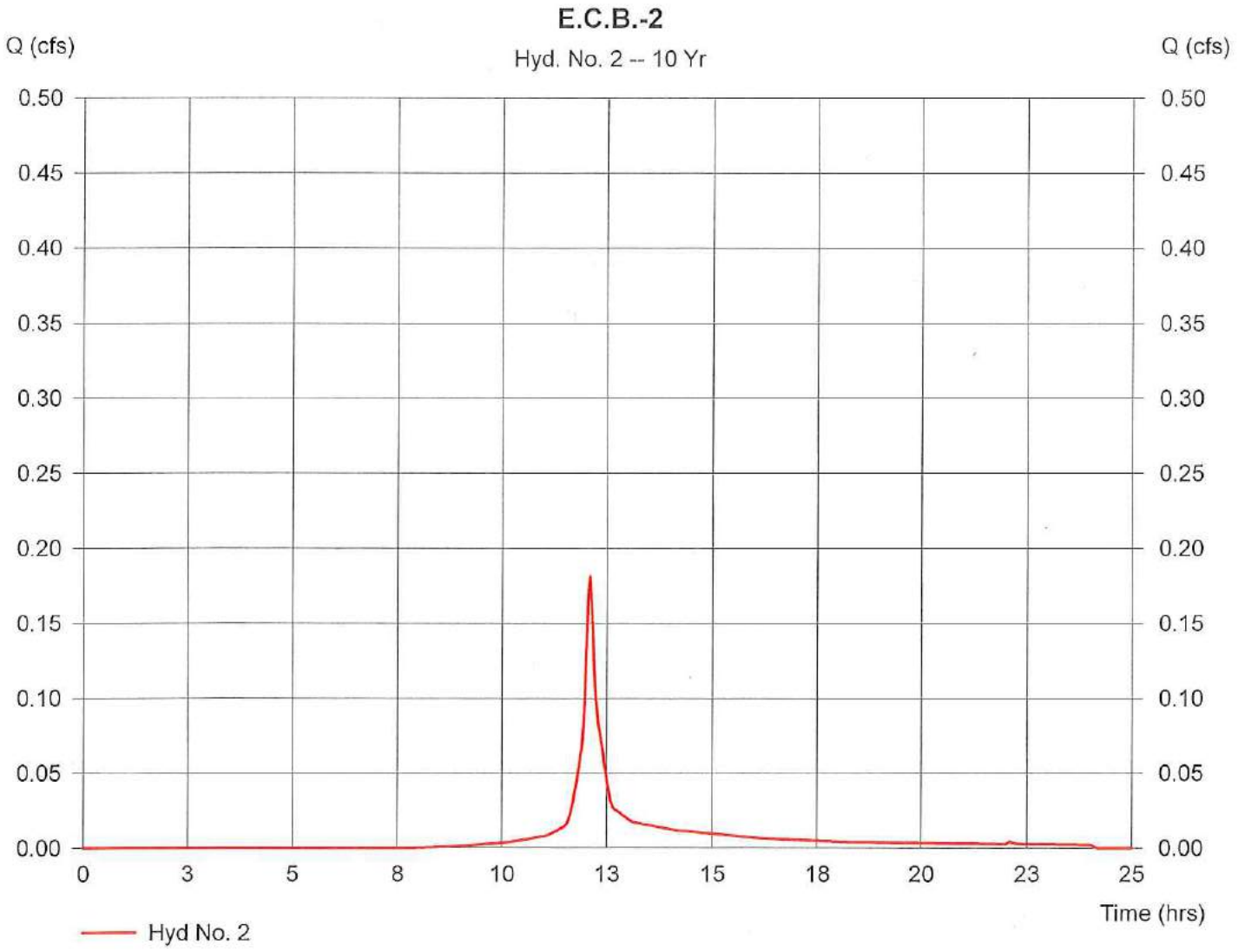


## Hyd. No. 2

E.C.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.18 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.07 ac | Curve number | = 79.8 |
| Basin Slope | = 1.9 % | Hydraulic length | = 68 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 602 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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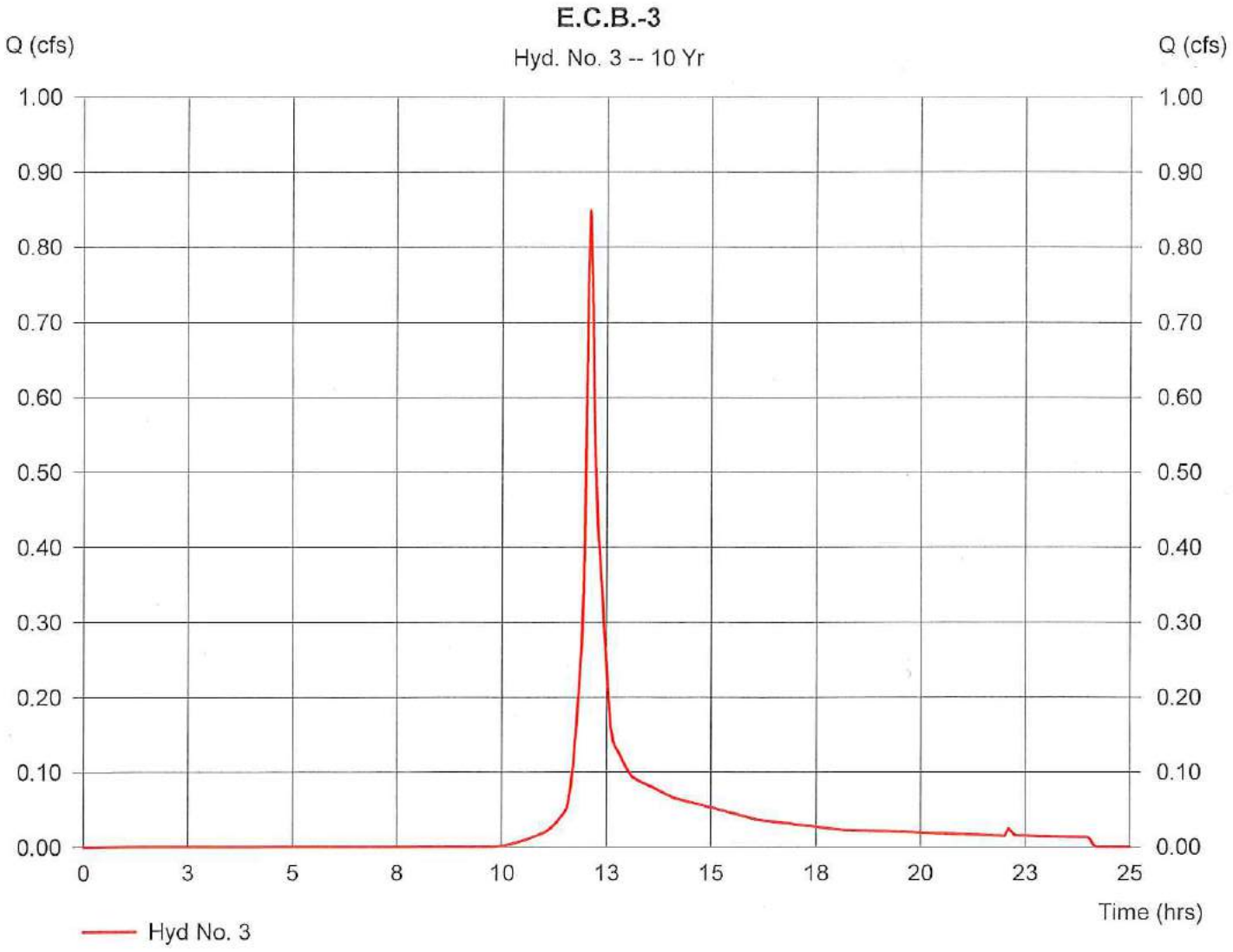
## Hyd. No. 3

E.C.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.85 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.45 ac | Curve number | = 70.4 |
| Basin Slope | = 4.2 % | Hydraulic length | = 207 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.817464 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 2,875 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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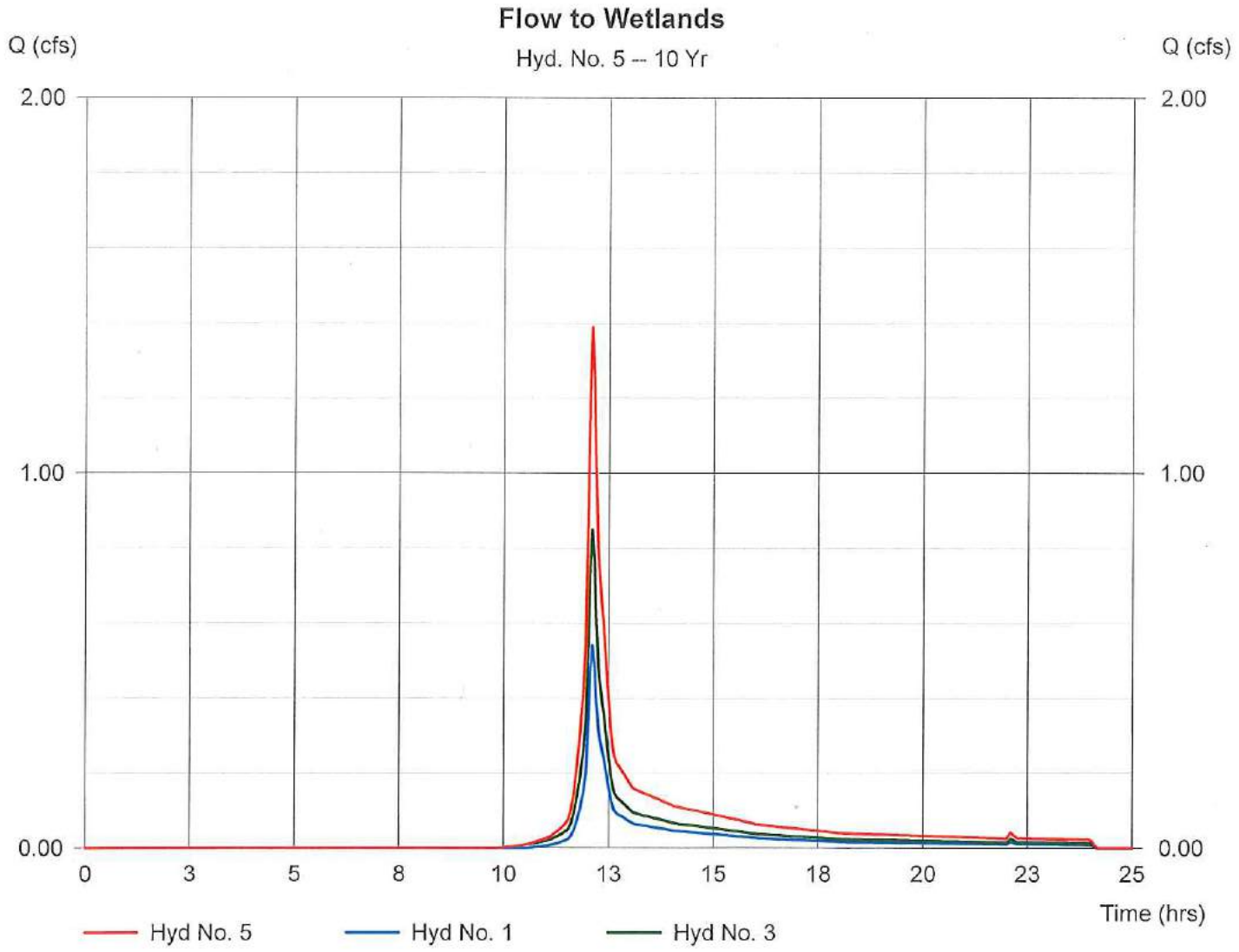
## Hyd. No. 5

Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.39 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 3 | | |

Hydrograph Volume = 4,756 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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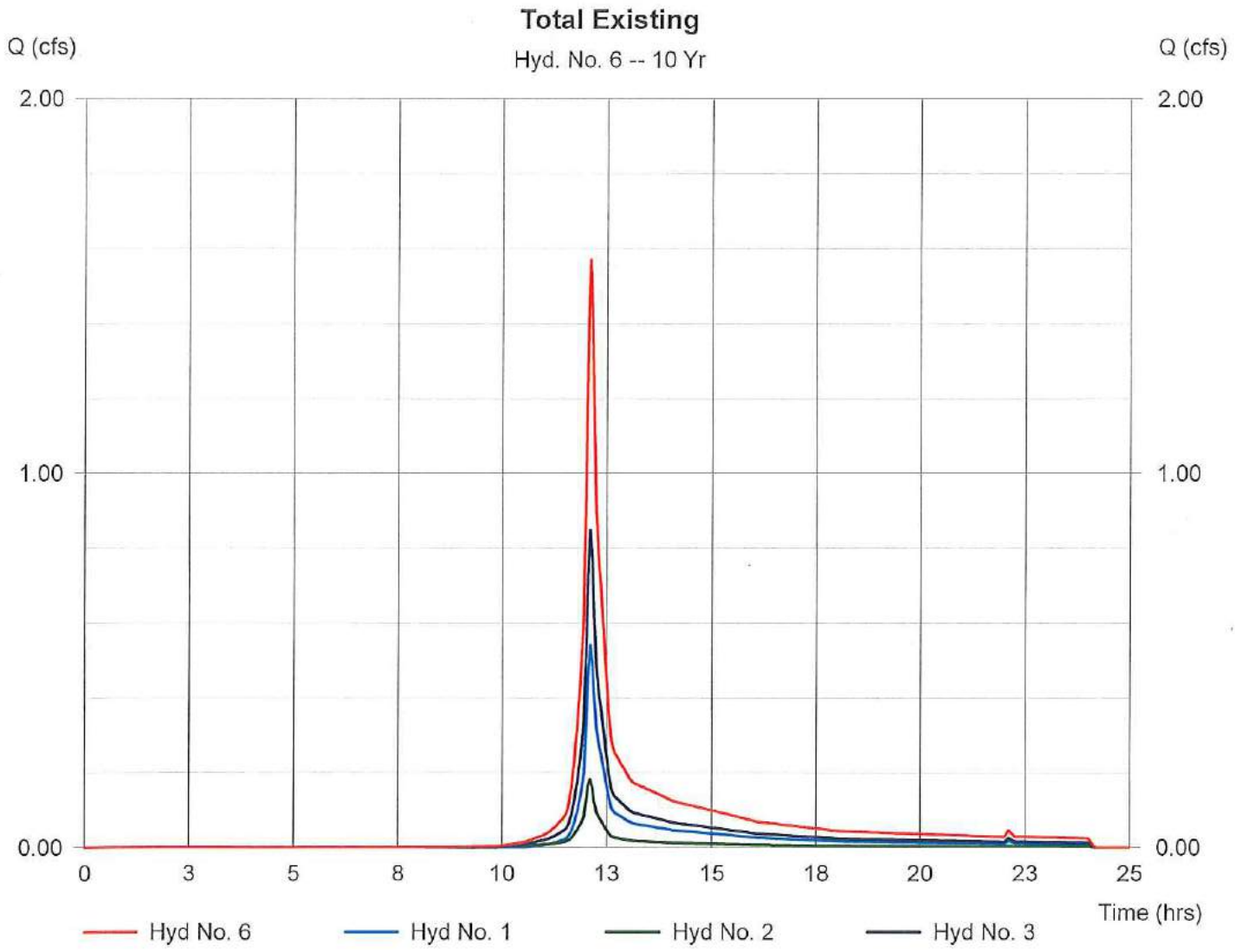
## Hyd. No. 6

Total Existing

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.57 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 2, 3 | | |

Hydrograph Volume = 5,358 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

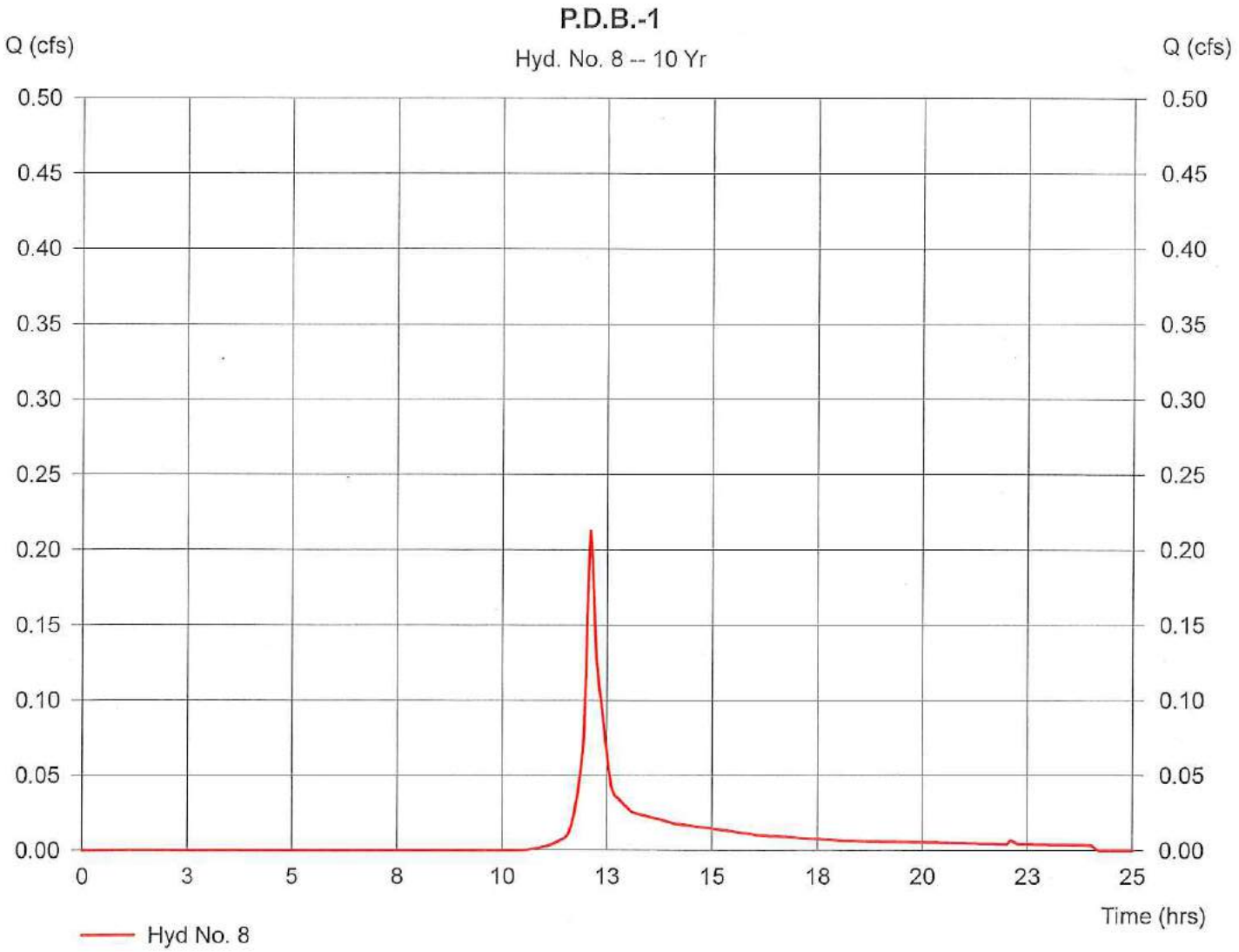
Monday, May 7 2018, 8:27 PM

## Hyd. No. 8

P.D.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.21 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.14 ac | Curve number | = 66.4 |
| Basin Slope | = 4.4 % | Hydraulic length | = 222 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 6.686719 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 740 cuft



# Hydrograph Plot

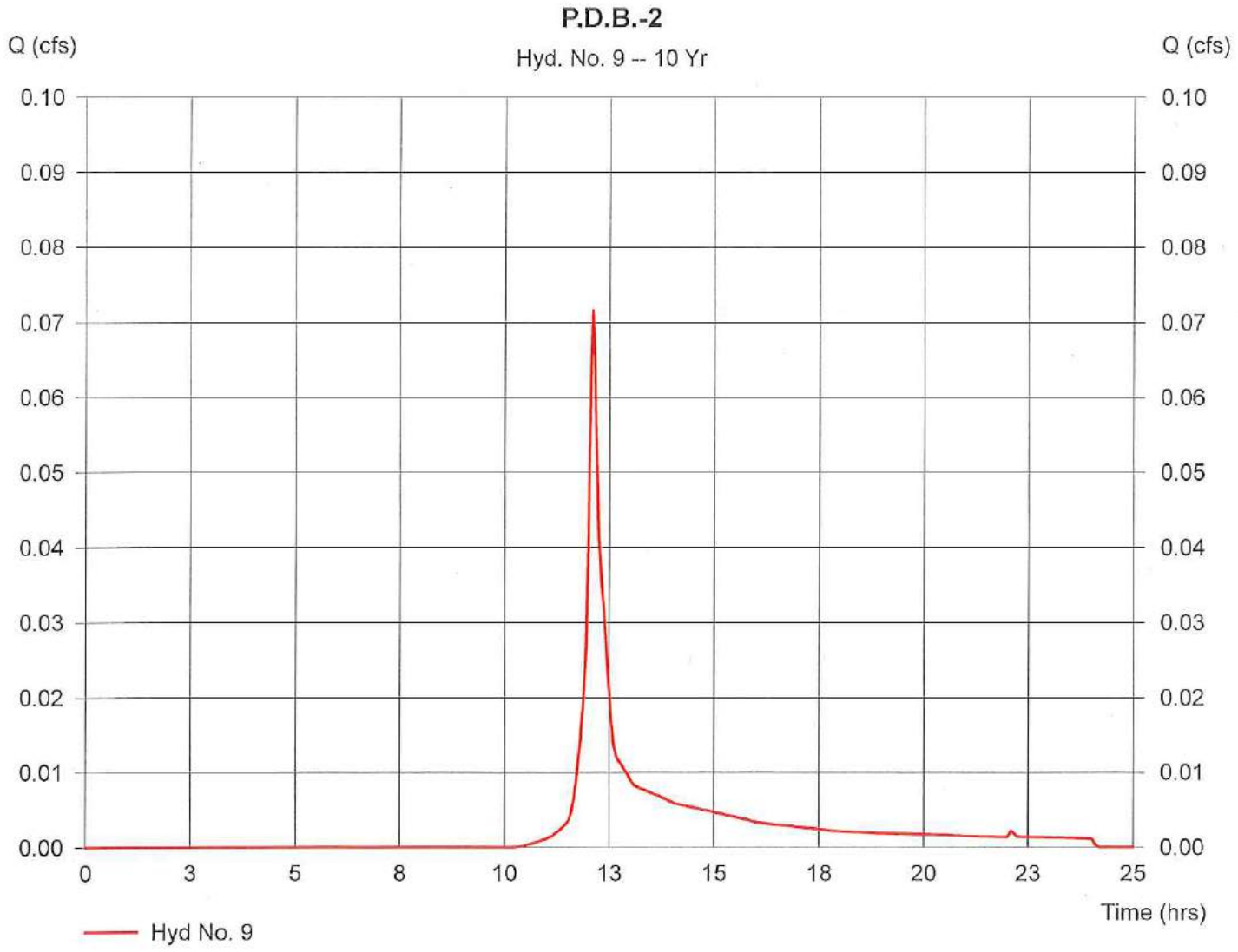


## Hyd. No. 9

P.D.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.07 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.04 ac | Curve number | = 67.9 |
| Basin Slope | = 1.0 % | Hydraulic length | = 49 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 246 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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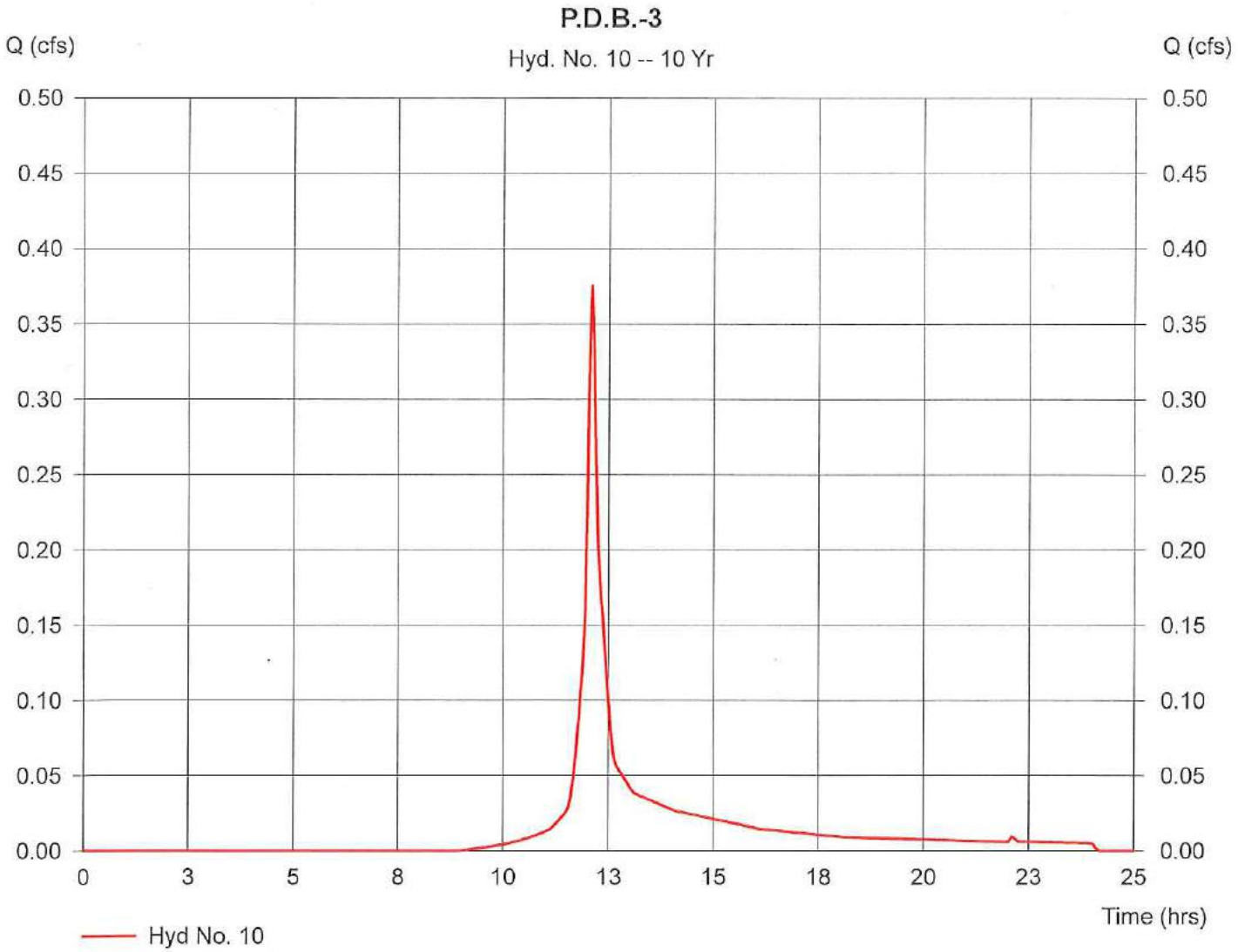
## Hyd. No. 10

P.D.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.38 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.16 ac | Curve number | = 75.3 |
| Basin Slope | = 3.8 % | Hydraulic length | = 196 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,252 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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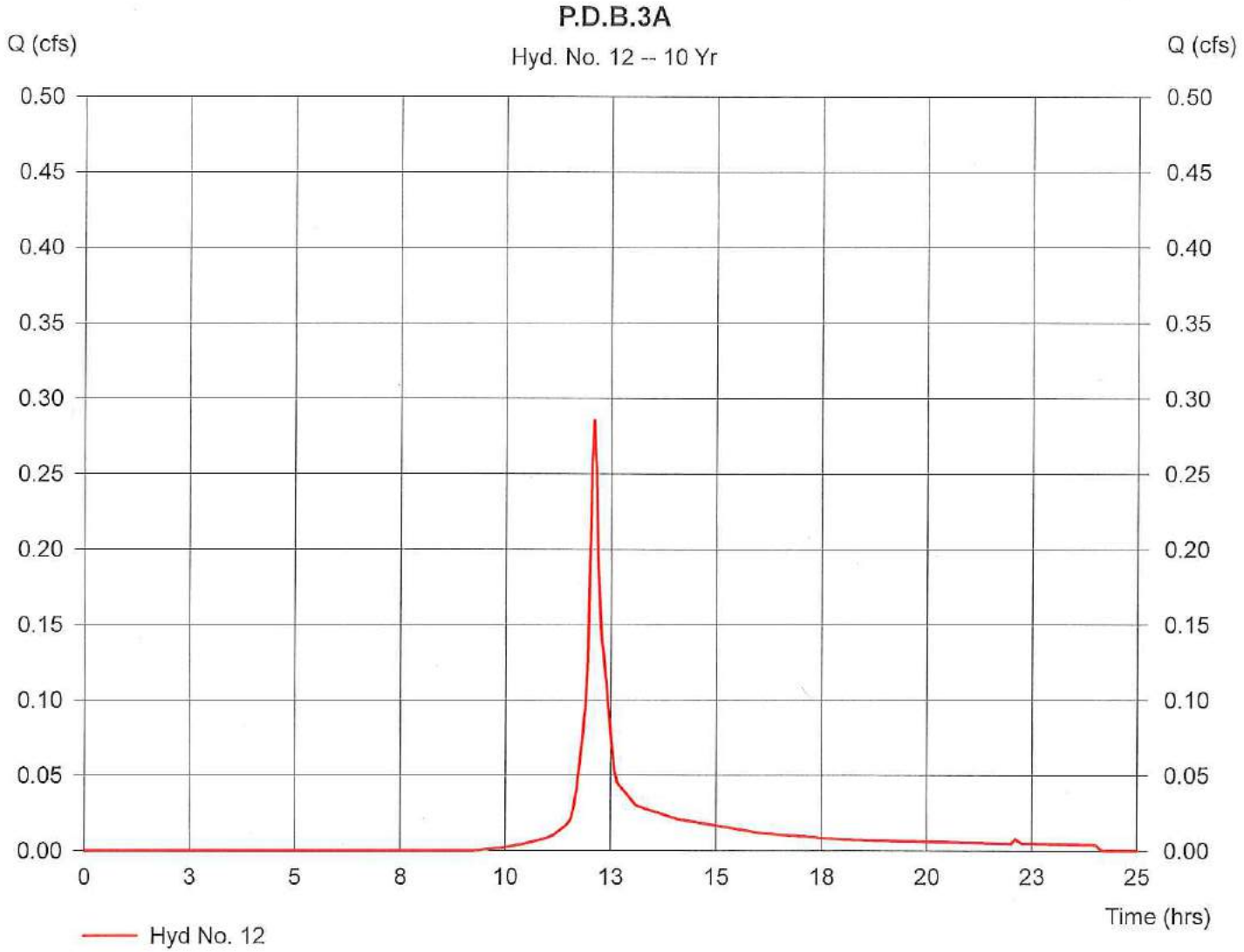
## Hyd. No. 12

P.D.B.3A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.29 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.13 ac | Curve number | = 73.5 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 955 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

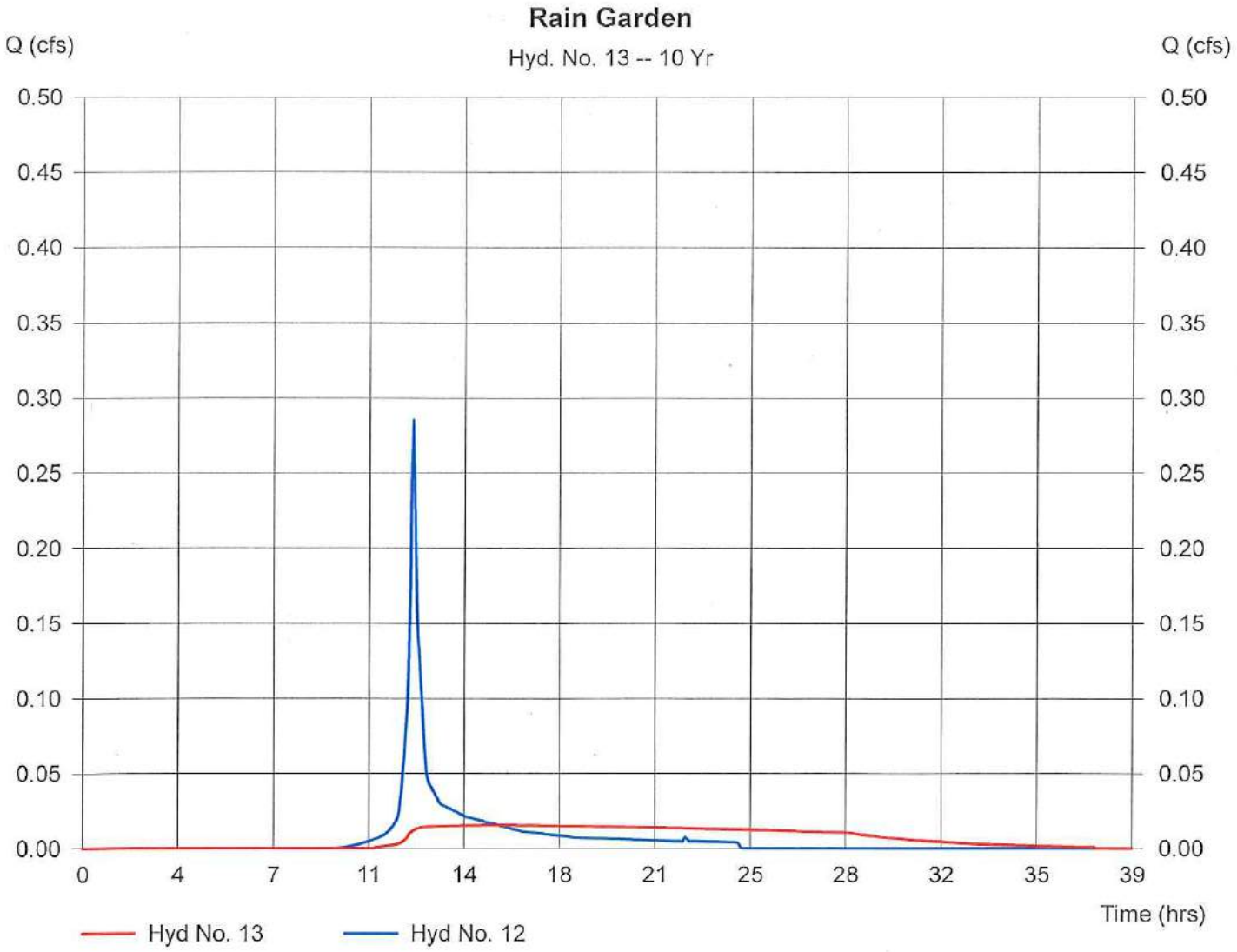
## Hyd. No. 13

Rain Garden

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.02 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 12 | Max. Elevation | = 164.70 ft |
| Reservoir name | = Rain Garden | Max. Storage | = 542 cuft |

Storage Indication method used.

Hydrograph Volume = 941 cuft



# Pond Report



## Pond No. 5 - Rain Garden

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 163.50 | 140 | 0 | 0 |
| 0.50 | 164.00 | 448 | 147 | 147 |
| 1.00 | 164.50 | 591 | 260 | 407 |
| 1.50 | 165.00 | 748 | 335 | 742 |

### Culvert / Orifice Structures

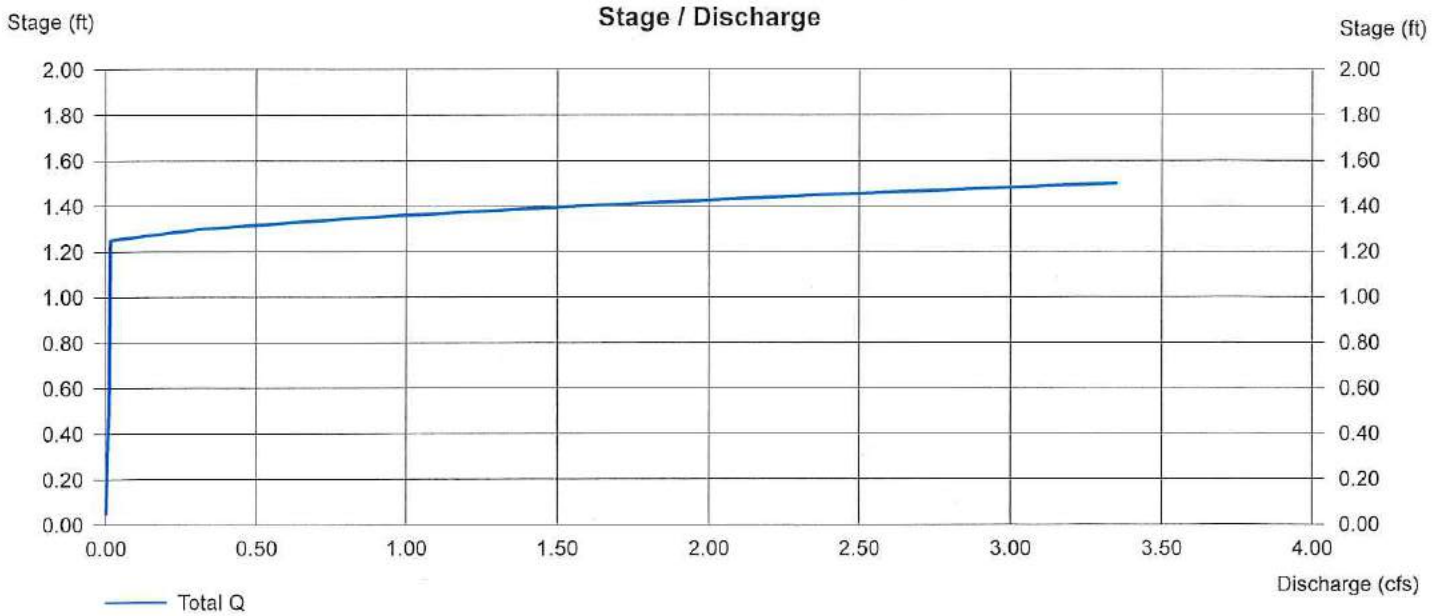
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Crest Len (ft) | = 8.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 164.75 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 3.33 | 0.00 | 0.00 | 0.00 |
| Weir Type | = Rect | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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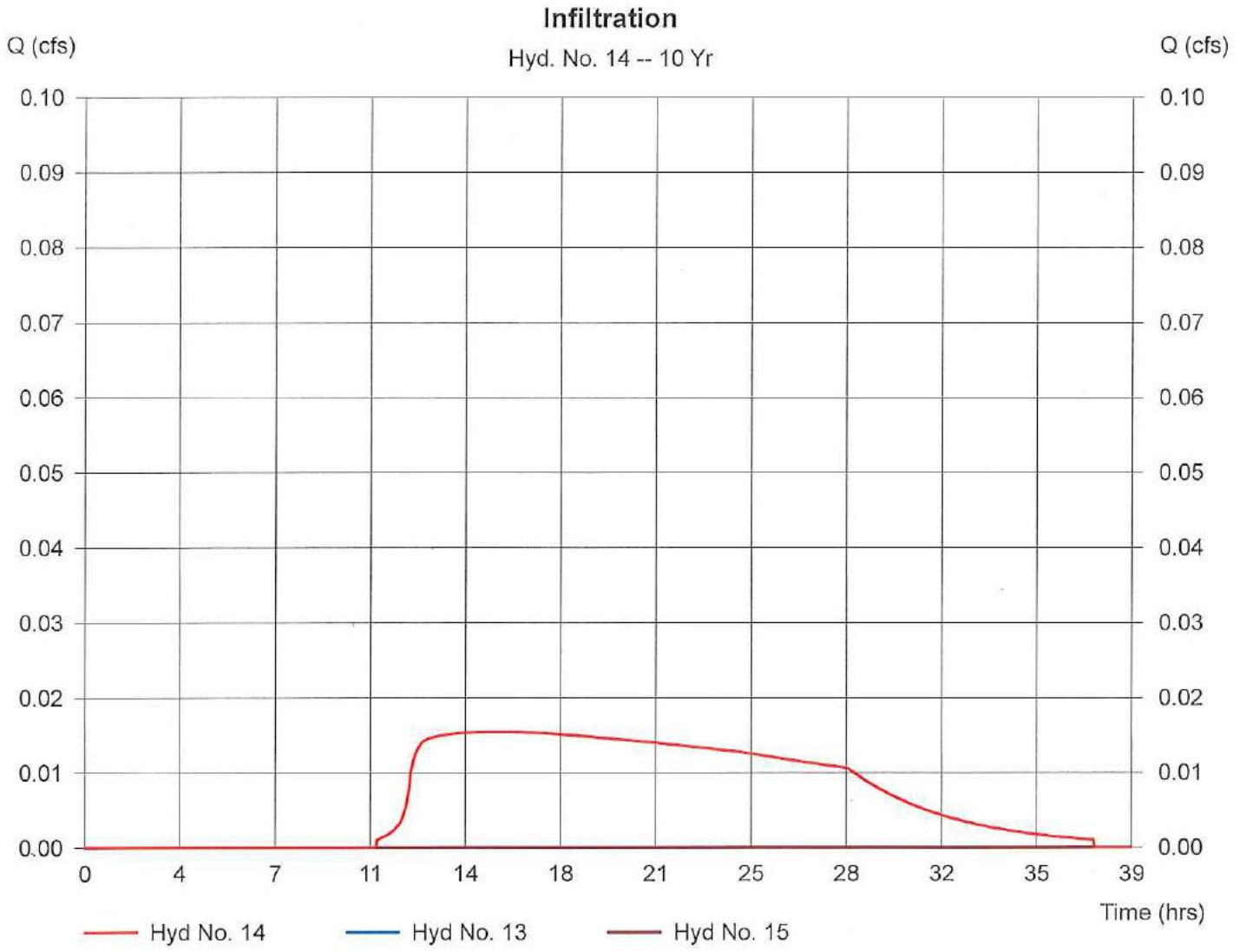
## Hyd. No. 14

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.02 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 15 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 941 cuft



# Hydrograph Plot

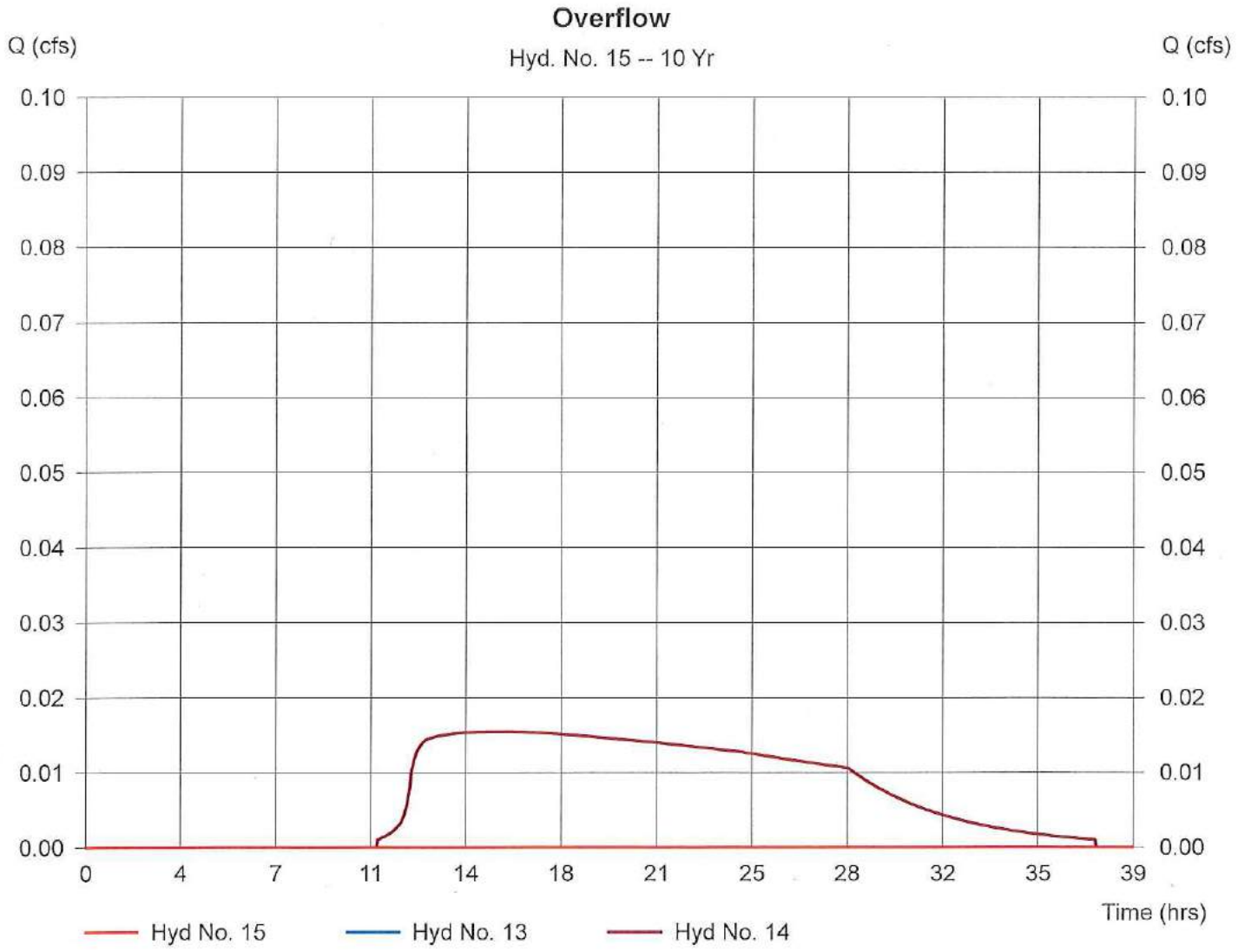


## Hyd. No. 15

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.00 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 14 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 0 cuft



# Hydrograph Plot

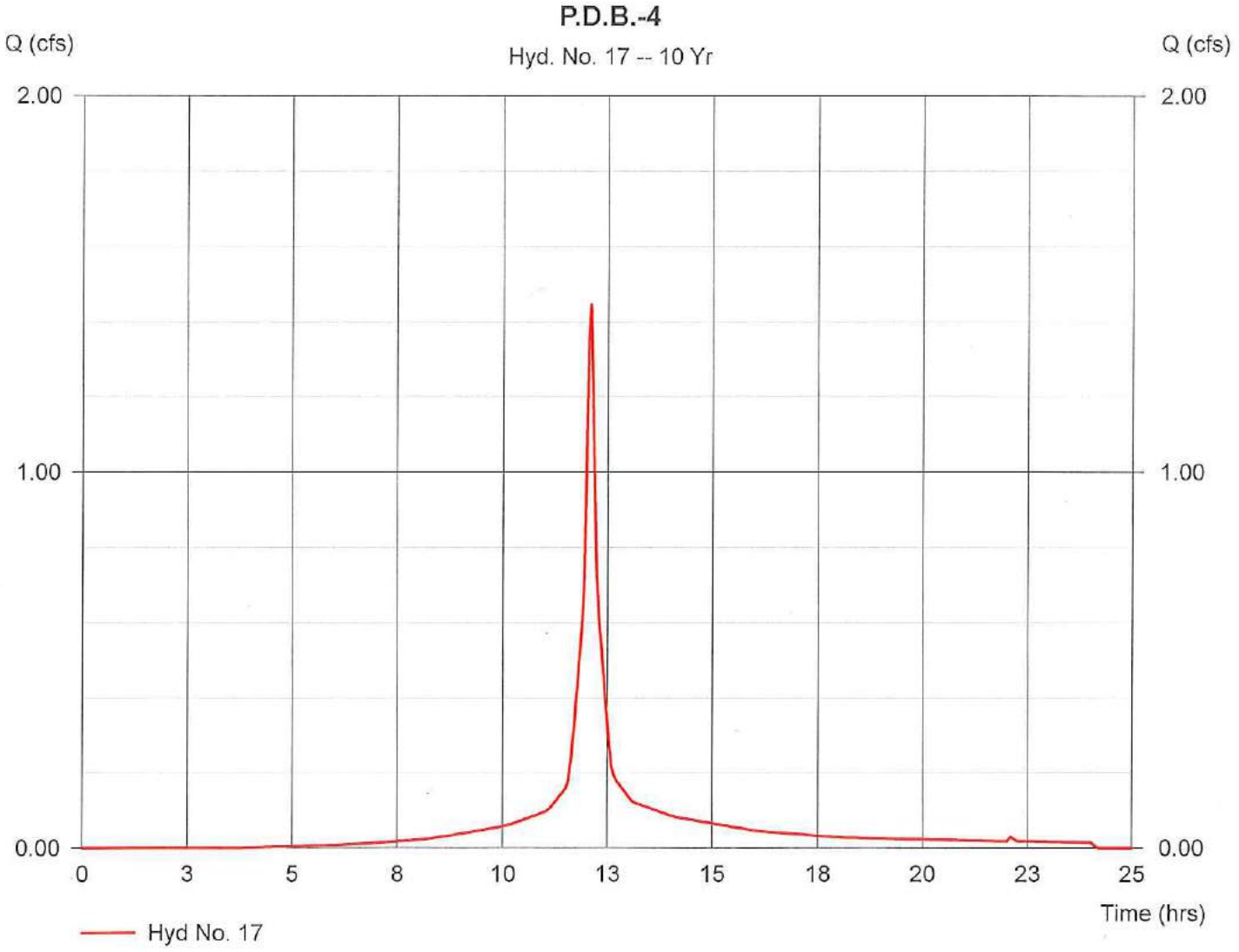


## Hyd. No. 17

P.D.B.-4

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 1.45 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Drainage area | = 0.39 ac | Curve number | = 91.7 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 4.73 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 5,061 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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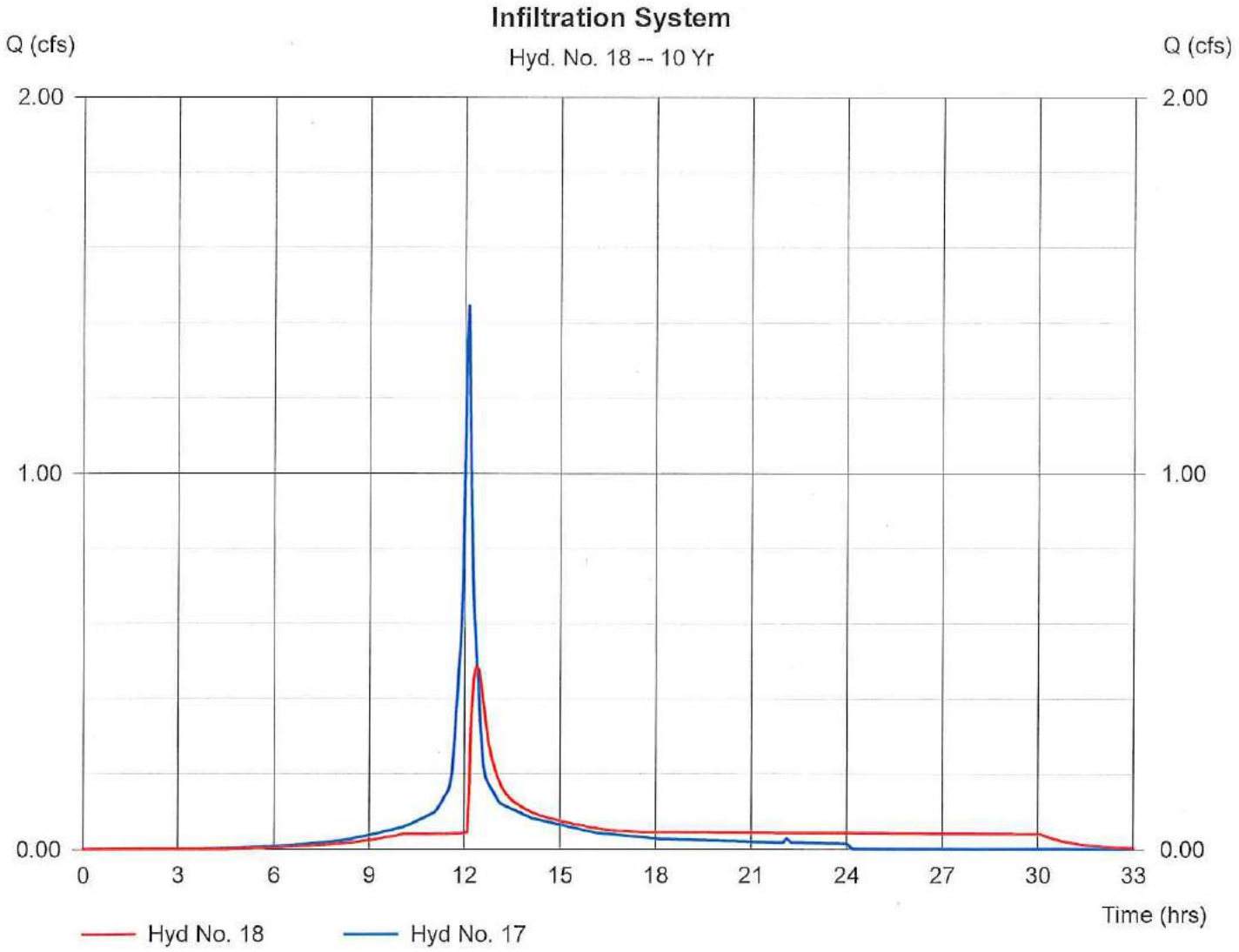
## Hyd. No. 18

Infiltration System

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.49 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 17 | Max. Elevation | = 164.21 ft |
| Reservoir name | = Infiltration System | Max. Storage | = 2,089 cuft |

Storage Indication method used.

Hydrograph Volume = 5,057 cuft



# Pond Report



## Pond No. 1 - Infiltration System

### Pond Data

Bottom LxW = 52.0 x 32.0 ft  Side slope = 0.0:1  Bottom elev. = 162.25 ft  Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft)* | Total storage (cuft)* |
|---|---|---|---|---|
| 0.00 | 162.25 | 1,664 | 0 | 0 |
| 0.15 | 162.40 | 1,664 | 160 | 160 |
| 0.30 | 162.55 | 1,664 | 160 | 319 |
| 0.45 | 162.70 | 1,664 | 160 | 479 |
| 0.60 | 162.85 | 1,664 | 160 | 639 |
| 0.75 | 163.00 | 1,664 | 160 | 799 |
| 0.90 | 163.15 | 1,664 | 160 | 958 |
| 1.05 | 163.30 | 1,664 | 160 | 1,118 |
| 1.20 | 163.45 | 1,664 | 160 | 1,278 |
| 1.35 | 163.60 | 1,664 | 160 | 1,438 |
| 1.50 | 163.75 | 1,664 | 160 | 1,597 |
| 1.65 | 163.90 | 1,664 | 160 | 1,757 |
| 1.80 | 164.05 | 1,664 | 160 | 1,917 |
| 1.95 | 164.20 | 1,664 | 160 | 2,077 |
| 2.10 | 164.35 | 1,664 | 160 | 2,236 |
| 2.25 | 164.50 | 1,664 | 160 | 2,396 |
| 2.40 | 164.65 | 1,664 | 160 | 2,556 |
| 2.55 | 164.80 | 1,664 | 160 | 2,716 |
| 2.70 | 164.95 | 1,664 | 160 | 2,875 |
| 2.85 | 165.10 | 1,664 | 160 | 3,035 |
| 3.00 | 165.25 | 1,664 | 160 | 3,195 |

*(*64.00% voids applied)*

### Culvert / Orifice Structures

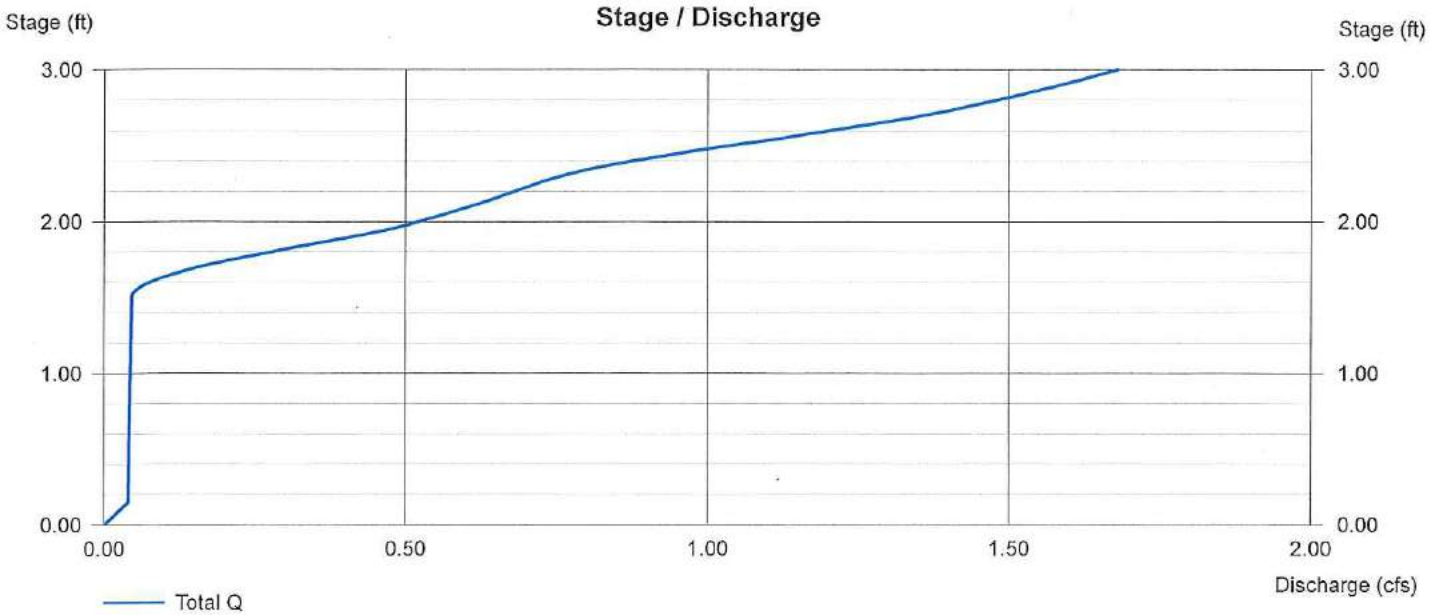
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| Span (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| No. Barrels | = 1 | 1 | 0 | 0 |
| Invert El. (ft) | = 163.75 | 164.50 | 0.00 | 0.00 |
| Length (ft) | = 50.00 | 50.00 | 0.00 | 0.00 |
| Slope (%) | = 2.00 | 2.00 | 0.00 | 0.00 |
| N-Value | = .013 | .013 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.60 | 0.00 | 0.00 |
| 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 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Wet area)  Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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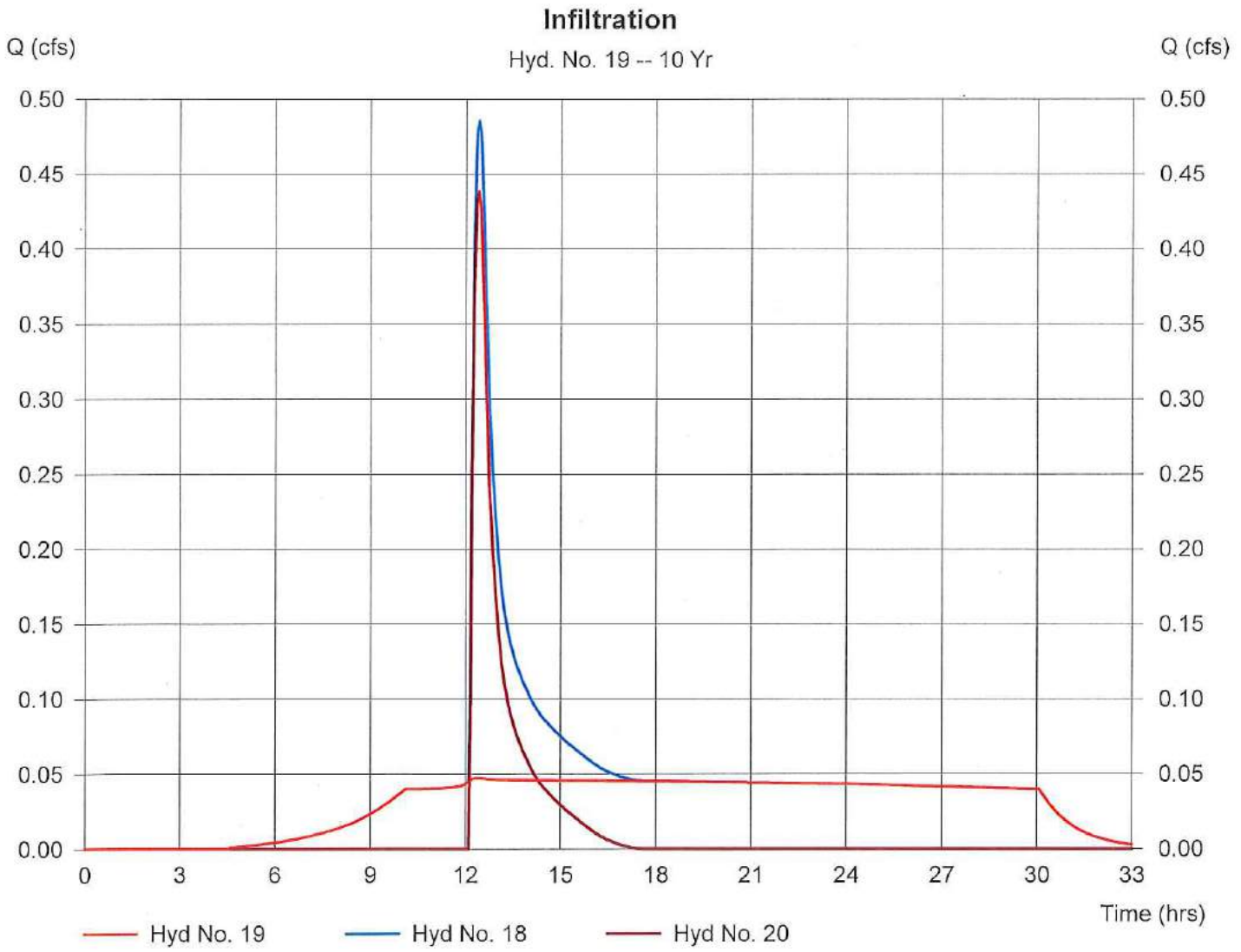
## Hyd. No. 19

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.05 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 20 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 3,548 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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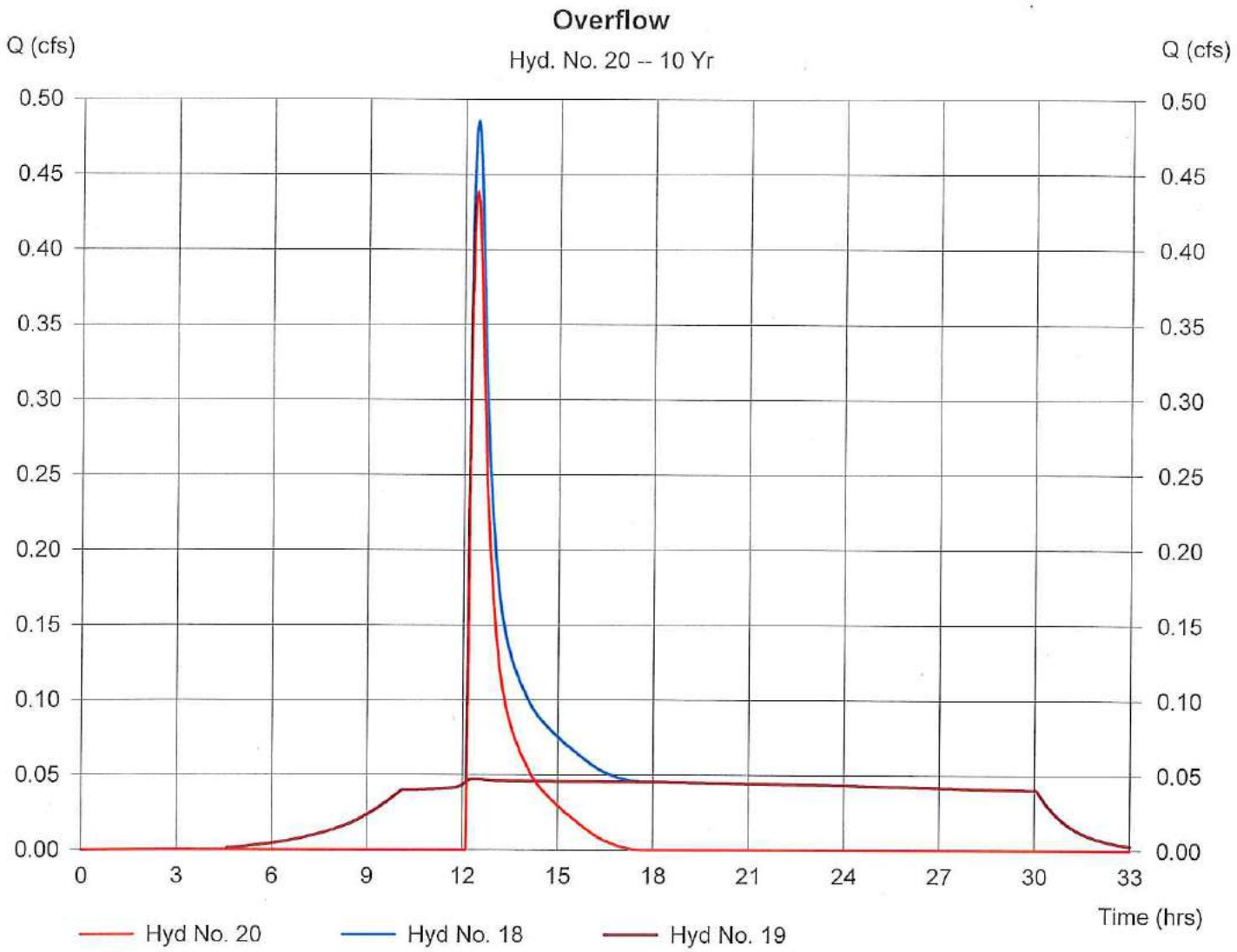
## Hyd. No. 20

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.44 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 19 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 1,510 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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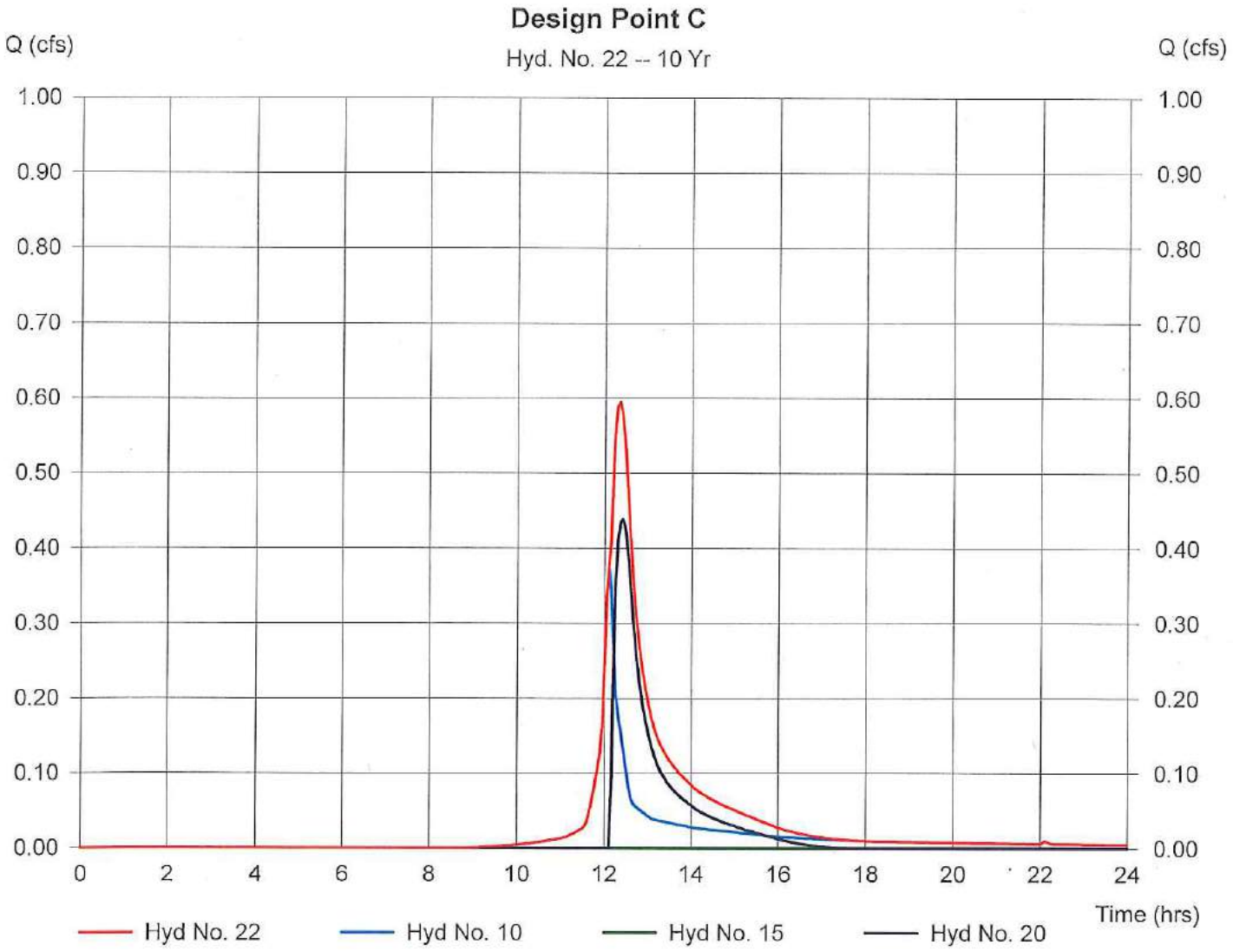
## Hyd. No. 22

Design Point C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.59 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyds. | = 10, 15, 20 | | |

Hydrograph Volume = 2,761 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

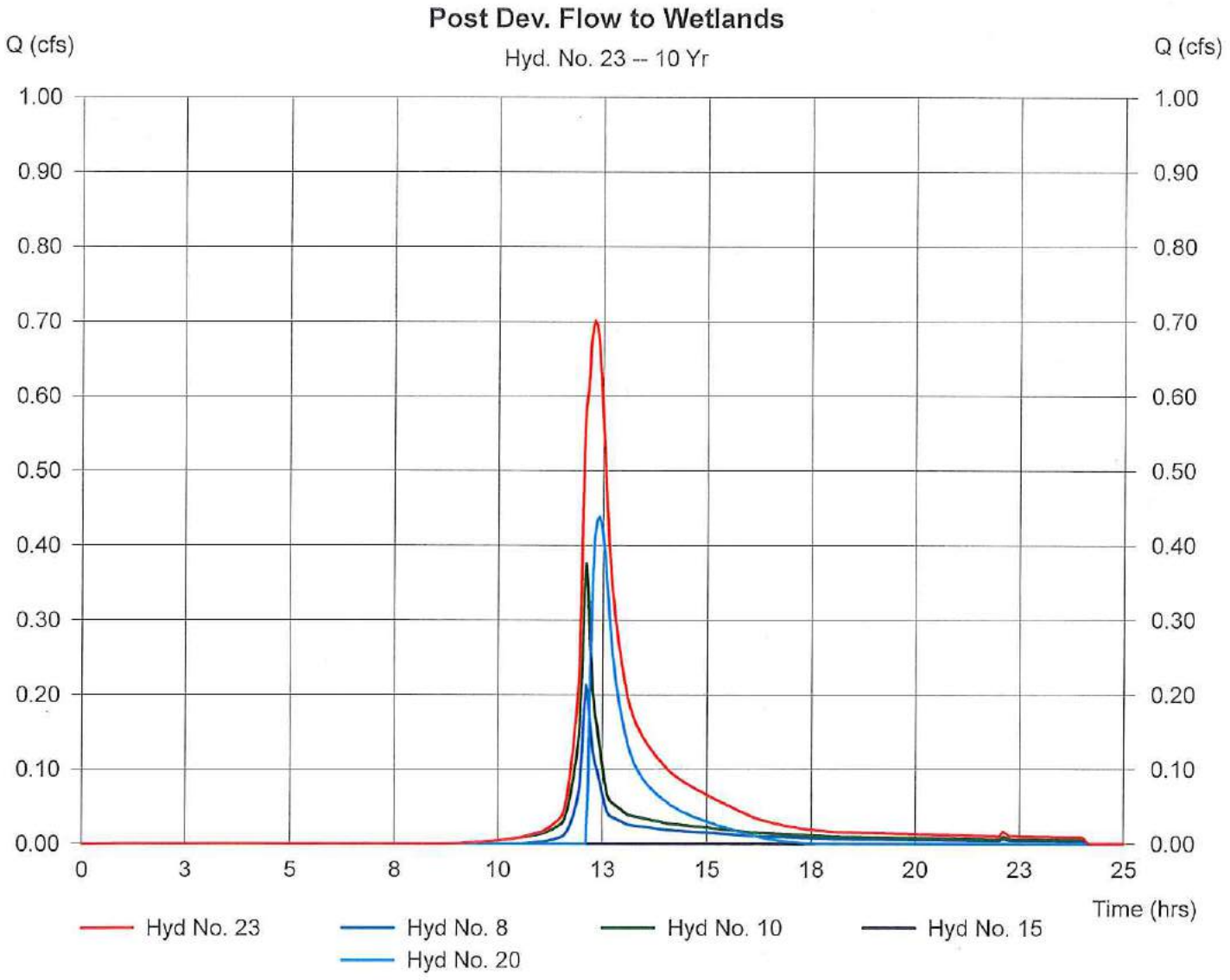
Monday, May 7 2018, 8:27 PM

## Hyd. No. 23

Post Dev. Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.70 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 10, 15, 20 | | |

Hydrograph Volume = 3,501 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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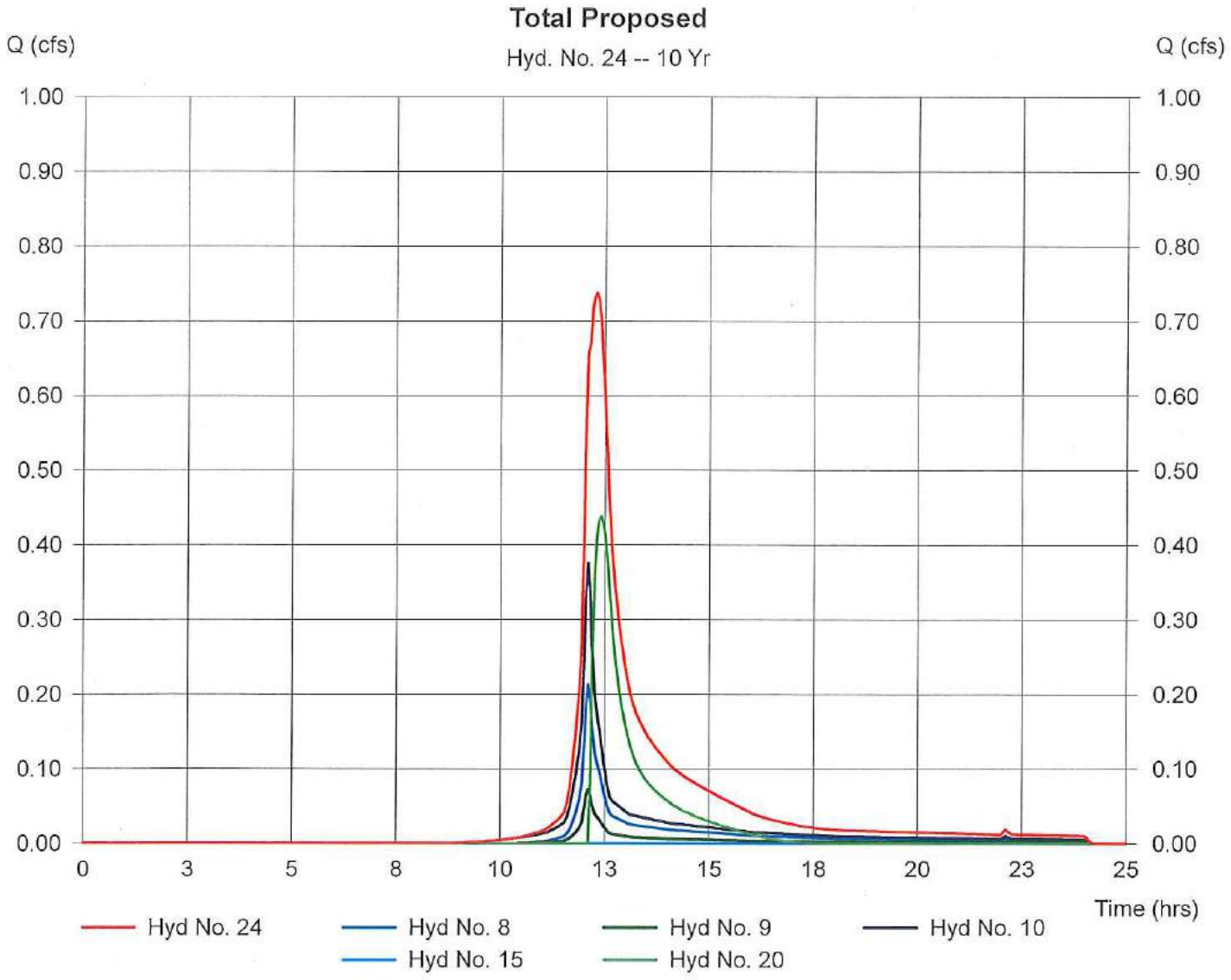
## Hyd. No. 24

Total Proposed

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 0.74 cfs |
| Storm frequency | = 10 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 9, 10, 15, 20 | | |

Hydrograph Volume = 3,747 cuft



# 25-Year Storm, Pre and Post-Development

# Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 0.86 | 3 | 726 | 2,913 | ---- | ------ | ------ | E.C.B.-1 |
| 2 | SCS Runoff | 0.25 | 3 | 726 | 847 | ---- | ------ | ------ | E.C.B.-2 |
| 3 | SCS Runoff | 1.29 | 3 | 726 | 4,311 | ---- | ------ | ------ | E.C.B.-3 |
| 5 | Combine | 2.16 | 3 | 726 | 7,224 | 1, 3, | ------ | ------ | Flow to Wetlands |
| 6 | Combine | 2.41 | 3 | 726 | 8,071 | 1, 2, 3, | ------ | ------ | Total Existing |
| 8 | SCS Runoff | 0.34 | 3 | 726 | 1,145 | ---- | ------ | ------ | P.D.B.-1 |
| 9 | SCS Runoff | 0.11 | 3 | 726 | 377 | ---- | ------ | ------ | P.D.B.-2 |
| 10 | SCS Runoff | 0.55 | 3 | 726 | 1,813 | ---- | ------ | ------ | P.D.B.-3 |
| 12 | SCS Runoff | 0.42 | 3 | 726 | 1,401 | ---- | ------ | ------ | P.D.B.3A |
| 13 | Reservoir | 0.17 | 3 | 741 | 1,387 | 12 | 164.78 | 591 | Rain Garden |
| 14 | Diversion1 | 0.02 | 3 | 741 | 1,075 | 13 | ------ | ------ | Infiltration |
| 15 | Diversion2 | 0.15 | 3 | 741 | 312 | 13 | ------ | ------ | Overflow |
| 17 | SCS Runoff | 1.87 | 3 | 726 | 6,652 | ---- | ------ | ------ | P.D.B.-4 |
| 18 | Reservoir | 0.81 | 3 | 738 | 6,648 | 17 | 164.60 | 2,505 | Infiltration System |
| 19 | Diversion1 | 0.05 | 3 | 738 | 3,857 | 18 | ------ | ------ | Infiltration |
| 20 | Diversion2 | 0.77 | 3 | 738 | 2,791 | 18 | ------ | ------ | Overflow |
| 22 | Combine | 1.13 | 3 | 741 | 4,916 | 10, 15, 20, | ------ | ------ | Design Point C |
| 23 | Combine | 1.40 | 3 | 729 | 6,061 | 8, 10, 15, 20, | ------ | ------ | Post Dev. Flow to Wetlands |
| 24 | Combine | 1.50 | 3 | 729 | 6,438 | 8, 9, 10, 15, 20, | ------ | ------ | Total Proposed |

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

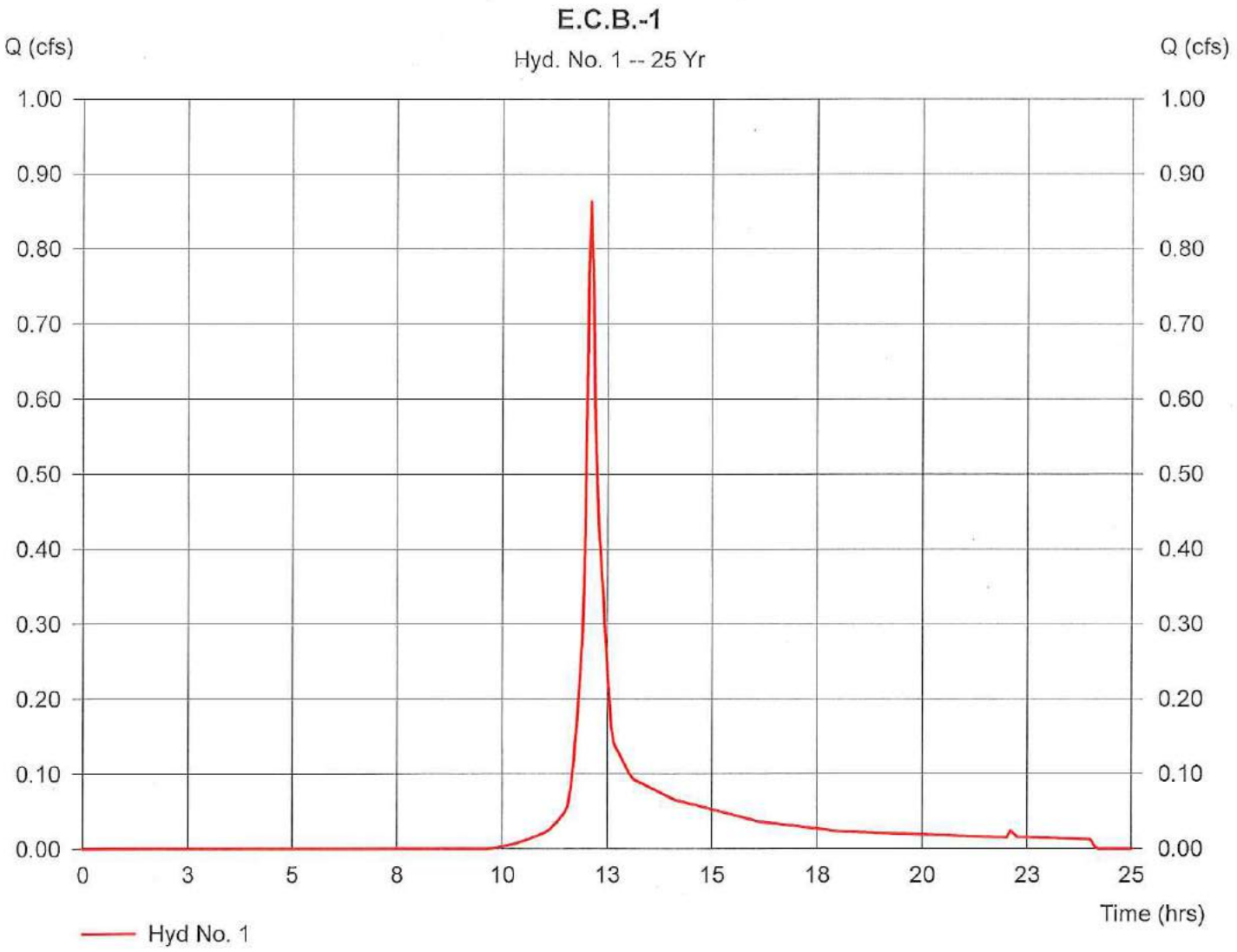
Monday, May 7 2018, 8:27 PM

## Hyd. No. 1

E.C.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.86 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.35 ac | Curve number | = 66.4 |
| Basin Slope | = 5.2 % | Hydraulic length | = 189 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.407852 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 2,913 cuft



# Hydrograph Plot

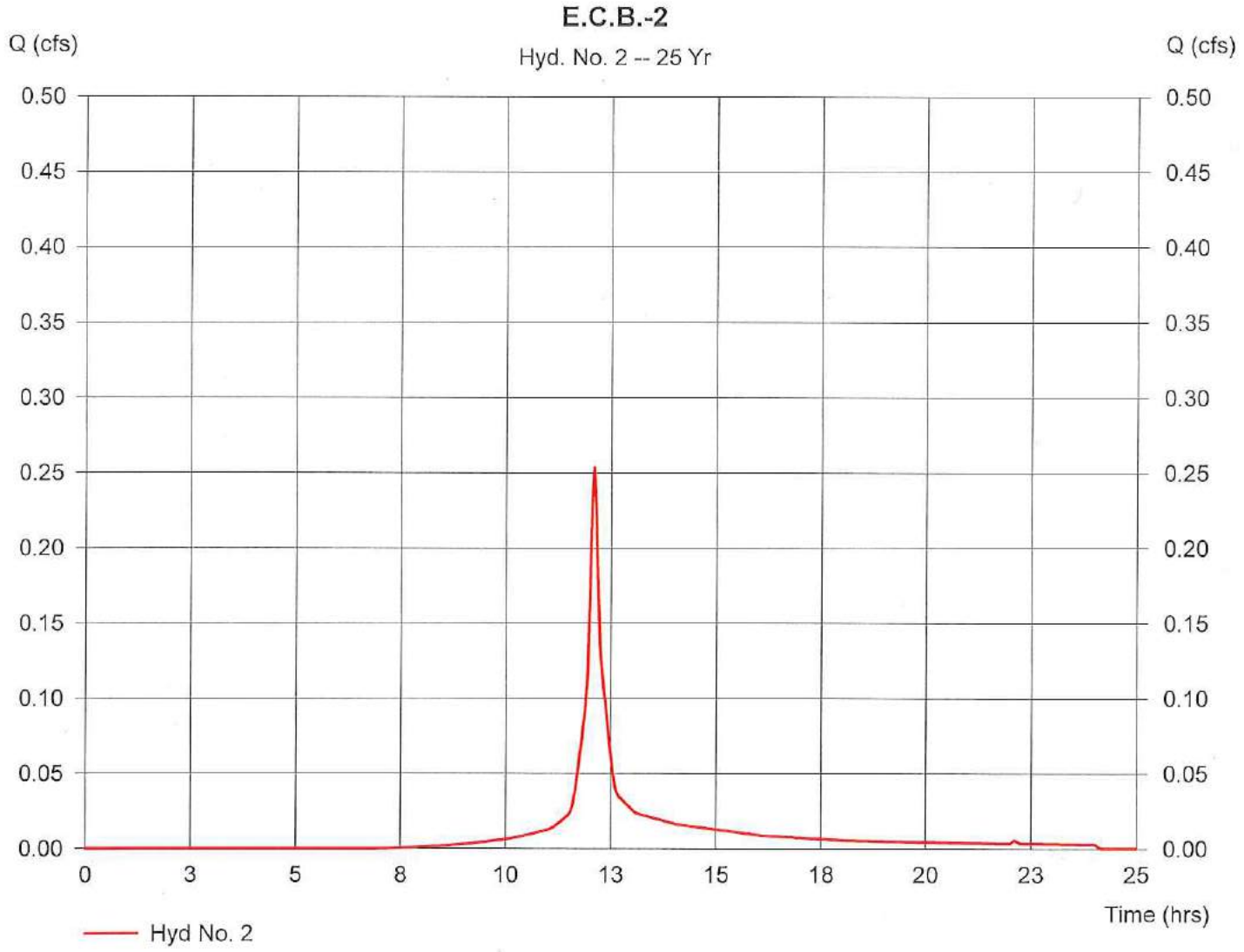


## Hyd. No. 2

E.C.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.25 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.07 ac | Curve number | = 79.8 |
| Basin Slope | = 1.9 % | Hydraulic length | = 68 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 847 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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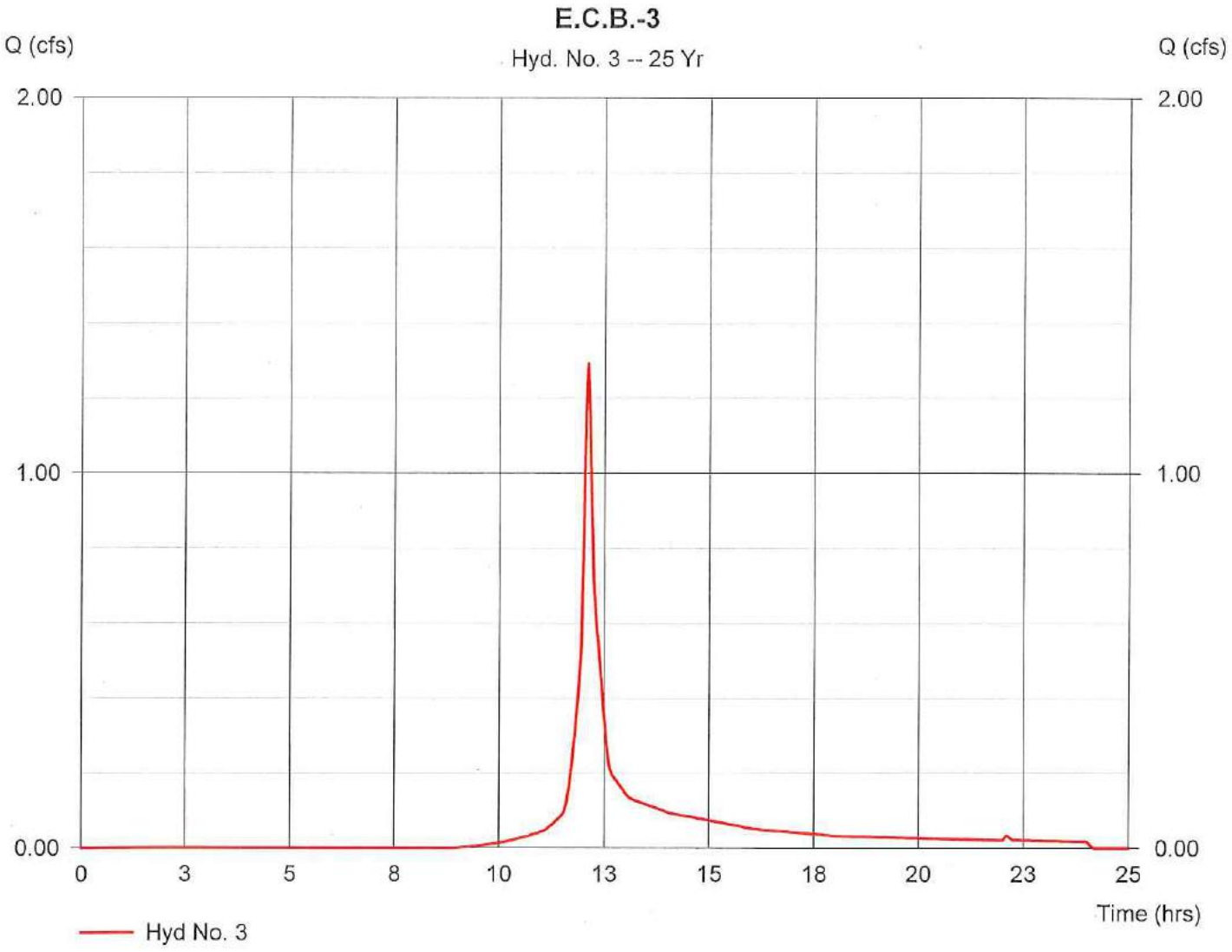
## Hyd. No. 3

E.C.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 1.29 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.45 ac | Curve number | = 70.4 |
| Basin Slope | = 4.2 % | Hydraulic length | = 207 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.817464 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 4,311 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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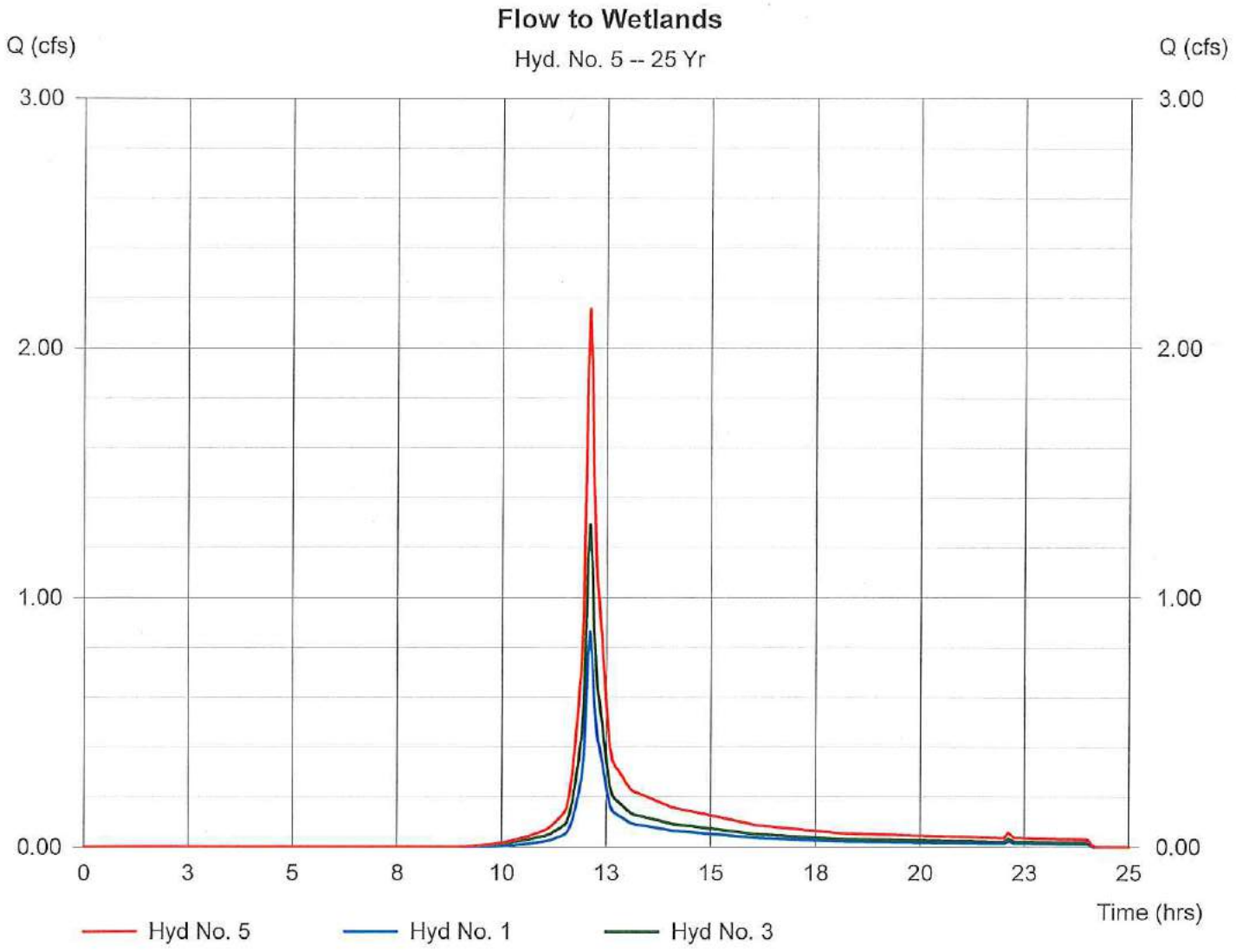
## Hyd. No. 5

Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 2.16 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 3 | | |

Hydrograph Volume = 7,224 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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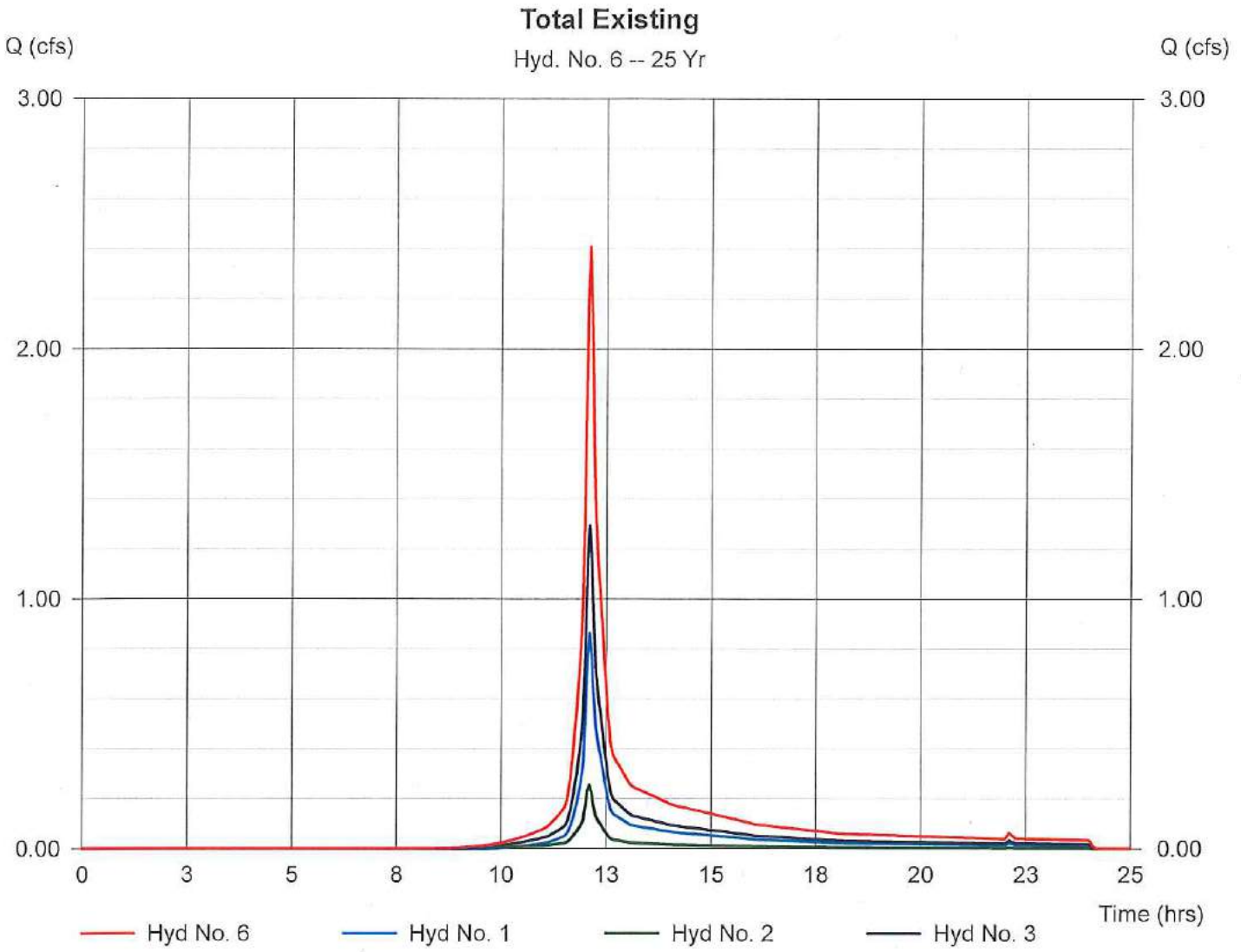
## Hyd. No. 6

Total Existing

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 2.41 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 2, 3 | | |

Hydrograph Volume = 8,071 cuft



# Hydrograph Plot

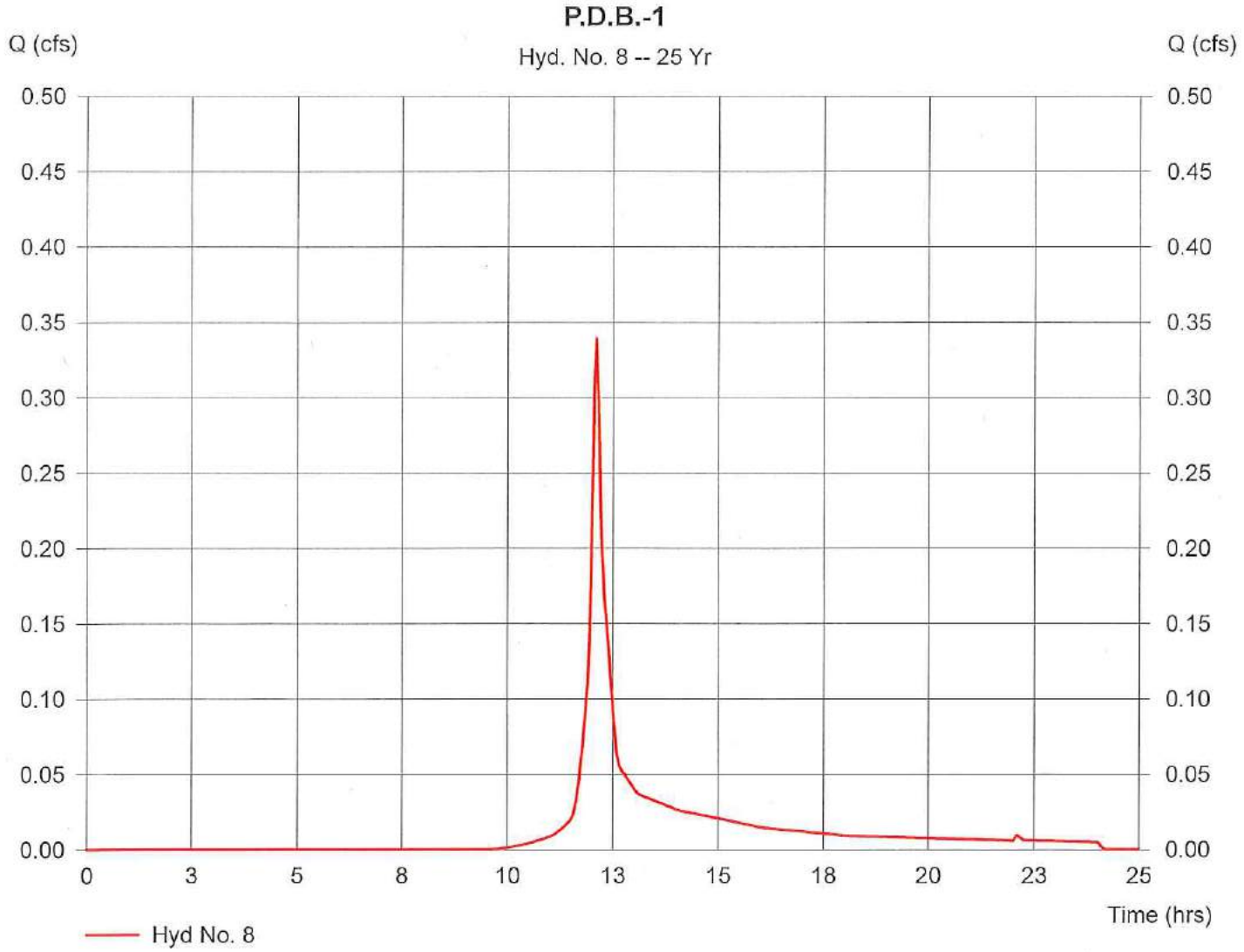


## Hyd. No. 8

P.D.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.34 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.14 ac | Curve number | = 66.4 |
| Basin Slope | = 4.4 % | Hydraulic length | = 222 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 6.686719 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,145 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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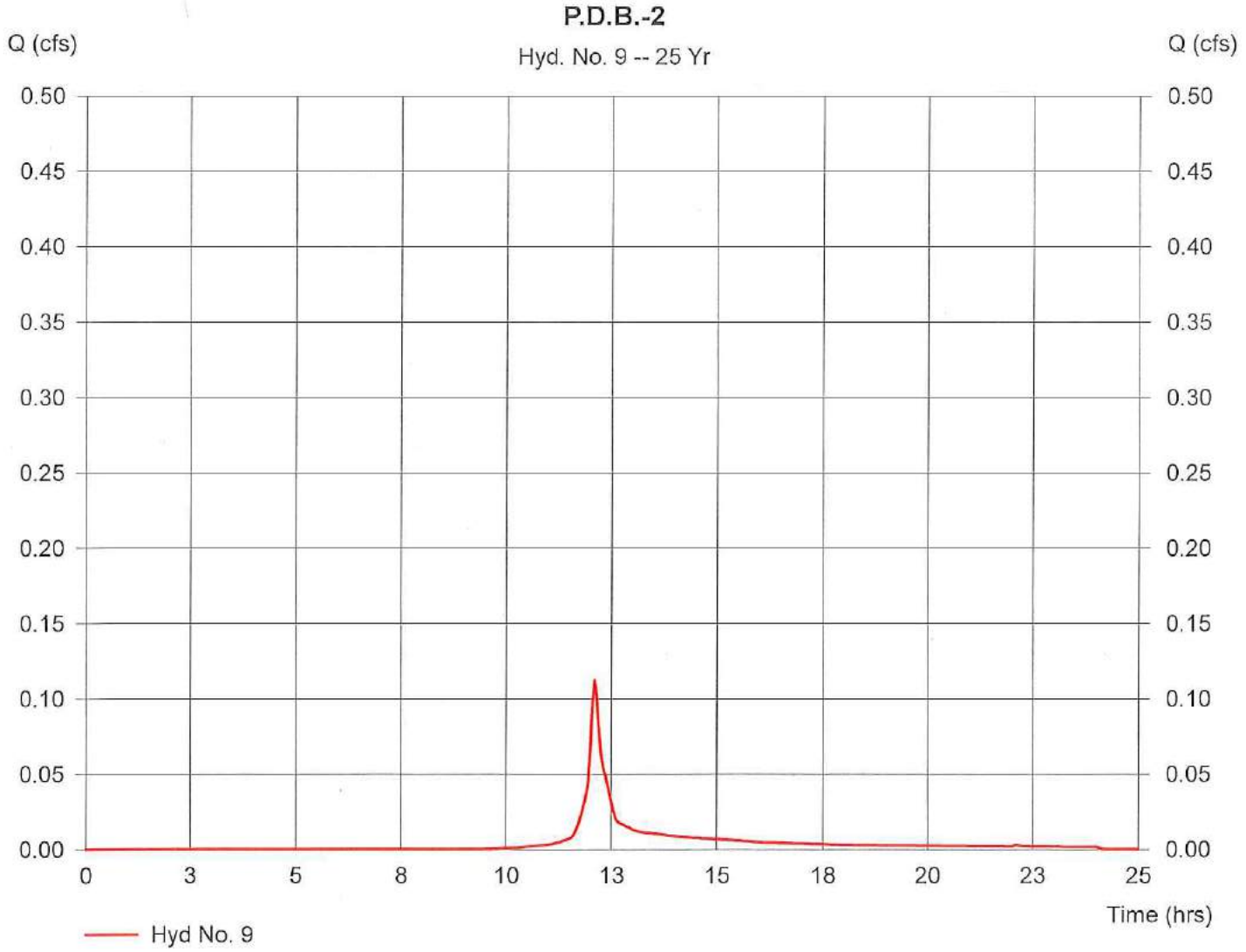
## Hyd. No. 9

P.D.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.11 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.04 ac | Curve number | = 67.9 |
| Basin Slope | = 1.0 % | Hydraulic length | = 49 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 377 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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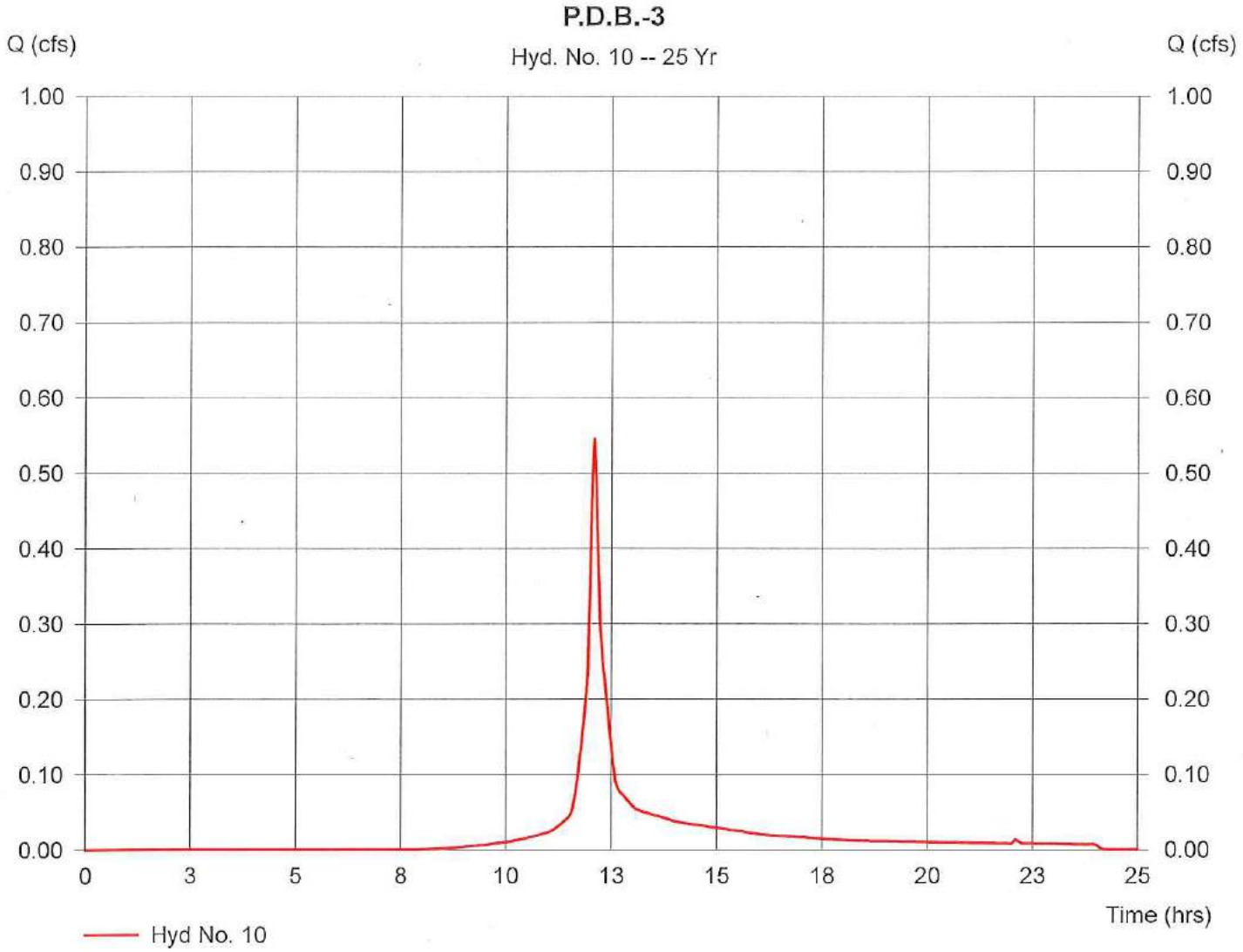
## Hyd. No. 10

P.D.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.55 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.16 ac | Curve number | = 75.3 |
| Basin Slope | = 3.8 % | Hydraulic length | = 196 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,813 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

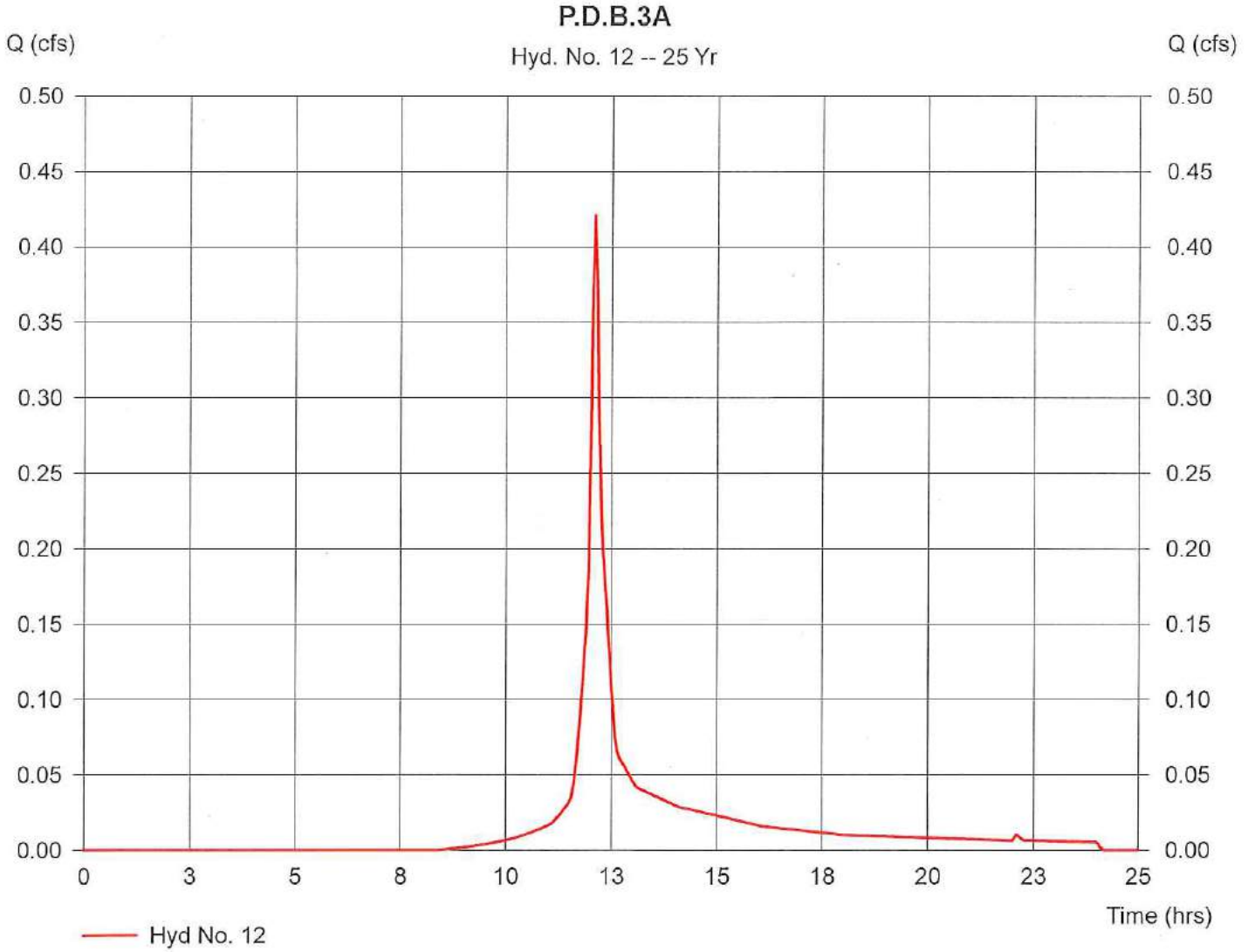
Monday, May 7 2018, 8:27 PM

## Hyd. No. 12

P.D.B.3A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.42 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.13 ac | Curve number | = 73.5 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,401 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

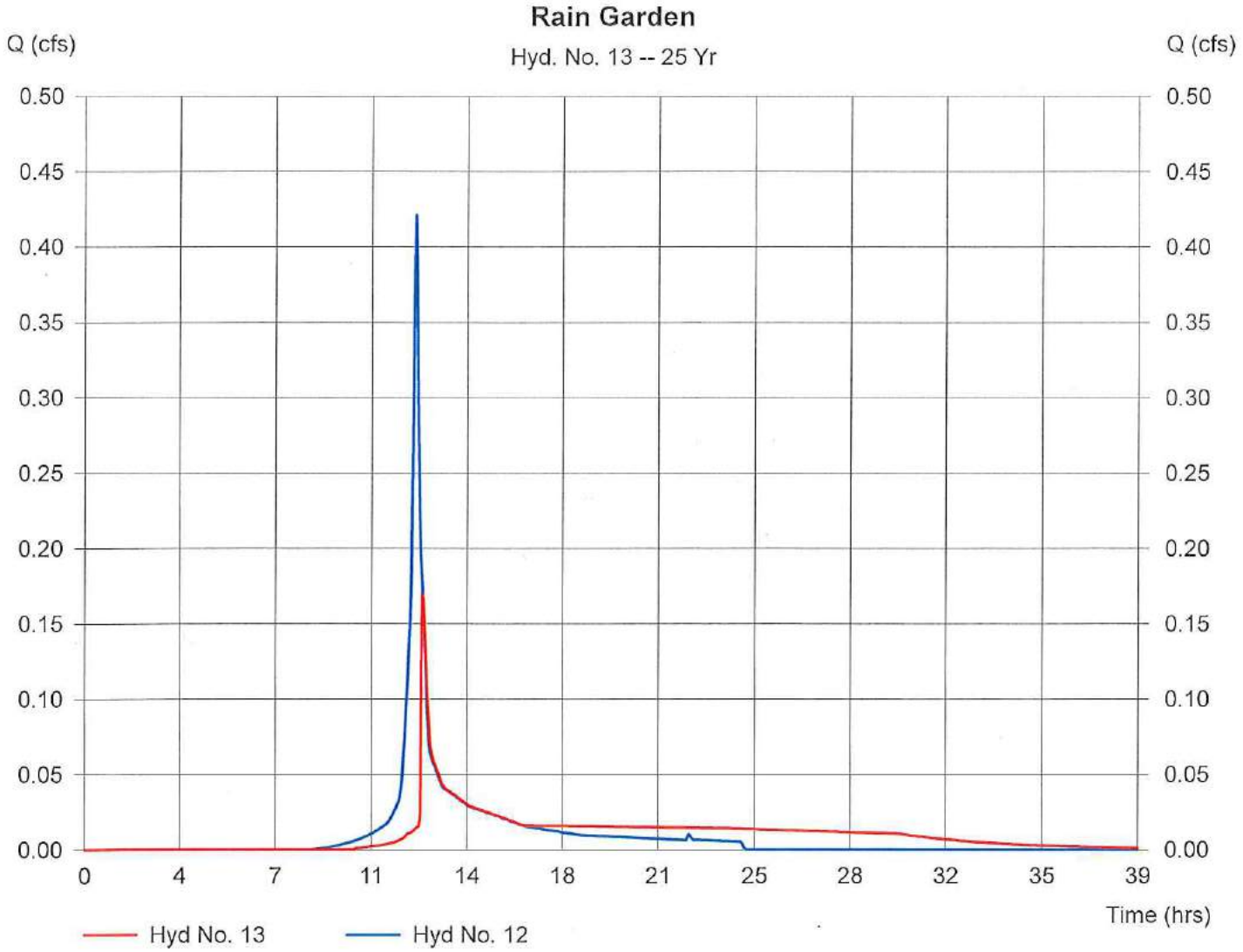
## Hyd. No. 13

Rain Garden

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.17 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 12 | Max. Elevation | = 164.78 ft |
| Reservoir name | = Rain Garden | Max. Storage | = 591 cuft |

Storage Indication method used.

Hydrograph Volume = 1,387 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

## Pond No. 5 - Rain Garden

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 163.50 | 140 | 0 | 0 |
| 0.50 | 164.00 | 448 | 147 | 147 |
| 1.00 | 164.50 | 591 | 260 | 407 |
| 1.50 | 165.00 | 748 | 335 | 742 |

### Culvert / Orifice Structures

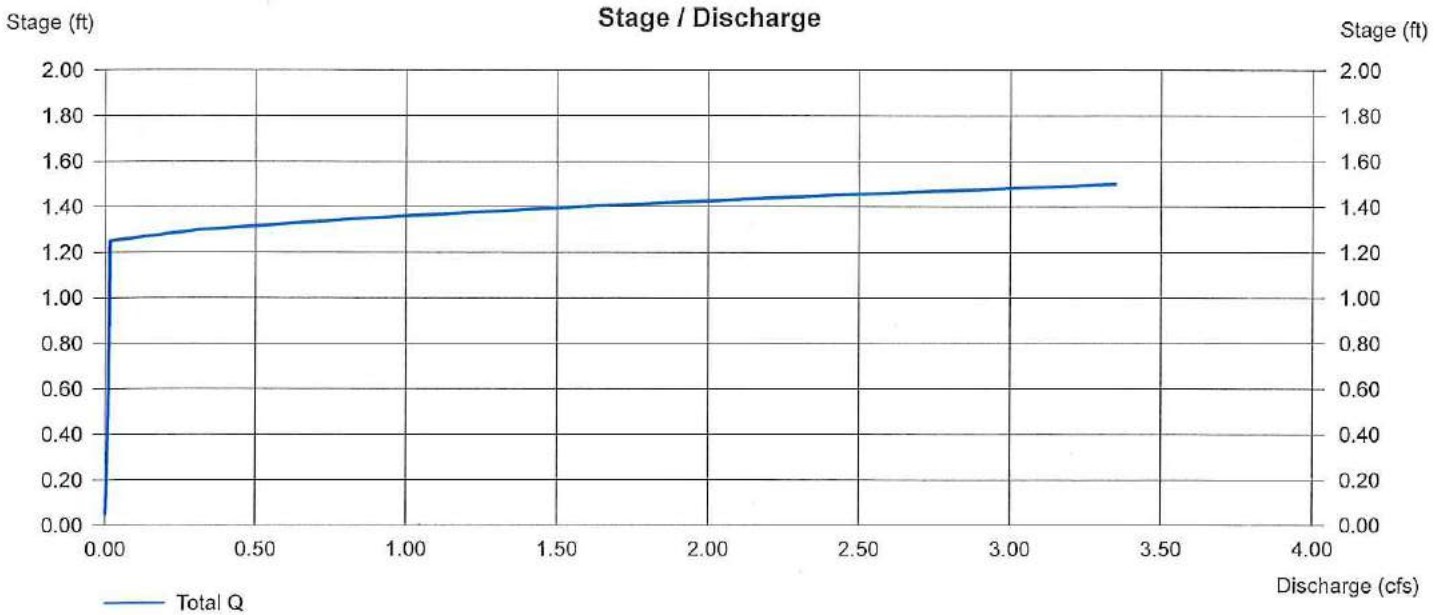
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Crest Len (ft) | = 8.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 164.75 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 3.33 | 0.00 | 0.00 | 0.00 |
| Weir Type | = Rect | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

**Exfiltration** = 1.020 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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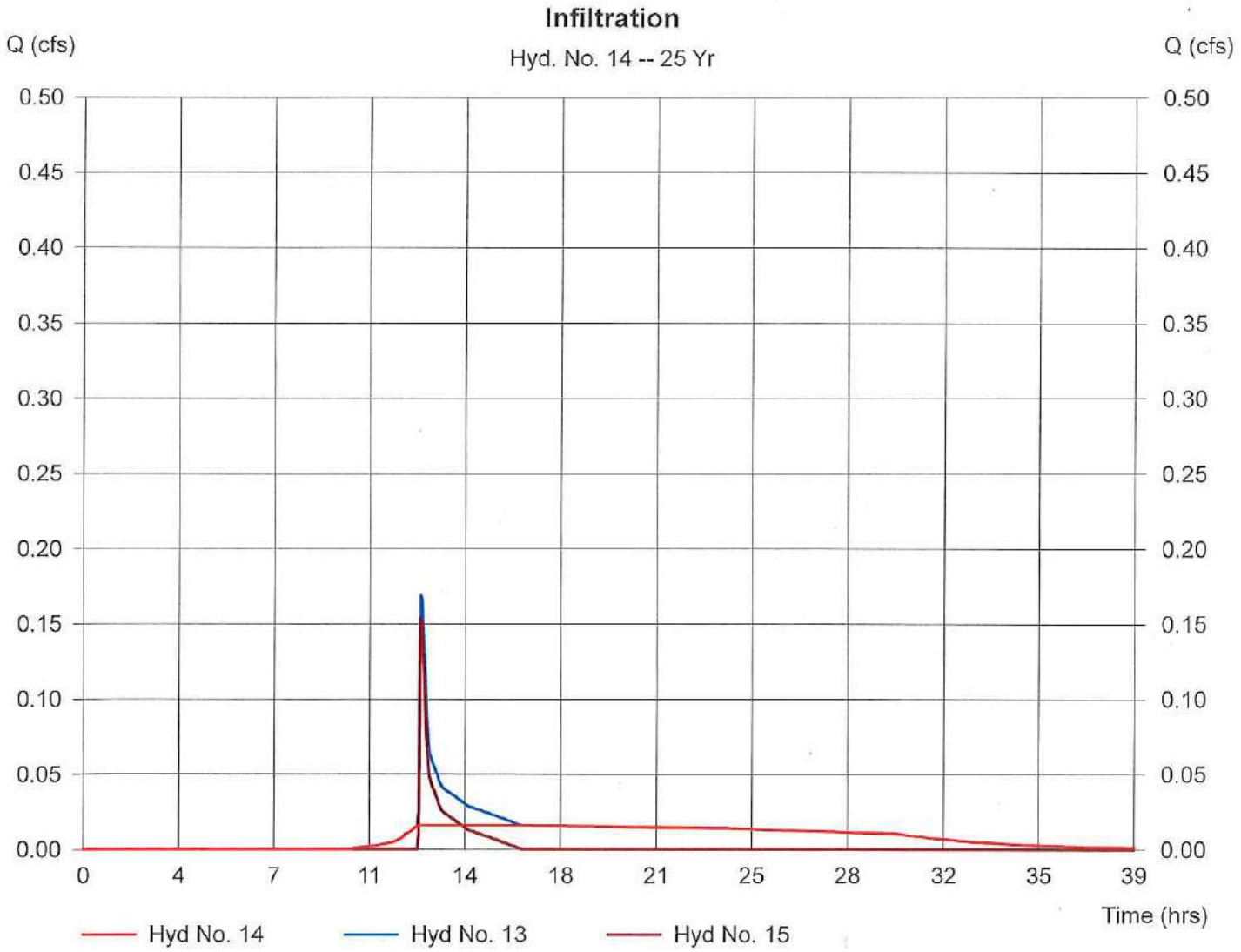
## Hyd. No. 14

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.02 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 15 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 1,075 cuft



# Hydrograph Plot

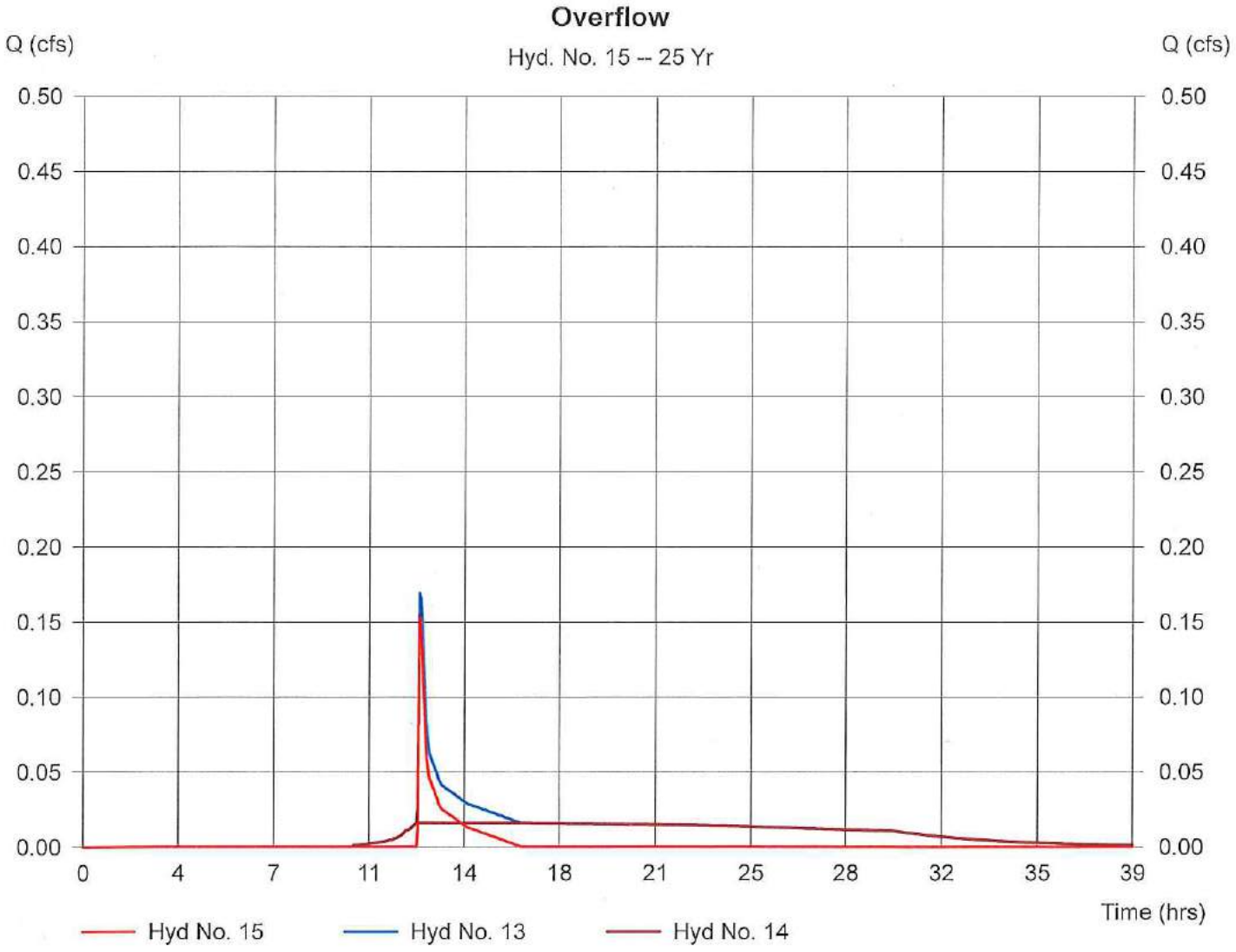


## Hyd. No. 15

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.15 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 14 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 312 cuft



# Hydrograph Plot

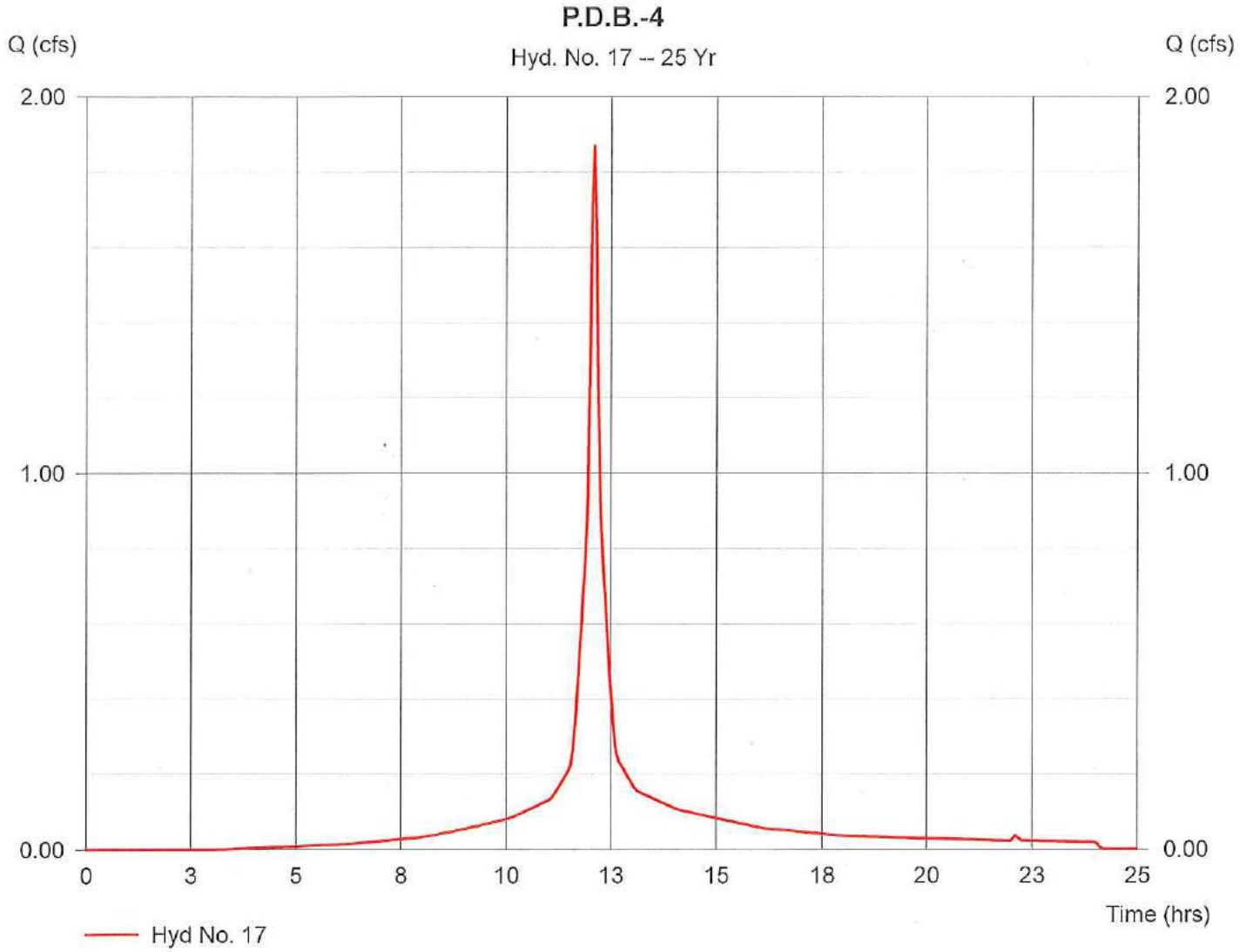


## Hyd. No. 17

P.D.B.-4

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 1.87 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Drainage area | = 0.39 ac | Curve number | = 91.7 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 5.95 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 6,652 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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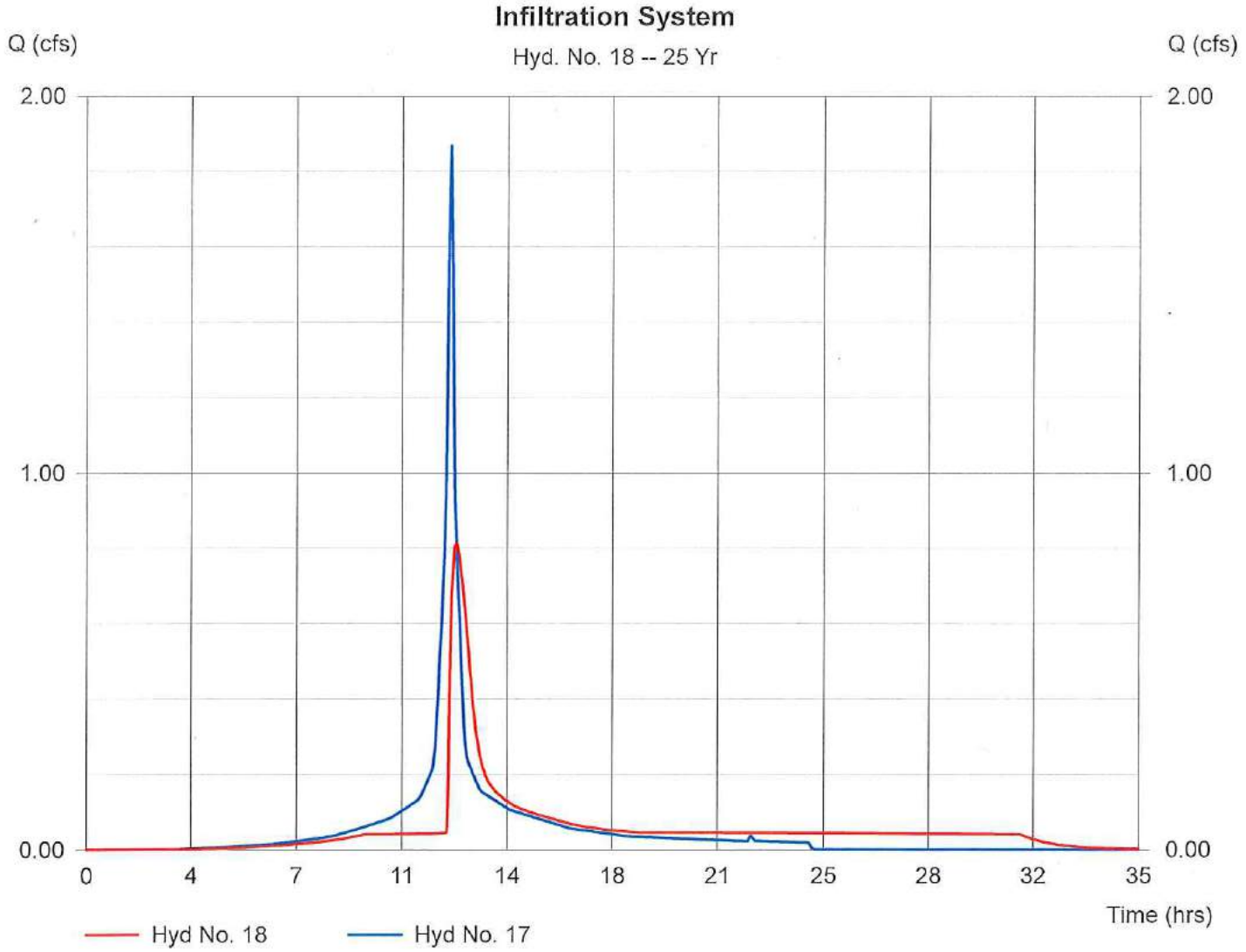
## Hyd. No. 18

Infiltration System

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.81 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 17 | Max. Elevation | = 164.60 ft |
| Reservoir name | = Infiltration System | Max. Storage | = 2,505 cuft |

Storage Indication method used.

Hydrograph Volume = 6,648 cuft



# Pond Report



## Pond No. 1 - Infiltration System

### Pond Data

Bottom LxW = 52.0 x 32.0 ft  Side slope = 0.0:1  Bottom elev. = 162.25 ft  Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft)* | Total storage (cuft)* |
|---|---|---|---|---|
| 0.00 | 162.25 | 1,664 | 0 | 0 |
| 0.15 | 162.40 | 1,664 | 160 | 160 |
| 0.30 | 162.55 | 1,664 | 160 | 319 |
| 0.45 | 162.70 | 1,664 | 160 | 479 |
| 0.60 | 162.85 | 1,664 | 160 | 639 |
| 0.75 | 163.00 | 1,664 | 160 | 799 |
| 0.90 | 163.15 | 1,664 | 160 | 958 |
| 1.05 | 163.30 | 1,664 | 160 | 1,118 |
| 1.20 | 163.45 | 1,664 | 160 | 1,278 |
| 1.35 | 163.60 | 1,664 | 160 | 1,438 |
| 1.50 | 163.75 | 1,664 | 160 | 1,597 |
| 1.65 | 163.90 | 1,664 | 160 | 1,757 |
| 1.80 | 164.05 | 1,664 | 160 | 1,917 |
| 1.95 | 164.20 | 1,664 | 160 | 2,077 |
| 2.10 | 164.35 | 1,664 | 160 | 2,236 |
| 2.25 | 164.50 | 1,664 | 160 | 2,396 |
| 2.40 | 164.65 | 1,664 | 160 | 2,556 |
| 2.55 | 164.80 | 1,664 | 160 | 2,716 |
| 2.70 | 164.95 | 1,664 | 160 | 2,875 |
| 2.85 | 165.10 | 1,664 | 160 | 3,035 |
| 3.00 | 165.25 | 1,664 | 160 | 3,195 |

(*64.00% voids applied)

### Culvert / Orifice Structures

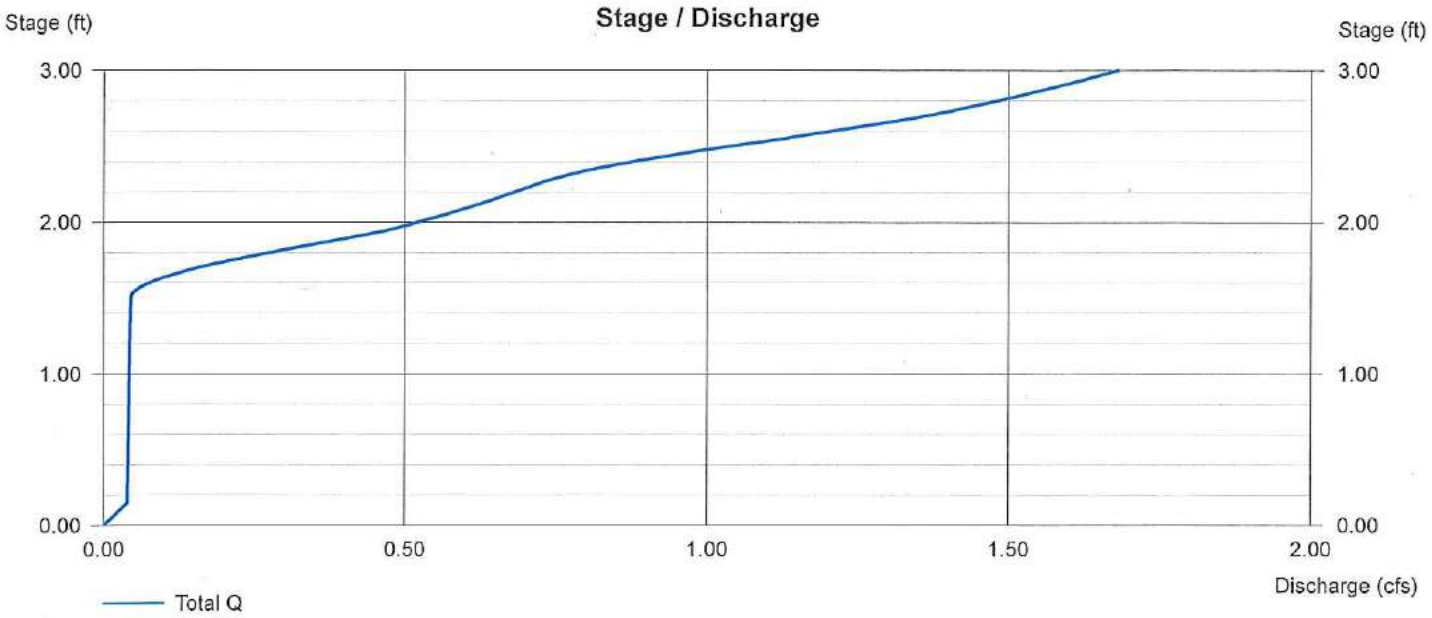
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| Span (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| No. Barrels | = 1 | 1 | 0 | 0 |
| Invert El. (ft) | = 163.75 | 164.50 | 0.00 | 0.00 |
| Length (ft) | = 50.00 | 50.00 | 0.00 | 0.00 |
| Slope (%) | = 2.00 | 2.00 | 0.00 | 0.00 |
| N-Value | = .013 | .013 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.60 | 0.00 | 0.00 |
| 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 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Wet area)  Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

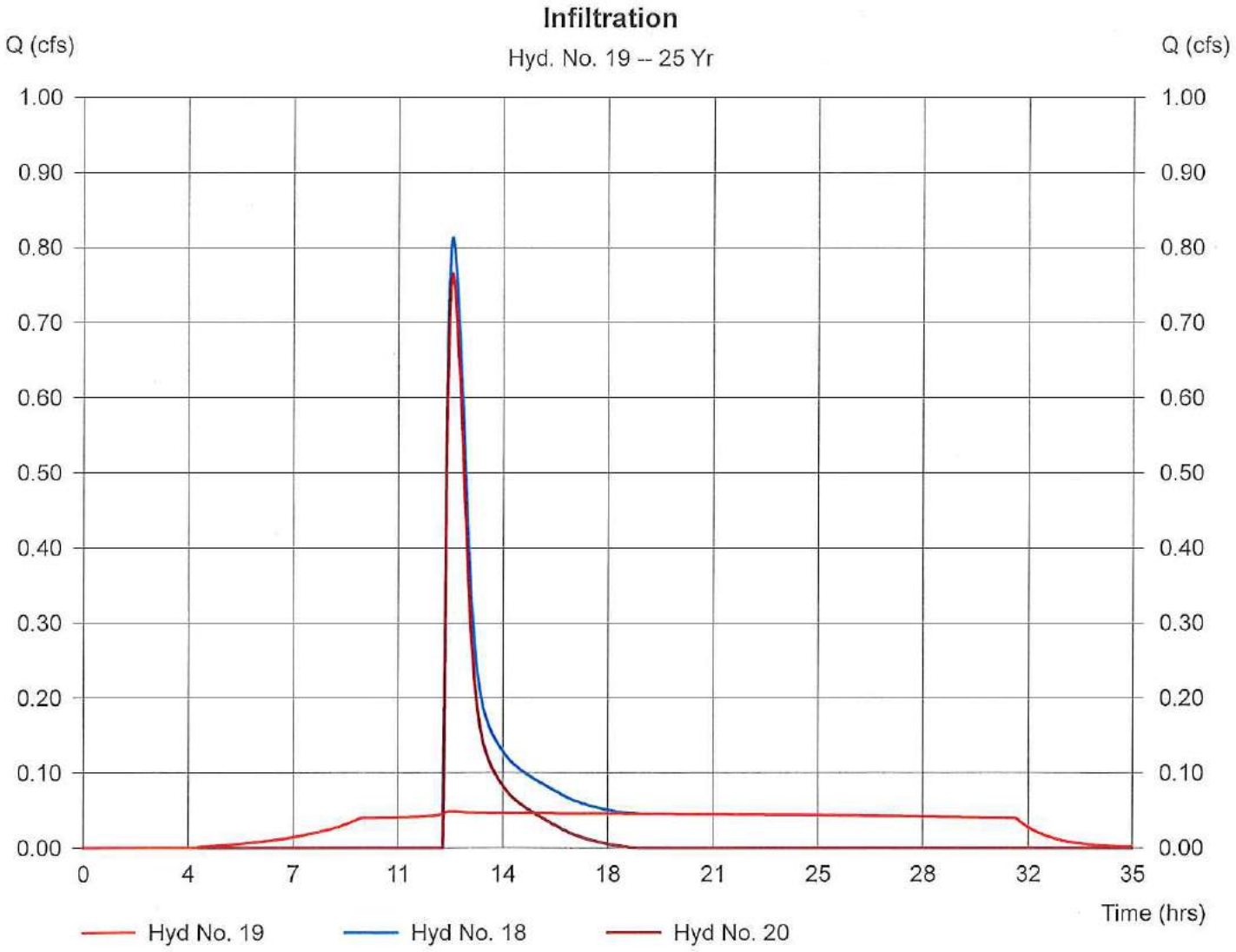
Monday, May 7 2018, 8:27 PM

## Hyd. No. 19

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.05 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 20 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 3,857 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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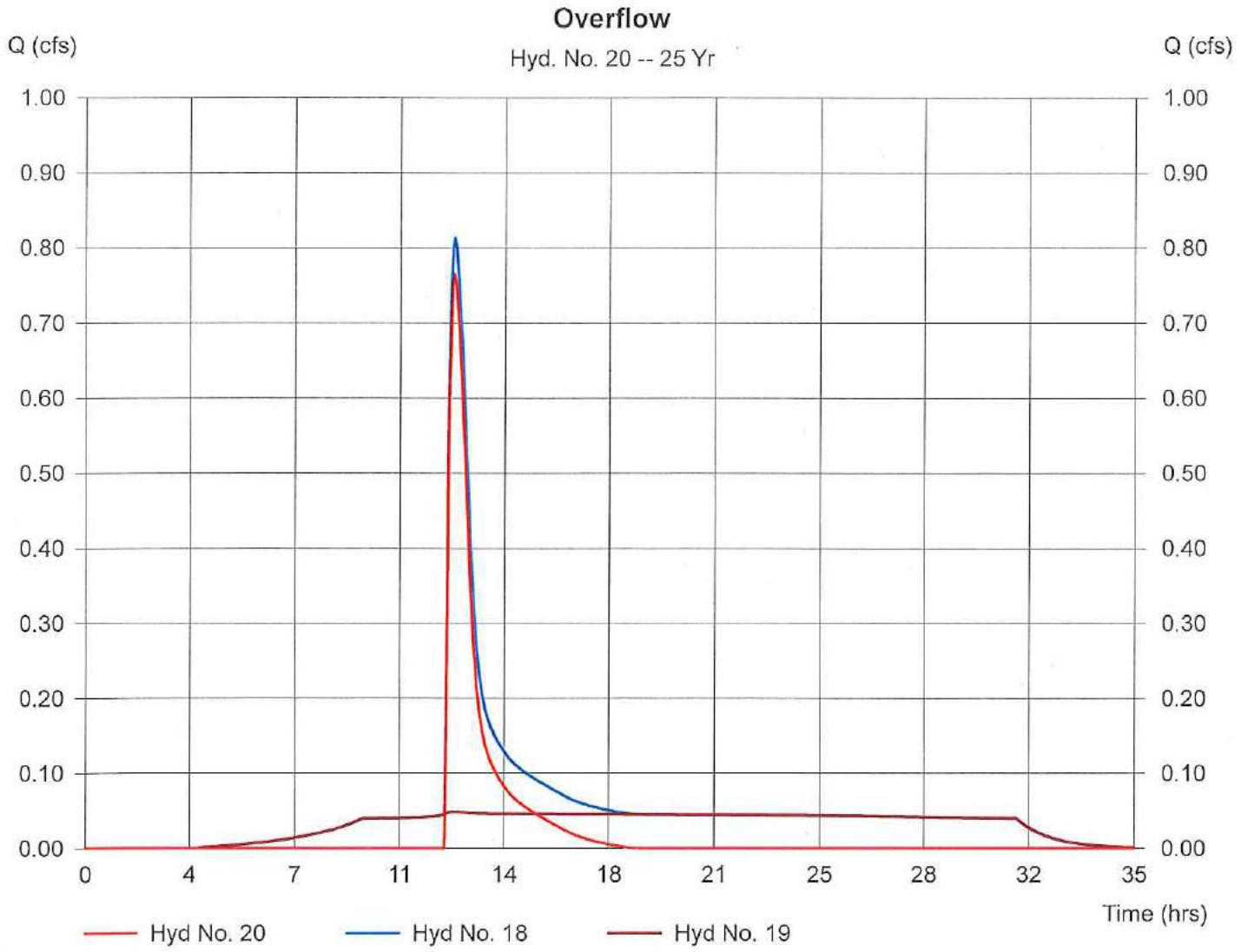
## Hyd. No. 20

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.77 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 19 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 2,791 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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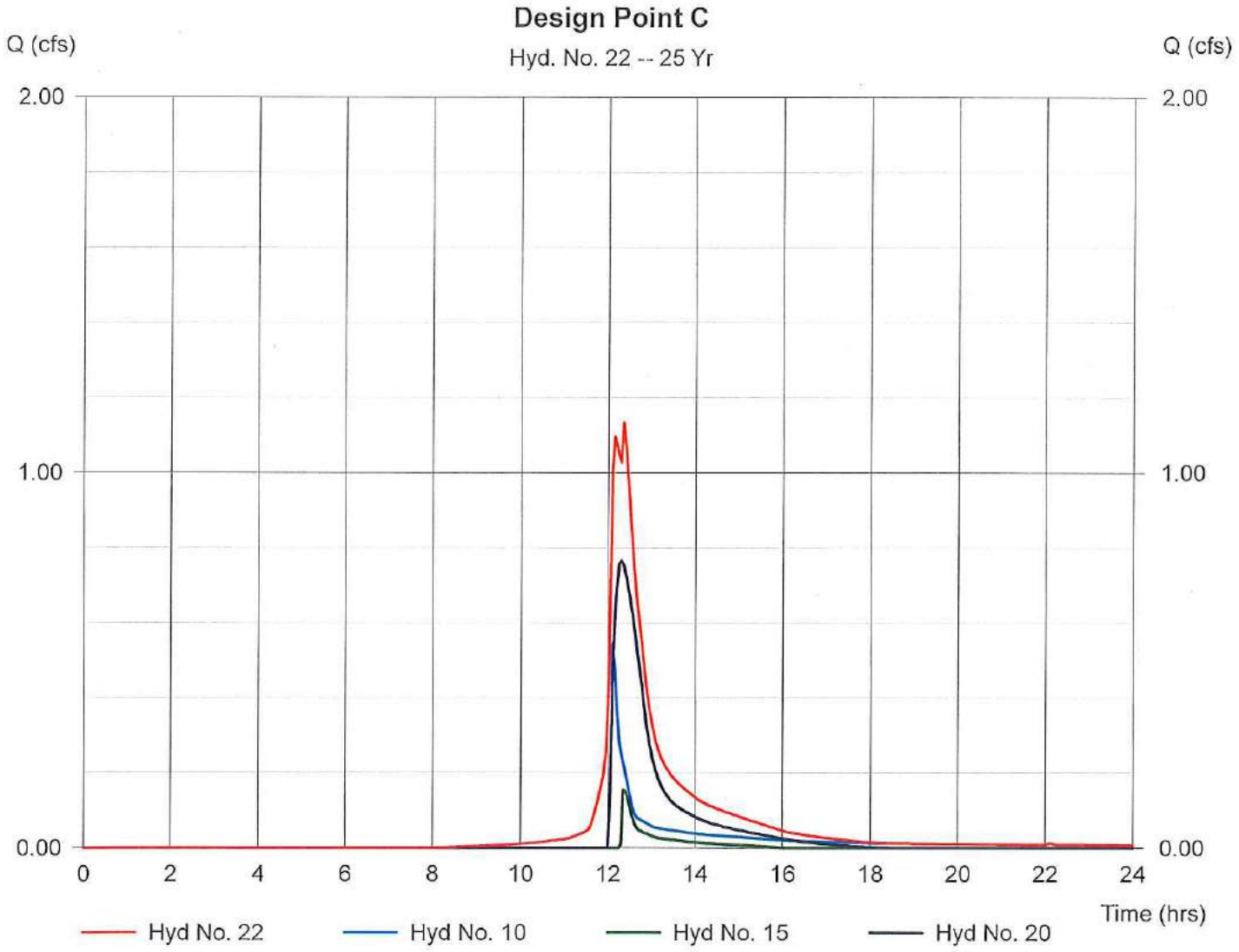
## Hyd. No. 22

Design Point C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.13 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyds. | = 10, 15, 20 | | |

Hydrograph Volume = 4,916 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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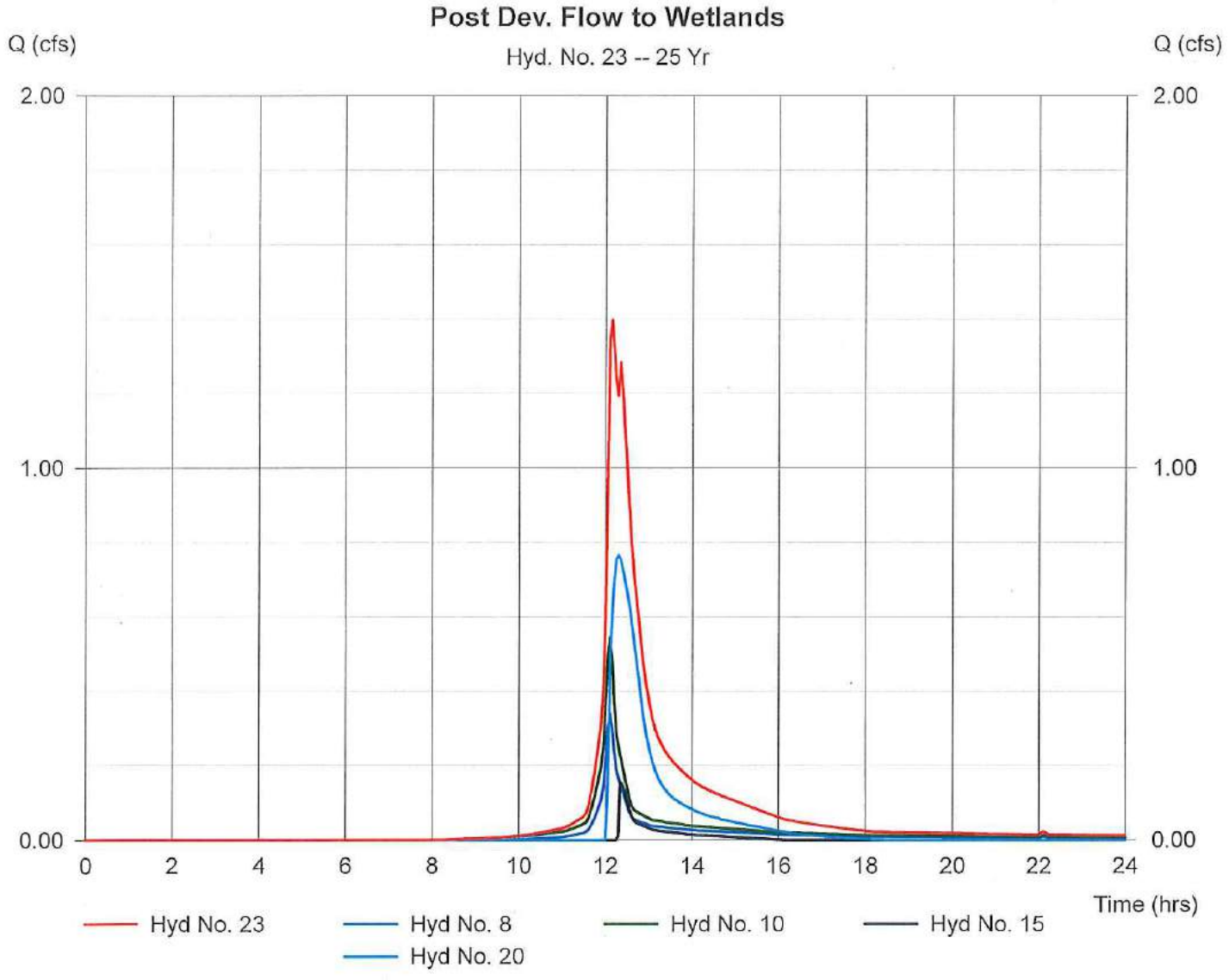
## Hyd. No. 23

Post Dev. Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.40 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 10, 15, 20 | | |

Hydrograph Volume = 6,061 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

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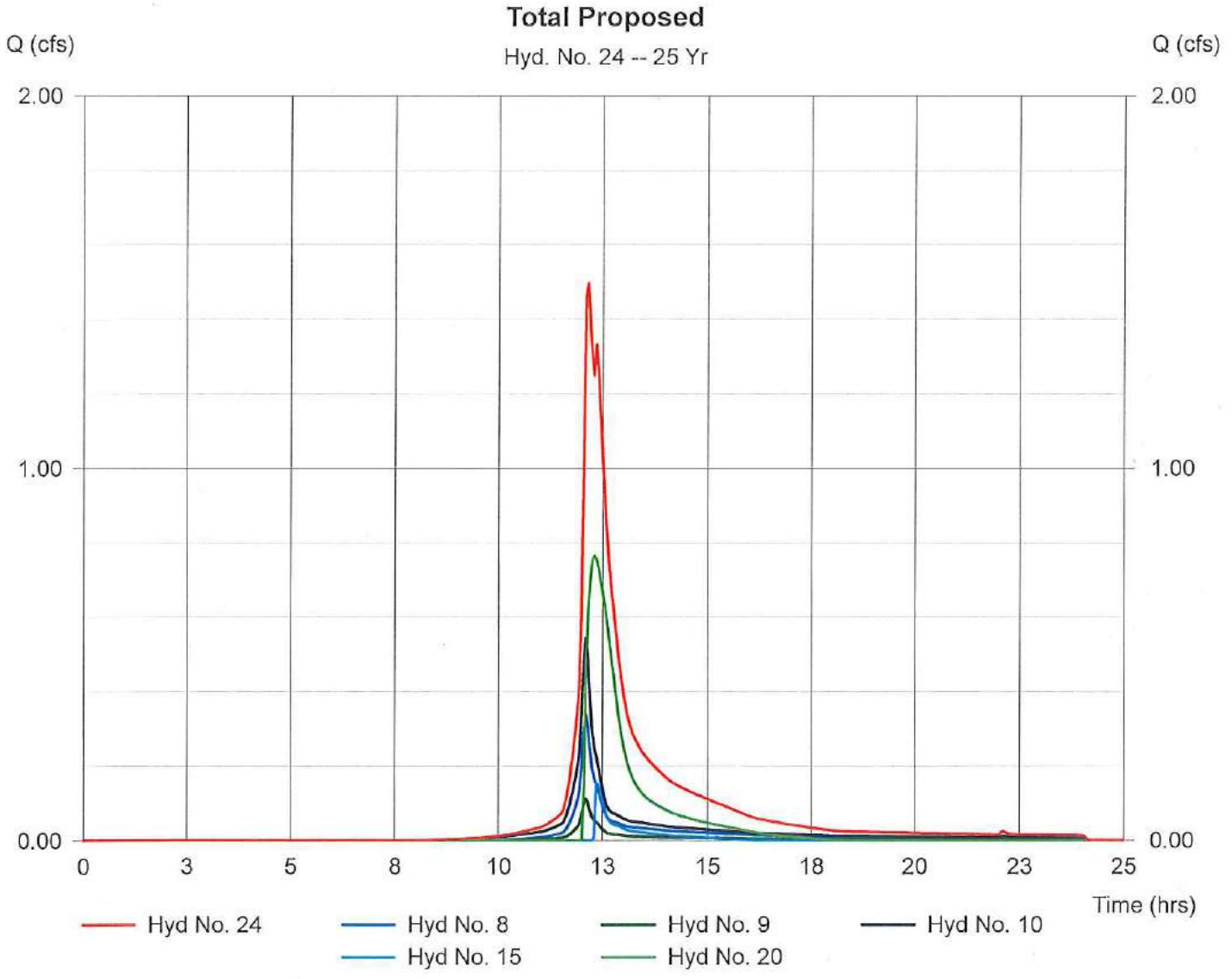
## Hyd. No. 24

Total Proposed

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 1.50 cfs |
| Storm frequency | = 25 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 9, 10, 15, 20 | | |

Hydrograph Volume = 6,438 cuft



# 100-Year Storm, Pre and Post-Development

# Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SCS Runoff | 1.59 | 3 | 726 | 5,287 | ---- | ------ | ------ | E.C.B.-1 |
| 2 | SCS Runoff | 0.40 | 3 | 726 | 1,374 | ---- | ------ | ------ | E.C.B.-2 |
| 3 | SCS Runoff | 2.26 | 3 | 726 | 7,539 | ---- | ------ | ------ | E.C.B.-3 |
| 5 | Combine | 3.85 | 3 | 726 | 12,826 | 1, 3, | ------ | ------ | Flow to Wetlands |
| 6 | Combine | 4.26 | 3 | 726 | 14,200 | 1, 2, 3, | ------ | ------ | Total Existing |
| 8 | SCS Runoff | 0.63 | 3 | 726 | 2,079 | ---- | ------ | ------ | P.D.B.-1 |
| 9 | SCS Runoff | 0.20 | 3 | 726 | 674 | ---- | ------ | ------ | P.D.B.-2 |
| 10 | SCS Runoff | 0.91 | 3 | 726 | 3,043 | ---- | ------ | ------ | P.D.B.-3 |
| 12 | SCS Runoff | 0.71 | 3 | 726 | 2,385 | ---- | ------ | ------ | P.D.B.3A |
| 13 | Reservoir | 0.73 | 3 | 726 | 2,372 | 12 | 164.84 | 633 | Rain Garden |
| 14 | Diversion1 | 0.02 | 3 | 726 | 1,231 | 13 | ------ | ------ | Infiltration |
| 15 | Diversion2 | 0.71 | 3 | 726 | 1,141 | 13 | ------ | ------ | Overflow |
| 17 | SCS Runoff | 2.73 | 3 | 726 | 9,943 | ---- | ------ | ------ | P.D.B.-4 |
| 18 | Reservoir | 1.65 | 3 | 732 | 9,939 | 17 | 165.22 | 3,163 | Infiltration System |
| 19 | Diversion1 | 0.05 | 3 | 732 | 4,344 | 18 | ------ | ------ | Infiltration |
| 20 | Diversion2 | 1.60 | 3 | 732 | 5,595 | 18 | ------ | ------ | Overflow |
| 22 | Combine | 2.97 | 3 | 726 | 9,778 | 10, 15, 20, | ------ | ------ | Design Point C |
| 23 | Combine | 3.59 | 3 | 726 | 11,857 | 8, 10, 15, 20, | ------ | ------ | Post Dev. Flow to Wetlands |
| 24 | Combine | 3.79 | 3 | 726 | 12,531 | 8, 9, 10, 15, 20, | ------ | ------ | Total Proposed |

# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

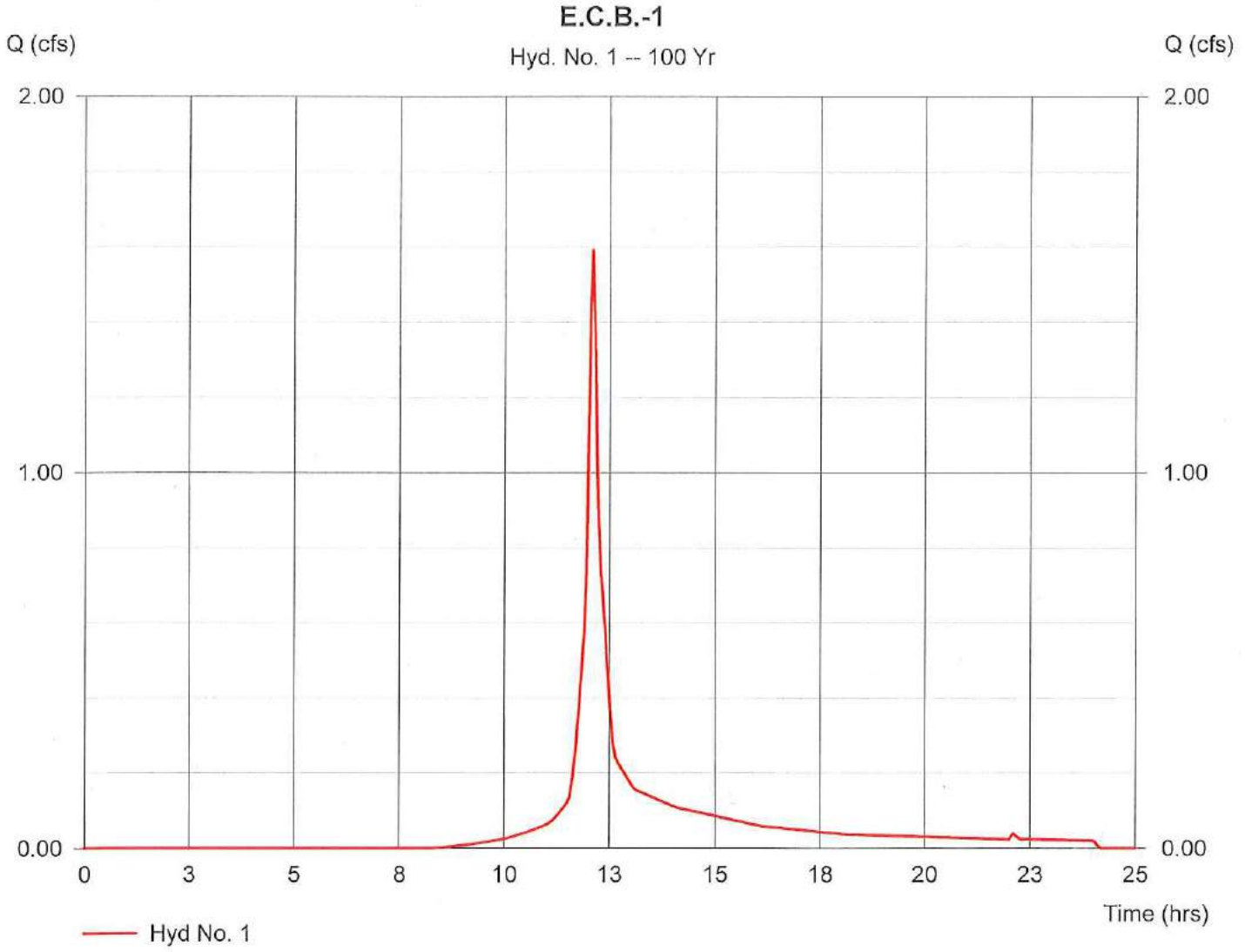
Monday, May 7 2018, 8:27 PM

## Hyd. No. 1

E.C.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 1.59 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.35 ac | Curve number | = 66.4 |
| Basin Slope | = 5.2 % | Hydraulic length | = 189 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.407852 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 5,287 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

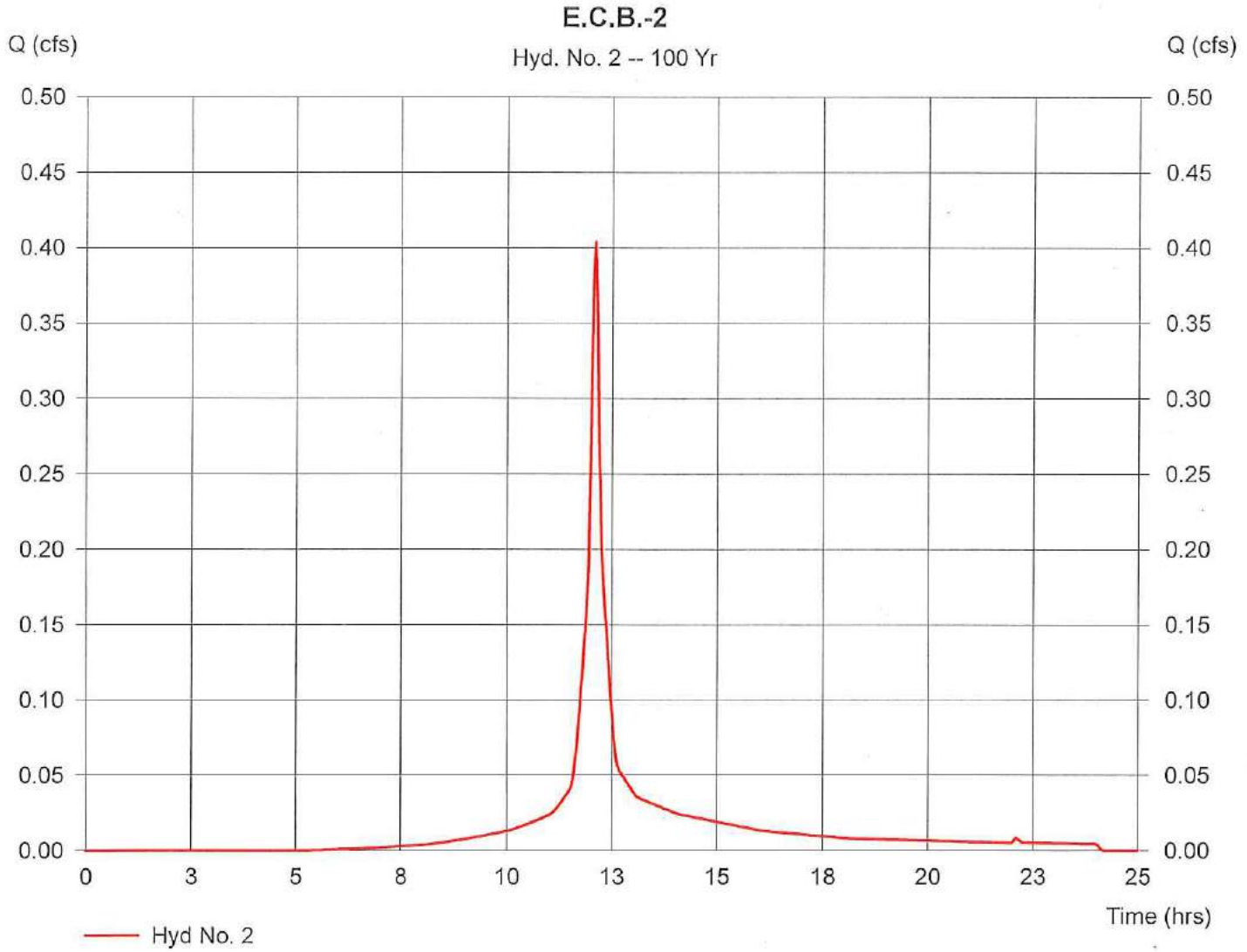
Monday, May 7 2018, 8:27 PM

## Hyd. No. 2

E.C.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.40 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.07 ac | Curve number | = 79.8 |
| Basin Slope | = 1.9 % | Hydraulic length | = 68 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 1,374 cuft



# Hydrograph Plot

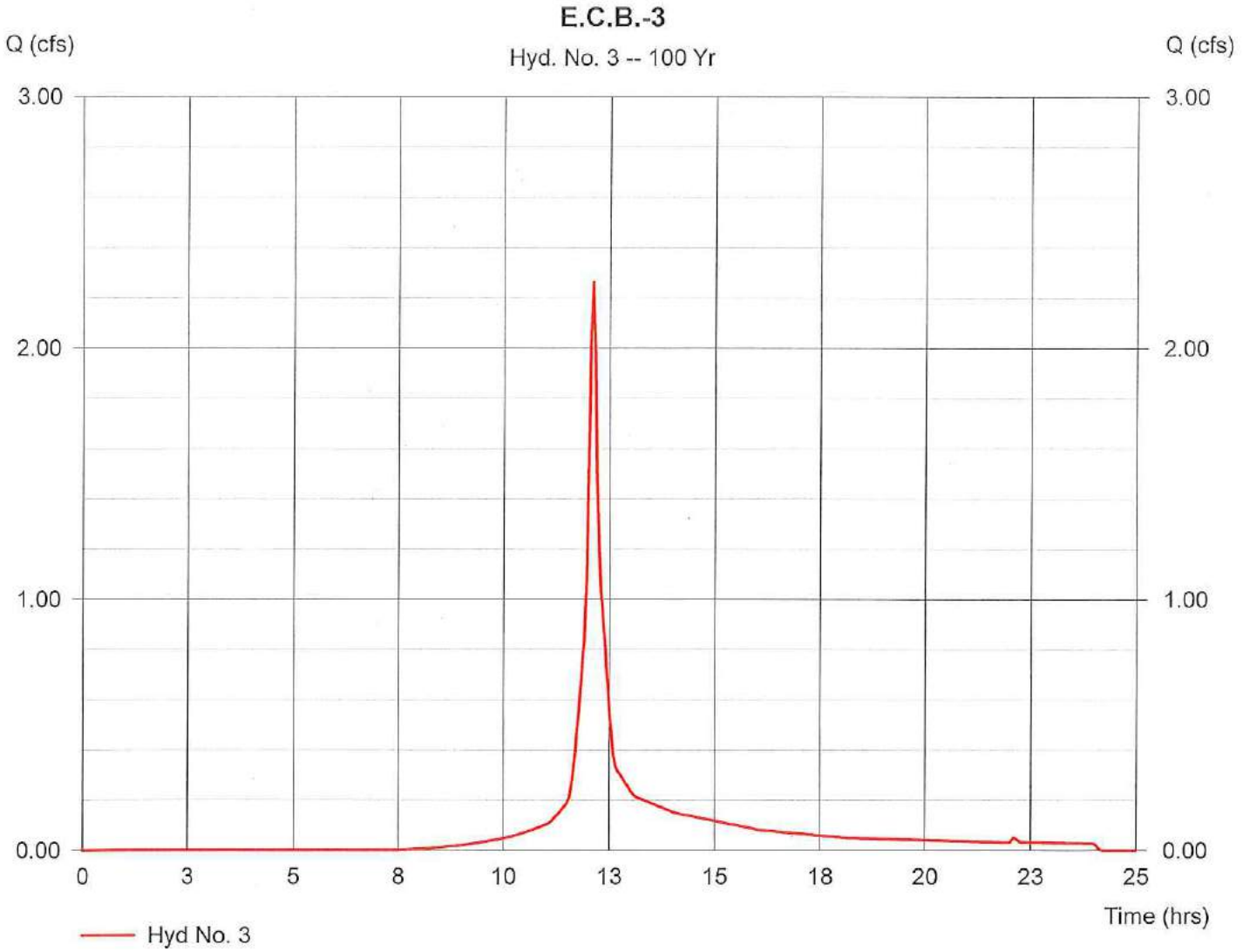


## Hyd. No. 3

E.C.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 2.26 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.45 ac | Curve number | = 70.4 |
| Basin Slope | = 4.2 % | Hydraulic length | = 207 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 5.817464 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 7,539 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

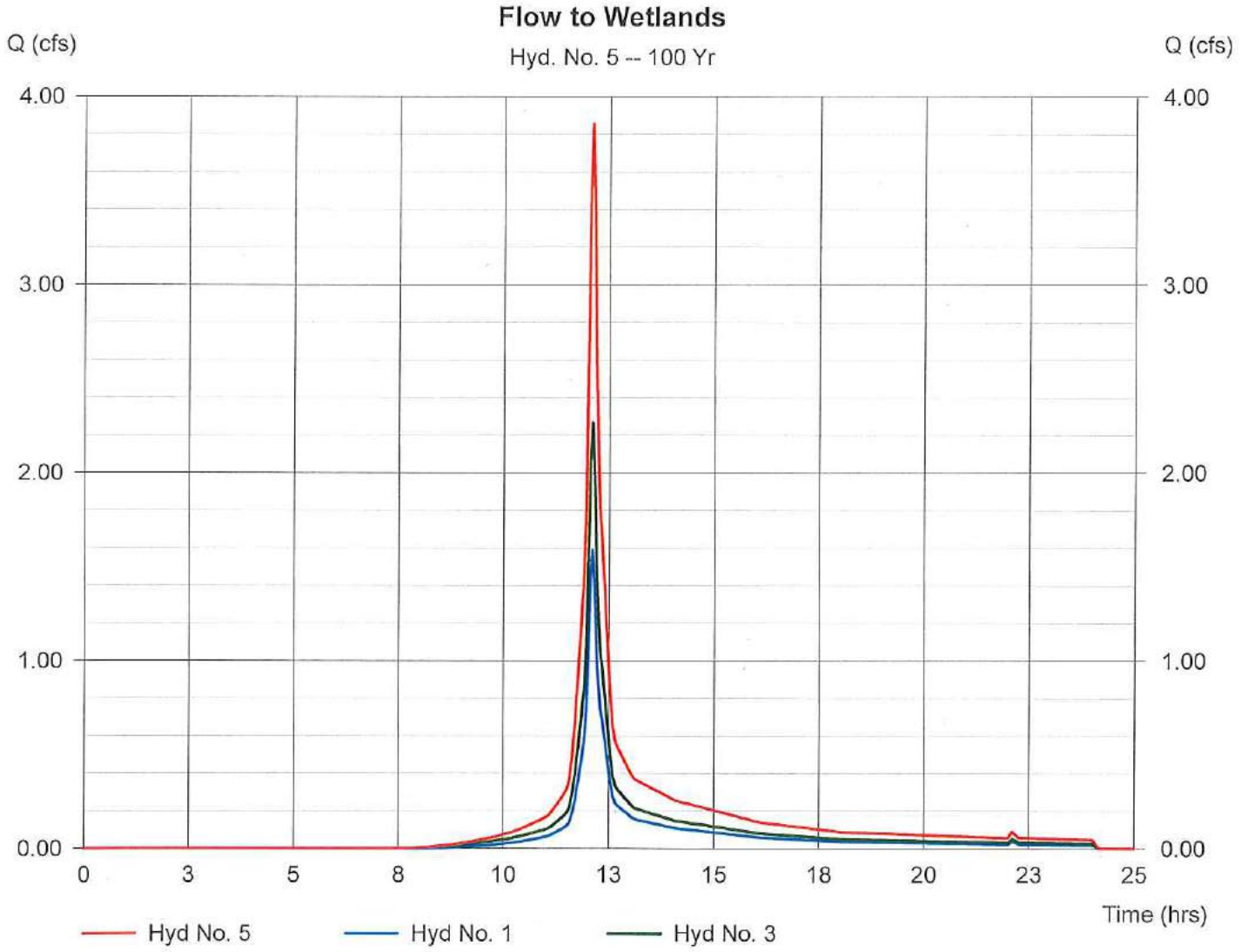
Monday, May 7 2018, 8:27 PM

## Hyd. No. 5

Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 3.85 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 3 | | |

Hydrograph Volume = 12,826 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

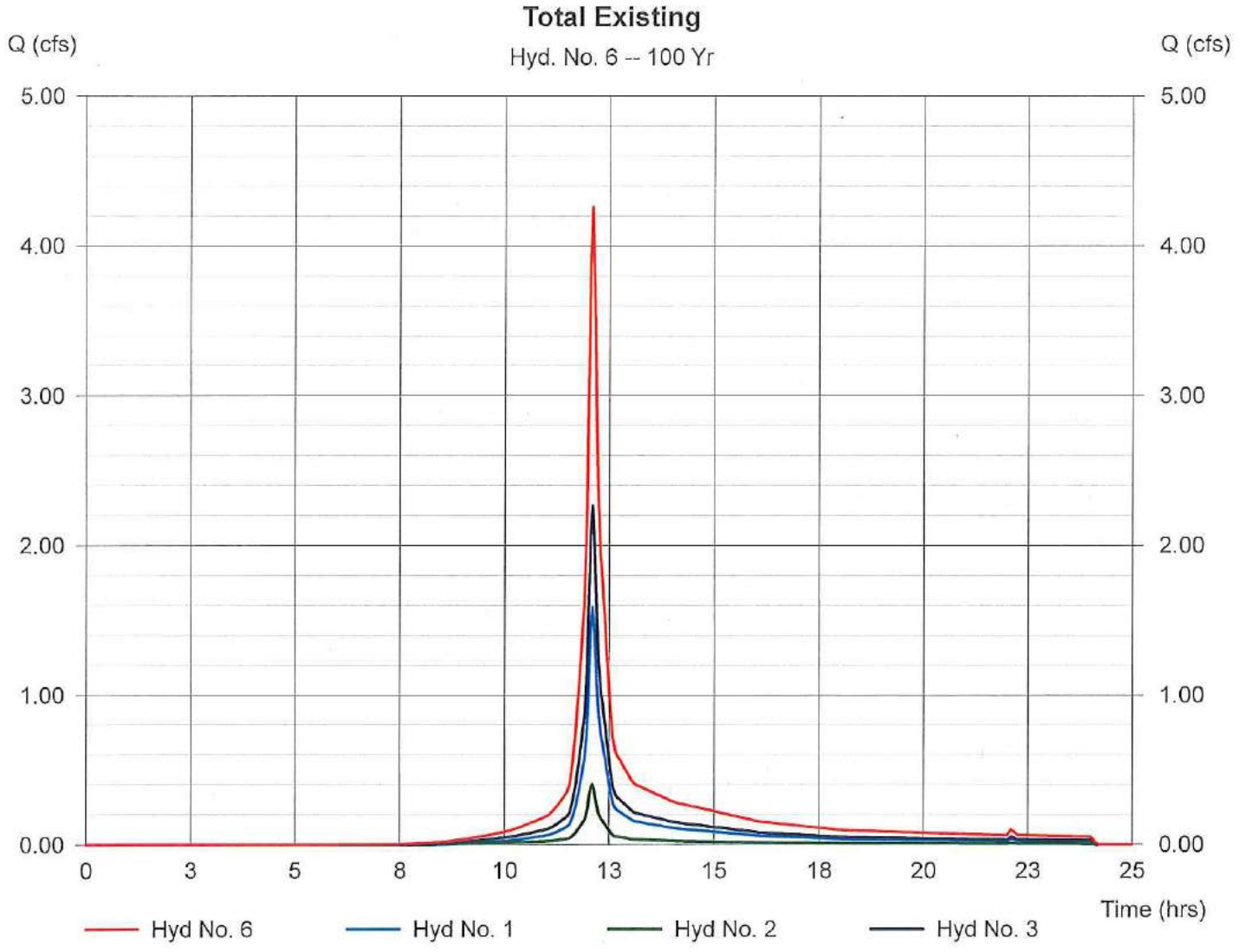
Monday, May 7 2018, 8:27 PM

## Hyd. No. 6

Total Existing

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 4.26 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyds. | = 1, 2, 3 | | |

Hydrograph Volume = 14,200 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

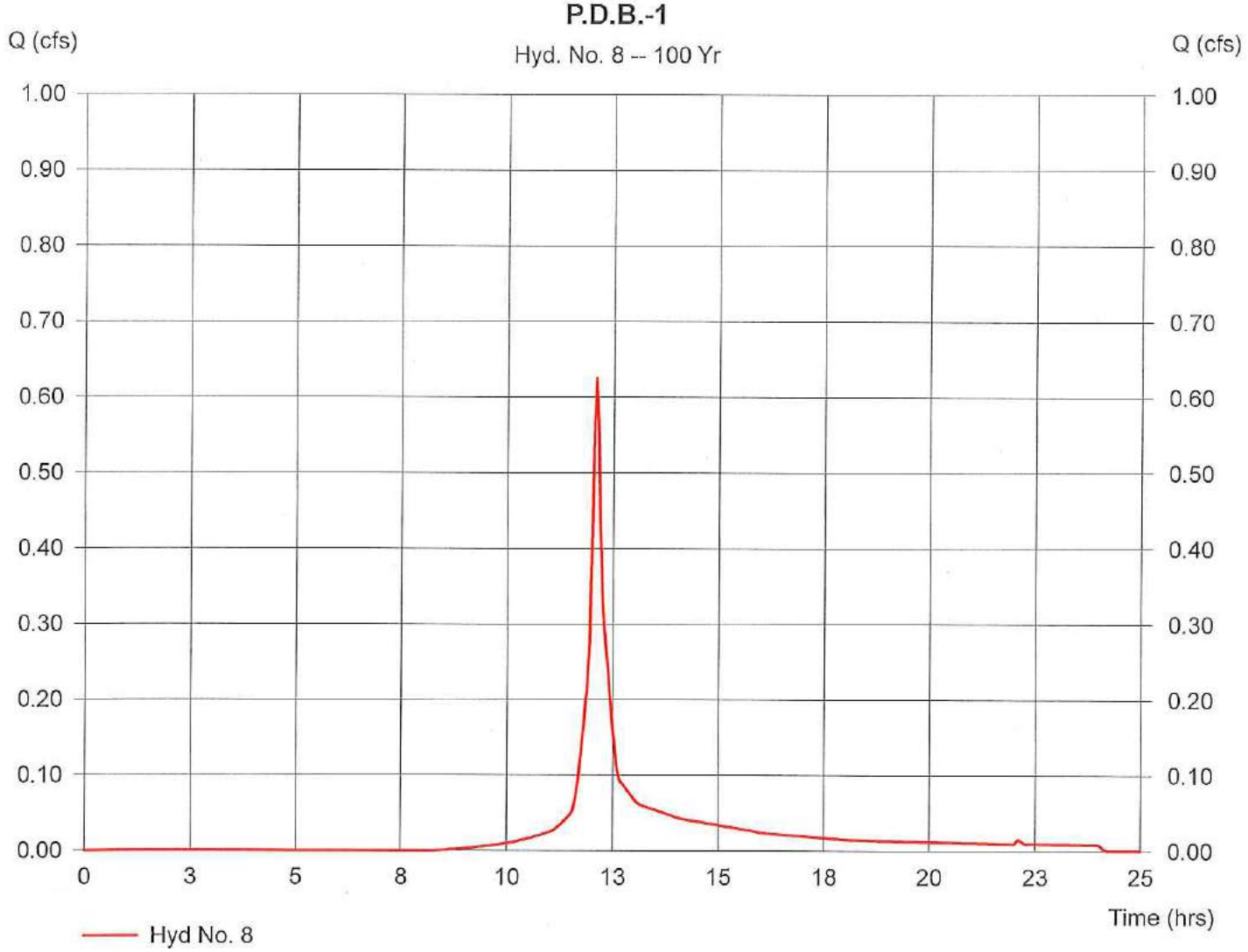
Monday, May 7 2018, 8:27 PM

## Hyd. No. 8

P.D.B.-1

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.63 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.14 ac | Curve number | = 66.4 |
| Basin Slope | = 4.4 % | Hydraulic length | = 222 ft |
| Tc method | = LAG | Time of conc. (Tc) | = 6.686719 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 2,079 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

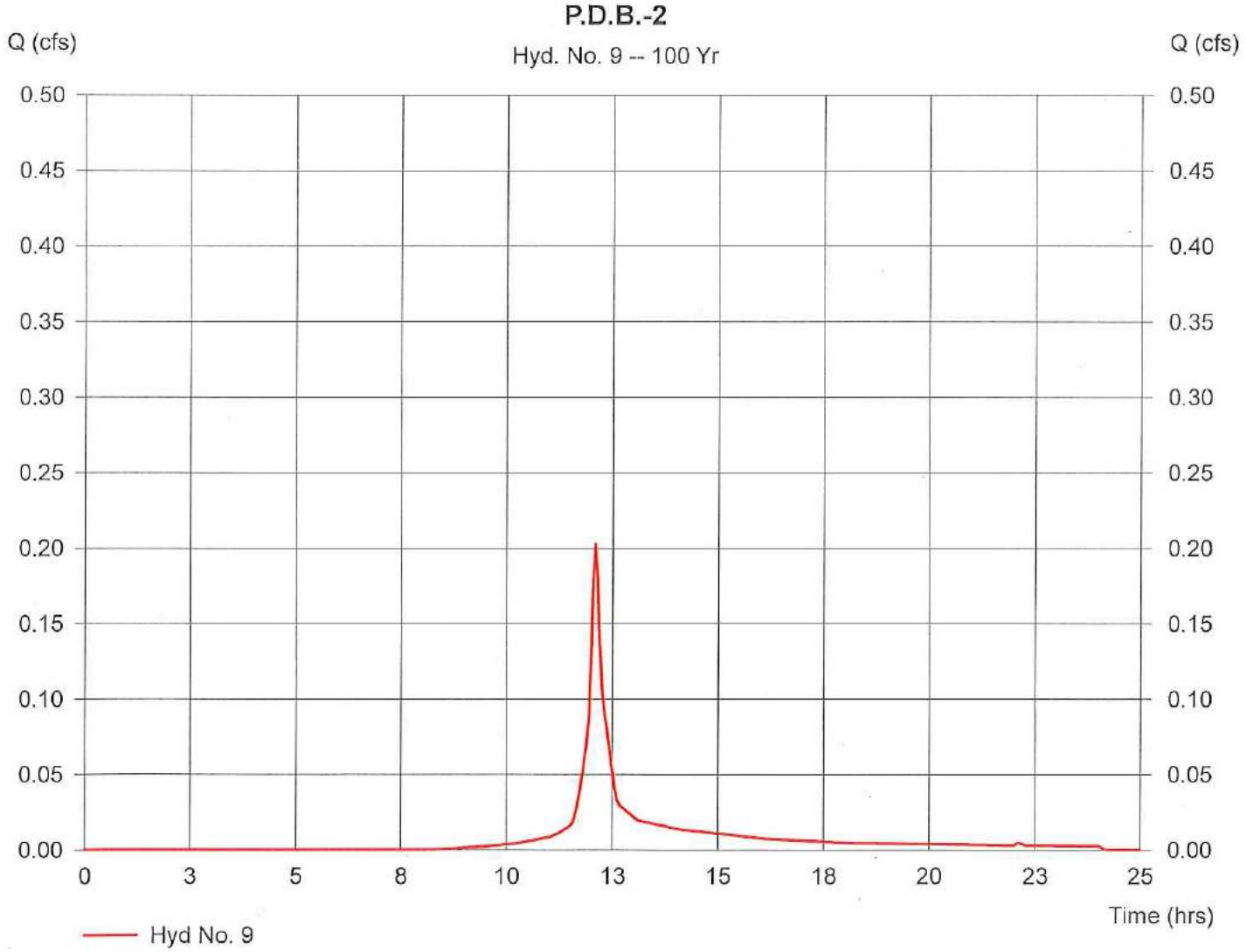
Monday, May 7 2018, 8:27 PM

## Hyd. No. 9

P.D.B.-2

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.20 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.04 ac | Curve number | = 67.9 |
| Basin Slope | = 1.0 % | Hydraulic length | = 49 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 674 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

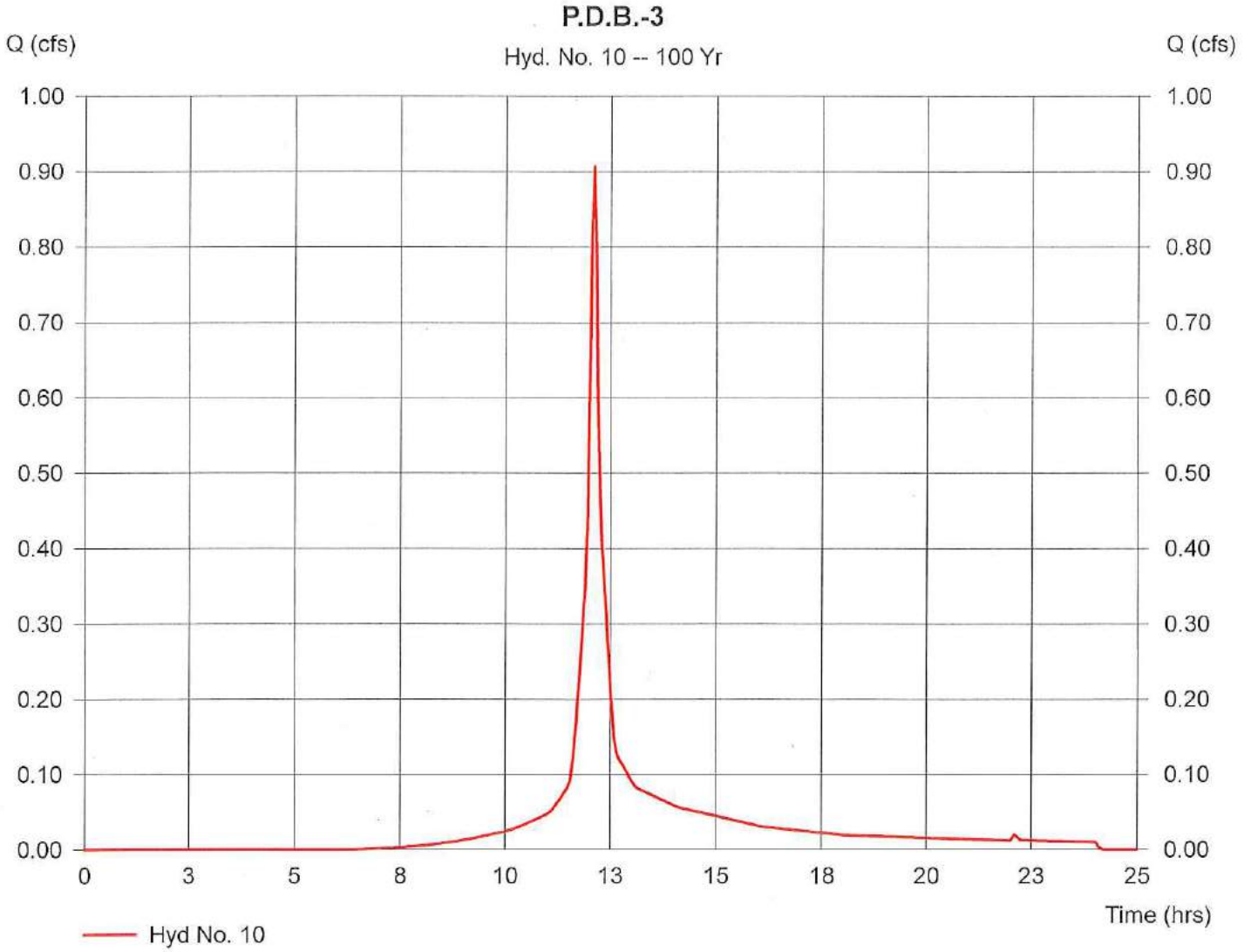
Monday, May 7 2018, 8:27 PM

## Hyd. No. 10

P.D.B.-3

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.91 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.16 ac | Curve number | = 75.3 |
| Basin Slope | = 3.8 % | Hydraulic length | = 196 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 3,043 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

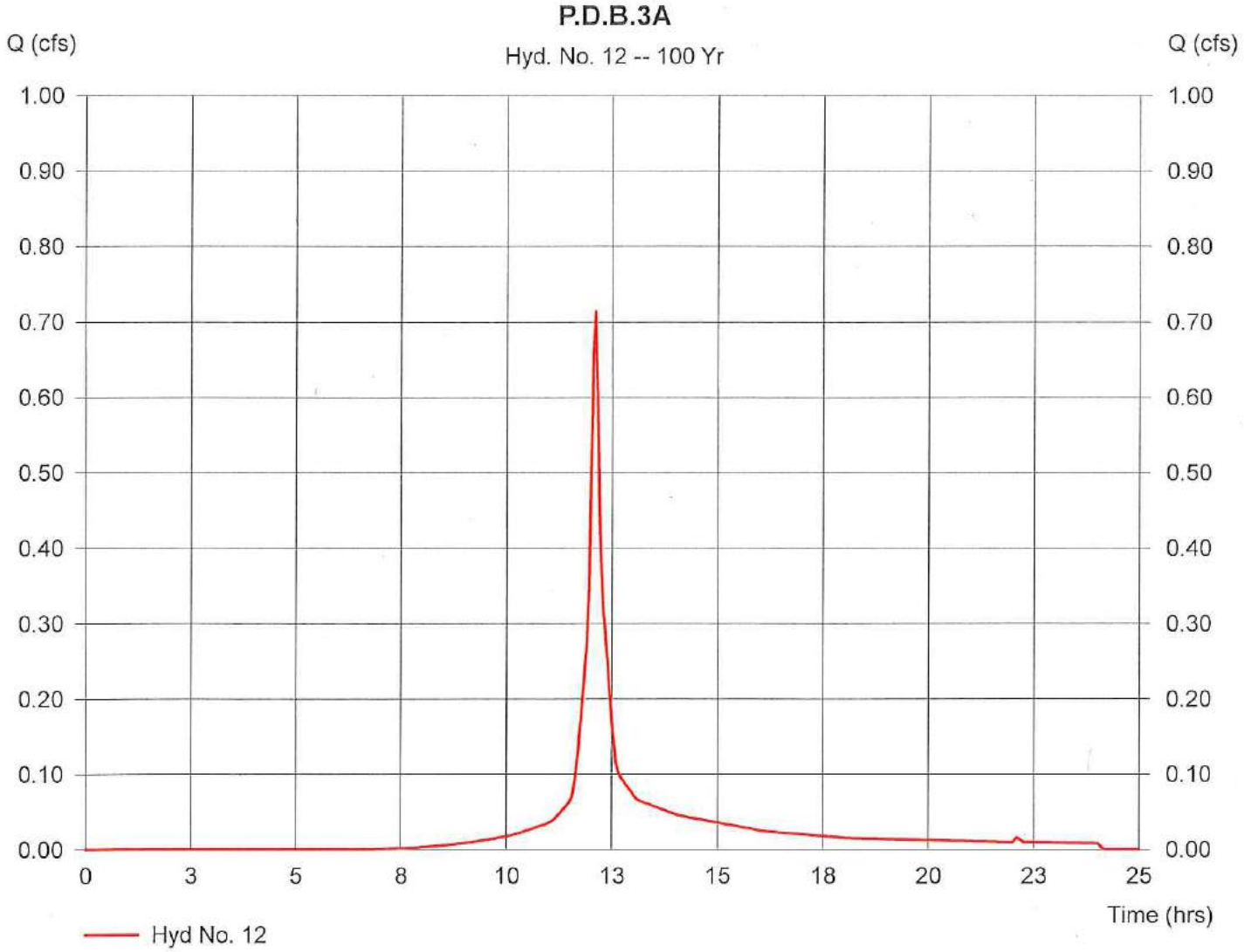
Monday, May 7 2018, 8:27 PM

## Hyd. No. 12

P.D.B.3A

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 0.71 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.13 ac | Curve number | = 73.5 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 2,385 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

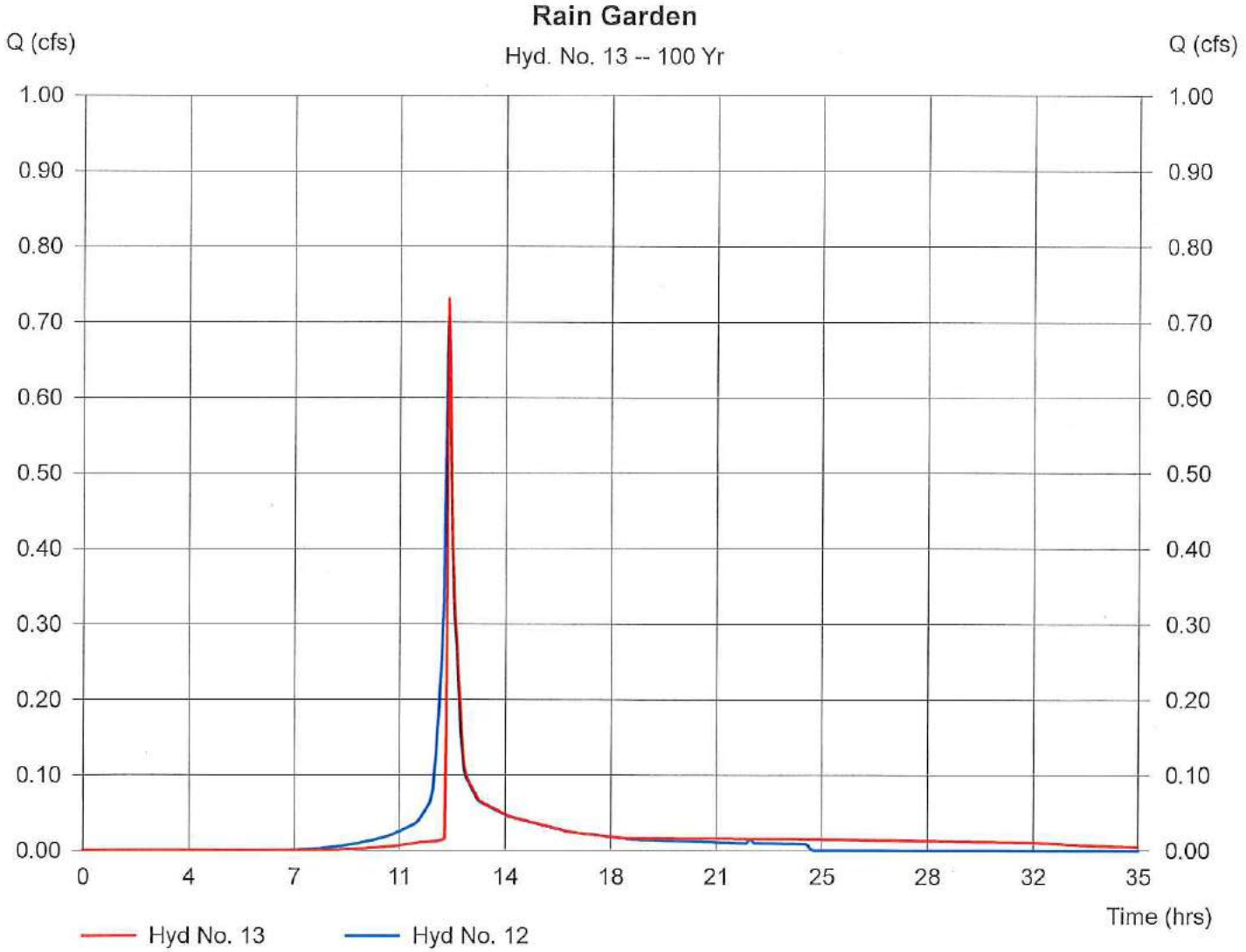
## Hyd. No. 13

Rain Garden

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 0.73 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 12 | Max. Elevation | = 164.84 ft |
| Reservoir name | = Rain Garden | Max. Storage | = 633 cuft |

Storage Indication method used.

Hydrograph Volume = 2,372 cuft



# Pond Report

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

## Pond No. 5 - Rain Garden

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|---|---|---|---|---|
| 0.00 | 163.50 | 140 | 0 | 0 |
| 0.50 | 164.00 | 448 | 147 | 147 |
| 1.00 | 164.50 | 591 | 260 | 407 |
| 1.50 | 165.00 | 748 | 335 | 742 |

### Culvert / Orifice Structures

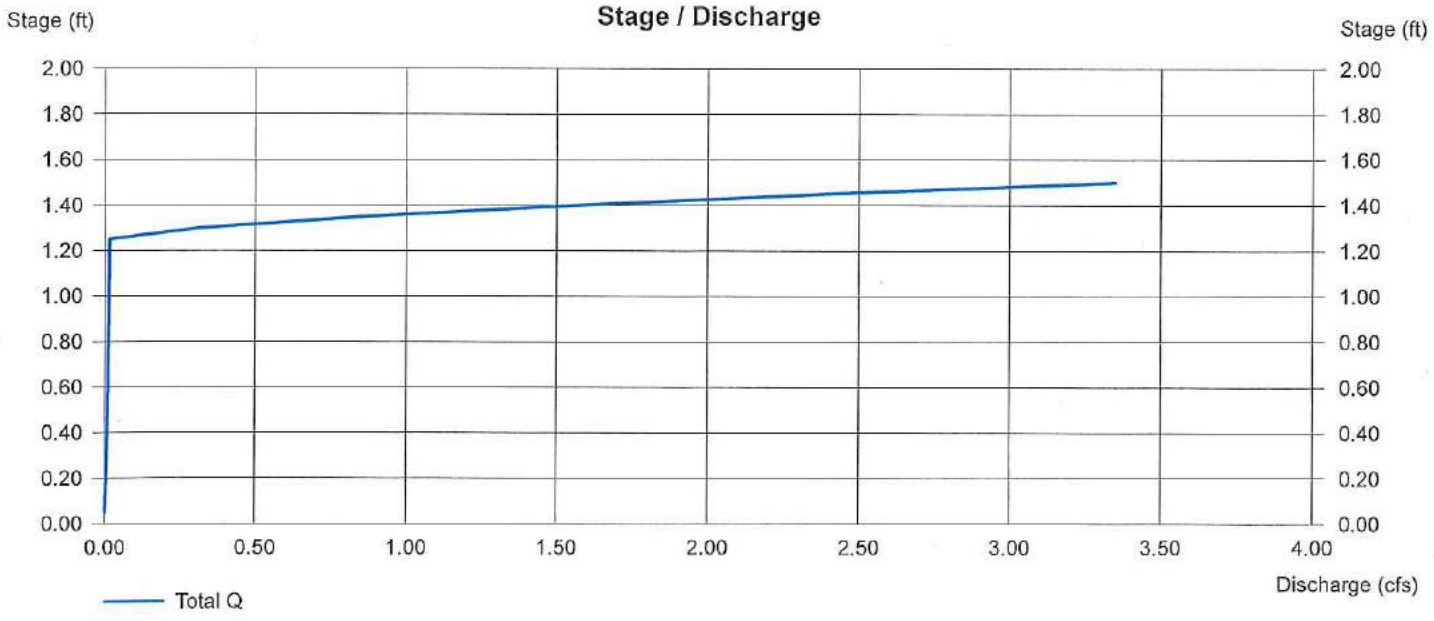
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

### Weir Structures

| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Crest Len (ft) | = 8.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 164.75 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 3.33 | 0.00 | 0.00 | 0.00 |
| Weir Type | = Rect | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

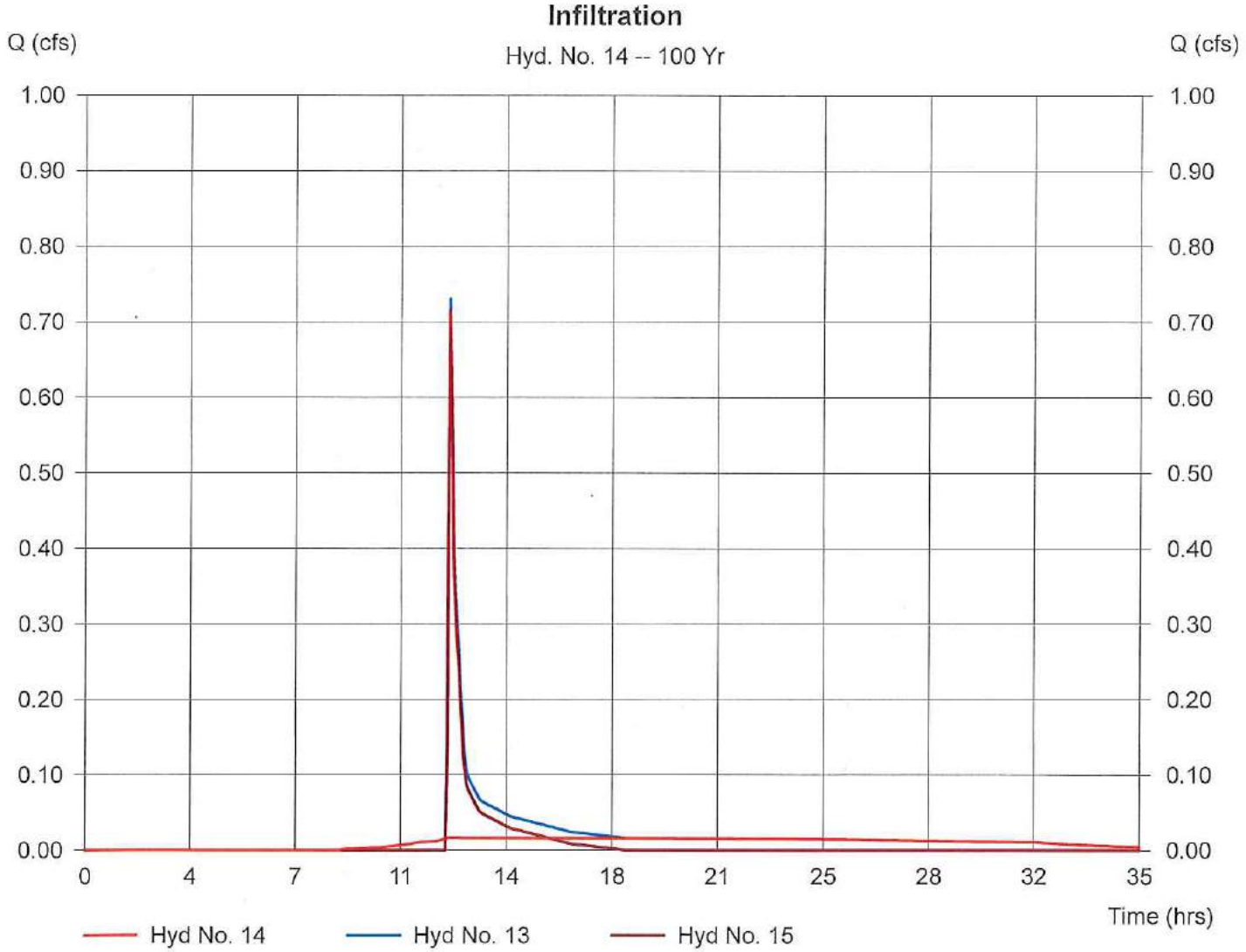
Monday, May 7 2018, 8:27 PM

## Hyd. No. 14

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.02 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 15 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 1,231 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

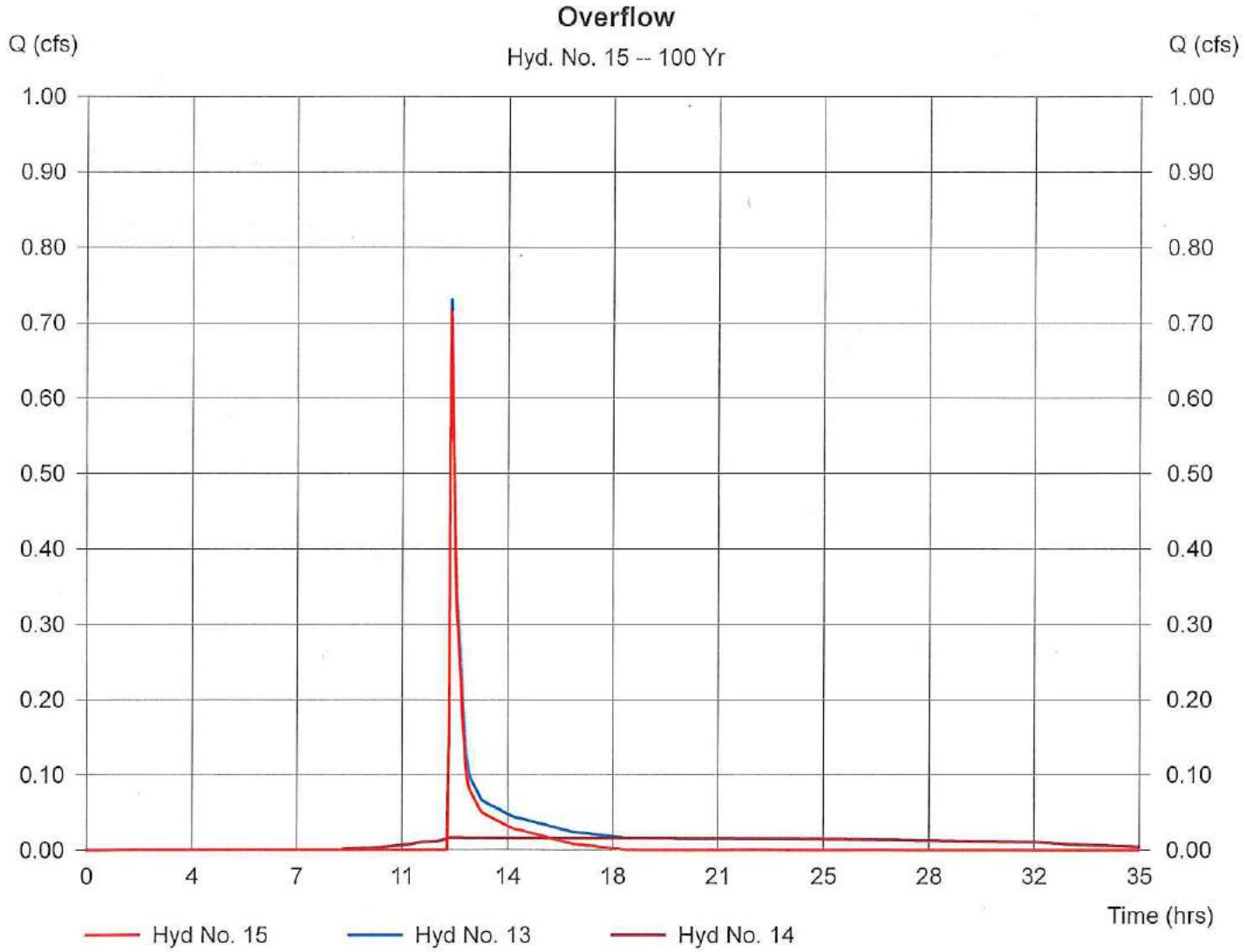
Monday, May 7 2018, 8:27 PM

## Hyd. No. 15

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 0.71 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 13 | 2nd diverted hyd. | = 14 |
| Diversion method | = Pond - Rain Garden | Pond structure | = Exfiltration |

Hydrograph Volume = 1,141 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

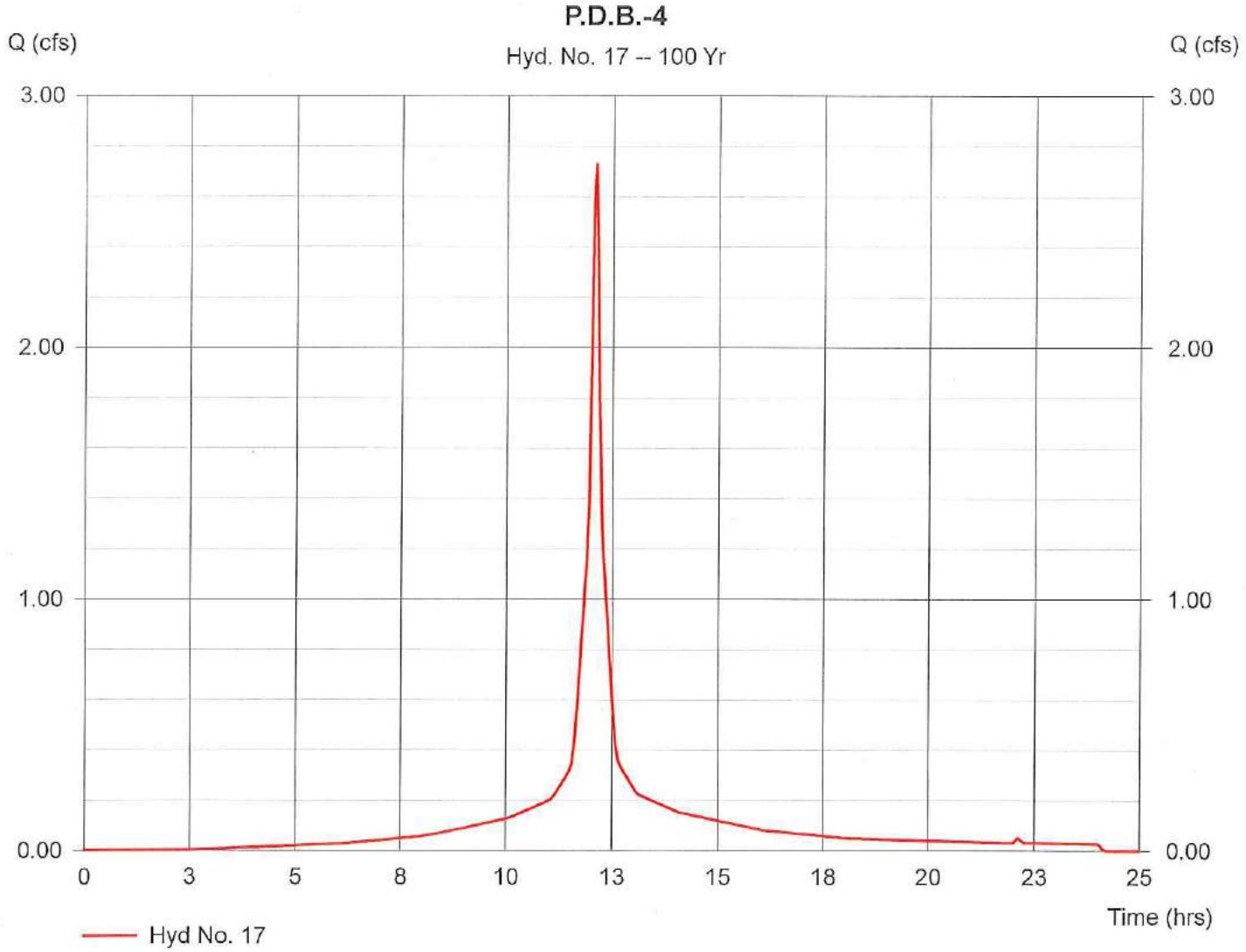
Monday, May 7 2018, 8:27 PM

## Hyd. No. 17

P.D.B.-4

| | | | |
|---|---|---|---|
| Hydrograph type | = SCS Runoff | Peak discharge | = 2.73 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Drainage area | = 0.39 ac | Curve number | = 91.7 |
| Basin Slope | = 2.0 % | Hydraulic length | = 100 ft |
| Tc method | = USER | Time of conc. (Tc) | = 5 min |
| Total precip. | = 8.45 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

Hydrograph Volume = 9,943 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Monday, May 7 2018, 8:27 PM

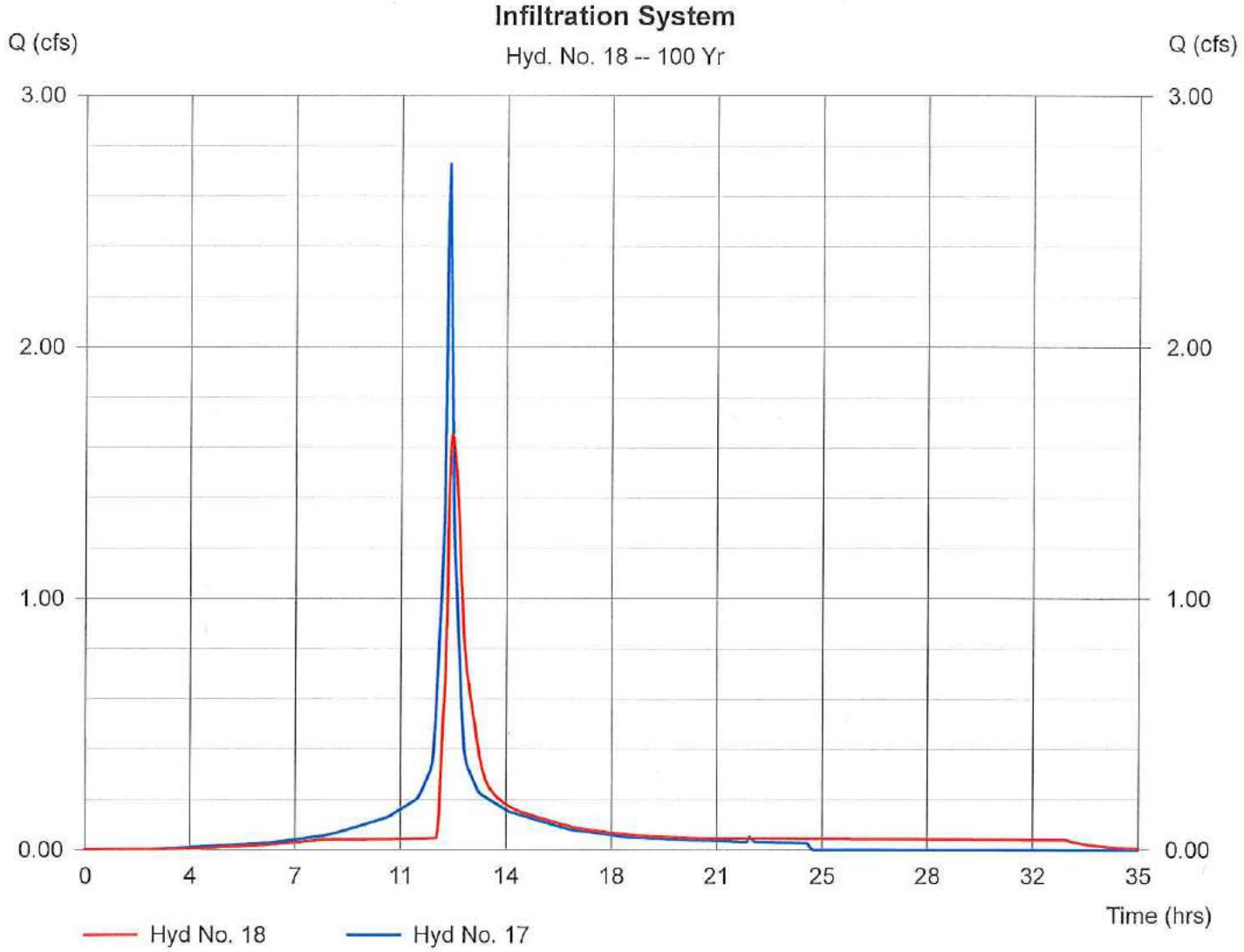
## Hyd. No. 18

Infiltration System

| | | | |
|---|---|---|---|
| Hydrograph type | = Reservoir | Peak discharge | = 1.65 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyd. No. | = 17 | Max. Elevation | = 165.22 ft |
| Reservoir name | = Infiltration System | Max. Storage | = 3,163 cuft |

Storage Indication method used.

Hydrograph Volume = 9,939 cuft



# Pond Report



## Pond No. 1 - Infiltration System

### Pond Data

Bottom LxW = 52.0 x 32.0 ft  Side slope = 0.0:1  Bottom elev. = 162.25 ft  Depth = 3.00 ft

### Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft)* | Total storage (cuft)* |
|---|---|---|---|---|
| 0.00 | 162.25 | 1,664 | 0 | 0 |
| 0.15 | 162.40 | 1,664 | 160 | 160 |
| 0.30 | 162.55 | 1,664 | 160 | 319 |
| 0.45 | 162.70 | 1,664 | 160 | 479 |
| 0.60 | 162.85 | 1,664 | 160 | 639 |
| 0.75 | 163.00 | 1,664 | 160 | 799 |
| 0.90 | 163.15 | 1,664 | 160 | 958 |
| 1.05 | 163.30 | 1,664 | 160 | 1,118 |
| 1.20 | 163.45 | 1,664 | 160 | 1,278 |
| 1.35 | 163.60 | 1,664 | 160 | 1,438 |
| 1.50 | 163.75 | 1,664 | 160 | 1,597 |
| 1.65 | 163.90 | 1,664 | 160 | 1,757 |
| 1.80 | 164.05 | 1,664 | 160 | 1,917 |
| 1.95 | 164.20 | 1,664 | 160 | 2,077 |
| 2.10 | 164.35 | 1,664 | 160 | 2,236 |
| 2.25 | 164.50 | 1,664 | 160 | 2,396 |
| 2.40 | 164.65 | 1,664 | 160 | 2,556 |
| 2.55 | 164.80 | 1,664 | 160 | 2,716 |
| 2.70 | 164.95 | 1,664 | 160 | 2,875 |
| 2.85 | 165.10 | 1,664 | 160 | 3,035 |
| 3.00 | 165.25 | 1,664 | 160 | 3,195 |

(*64.00% voids applied)

### Culvert / Orifice Structures

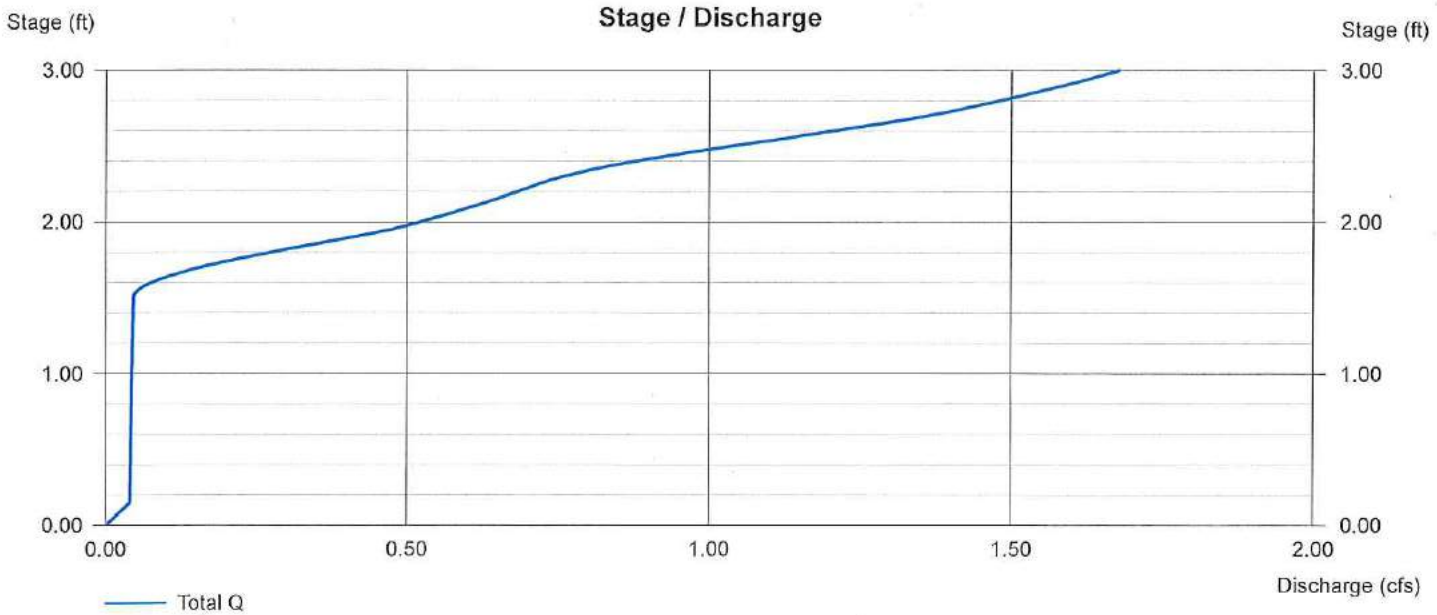
| | [A] | [B] | [C] | [D] |
|---|---|---|---|---|
| Rise (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| Span (in) | = 6.00 | 6.00 | 0.00 | 0.00 |
| No. Barrels | = 1 | 1 | 0 | 0 |
| Invert El. (ft) | = 163.75 | 164.50 | 0.00 | 0.00 |
| Length (ft) | = 50.00 | 50.00 | 0.00 | 0.00 |
| Slope (%) | = 2.00 | 2.00 | 0.00 | 0.00 |
| N-Value | = .013 | .013 | .000 | .000 |
| Orif. Coeff. | = 0.60 | 0.60 | 0.00 | 0.00 |
| 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 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 1.020 in/hr (Wet area)  Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

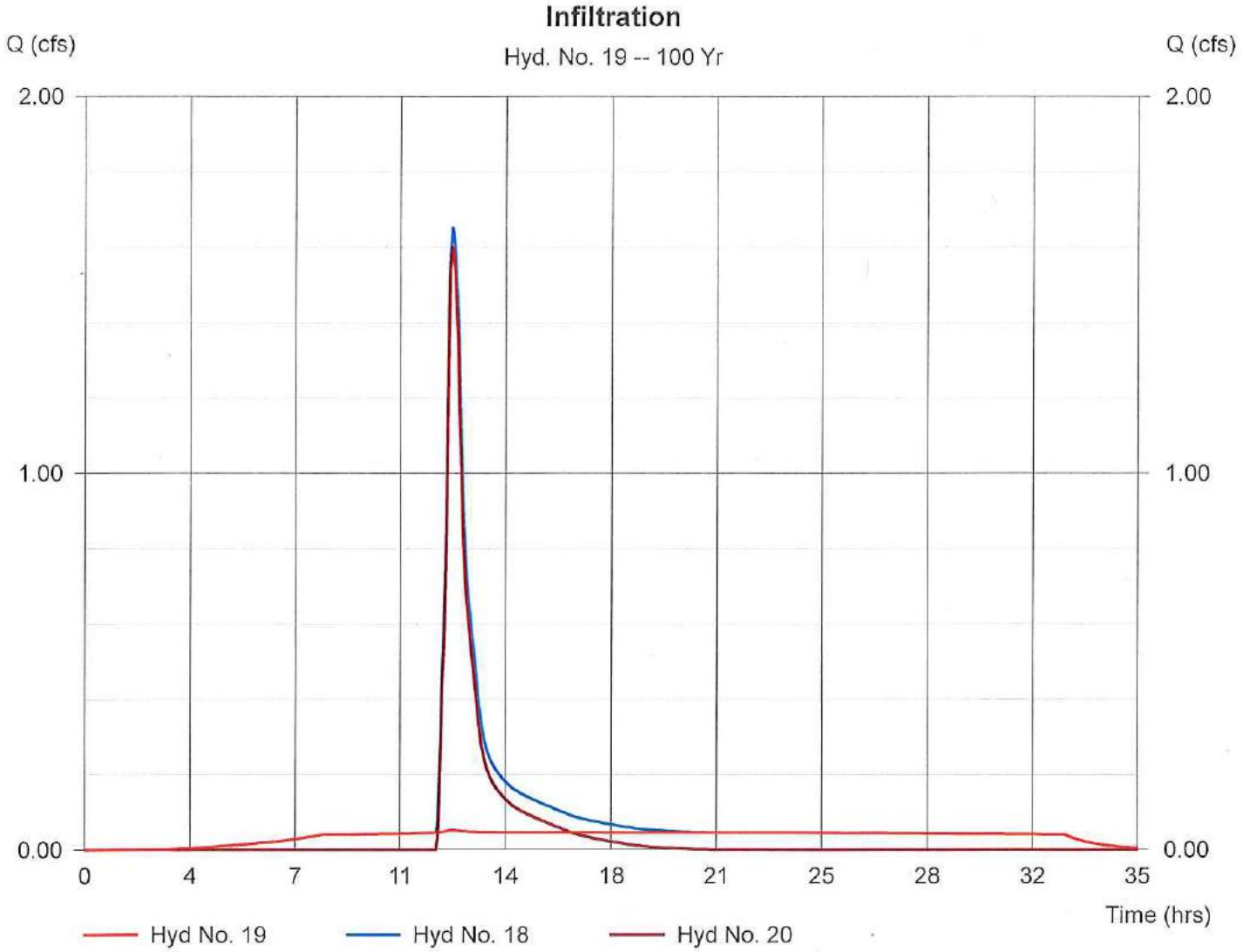
Monday, May 7 2018, 8:27 PM

## Hyd. No. 19

Infiltration

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion1 | Peak discharge | = 0.05 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 20 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 4,344 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

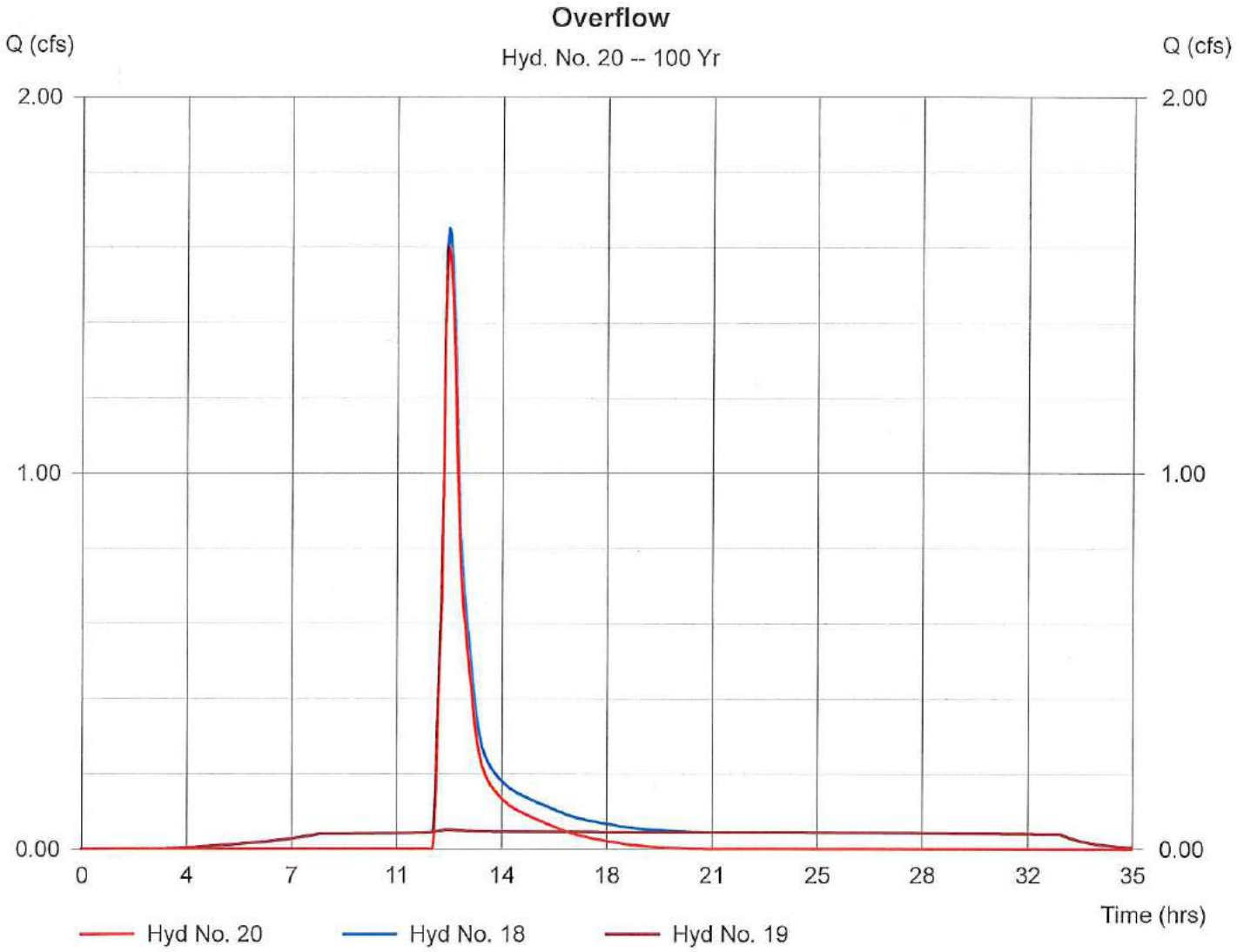
Monday, May 7 2018, 8:27 PM

## Hyd. No. 20

Overflow

| | | | |
|---|---|---|---|
| Hydrograph type | = Diversion2 | Peak discharge | = 1.60 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hydrograph | = 18 | 2nd diverted hyd. | = 19 |
| Diversion method | = Pond - Infiltration System | Pond structure | = Exfiltration |

Hydrograph Volume = 5,595 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

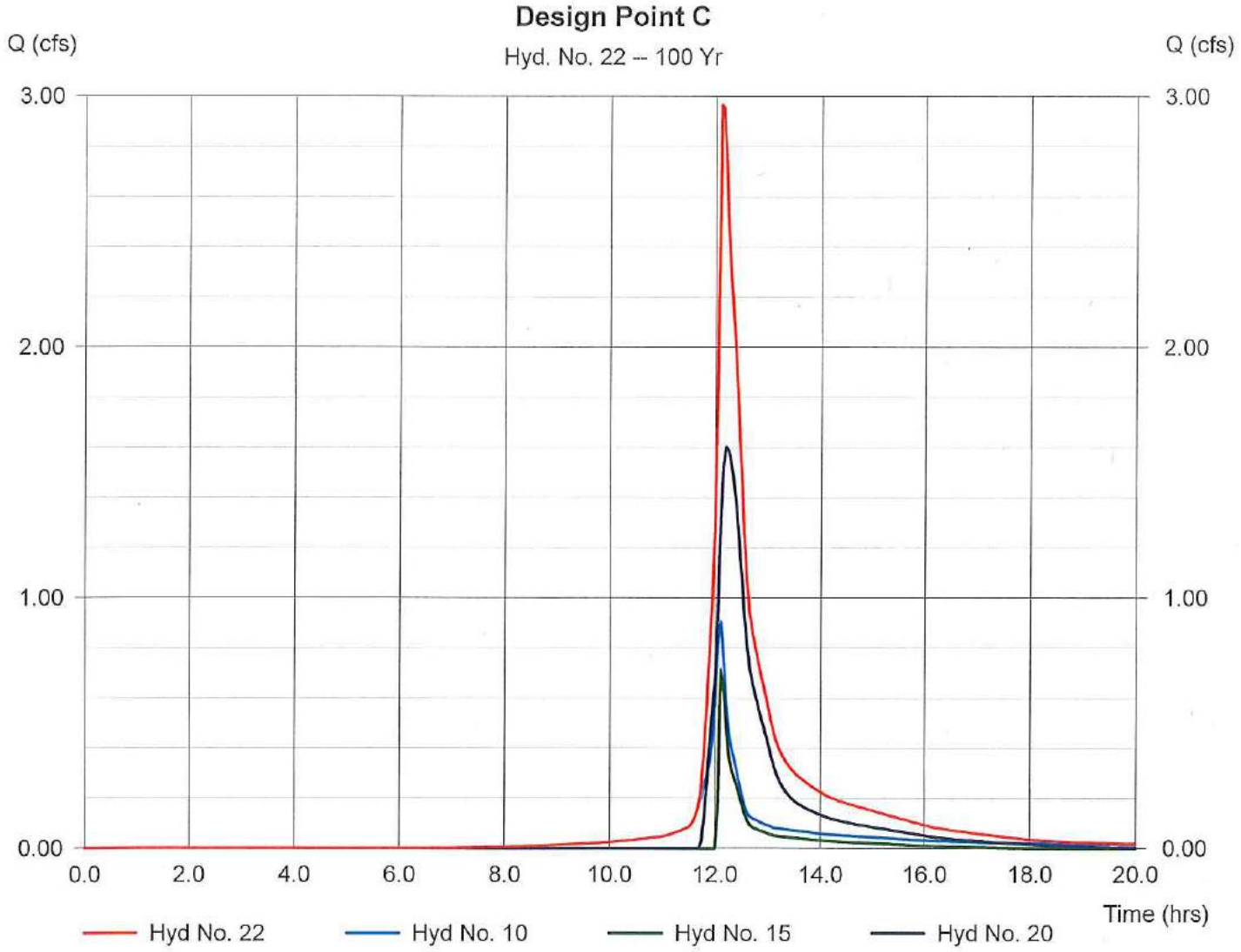
Monday, May 7 2018, 8:27 PM

## Hyd. No. 22

Design Point C

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 2.97 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyds. | = 10, 15, 20 | | |

Hydrograph Volume = 9,778 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

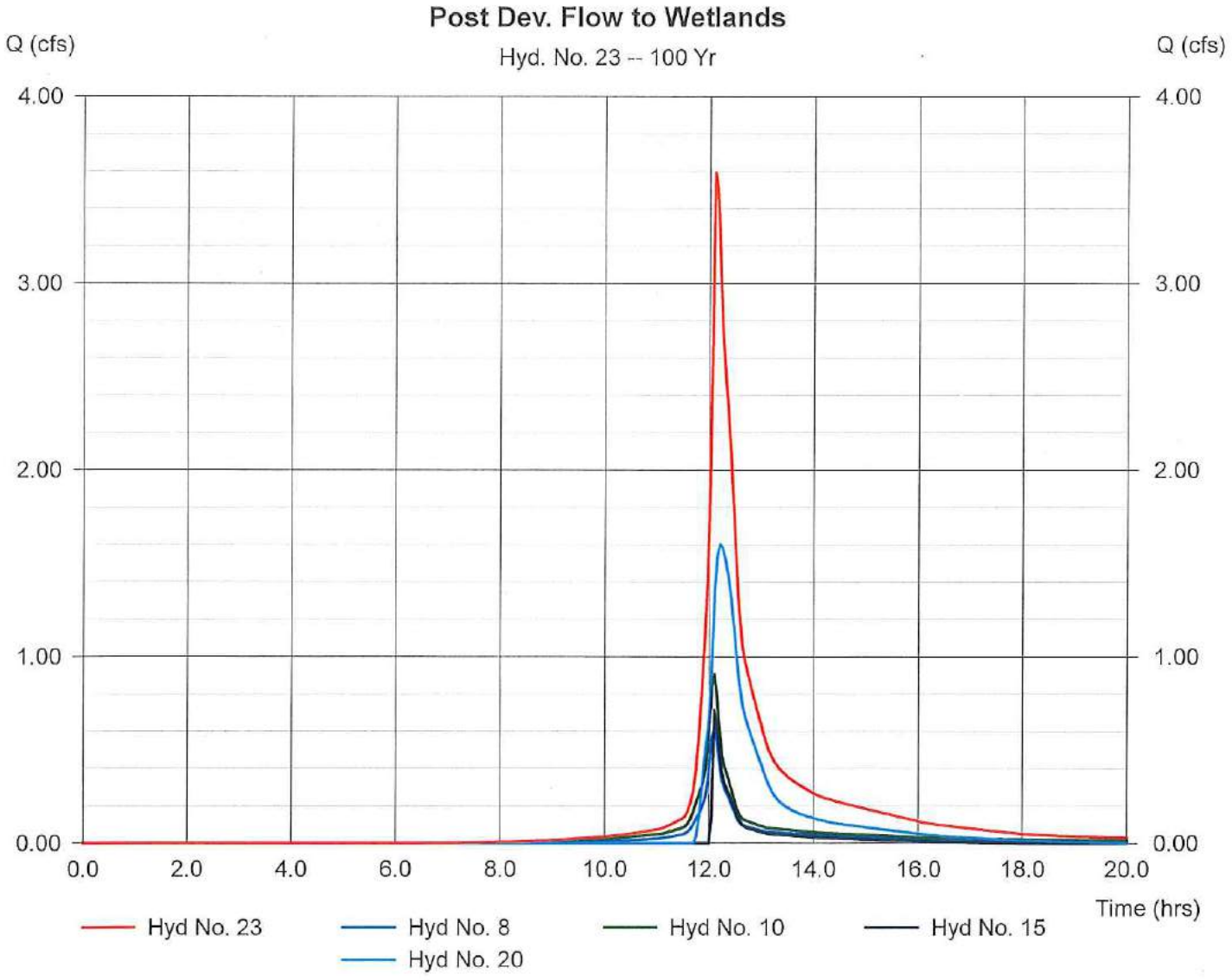
Monday, May 7 2018, 8:27 PM

## Hyd. No. 23

Post Dev. Flow to Wetlands

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 3.59 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 10, 15, 20 | | |

Hydrograph Volume = 11,857 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

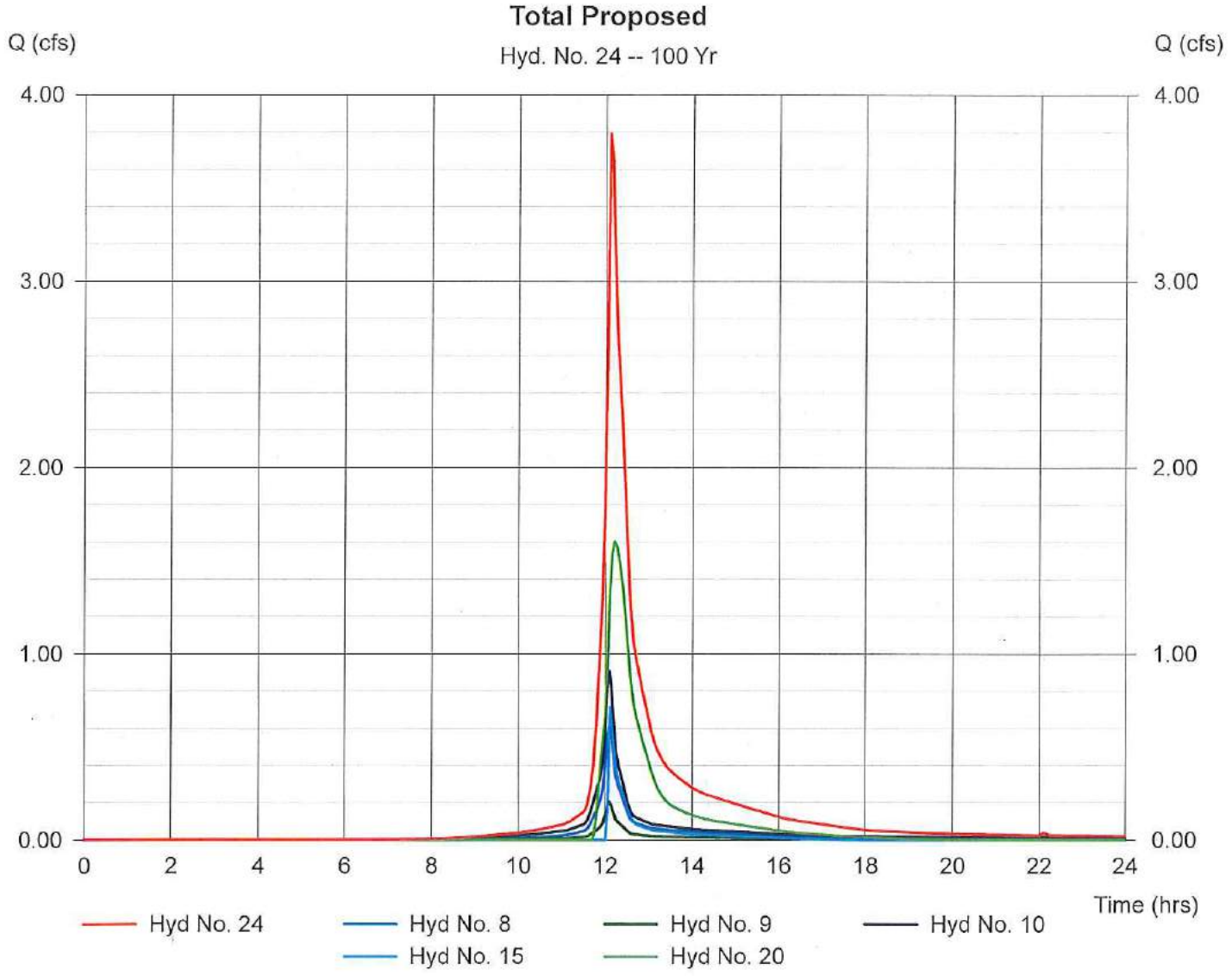
Monday, May 7 2018, 8:27 PM

## Hyd. No. 24

Total Proposed

| | | | |
|---|---|---|---|
| Hydrograph type | = Combine | Peak discharge | = 3.79 cfs |
| Storm frequency | = 100 yrs | Time interval | = 3 min |
| Inflow hyds. | = 8, 9, 10, 15, 20 | | |

Hydrograph Volume = 12,531 cuft

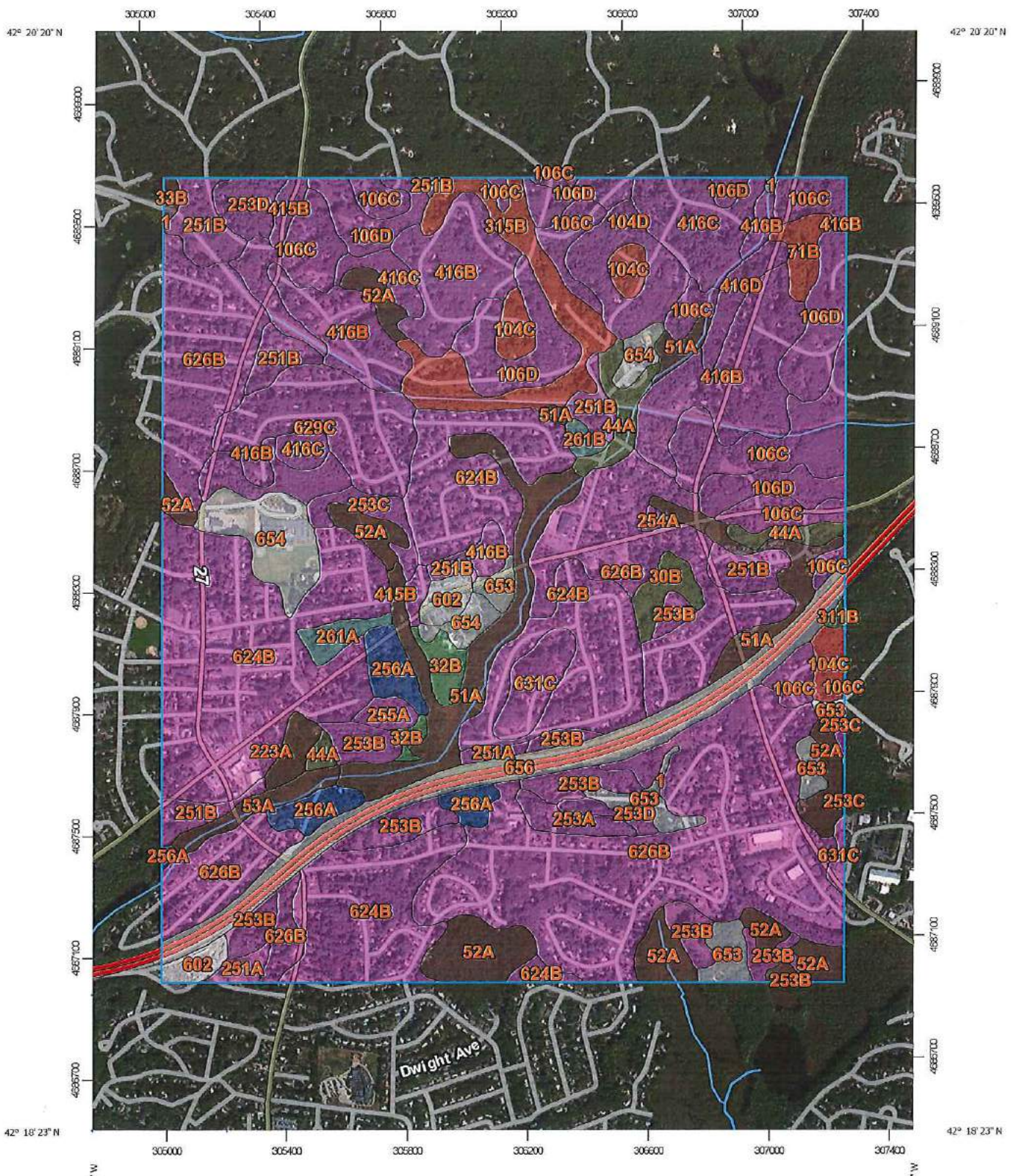


# Appendix B:
# Stormwater Operation and Maintenance Plan

*See Chapter 11 in Stormwater Report*
*For Operation and Maintenace Plan*
*Proposed Site Redevelopment*
*24 School Street*
*Wayland MA 01778*

# Appendix C:
# NRCS Soil Survey

Hydrologic Soil Group—Middlesex County, Massachusetts
(NRCS Soil Survey, 24 School Street, Wayland MA)



## MAP LEGEND

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

Soils

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Date: Version 17, Oct 6, 2017

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 1 | Water | | 1.8 | 0.1% |
| 30B | Raynham silt loam, 0 to 5 percent slopes | C/D | 8.0 | 0.5% |
| 32B | Wareham loamy fine sand, 0 to 5 percent slopes | A/D | 8.0 | 0.5% |
| 33B | Raypol silt loam, 0 to 5 percent slopes | B/D | 1.6 | 0.1% |
| 44A | Birdsall mucky silt loam, 0 to 1 percent slopes | C/D | 17.0 | 1.1% |
| 51A | Swansea muck, 0 to 1 percent slopes | B/D | 63.9 | 4.3% |
| 52A | Freetown muck, 0 to 1 percent slopes | B/D | 55.0 | 3.7% |
| 53A | Freetown muck, ponded, 0 to 1 percent slopes | B/D | 8.9 | 0.6% |
| 71B | Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony | D | 7.8 | 0.5% |
| 104C | Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes | D | 16.0 | 1.1% |
| 104D | Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes | A | 22.5 | 1.5% |
| 106C | Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes | A | 93.7 | 6.3% |
| 106D | Narragansett-Hollis-Rock outcrop complex, 15 to 25 percent slopes | A | 73.0 | 4.9% |
| 223A | Scio very fine sandy loam, 0 to 3 percent slopes | B/D | 6.1 | 0.4% |
| 251A | Haven silt loam, 0 to 3 percent slopes | A | 6.2 | 0.4% |
| 251B | Haven silt loam, 3 to 8 percent slopes | A | 40.8 | 2.7% |
| 253A | Hinckley loamy sand, 0 to 3 percent slopes | A | 7.2 | 0.5% |

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 253B | Hinckley loamy sand, 3 to 8 percent slopes | A | 43.4 | 2.9% |
| 253C | Hinckley loamy sand, 8 to 15 percent slopes | A | 8.8 | 0.6% |
| 253D | Hinckley loamy sand, 15 to 25 percent slopes | A | 13.5 | 0.9% |
| 254A | Merrimac fine sandy loam, 0 to 3 percent slopes | A | 1.5 | 0.1% |
| 255A | Windsor loamy sand, 0 to 3 percent slopes | A | 4.2 | 0.3% |
| 256A | Deerfield loamy sand, 0 to 3 percent slopes | B | 21.3 | 1.4% |
| 261A | Tisbury silt loam, 0 to 3 percent slopes | C | 5.7 | 0.4% |
| 261B | Tisbury silt loam, 3 to 8 percent slopes | C | 2.7 | 0.2% |
| 311B | Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony | C/D | 1.0 | 0.1% |
| 315B | Scituate fine sandy loam, 3 to 8 percent slopes | D | 37.3 | 2.5% |
| 415B | Narragansett silt loam, 3 to 8 percent slopes | A | 6.7 | 0.5% |
| 416B | Narragansett silt loam, 3 to 8 percent slopes, very stony | A | 116.6 | 7.9% |
| 416C | Narragansett silt loam, 8 to 15 percent slopes, very stony | A | 35.9 | 2.4% |
| 416D | Narragansett silt loam, 15 to 25 percent slopes, very stony | A | 9.0 | 0.6% |
| 602 | Urban land | | 10.5 | 0.7% |
| 624B | Haven-Urban land complex, 0 to 8 percent slopes | A | 257.7 | 17.4% |
| 626B | Merrimac-Urban land complex, 0 to 8 percent slopes | A | 307.8 | 20.7% |
| 628C | Canton-Charlton-Urban land complex, 3 to 15 percent slopes | A | 43.0 | 2.9% |
| 631C | Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky | A | 15.2 | 1.0% |
| 653 | Udorthents, sandy | | 20.5 | 1.4% |
| 654 | Udorthents, loamy | | 32.7 | 2.2% |

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 656 | Udorthents-Urban land complex | | 51.2 | 3.5% |
| **Totals for Area of Interest** | | | 1,483.5 | **100.0%** |

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# Appendix D:
# Time of Concentration Calculations

| | |
|---|---|
| **Time of Concentration Calculations** | |
| **24 School Street, Wayland MA** | |
| ***Prepared For: Windsor Place, LLC*** | |
| | |
| **Existing Conditions Watersheds** | |
| | |
| **E.C.B.-1** | |
| Longest Flow Path (ft.) | 189 |
| L^0.8 (ft.) | 66.25 |
| | |
| Runoff Curve Number | 66.4 |
| Maximum Retention (S) | 5.06 |
| (S+1)^0.7 | 3.53 |
| Basin Slope (%) | 5.2 |
| | |
| Lag Time (Hours) | 0.05 |
| Lag Time (Minutes) | 3.24 |
| **Time of Concentration (Tc) (minutes)** | **5.4** |
| | |
| **E.C.B.-2** | |
| **Time of Concentration (Tc) (minutes)** | **5.0** |
| | **Manually Entered** |
| **E.C.B.-3** | |
| Longest Flow Path (ft.) | 207 |
| L^0.8 (ft.) | 71.25 |
| | |
| Runoff Curve Number | 70.4 |
| Maximum Retention (S) | 4.20 |
| (S+1)^0.7 | 3.17 |
| Basin Slope (%) | 4.2 |
| | |
| Lag Time (Hours) | 0.06 |
| Lag Time (Minutes) | 3.48 |
| **Time of Concentration (Tc) (minutes)** | **5.8** |

| Time of Concentration Calculations | |
|---|---|
| **24 School Street, Wayland MA** | |
| ***Prepared For: Windsor Place, LLC*** | |
| | |
| **Proposed Conditions Watersheds** | |
| | |
| **P.D.B.-1** | |
| Longest Flow Path (ft.) | 222 |
| L^0.8 (ft.) | 75.35 |
| | |
| Runoff Curve Number | 66.4 |
| Maximum Retention (S) | 5.06 |
| (S+1)^0.7 | 3.53 |
| Basin Slope (%) | 4.4 |
| | |
| Lag Time (Hours) | 0.07 |
| Lag Time (Minutes) | 4.00 |
| **Time of Concentration (Tc) (minutes)** | **6.7** |
| | |
| **P.D.B.-2** | |
| **Time of Concentration (Tc) (minutes)** | **5.0** |
| | **Manually Entered** |
| | |
| **P.D.B.-3** | |
| Longest Flow Path (ft.) | 196 |
| L^0.8 (ft.) | 68.20 |
| | |
| Runoff Curve Number | 75.3 |
| Maximum Retention (S) | 3.28 |
| (S+1)^0.7 | 2.77 |
| Basin Slope (%) | 4 |
| | |
| Lag Time (Hours) | 0.05 |
| Lag Time (Minutes) | 2.98 |
| **Time of Concentration (Tc) (minutes)** | **5.0** |
| | **Manually Entered at 5.0 Minutes** |
| | |
| P.D.B.-3A | |
| **Time of Concentration (Tc) (minutes)** | **5.0** |
| | **Manually Entered** |
| | |
| **P.D.B.-4** | |
| **Time of Concentration (Tc) (minutes)** | **5.0** |
| Page 1 of 1 | **Manually Entered** |

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 69050, PAGE 394.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE– AND BELOW–GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT–INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN–MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB–SURFACE UTILITIES AND MAN–MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.)

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG–SAFE BEFORE YOU DIG 811.

## ZONING:

### RESIDENCE ZONE 20,000 – 120' FRONT

MINIMUM LOT AREA= $20{,}000^{15}$ S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= $30^{2}$ FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= $15^{3}$ FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198–702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198–702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198–702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198–703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198–705.1 OF THE ZONING BYLAW.

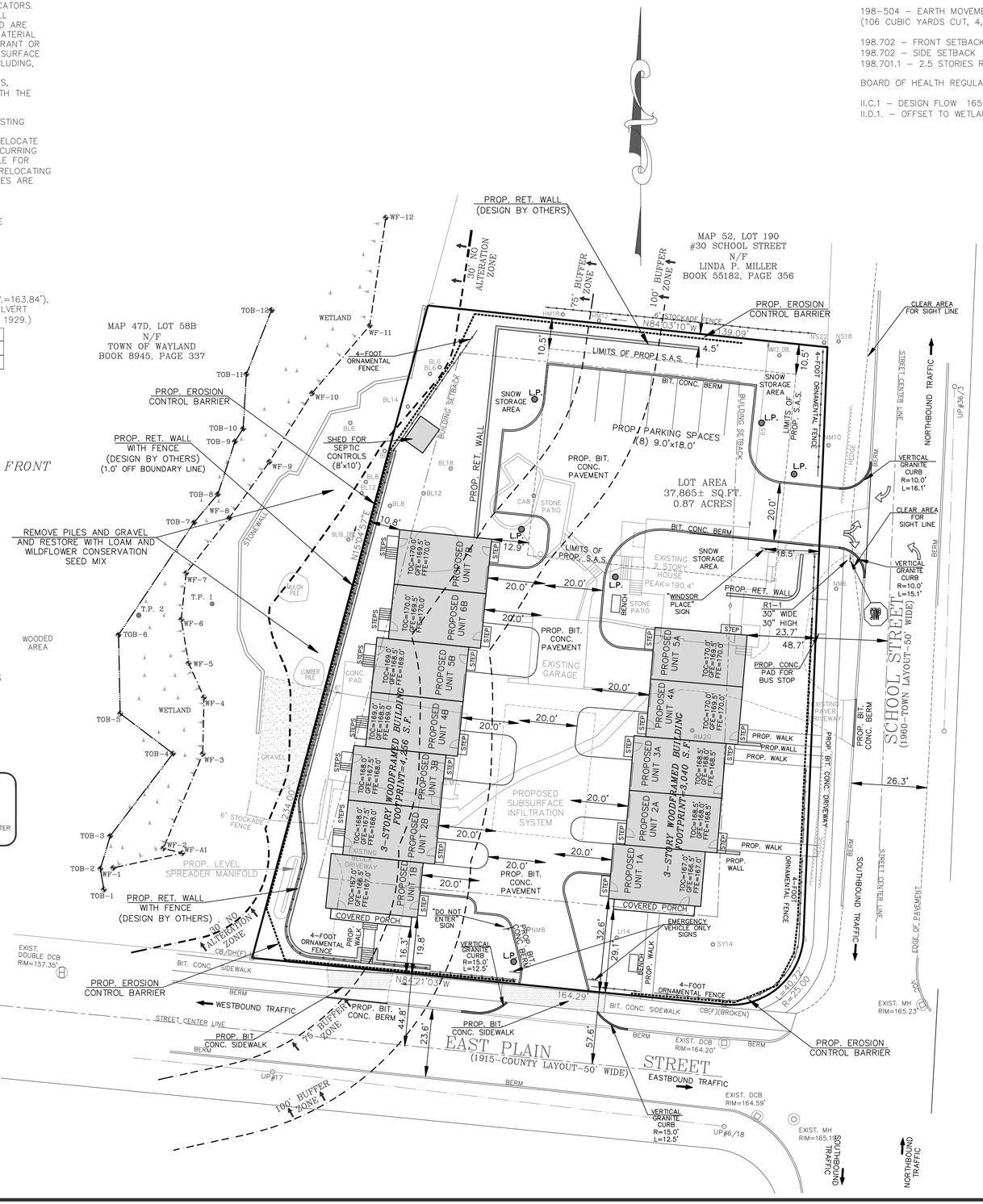
## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL
TREE LOCATION
RO14
TREE CODE — TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| WG | WATER GATE |
| GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| 200.0 | EXISTING SPOT GRADE |
| ----200---- | EXISTING GRADING |
| ---------- | EXISTING OVERHEAD WIRE |




## LOCAL WAIVERS REQUESTED:

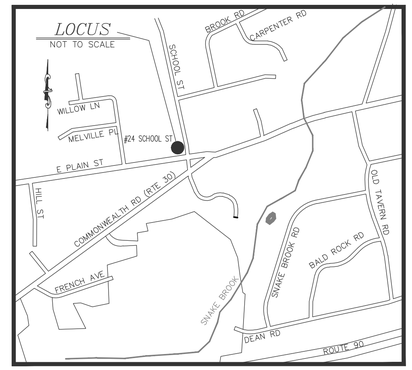
ZONING BYLAWS:

198–504 – EARTH MOVEMENT – 500 CUBIC YARDS MAXIMUM ALLOWED
(106 CUBIC YARDS CUT, 4,571 CUBIC YARDS FILL REQUESTED)

198.702 – FRONT SETBACK 30–FEET REQUIRED (16.3 AND 23.7–FEET REQUESTED)
198.702 – SIDE SETBACK 15.0 FEET REQUIRED (10.8–FEET REQUESTED)
198.701.1 – 2.5 STORIES REQUIRED (3 STORIES REQUESTED)

BOARD OF HEALTH REGULATIONS:

II.C.1 – DESIGN FLOW 165 G.P.D. REQUIRED (110 G.P.D REQUESTED)
II.D.1. – OFFSET TO WETLANDS 100–FEET REQUIRED (54.6–FEET REQUESTED)




## ZONING TABLE

### RESIDENCE ZONE, 20,000 SQUARE FEET

| | REQUIRED | EXISTING | PROPOSED |
|---|---|---|---|
| AREA | 20,000 S.F. | 37,865 S.F. | 37,865 S.F. |
| FRONTAGE | 120 FEET | 204.01 FEET | 204.01 FEET |
| SETBACKS: | | | |
| FRONT YARD | 30 FEET* | 17.5 FEET | 19.8 FEET |
| SIDE YARD | 15 FEET | N.A. | N.A. |
| REAR YARD | 30 FEET | 6.2 FEET | 10.8 FEET |
| BUILDING COVERAGE | 20% MAXIMUM | 0.092 (9.2%) | 0.199 (19.9%) |
| LOT COVERAGE | 20% MAXIMUM | 0.092 (9.2%) | 0.199 (19.9%) |
| IMPERVIOUS AREA | N.A. | 8,908 S.F. (23.5%) | 19,956 S.F. (52.7%) |
| BUILDING COVERAGE | 7,573 S.F. | 3,493 S.F. (9.2%) | 7,572 S.F. (19.9%) |
| OTHER IMPERV. AREA | N.A. | 5,415 S.F. (14.3%) | 12,384 S.F. (32.7%) |
| OPEN SPACE | N.A. | 28,957 S.F. (76.5%) | 17,909 S.F. (47.3%) |
| BUILDING HEIGHT | 35 FEET | 28± FEET | 35.5 FEET |
| NUMBER OF STORIES | 2.5 STORIES | 2 STORIES | 3 STORIES |
| BUILDING TYPE | N.A. | 2–STORY W.F. | 3–STORY W.F. |
| FLOOR AREA RATIO | N.A. | 0.090 (9.0%±) | 0.52 (52.0%±) |
| NUMBER OF BEDROOMS | N.A. | 4 BEDROOMS | 26 BEDROOMS |
| UNITS PER ACRE | N.A. | 0.9 | 13.8 |
| UNITS PER BUILDABLE ACRE | N.A. | 0.9 | 13.9 |
| # PARKING SPACES PER UNIT | N.A. | 4 | 2.5 |
| # PARKING SPACES PER SQUARE FOOT | N.A. | N.A. | 0.002 |
| # PARKING SPACES | N.A. | 4 | 30* |

* – INCLUDES GARAGE PARKING

## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 4 10 20 ( METERS ) 30

# PROPOSED LAYOUT PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626–0063*
*FAX: (508)875–6440*

| | |
|---|---|
| SHEET 1 OF 5 | DATE: SEPTEMBER 6, 2017 |
| CALC'D BY: BTN / FIELD BK: 621 | CAD FILE: PROP_SITE_3_R7.dwg |
| DRAFTER: BTN / PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 69050, PAGE 394.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE– AND BELOW–GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT–INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN–MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB–SURFACE UTILITIES AND MAN–MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

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| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG–SAFE BEFORE YOU DIG 811.

## ZONING:

### RESIDENCE ZONE 20,000 – 120' FRONT

MINIMUM LOT AREA= 20,000[15] S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= 30[2] FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= 15[3] FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198–702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198–702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198–702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198–703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198–705.1 OF THE ZONING BYLAW.

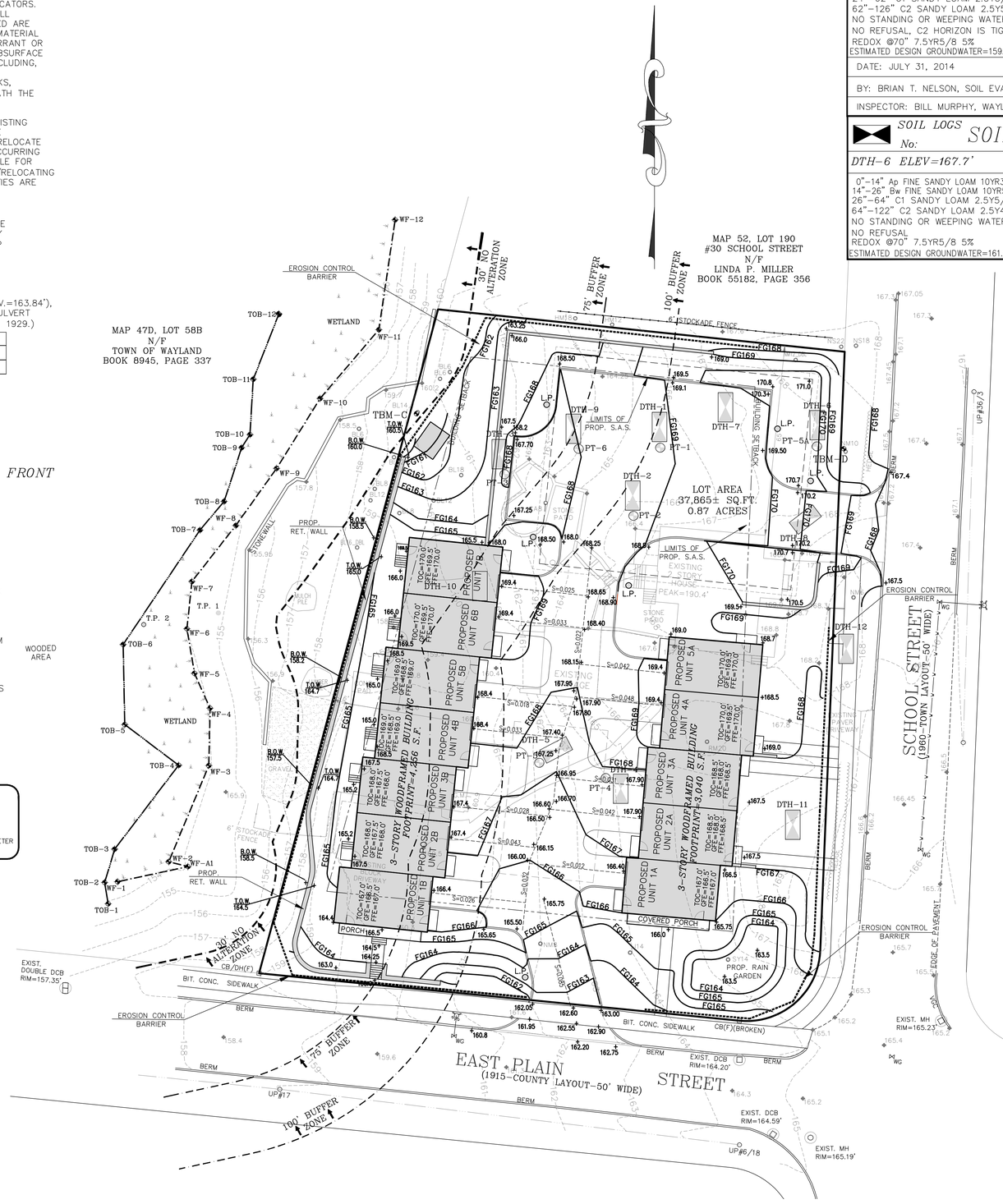
## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL: TREE LOCATION RO14 TREE CODE TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| WG | WATER GATE |
| GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| 200.0 | EXISTING SPOT GRADE |
| 200 | EXISTING GRADING |
| | EXISTING OVERHEAD WIRE |




## SOIL LOGS No: SOIL TEST RESULTS

| DTH–1 ELEV=165.7' | DTH–2 ELEV=165.9' | DTH–3 ELEV=161.7' | DTH–4 ELEV=164.1' | DTH–5 ELEV=162.6' |
|---|---|---|---|---|
| 0"–10" Ap FINE SANDY LOAM 10YR3/3<br>10"–24" Bw FINE SANDY LOAM 10YR5/6<br>24"–62" C1 SANDY LOAM 2.5Y5/3<br>62"–126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"–22" Ap FINE SANDY LOAM 10YR3/3<br>22"–42" Bw FINE SANDY LOAM 10YR5/6<br>42"–96" C1 SANDY LOAM 2.5Y5/3<br>96"–118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"–10" Ap FINE SANDY LOAM 10YR3/3<br>10"–22" Bw FINE SANDY LOAM 10YR5/6<br>22"–84" C1 SANDY LOAM 2.5Y5/3<br>84"–110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"–20" FILL<br>20"–28" Ap FINE SANDY LOAM 10YR3/3<br>28"–40" Bw FINE SANDY LOAM 10YR5/6<br>40"–86" C1 SANDY LOAM 2.5Y5/4<br>86"–116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"–16" Ap FINE SANDY LOAM 10YR3/3<br>16"–34" Bw FINE SANDY LOAM 10YR5/6<br>34"–84" C1 SANDY LOAM 2.5Y5/4<br>84"–118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |

DATE: JULY 31, 2014

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH

## SOIL LOGS No: SOIL TEST RESULTS

| DTH–6 ELEV=167.7' | DTH–7 ELEV=166.8' | DTH–8 ELEV=168.2' | DTH–9 ELEV=163.0' | DTH–10 ELEV=160.75' |
|---|---|---|---|---|
| 0"–14" Ap FINE SANDY LOAM 10YR3/3<br>14"–26" Bw FINE SANDY LOAM 10YR5/6<br>26"–64" C1 SANDY LOAM 2.5Y5/3<br>64"–122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"–14" Ap FINE SANDY LOAM 10YR3/3<br>14"–32" Bw FINE SANDY LOAM 10YR5/6<br>32"–58" C1 SANDY LOAM 2.5Y5/3<br>58"–114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"–26" FILL<br>26"–40" Bw FINE SANDY LOAM 10YR5/6<br>40"–78" C1 SANDY LOAM 2.5Y5/4<br>78"–108" C2 LOAMY SAND 2.5Y5/3<br>108"–126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"–16" Ap FINE SANDY LOAM 10YR3/3<br>16"–30" Bw FINE SANDY LOAM 10YR5/6<br>30"–46" Bc SANDY LOAM 2.5Y5/4<br>46"–98" C1 SANDY LOAM 2.5Y5/3<br>98"–118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>WATER WEEPING @88"<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"–15" Ap FINE SANDY LOAM 10YR3/3<br>15"–30" Bw FINE SANDY LOAM 10YR5/6<br>30"–66" C1 LOAMY SAND 2.5Y5/3<br>66"–112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT–1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT–2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT–3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT–4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT–5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

DATE: AUGUST 21, 2014

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT–5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT–6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

| DTH–11 ELEV=166.0' | DTH–12 ELEV=168.2' |
|---|---|
| 0"–18" FILL<br>18"–30" Ap FINE SANDY LOAM 10YR3/3<br>30"–36" Bw FINE SANDY LOAM 10YR5/6<br>36"–58" C1 SANDY LOAM 2.5Y5/3<br>58"–128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"–54" FILL<br>58"–82" C1 SANDY LOAM 2.5Y4/4<br>82"–114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |

## APPROXIMATE EARTHWORK CALCULATIONS:

TOTAL FILL= 4,571 C.Y.
TOTAL CUT= 106 C.Y.

NET EARTHWORK= 4,465 C.Y. (FILL)

EARTHWORK ACTIVITIES EXEMPTED BY BYLAW

INFILTRATION SYSTEM – 38 CUBIC YARDS (CUT)
GENERAL EARTHWORK – 68 CUBIC YARDS (CUT)
FOUNDATION BUILDING A – 286 CUBIC YARDS (FILL)
FOUNDATION BUILDING B – 1,380 CUBIC YARDS (FILL)
EXISTING HOUSE – 274 CUBIC YARDS (FILL)
DRIVEWAY – 740 CUBIC YARDS (FILL)
PROPOSED SEPTIC SYSTEM – 788 CUBIC YARDS (FILL)

EARTHWORK ACTIVITIES SUBJECT TO BYLAW

GENERAL EARTHWORK – 1,103 CUBIC YARDS (FILL)

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 4 10 20 ( METERS ) 30

## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

# PROPOSED GRADING PLAN
#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626–0063*
*FAX: (508)875–6440*

| | | |
|---|---|---|
| SHEET 2 OF 5 | | DATE: SEPTEMBER 6, 2017 |
| CALC'D BY: BTN | FIELD BK: 621 | CAD FILE: PROP_SITE_3_R7.dwg |
| DRAFTER: BTN | PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 69050, PAGE 394.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE- AND BELOW-GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT-INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN-MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB-SURFACE UTILITIES AND MAN-MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.)

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG-SAFE BEFORE YOU DIG 811.

## ZONING:

### RESIDENCE ZONE 20,000 – 120' FRONT

MINIMUM LOT AREA= 20,000[15] S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= 30[2] FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= 15[3] FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198-702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198-702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198-702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198-703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198-705.1 OF THE ZONING BYLAW.

## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

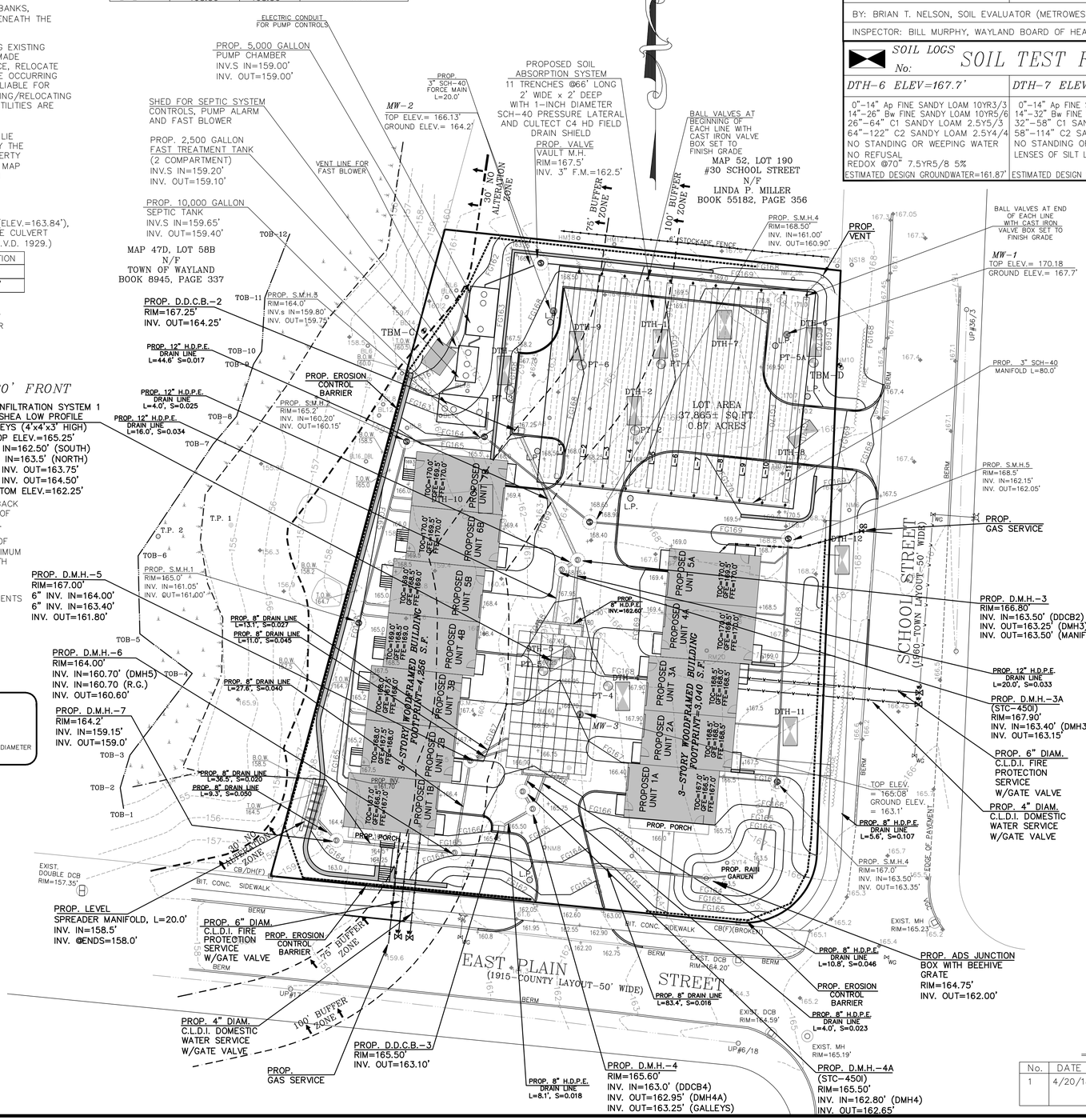
DETAIL
TREE LOCATION
RO14
TREE CODE
TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| ⋈WG | WATER GATE |
| ⋈GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| +200.0 | EXISTING SPOT GRADE |
| ----200---- | EXISTING GRADING |
| ---------- | EXISTING OVERHEAD WIRE |

## PROPOSED SOIL ABSORPTION SYSTEM ELEVATIONS

| LOCATION | BEG. LINE | END LINE | BOTTOM OF TRENCH |
|---|---|---|---|
| LINE 1 | 164.50' | 164.50' | 162.50' |
| LINE 2 | 164.90' | 164.90' | 162.90' |
| LINE 3 | 165.30' | 165.30' | 163.30' |
| LINE 4 | 165.70' | 165.70' | 163.70' |
| LINE 5 | 166.10' | 166.10' | 164.10' |
| LINE 6 | 166.50' | 166.50' | 164.50' |
| LINE 7 | 166.90' | 166.90' | 164.90' |
| LINE 8 | 167.30' | 167.30' | 165.30' |
| LINE 9 | 167.70' | 167.70' | 165.70' |
| LINE 10 | 168.10' | 168.10' | 166.10' |
| LINE 11 | 168.50' | 168.50' | 166.50' |




## SOIL LOGS No: SOIL TEST RESULTS

| DTH-1 ELEV=165.7' | DTH-2 ELEV=165.9' | DTH-3 ELEV=161.7' | DTH-4 ELEV=164.1' | DTH-5 ELEV=162.6' |
|---|---|---|---|---|
| 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-24" Bw FINE SANDY LOAM 10YR5/6<br>24"-62" C1 SANDY LOAM 2.5Y5/3<br>62"-126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"-22" Ap FINE SANDY LOAM 10YR3/3<br>22"-42" Bw FINE SANDY LOAM 10YR5/6<br>42"-96" C1 SANDY LOAM 2.5Y5/3<br>96"-118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-22" Bw FINE SANDY LOAM 10YR5/6<br>22"-84" C1 SANDY LOAM 2.5Y5/3<br>84"-110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"-20" FILL<br>20"-28" Ap FINE SANDY LOAM 10YR3/3<br>28"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-86" C1 SANDY LOAM 2.5Y5/4<br>86"-116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-34" Bw FINE SANDY LOAM 10YR5/6<br>34"-84" C1 SANDY LOAM 2.5Y5/4<br>84"-118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |

DATE: JULY 31, 2014

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH

## SOIL LOGS No: SOIL TEST RESULTS

| DTH-6 ELEV=167.7' | DTH-7 ELEV=166.8' | DTH-8 ELEV=168.2' | DTH-9 ELEV=163.0' | DTH-10 ELEV=160.75' |
|---|---|---|---|---|
| 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-26" Bw FINE SANDY LOAM 10YR5/6<br>26"-64" C1 SANDY LOAM 2.5Y5/3<br>64"-122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-32" Bw FINE SANDY LOAM 10YR5/6<br>32"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-26" FILL<br>26"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-78" C1 SANDY LOAM 2.5Y5/4<br>78"-108" C2 LOAMY SAND 2.5Y5/3<br>108"-126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-46" Bc SANDY LOAM 2.5Y5/4<br>46"-98" C1 SANDY LOAM 2.5Y5/3<br>98"-118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>NO REFUSAL<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"-15" Ap FINE SANDY LOAM 10YR3/3<br>15"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-66" C1 LOAMY SAND 2.5Y5/3<br>66"-112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT-2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT-3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT-4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT-5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

DATE: AUGUST 21, 2014

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT-6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

| DTH-11 ELEV=166.0' | DTH-12 ELEV=168.2' |
|---|---|
| 0"-18" FILL<br>18"-30" Ap FINE SANDY LOAM 10YR3/3<br>30"-36" Bw FINE SANDY LOAM 10YR5/6<br>36"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"-54" FILL<br>58"-82" C1 SANDY LOAM 2.5Y4/4<br>82"-114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |

## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

FOR METROWEST ENGINEERING, INC. DATE
ROBERT A. GEMMA, P.E.(CIVIL) # 31967
P.L.S. # 37046

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 4 10 20 ( METERS ) 30

# PROPOSED SITE PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

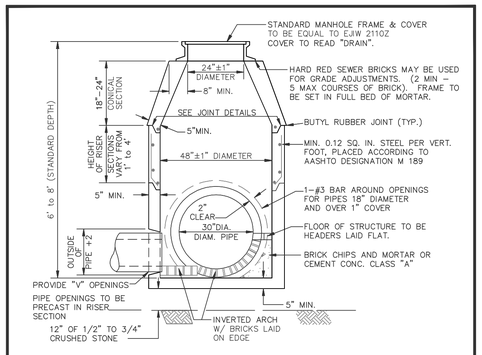
PREPARED FOR:
WINDSOR PLACE LLC
73 PELHAM ISLAND ROAD
WAYLAND, MA 01778

PROPERTY OF:
WINDSOR PLACE LLC
73 PELHAM ISLAND ROAD
WAYLAND, MA 01778

ENGINEERS & SURVEYORS:
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
WAYLAND, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440

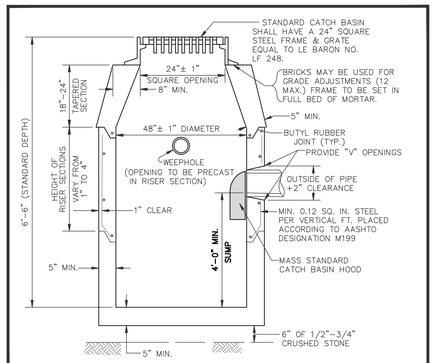
| SHEET 3 OF 5 | | DATE: SEPTEMBER 6, 2017 |
|---|---|---|
| CALC'D BY: BTN | FIELD BK: 621 | CAD FILE: PROP_SITE_3_R4.dwg |
| DRAFTER: BTN | PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

## PRECAST CONCRETE DRAIN MANHOLE
NOT TO SCALE



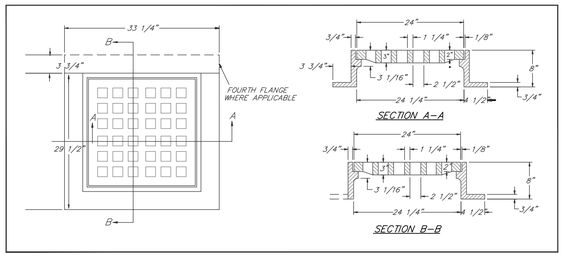

NOTES:
1. ALL DRAINS AND STORM DRAIN MANHOLES SHALL CONFORM TO TOWN OF WAYLAND STANDARDS
2. ALL INLET AND OUTLET PIPES SHALL BE FITTED WITH WATER TIGHT, SYNTHETIC RUBBER BOOTS

## PRECAST CONCRETE CATCH BASIN
NOT TO SCALE

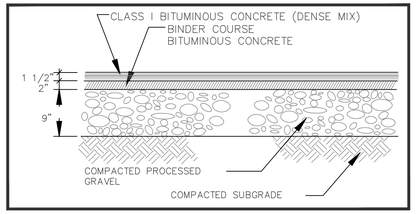



NOTE: NO BELL ENDS IN CATCH BASIN. ALL INLET AND OUTLET PIPES SHALL BE FITTED WITH WATER TIGHT, SYNTHETIC RUBBER BOOTS

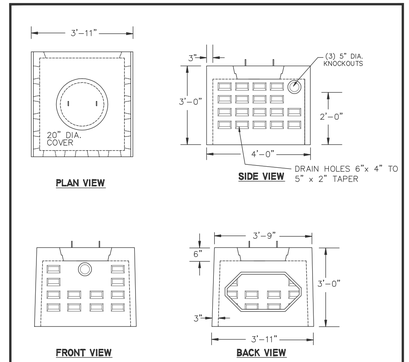
## SQUARE CATCH BASIN FRAME & GRATE
NOT TO SCALE




## BITUMINOUS CONCRETE PAVEMENT
NOT TO SCALE

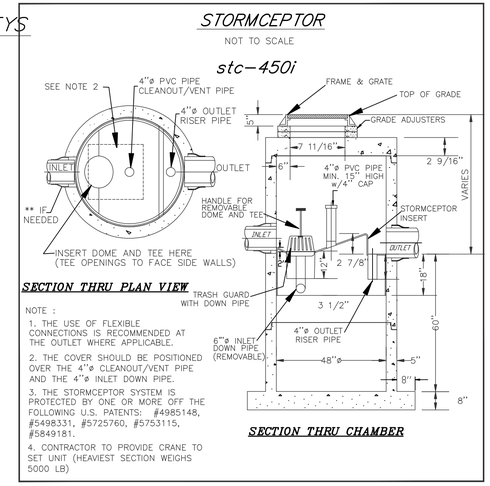



## DRAINAGE INFILTRATION LEACHING GALLEYS
NOT TO SCALE




NOTES
1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS
2. DESIGNED FOR H–20 LOADING
3. GALLEY AVAILABLE IN BOTH END AND CENTER SECTIONS. CENTER SECTIONS HAVE LARGE OPENING IN BOTH THE BACK AND FRONT SIDES.

## STORMCEPTOR
NOT TO SCALE

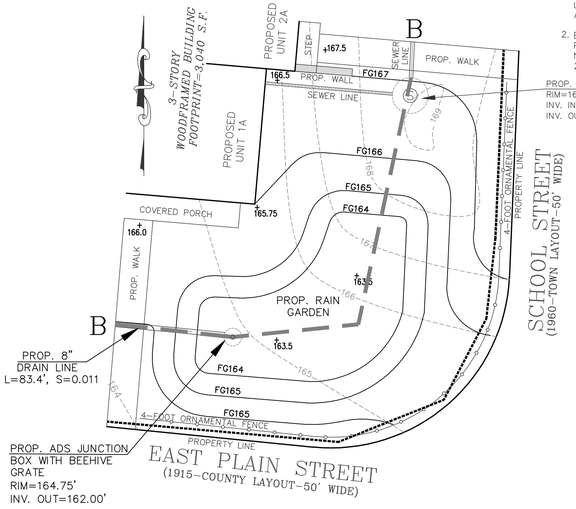



**SECTION THRU PLAN VIEW**

NOTE :
1. THE USE OF FLEXIBLE CONNECTIONS IS RECOMMENDED AT THE OUTLET WHERE APPLICABLE.
2. THE COVER SHOULD BE POSITIONED OVER THE 4"ø CLEANOUT/VENT PIPE AND THE 4"ø INLET DOWN PIPE.
3. THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OFF THE FOLLOWING U.S. PATENTS: #4985148, #5498331, #5725760, #5753115, #5849181.
4. CONTRACTOR TO PROVIDE CRANE TO SET UNIT (HEAVIEST SECTION WEIGHS 5000 LB)

**SECTION THRU CHAMBER**

## PROPOSED RAIN GARDEN
NOT TO SCALE




NOTE:
1. PLANTING MIX FOR RAIN GARDENS SHALL BE TESTED PRIOR TO INSTALLATION OF PLANTS AND/OR SEEDING. A COMPREHENSIVE SOIL TEST WILL BE PERFORMED BY A QUALIFIED LABORATORY FOR pH, ORGANIC MATTER, P, K, Mg, Ca, S, B, Cu, Fe, Mn, Zn, Na, AVAILABLE NITROGEN, SOLUABLE SALT AND LEAD SCAN. LABORATORY REPORT SHALL INCLUDE RECOMMENDATIONS FOR ADDITIVES
2. BASINS SHALL BE HYDRO–SPRAYED WITH A BLEND OF PROFILE PROGANICS, APPLIED AT A RATE OF 5,000 POUNDS PER ACRE, AND NEW ENGLAND CONSERVATION WILDLIFE MIX, APPLIED AT A RATE OF 25 POUNDS PER ACRE.

## PLANTING SCHEDULE

*ZONE 1 – ELEVATION 163.5' TO 164.0'*

*HERBACEOUS*

| SPECIES | QUANTITY | SIZE |
|---|---|---|
| SWITCHGRASS (PANICUM VIRGATUM) | 100 | 1 GALLON |
| LURID SEDGE (CAREX LURIDA) | 100 | 1 GALLON |
| BLUE FLAG IRIS (IRIS VERSICOLOR) | 100 | 1 GALLON |
| CARDINAL FLOWER (LOBELIA CARDINALIS) | 100 | 1 GALLON |
| NEW ENGLAND ASTER (ASTER NOVAE–ANGLIAE) | 100 | 1 GALLON |
| BEARD TONGUE (PENSTEMON) | 100 | 1 GALLON |
| BEE BALM (MONARDA) | 100 | 1 GALLON |
| IRONWEED (VERNONIA NOVEBORACENSIS) | 100 | 1 GALLON |
| BROOM SEDGE (ANDROPOGON VIRGINICUS) | 100 | 1 GALLON |

*ZONE 2 – ELEVATION 164.0' TO 165.0'*

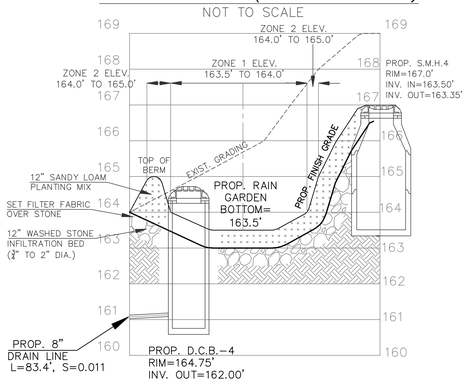
*SHRUBS*

| SYMBOL | SPECIES | QUANTITY | SIZE |
|---|---|---|---|
| SC | ELDERBERRY (SAMBUCUS CANADENSIS) | 2 | 6' HIGH |
| VC | HIGHBUSH BLUEBERRY (VACCINIUM CORYMBOSUM) | 2 | 6' HIGH |
| CS | RED OSIER DOGWOOD (CORNUS SERICEA) | 2 | 6' HIGH |

*HERBACEOUS*

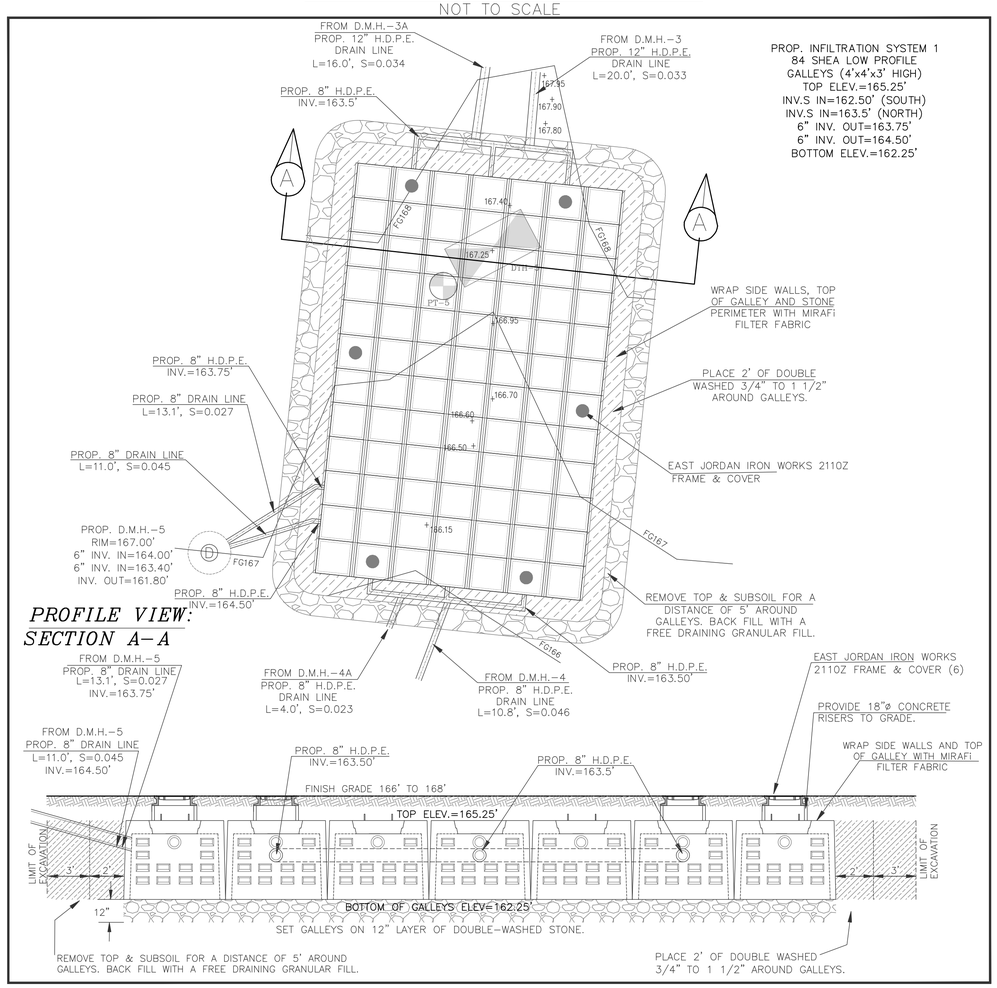
| SPECIES | QUANTITY | SIZE |
|---|---|---|
| NEW ENGLAND ASTER (ASTER NOVAE–ANGLIAE) | 250 | 1 GALLON |
| MARSH BLAZINGSTAR (LIATRIS SPICATA) | 250 | 1 GALLON |
| WILD BERGAMOT (MONARDA FISTULOSA) | 250 | 1 GALLON |
| JOE–PYE WEED (EUPATORIUM MACULATUM) | 250 | 1 GALLON |
| SWITCHGRASS (PANICUM VIRCATUM) | 100 | 1 GALLON |
| BIG BLUESTEM (ANDROPOGON GERARDII) | 100 | 1 GALLON |
| BLACK EYED SUSAN (RUDBECKIA HIRTA) | 100 | 1 GALLON |
| INDIAN GRASS (SORGHASTRUM NUTANS) | 100 | 1 GALLON |

## PROFILE B–B (RAIN GARDEN)
NOT TO SCALE




NOTE: BOTTOM, SIDESLOPES AND BERM OF RAIN GARDEN ARE TO BE HYDROSEEDED WITH A "NEW ENGLAND WET MIX" NATIVE SEED BLEND AND APPLIED AT A RATE OF 1 POUND PER 1,000 SQUARE FEET.

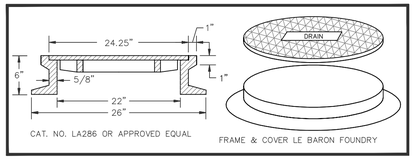
## PROPOSED INFILTRATION SYSTEM 1
NOT TO SCALE




*PROFILE VIEW: SECTION A–A*

PROP. INFILTRATION SYSTEM 1
84 SHEA LOW PROFILE
GALLEYS (4'x4'x3' HIGH)
TOP ELEV.=165.25'
INV.S IN=162.50' (SOUTH)
INV.S IN=163.5' (NORTH)
6" INV. OUT=163.75'
6" INV. OUT=164.50'
BOTTOM ELEV.=162.25'

## STANDARD DRAIN MANHOLE FRAME & COVER
NOT TO SCALE




## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

*FOR METROWEST ENGINEERING, INC. DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

# PROPOSED DETAILS PLAN
#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626–0063*
*FAX: (508)875–6440*

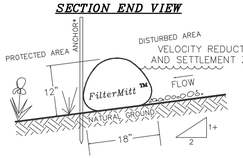
| SHEET 4 OF 5 | | DATE: SEPTEMBER 6, 2017 |
|---|---|---|
| CALC'D BY: BTN | FIELD BK: 621 | CAD FILE: PROP_SITE_3_R4.dwg |
| DRAFTER: BTN | PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

## EROSION CONTROL BARRIER

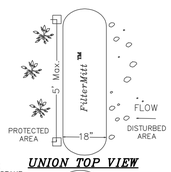
NOT TO SCALE

*FilterMitt*™ **by Groundscapes Express, Inc.**
2:1 SLOPES OR GREATER

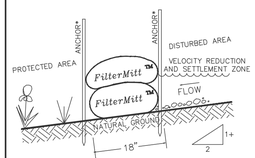
**SECTION END VIEW**




**SECTION TOP VIEW**

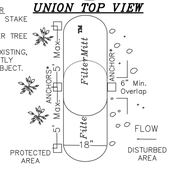



**UNION END VIEW**




**UNION TOP VIEW**

*ANCHOR
1"x1"x36" OAK STAKE
OR
2" OR GREATER TREE
OR
OTHER PRE-EXISTING, EQUIVALENTLY ANCHORED OBJECT.




**USE 18-INCH DIAMETER FILTER MITT.**

***FilterMitt*™ COMPONENTS:**
OUTSIDE CASING: 100% organic hessian.
FILLER INGREDIENT: *FiberRoot Mulch*™
- A blend of coarse and fine compost and shredded wood.
- Particle sizes: 100% passing a 3" screen; 90–100% passing a 1" screen; 70–100% passing a 0.75" screen; 30–75% passing a 0.25" screen.
- Weight: Approx. 850 lbs./cu.yd. (Ave. 30 lbs./l.f.)

For more information visit:
www.groundscapesexpress.com
or contact us at:
**Groundscapes Express, Inc.**
P.O. Box 737
Wrentham, MA 02093
(508) 384–7140

***FilterMitt*™ INSTALLATION:**
With the newest technology and equipment, sections can be constructed on site in lengths from 1' to 100'.

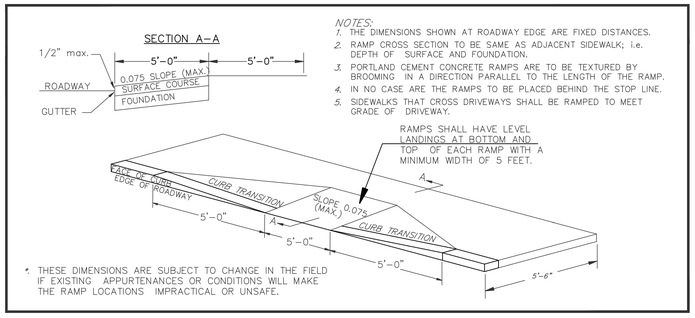
Sections can also be delivered to the site in lengths from 1' to 8'.

The flexibility of *FilterMitt*™ allows it to conform to any contour or terrain while holding a slightly oval shape at 12" high by 18" wide.

Where section ends meet, there shall be an overlap of 6" or greater. Both sides shall be anchored (oak stakes, trees, etc.) to stabilize the union. Additional anchors shall also be placed at 5' intervals (max.) on the downslope or protected side to prevent movement.

## CONCRETE RAMP DETAIL

NOT TO SCALE

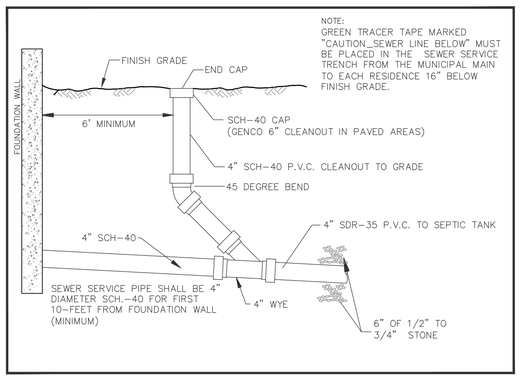



NOTES:
1. THE DIMENSIONS SHOWN AT ROADWAY EDGE ARE FIXED DISTANCES.
2. RAMP CROSS SECTION TO BE SAME AS ADJACENT SIDEWALK; i.e. DEPTH OF SURFACE AND FOUNDATION.
3. PORTLAND CEMENT CONCRETE RAMPS ARE TO BE TEXTURED BY BROOMING IN A DIRECTION PARALLEL TO THE LENGTH OF THE RAMP.
4. IN NO CASE ARE THE RAMPS TO BE PLACED BEHIND THE STOP LINE.
5. SIDEWALKS THAT CROSS DRIVEWAYS SHALL BE RAMPED TO MEET GRADE OF DRIVEWAY.

* THESE DIMENSIONS ARE SUBJECT TO CHANGE IN THE FIELD IF EXISTING APPURTENANCES OR CONDITIONS WILL MAKE THE RAMP LOCATIONS IMPRACTICAL OR UNSAFE.

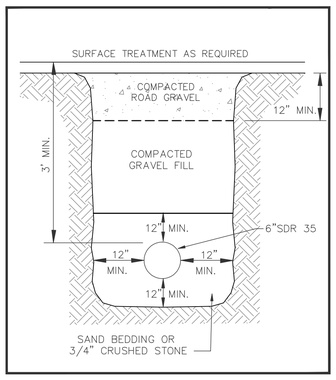
## TYPICAL SEWER SERVICE CONNECTION

NOT TO SCALE



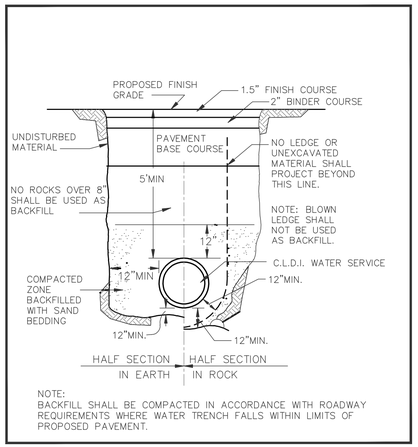

## TYPICAL SEWER TRENCH

NOT TO SCALE




## WATER MAIN TRENCH DETAIL

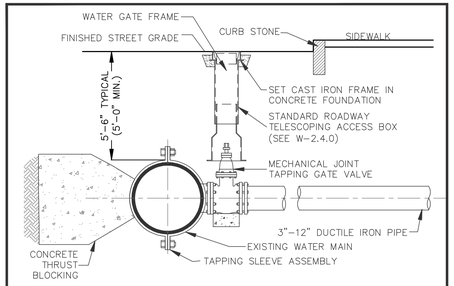
NOT TO SCALE




NOTE:
BACKFILL SHALL BE COMPACTED IN ACCORDANCE WITH ROADWAY REQUIREMENTS WHERE WATER TRENCH FALLS WITHIN LIMITS OF PROPOSED PAVEMENT.

## TYPICAL DOMESTIC AND FIRE SERVICE CONNECTION

NOT TO SCALE

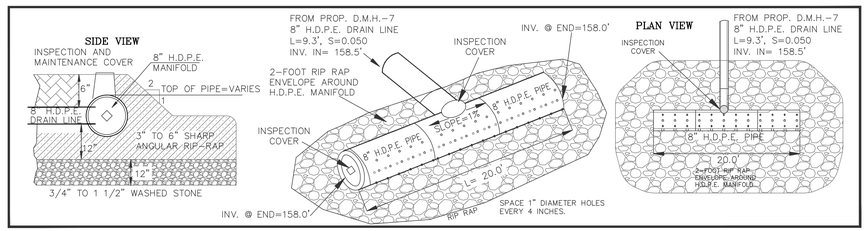



NOTES:

1. MAXIMUM TAPPING SLEEVE SHALL NOT BE GREATER THAN ½ DIAMETER OF CONNECTING MAIN.
2. MEGA LUG RESTRAINTS ON ALL MECHANICAL JOINTS.
3. SEPARATE DOMESTIC AND FIRE SERVICES SHALL BE INSTALLED FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN.
4. THE PROPERTY OWNER IS RESPONSIBLE FOR MAINTENANCE OF THE FIRE SERVICE FROM THE BUILDING SERVICED TO THE PUBLIC WATER MAIN

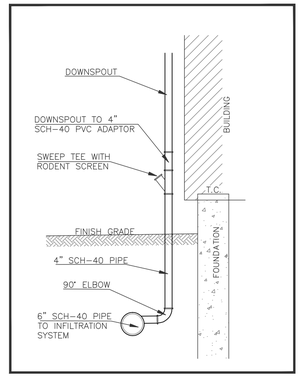
## LEVEL SPREADER FLOW MANIFOLD DETAIL

NOT TO SCALE



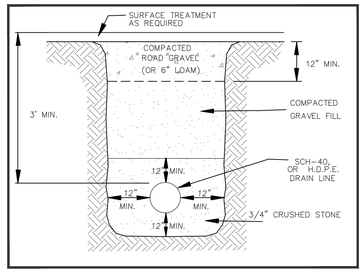

## DOWNSPOUT DETAIL

NOT TO SCALE




## TYPICAL DRAIN LINE TRENCH

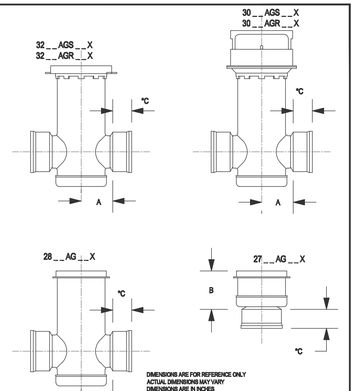
NOT TO SCALE




## P.V.C. JUNCTION BOX

NOT TO SCALE

| BODY SIZE | ADAPTER SIZE | A | B |
|---|---|---|---|
| 8" | 4" | 6.50 | 7.50 |
| 8" | 6" | 6.50 | 8.50 |
| 8" | 8" | 6.70 | 7.25 |
| 10" | 4" | 7.25 | 8.75 |
| 10" | 6" | 7.25 | 8.75 |
| 10" | 8" | 7.75 | 8.50 |
| 10" | 10" | 7.75 | 7.75 |
| 12" | 4" | 8.25 | 10.50 |
| 12" | 6" | 8.25 | 11.00 |
| 12" | 8" | 8.75 | 11.00 |
| 12" | 10" | 8.75 | 11.00 |
| 12" | 12" | 8.25 | 8.00 |
| 15" | 4" | 8.65 | 13.25 |
| 15" | 6" | 9.65 | 12.75 |
| 15" | 8" | 10.15 | 12.25 |
| 15" | 10" | 10.15 | 13.50 |
| 15" | 12" | 10.65 | 12.75 |
| 15" | 15" | 10.65 | 7.00 |
| 18" | 4" | 11.35 | 14.00 |
| 18" | 6" | 11.35 | 14.00 |
| 18" | 8" | 11.85 | 14.00 |
| 18" | 10" | 11.85 | 14.00 |
| 18" | 12" | 12.35 | 14.00 |
| 18" | 15" | 12.35 | 13.50 |
| 18" | 18" | 12.85 | 8.25 |
| 24" | 4" | 14.40 | 15.00 |
| 24" | 6" | 14.40 | 15.00 |
| 24" | 8" | 14.90 | 15.00 |
| 24" | 10" | 14.90 | 15.00 |
| 24" | 12" | 15.40 | 15.00 |
| 24" | 15" | 15.40 | 15.00 |
| 24" | 18" | 15.90 | 15.00 |
| 24" | 24" | 16.80 | 10.25 |
| 30" | 4" | 18.00 | 16.00 |
| 30" | 6" | 18.00 | 15.50 |
| 30" | 8" | 18.00 | 15.75 |
| 30" | 10" | 18.50 | 18.00 |
| 30" | 12" | 19.00 | 15.50 |
| 30" | 15" | 19.00 | 17.00 |
| 30" | 18" | 19.00 | 17.75 |
| 30" | 24" | 20.00 | 14.00 |
| 30" | 30" | 27.00 | 9.50 |




DIMENSIONS ARE FOR REFERENCE ONLY
ACTUAL DIMENSIONS MAY VARY
DIMENSIONS ARE IN INCHES
°C – SEE DRAWING NO. 7005-110-276 FOR ADS N-12 & HANCOR DUAL WALL BELL INFORMATION & DRAWING NO. 7005-110-364 FOR N-12 HP BELL INFORMATION



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TITLE
8 IN - 30 IN BODY TO ADAPTER DIMENSIONS

DWG NO. 7003-110-003 REV E

## DRAINAGE MATERIALS NOTES:

### PRECAST CONCRETE DRAIN MANHOLE MATERIALS AND INSTALLATION

1.) ALL MATERIALS ASSOCIATED SHALL BE IN ACCORDANCE WITH THE DESIGN PLANS, THE TOWN OF WAYLAND DEPARTMENT OF PUBLIC WORKS CONSTRUCTION STANDARDS.
2.) STORMCEPTOR UNITS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS.
3.)FILTER FABRIC SHALL BE MIRAFI 140N (TENCATE INDUSTRIES) OR APPROVED EQUAL.
4.) MANHOLES SHALL BE CONSTRUCTION OF REINFORCED PRECAST CONCRETE BASE SECTION, BARREL SECTION AND DOME SECTION MEETING THE REQUIREMENTS OF ASTM C78 AND AASHTO M199. CONCRETE SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 4,000 P.S.I.
5.) IN CASES WHERE VERTICAL TOLERANCE DOES NOT PERMIT A CONE TOP SECTION, A PRECAST CONCRETE FLAT SECTION MAY BE USED.
6.) MANHOLES SHALL MEET OR EXCEED HS–20 LOADING REQUIREMENTS.
7.) MANHOLES SHALL HAVE A MINIMUM OPENING OF 26–INCHES AND A MINIMUM INSIDE DIAMETER OF FOUR–FEET (4').
7.) MANHOLES SHALL HAVE TONGUE AND GROOVE JOINTS BETWEEN SECTIONS THAT ARE MORTARED OR SEALED WITH BUTYL RUBBER SEALANTS.
8.) PIPE INLETS AND OUTLETS SHALL BE SEALED WITH MORTAR OR RUBBER SEALANTS OR BOOT TYPE CONNECTIONS.
9.) DRAIN MANHOLES SHALL BE PLACED ON A LAYER OF COMPACTED, LEVEL, BEDDING MATERIAL NOT LESS THAN SIX–INCHES IN HEIGHT.
10.) MANHOLE SECTIONS SHALL BE CAREFULLY PLACED SO THAT ALL SECTIONS ARE LEVEL AND PLUMB.
11.) EXCAVATION AROUND THE MANHOLE STRUCTURES SHALL BE BACKFILLED AND COMPACTED IN TWELVE–INCH (12") LIFTS WITH SUITABLE MATERIALS.
12.) ROAD BASE MATERIAL AND PAVEMENT MATERIALS SHALL BE INSTALLED AROUND STRUCTURES IN ACCORDANCE WITH BASE AND PAVEMENT PREPARATION INSTRUCTIONS.
13.) MANHOLE ACCESS FRAME AND COVER SHALL CONSIST OF EAST JORDAN IRONWORKS 2111A/2111Z FRAME AND COVER.
14.) FRAME AND COVER SHALL BE ADJUSTED TO FINISH GRADE USING LAYERS OF MORTAR AND BRICK.
15.) FRAME AND COVERS SHALL MEET ASTM A888 ANDMADE FROM CLASS 20, GREY CAST IRON.

### PRECAST CONCRETE DRAIN CATCH BASIN MATERIALS AND INSTALLATION

1.) ALL MATERIALS ASSOCIATED SHALL BE IN ACCORDANCE WITH THE DESIGN PLANS, THE TOWN OF WAYLAND DEPARTMENT OF PUBLIC WORKS CONSTRUCTION STANDARDS.
2.) ALL CATCH BASINS SHALL HAVE A SUMP OF AT LEAST FOUR–FEET (48–INCHES) BELOW THE INVERT OF THE OUTLET PIPE AND SHALL HAVE A HOOD ON OUTLET PIPES.
3.) CATCH BASIN HOODS SHALL EXTEND AT LEAST ONE–FOOT BELOW THE INVERT OF THE OUTLET PIPE.
4.) CATCH BASINS SHALL BE CONSTRUCTED OF REINFORCED PRECAST CONCRETE BASE SECTION, BARREL SECTION AND DOME SECTION MEETING THE REQUIREMENTS OF ASTM C78 AND AASHTO M199. CONCRETE SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 4,000 P.S.I.
5.) IN CASES WHERE VERTICAL TOLERANCE DOES NOT PERMIT A CONE TOP SECTION, A PRECAST CONCRETE FLAT SECTION MAY BE USED.
6.) CATCH BASINS SHALL MEET OR EXCEED HS–20 LOADING REQUIREMENTS.
7.) CATCH BASINS SHALL HAVE A MINIMUM OPENING OF 26–INCHES AND A MINIMUM INSIDE DIAMETER OF FOUR–FEET (4').
7.) CATCH BASINS SHALL HAVE TONGUE AND GROOVE JOINTS BETWEEN SECTIONS THAT ARE MORTARED OR SEALED WITH BUTYL RUBBER SEALANTS.
8.) PIPE INLETS AND OUTLETS SHALL BE SEALED WITH MORTAR OR RUBBER SEALANTS OR BOOT TYPE CONNECTIONS.
9.) DRAIN MANHOLES SHALL BE PLACED ON A LAYER OF COMPACTED, LEVEL, BEDDING MATERIAL NOT LESS THAN SIX–INCHES IN HEIGHT.
10.) CATCH BASIN SECTIONS SHALL BE CAREFULLY PLACED SO THAT ALL SECTIONS ARE LEVEL AND PLUMB.
11.) EXCAVATION AROUND THE MANHOLE STRUCTURED SHALL BE BACKFILLED AND COMPACTED IN TWELVE–INCH (12") LIFTS WITH SUITABLE MATERIALS.
12.) ROAD BASE MATERIAL AND PAVEMENT MATERIALS SHALL BE INSTALLED AROUND STRUCTURES IN ACCORDANCE WITH BASE AND PAVEMENT PREPARATION INSTRUCTIONS.
13.) MANHOLE ACCESS FRAME AND COVER SHALL CONSIST OF EAST JORDAN IRONWORKS 5523A/5524Z FRAME AND 5520 M5 COVER.
14.) FRAME AND COVER SHALL BE ADJUSTED TO FINISH GRADE USING LAYERS OF MORTAR AND BRICK.

### H.D.P.E. DRAIN PIPE MATERIALS AND INSTALLATION

1.) ALL PIPE SHALL CONFORM TO MASSDOT SECTION M5.03.10.
2.) PIPE SHALL BE SMOOTH INTERIOR WALL AND CORRUGATED EXTERIOR WALL AND SHALL BE BELL AND SPIGOT CONNECTION.
3.) PIPE SHALL COMPLY WITH REQUIREMENTS AND MARKINGS FOUND IN AASHTO DESIGNATIONS M252 AND M294.
4.) ALL PIPE SHALL SUPPORT AN HS–20 LIVE LOAD WITH A MAXIMUM DEFLECTION OF 5% OF THE PIPE DIAMETER.
5.) ALL PIPE AND FITTINGS SHALL BE MADE FROM VIRGIN POLYETHYLENE COMPOUNDS WHICH CONFORM TO CURRENT AASHTO CLASSIFICATIONS AND ALSO AS DEFINED IN ASTM D3530.
6.) PIPES SHALL BE CAREFULLY LAID TO LINES AND GRADES AS SHOWN ON DESIGN PLANS.
7.) PIPE BEDDING MATERIAL SHALL BE PLACED TO A DEPTH OF NO LESS THAN SIX–INCHES BELOW THE INVERT OF THE PIPE.
8.) TRENCHES FOR DRAIN LINES SHALL PROVIDE MINIMUM OF TWELVE–INCHES (12") OF HORIZONTAL CLEARANCE FROM SIDES OF PIPE TO EDGE OF TRENCH.
9.) INSTALLATION OF H.D.P.E. PIPE SHALL BE IN ACCORDANCE WITH ASTM D2321 AND AS RECOMMENDED BY THE MANUFACTURER.
10.) WATER TIGHT JOINTS SHALL BE USED ON ALL PIPES IN ACCORDANCE WITH ASTM D3212. PIPE JOINTS SHALL BE BELL AND SPIGOT WITH ELASTOMERIC RUBBER GASKETS MEETING OR EXCEEDING ASTM F477.
11.) PIPE BEDDING MATERIAL OR 3/4" CRUSHED STONE SHALL BE CAREFULLY BACKFILLED AND COMPACTED AROUND PIPE TO A DEPTH OF TWELVE–INCHES ABOVE THE TOP OF PIPE.
12.) MATERIAL FOR BACKFILLING THE REMAINDER OF THE TRENCH, PAVEMENT AND PAVEMENT BASE MATERIAL EXCLUDED, SHALL BE BACKFILLED AND COMPACTED IN TWELVE–INCH LIFTS WITH SUITABLE MATERIAL WITH NO STONES GREATER THAN FOUR–INCHES IN DIAMETER. MATERIAL SHOULD BE FREE OF ORGANICS AND DEBRIS.
13.) TRENCH SHALL BE FINISHED WITH SIX–INCHES (6") OF LOAM AND SEED IN NON PAVED AREAS AND PREPARED IN ACCORDANCE WITH PAVEMENT STRUCTURE IN PAVED AREAS.

### SUBSURFACE INFILTRATION SYSTEM MATERIALS AND INSTALLATION

1.) ALL MATERIALS ASSOCIATED SHALL BE IN ACCORDANCE WITH THE DESIGN PLANS AND THE TOWN OF WAYLAND DEPARTMENT OF PUBLIC WORKS CONSTRUCTION STANDARDS.
2.) SUBSURFACE LEACHING CHAMBERS SHALL BE SHEA DW–SDW GALLEYS OR APPROVED EQUAL.
3.) FILTER FABRIC SHALL BE MIRAFI 140N (TENCATE INDUSTRIES) OR APPROVED EQUAL.
4.) ACCESS MANHOLES SHALL BE REQUIRED AT LOCATIONS SPECIFIED ON DESIGN PLANS.
5.) ACCESS MANHOLES SHALL CONSIST OF EAST JORDAN IRON WORKS 2111Z/2111A, HEAVY DUTY FRAME AND COVER AND SHALL MEET OR EXCEED HS–20 LOADING REQUIREMENTS.
6.) ACCESS MANHOLES SHALL BE ADJUSTED TO FINISH GRADE WITH PRECAST CONCRETE RISERS AND/OR LAYERS OF BRICK AND MORTAR.
7.) EXCAVATION FOR PRECAST LEACHING CHAMBERS SHALL BE DONE CAREFULLY TO AVOID SMEARING AND COMPACTION OF BOTTOM AND EXCAVATION SIDEWALLS.
8.) ANY UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH FREE DRAINING MATERIAL, INCLUDING BUT NOT LIMITED TO TITLE V SAND.
9.) ALL PRECAST LEACHING CHAMBERS SHALL BE PLACED ON A TWELVE–INCH (12") DEEP LAYER OF COMPACTED 3/4" TO 1 1/2" DOUBLE WASHED CRUSHED STONE.
10.) PRECAST LEACHING CHAMBERS SHALL BE CAREFULLY PLACED AT THE SAME ELEVATION IN ROWS AND BUTTED TOGETHER SO NO VOIDS EXIST BETWEEN UNITS.
11.) AREAS BETWEEN ROWS OF PRECAST LEACHING CHAMBERS SHALL BE FILLED WITH 3/4" TO 1 1/2" DOUBLE WASHED STONE.
12.) ALL PIPES SHALL BE SECURELY MORTARED IN PLACE TO PROVIDE WATER TIGHT CONNECTIONS.
13.) FILTER FABRIC SHALL BE INSTALLED AROUND THE SIDES, AND ON TOPO OF THE PRECAST LEACHING CHAMBERS.
14.) CONTRACTOR SHALL OVERLAP ROWS OF FILTER FABRIC ONE–HALF FOOT (0.5') AND CAREFULLY BACKFILL AROUND AND ON TOP OF THE LEACHING CHAMBERS TO AVOID SHIFTING OR TEARING FILTER FABRIC.
15.) INSTALL AND COMPACT 3/4" TO 1 1/2" DOUBLE WASHED STONE IN TWELVE–INCH (12") LIFTS FOR A DISTANCE OF TWO–FEET (2') AROUND THE PERIMETER OF LEACHING CHAMBERS.

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

### REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 4/20/18 | REVISIONS TO BUILDING FOOTPRINTS, GRADING, DRAINAGE SYSTEM SND SEPTIC SYSTEM |

# PROPOSED DETAILS PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS
(MIDDLESEX COUNTY)

PREPARED FOR:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*WINDSOR PLACE LLC*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*WAYLAND, MA 01702*
*TEL.: (508)626–0063*
*FAX: (508)875–6440*

| | | |
|---|---|---|
| SHEET 5 OF 5 | | DATE: SEPTMEBER 6, 2017 |
| CALC'D BY: BTN | FIELD BK: 621 | CAD FILE: PROP_SITE_3_R4.dwg |
| DRAFTER: BTN | PROJECT: WY_SCH | DWG FILE: SP090617_R1.dwg |

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 31869, PAGE 55.
2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE– AND BELOW–GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT–INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN–MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.
3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB–SURFACE UTILITIES AND MAN–MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.
4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.)

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

## LEGEND

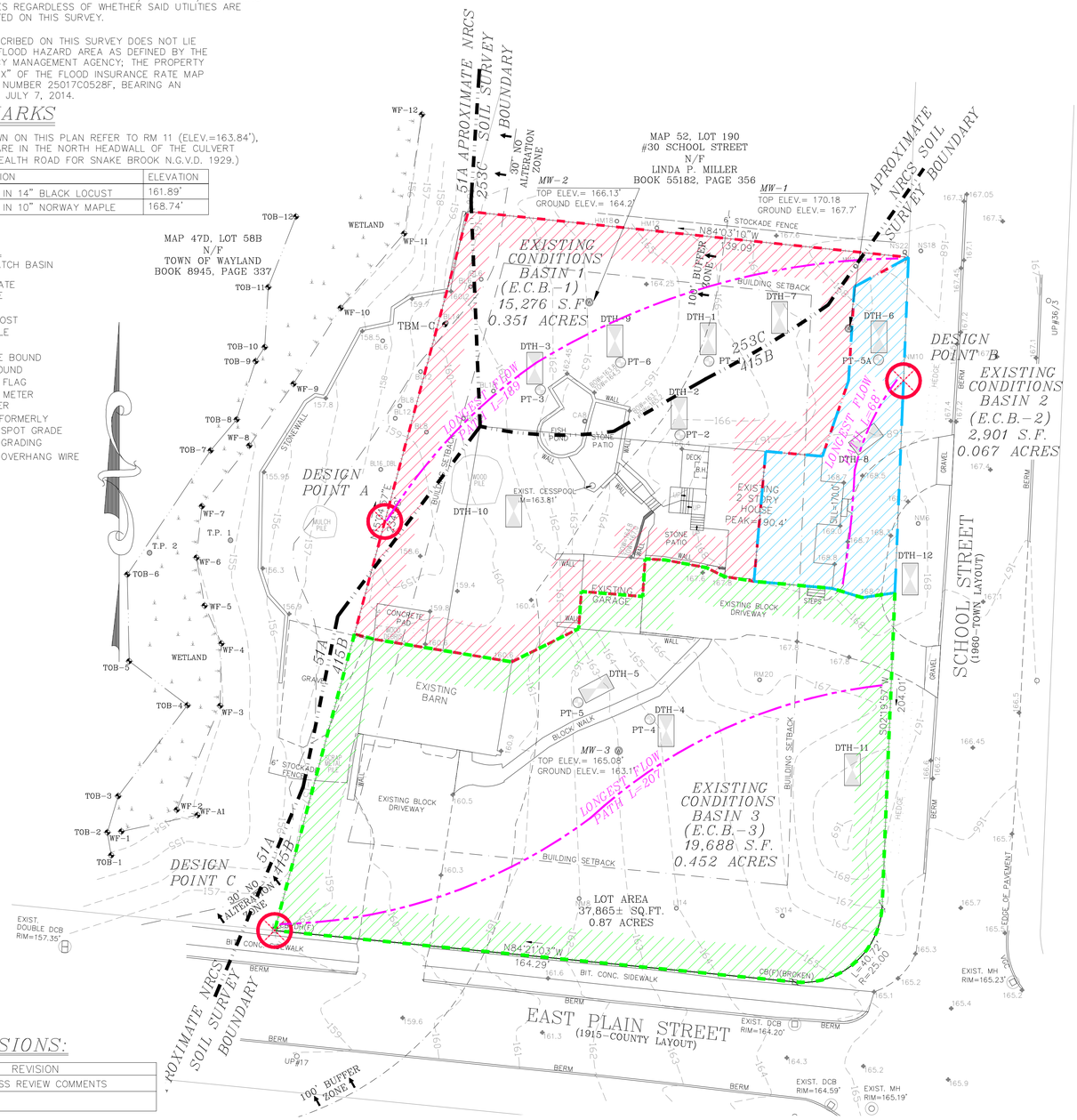
| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| ⋈WG | WATER GATE |
| ⋈GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| + 200.0 | EXISTING SPOT GRADE |
| – – 200 – – – | EXISTING GRADING |
| – – – – – – – | EXISTING OVERHANG WIRE |

## EXISTING TREE DESCRIPTION LEGEND

| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL: TREE LOCATION, RO14, TREE CODE, TREE DIAMETER

DIG SAFE 811 — CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG–SAFE BEFORE YOU DIG 811.




## REVISIONS:

| No. | DATE | REVISION |
|---|---|---|
| 1 | 11/04/17 | ADDRESS REVIEW COMMENTS |
| | | |
| | | |

## SOIL LOGS No: SOIL TEST RESULTS

| DTH–1 ELEV=165.7' | DTH–2 ELEV=165.9' | DTH–3 ELEV=161.7' | DTH–4 ELEV=164.1' | DTH–5 ELEV=162.6' |
|---|---|---|---|---|
| 0"–10" Ap FINE SANDY LOAM 10YR3/3<br>10"–24" Bw FINE SANDY LOAM 10YR5/6<br>24"–62" C1 SANDY LOAM 2.5Y5/3<br>62"–126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"–22" Ap FINE SANDY LOAM 10YR3/3<br>22"–42" Bw FINE SANDY LOAM 10YR5/6<br>42"–96" C1 SANDY LOAM 2.5Y5/3<br>96"–118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"–10" Ap FINE SANDY LOAM 10YR3/3<br>10"–22" Bw FINE SANDY LOAM 10YR5/6<br>22"–84" C1 SANDY LOAM 2.5Y5/3<br>84"–110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"–20" FILL<br>20"–28" Ap FINE SANDY LOAM 10YR3/3<br>28"–40" Bw FINE SANDY LOAM 10YR5/6<br>40"–86" C1 SANDY LOAM 2.5Y5/4<br>86"–116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"–16" Ap FINE SANDY LOAM 10YR3/3<br>16"–34" Bw FINE SANDY LOAM 10YR5/6<br>34"–84" C1 SANDY LOAM 2.5Y5/4<br>84"–118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |
| DATE: JULY 31, 2014 | | | | |

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH

## SOIL LOGS No: SOIL TEST RESULTS

| DTH–6 ELEV=167.7' | DTH–7 ELEV=166.8' | DTH–8 ELEV=168.2' | DTH–9 ELEV=163.0' | DTH–10 ELEV=160.75' |
|---|---|---|---|---|
| 0"–14" Ap FINE SANDY LOAM 10YR3/3<br>14"–26" Bw FINE SANDY LOAM 10YR5/6<br>26"–64" C1 SANDY LOAM 2.5Y5/3<br>64"–122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"–14" Ap FINE SANDY LOAM 10YR3/3<br>14"–32" Bw FINE SANDY LOAM 10YR5/6<br>32"–58" C1 SANDY LOAM 2.5Y5/3<br>58"–114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"–26" FILL<br>26"–40" Bw FINE SANDY LOAM 10YR5/6<br>40"–78" C1 SANDY LOAM 2.5Y5/4<br>78"–108" C2 LOAMY SAND 2.5Y5/3<br>108"–126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"–16" Ap FINE SANDY LOAM 10YR3/3<br>16"–30" Bw FINE SANDY LOAM 10YR5/6<br>30"–46" Bc SANDY LOAM 2.5Y5/4<br>46"–98" C1 SANDY LOAM 2.5Y5/3<br>98"–118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>WATER WEEPING @88"<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"–15" Ap FINE SANDY LOAM 10YR3/3<br>15"–30" Bw FINE SANDY LOAM 10YR5/6<br>30"–66" C1 LOAMY SAND 2.5Y5/3<br>66"–112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

### PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT–1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT–2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT–3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT–4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT–5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

### PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT–5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT–6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

| DTH–11 ELEV=166.0' | DTH–12 ELEV=168.2' |
|---|---|
| 0"–18" FILL<br>18"–30" Ap FINE SANDY LOAM 10YR3/3<br>30"–36" Bw FINE SANDY LOAM 10YR5/6<br>36"–58" C1 SANDY LOAM 2.5Y5/3<br>58"–128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"–54" FILL<br>58"–82" C1 SANDY LOAM 2.5Y4/4<br>82"–114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |
| DATE: AUGUST 21, 2014 | |

BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.)

INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH

## USDA SOIL CLASSIFICATION

| SOIL NUMBER | SOIL SERIES | HYDROLOGIC SOIL GROUP |
|---|---|---|
| 51A | SWANSEA MUCK | B/D |
| 253C | HINCKLEY LOAMY SAND | A |
| 415B | NARRAGANSETT SILT LOAM | B |

*HYDROLOGIC SOIL GROUP B USED FOR ANALSYIS*

SOILS ON SITE ARE SANDY LOAM TEXTURES AND CLASSIFIED WITHIN HYDROLOGIC SOIL GROUP B.

## EXISTING CONDITIONS BASIN PROPERTIES:

### EXISTING CONDITIONS BASIN 1 (E.C.B.–1)

TOTAL BASIN AREA = 15,276 S.F. (0.351 ACRES)
HYDRAULIC LENGTH = 189 FEET
CHANGE IN ELEVATION = 9.8 FEET
BASIN SLOPE = 0.052 (5.2%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 2,205 S.F. (0.051 ACRES) | 98 | 0.051 | 5.000 |
| LAWN AREA (GOOD COND.) = 13,071 S.F. (0.300 ACRES) | 61 | 0.300 | 18.300 |
| | | SUM 0.351 | SUM 23.300 |

WEIGHTED CURVE NUMBER ($C_N$) = (23.300/0.351) = 66.4

### EXISTING CONDITIONS BASIN 2 (E.C.B.–2)

TOTAL BASIN AREA = 2,901 S.F. (0.067 ACRES)
HYDRAULIC LENGTH = 68 FEET
CHANGE IN ELEVATION = 1.3 FEET
BASIN SLOPE = 0.019 (1.9%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 1,460 S.F. (0.034 ACRES) | 98 | 0.034 | 3.332 |
| LAWN AREA (GOOD COND.) = 1,440 S.F. (0.033 ACRES) | 61 | 0.033 | 2.013 |
| | | SUM 0.067 | SUM 5.345 |

WEIGHTED CURVE NUMBER ($C_N$) = (5.345/0.067) = 79.8

### EXISTING CONDITIONS BASIN 3 (E.C.B.–3)

TOTAL BASIN AREA = 19,688 S.F. (0.452 ACRES)
HYDRAULIC LENGTH = 207 FEET
CHANGE IN ELEVATION = 8.8 FEET
BASIN SLOPE = 0.042 (4.2%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 5,115 S.F. (0.117 ACRES) | 98 | 0.117 | 11.466 |
| LAWN AREA (GOOD COND.) = 14,573 S.F. (0.334 ACRES) | 61 | 0.334 | 20.374 |
| | | SUM 0.452 | SUM 31.840 |

WEIGHTED CURVE NUMBER ($C_N$) = (31.840/0.452) = 70.4

EXISTING CONDITIONS – TOTAL IMPERVIOUS AREA = 8,780 S.F.
EXISTING CONDITIONS – TOTAL LAWN AREA = 29,085 S.F.

*FOR METROWEST ENGINEERING, INC.* *DATE*
*ROBERT A. GEMMA, P.E.(CIVIL) # 31967*
*P.L.S. # 37046*

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 80
0 4 10 20 ( METERS ) 30

# FIGURE TWO

## EXISTING CONDITIONS WATERSHED DELINEATION PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS

PREPARED FOR:
*CHADWICK HOMES*
*73 PELHAM ISLAND ROAD*
*WAYLAND, MA 01778*

PROPERTY OF:
*LINDA C. KNOWLES &*
*CARY W. RIDGE*
*24 SCHOOL STREET*
*WAYLAND, MA 01778*

ENGINEERS & SURVEYORS:
MWE
*METROWEST ENGINEERING, INC.*
*75 FRANKLIN STREET*
*FRAMINGHAM, MA 01702*
*TEL.: (508)626–0063*
*FAX: (508)875–6440*

| SHEET 1 OF 1 | | DATE: DECEMBER 19, 2016 |
|---|---|---|
| CALC'D BY: RAG | FIELD BK: 621 | CAD FILE: EC_HYDRO_R1.dwg |
| DRAFTER: | PROJECT: WY_SCH | DWG FILE: SK121916_R1.dwg |

## NOTES:

1. SUBJECT PARCEL IS SHOWN AS ASSESSORS MAP 52, LOT 189. RECORD TITLE FROM BOOK 31869, PAGE 55.

2. UTILITY LOCATIONS DEPICTED ON THIS PLAN, BOTH ABOVE- AND BELOW-GROUND, ARE BASED UPON DIRECT FIELD OBSERVATIONS MADE BY METROWEST ENGINEERING, INC. PERSONNEL DURING A FIELD SURVEY, RECORD PLAN LOCATIONS, OR DIGSAFE PAINT-INDICATORS. METROWEST ENGINEERING, INC. DOES NOT WARRANT THAT ALL UTILITIES ARE SHOWN OR THAT UTILITIES THAT ARE DEPICTED ARE SHOWN IN THE CORRECT LOCATION, OR WITH THE PROPER MATERIAL DESIGNATION. METROWEST ENGINEERING, INC. DOES NOT WARRANT OR PROVIDE AN EXPRESS OR IMPLIED WARRANTY THAT ALL SUBSURFACE IMPROVEMENTS ARE SHOWN OR ARE SHOWN CORRECTLY, INCLUDING, BUT NOT LIMITED TO, UTILITIES, UNDERGROUND VAULTS, UNDERGROUND TANKS OR CHAMBERS, BUNKERS, DUCT BANKS, AND/OR OTHER MAN-MADE IMPROVEMENTS THAT LIE BENEATH THE GROUND SURFACE AT THE TIME OF THE SURVEY.

3. CONTRACTOR IS SOLELY RESPONSIBLE FOR ESTABLISHING EXISTING LOCATIONS OF ALL SUB-SURFACE UTILITIES AND MAN-MADE IMPROVEMENTS AND FOR THE REQUIREMENTS TO REPLACE, RELOCATE OR REPAIR EXISTING UTILITIES IN THE EVENT OF DAMAGE OCCURRING DURING CONSTRUCTION. MWE IS NOT RESPONSIBLE OR LIABLE FOR DELAYS OR COSTS ASSOCIATED WITH REMOVING/REPLACING/RELOCATING OF EXISTING UTILITIES REGARDLESS OF WHETHER SAID UTILITIES ARE ACCURATELY DEPICTED ON THIS SURVEY.

4. THE PROPERTY DESCRIBED ON THIS SURVEY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AREA AS DEFINED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY; THE PROPERTY LIES WITHIN ZONE "X" OF THE FLOOD INSURANCE RATE MAP IDENTIFIED AS MAP NUMBER 25017C0528F, BEARING AN EFFECTIVE DATE OF JULY 7, 2014.

## BENCHMARKS

ELEVATIONS SHOWN ON THIS PLAN REFER TO RM 11 (ELEV.=163.84'), A CHISELED SQUARE IN THE NORTH HEADWALL OF THE CULVERT UNDER COMMONWEALTH ROAD FOR SNAKE BROOK N.G.V.D. 1929.

| T.B.M. | DESCRIPTION | ELEVATION |
|---|---|---|
| C | DHN SET IN 14" BLACK LOCUST | 161.89' |
| D | DHN SET IN 10" NORWAY MAPLE | 168.74' |

CONTRACTOR TO VERIFY ACTUAL LOCATION OF EXISTING UTILITY SERVICES IN THE FIELD PRIOR TO CONSTRUCTION (WATER, ELECTRICAL, ETC.) CALL DIG-SAFE BEFORE YOU DIG 811.

## ZONING:

### RESIDENCE ZONE 20,000 – 120' FRONT

MINIMUM LOT AREA= $20,000^{15}$ S.F.
MINIMUM LOT COVERAGE= 20%
MINIMUM FRONTAGE= 200 FT.
SETBACKS:
FRONT LOT LINE= $30^{2}$ FT.
FRONT ROW CENTER LINE= 55 FT.
SIDE YARD= $15^{3}$ FT.
REAR YARD=30 FT.
MAX. HEIGHT = 35 FT./2½ STORIES

2) IF §198-702 SHALL REQUIRE A GREATER SETBACK OR PERMIT A LESSER SETBACK, THE PROVISIONS OF SAID §198-702 SHALL PREVAIL OVER THIS TABLE.

3) SIDE YARDS SHALL MEET THE REQUIREMENTS OF §§198-702.4 AND 703.2, AND THE REQUIRED MINIMUM SIDE YARD MAY BE REDUCED IN ACCORDANCE WITH PROVISIONS OF §198-703.2

15) MINIMUM FRONT YARD WIDTH SHALL BE CALCULATED IN ACCORDANCE WITH THE REQUIREMENTS OF §198-705.1 OF THE ZONING BYLAW.

## EXISTING TREE DESCRIPTION LEGEND

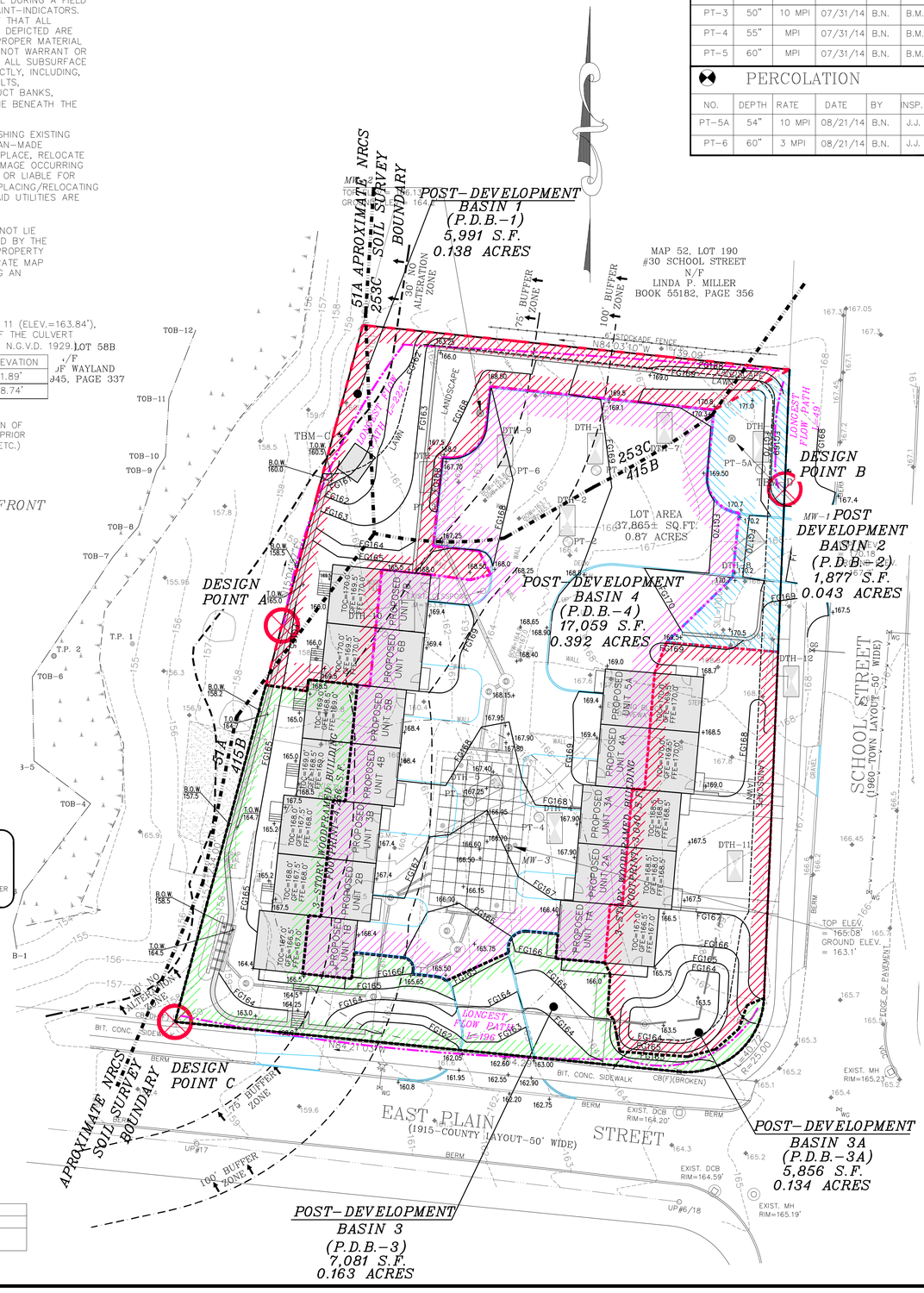
| CODE | DESCRIPTION |
|---|---|
| BL# | BALCK LOCUST |
| CA# | CRAB APPLE |
| HM# | HEMLOCK |
| LI# | LINDEN |
| NM# | NORWAY MAPLE |
| NS# | NORWAY SPRUCE |
| RM# | RED MAPLE |
| SY# | SYCAMORE |

DETAIL
TREE LOCATION
RO14
TREE CODE — TREE DIAMETER

## LEGEND

| | |
|---|---|
| DCB | DRAIN CATCH BASIN |
| HM | MANHOLE |
| WG | WATER GATE |
| GG | GAS GATE |
| | HYDRANT |
| U.P. | UTILITY POST |
| DH | DRILL HOLE |
| (F) | FOUND |
| CB | CONCRETE BOUND |
| SB | STONE BOUND |
| WF | WETLAND FLAG |
| E.M. | ELECTRIC METER |
| G.M. | GAS METER |
| N/F | NOW OR FORMERLY |
| +200.0 | EXISTING SPOT GRADE |
| ----200---- | EXISTING GRADING |
| | EXISTING OVERHANG WIRE |

| No. | DATE | REVISION |
|---|---|---|
| 2 | 07/29/15 | ADD TOP OF BANK |
| 3 | 11/01/15 | ADD ELEVATION DATUM REFERENCE REVISE WF#11, WF#12 |




## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-1 | 60" | 8 MPI | 07/31/14 | B.N. | B.M. |
| PT-2 | 68" | 13 MPI | 07/31/14 | B.N. | B.M. |
| PT-3 | 50" | 10 MPI | 07/31/14 | B.N. | B.M. |
| PT-4 | 55" | MPI | 07/31/14 | B.N. | B.M. |
| PT-5 | 60" | MPI | 07/31/14 | B.N. | B.M. |

## PERCOLATION

| NO. | DEPTH | RATE | DATE | BY | INSP. |
|---|---|---|---|---|---|
| PT-5A | 54" | 10 MPI | 08/21/14 | B.N. | J.J. |
| PT-6 | 60" | 3 MPI | 08/21/14 | B.N. | J.J. |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-1 ELEV=165.7' | DTH-2 ELEV=165.9' | DTH-3 ELEV=161.7' | DTH-4 ELEV=164.1' | DTH-5 ELEV=162.6' |
|---|---|---|---|---|
| 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-24" Bw FINE SANDY LOAM 10YR5/6<br>24"-62" C1 SANDY LOAM 2.5Y5/3<br>62"-126" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL, C2 HORIZON IS TIGHT<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=159.87' | 0"-22" Ap FINE SANDY LOAM 10YR3/3<br>22"-42" Bw FINE SANDY LOAM 10YR5/6<br>42"-96" C1 SANDY LOAM 2.5Y5/3<br>96"-118" C2 SILT LOAM 2.5Y6/3<br>WATER WEEPING @106"<br>NO STANDING WATER, NO REFUSAL<br>REDOX @80" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=159.23' | 0"-10" Ap FINE SANDY LOAM 10YR3/3<br>10"-22" Bw FINE SANDY LOAM 10YR5/6<br>22"-84" C1 SANDY LOAM 2.5Y5/3<br>84"-110" C2 SILT LOAM 2.5Y6/3<br>NO STANDING WATER, NO REFUSAL<br>C2 HORIZON IS DAMP<br>REDOX @82" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=154.87' | 0"-20" FILL<br>20"-28" Ap FINE SANDY LOAM 10YR3/3<br>28"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-86" C1 SANDY LOAM 2.5Y5/4<br>86"-116" C2 SANDY LOAM 2.5Y4/4<br>NO REFUSAL, NO STANDING OR WEEPING WATER<br>NO REDOX<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-34" Bw FINE SANDY LOAM 10YR5/6<br>34"-84" C1 SANDY LOAM 2.5Y5/4<br>84"-118" C2 SANDY LOAM 2.5Y4/3<br>WEEPING WATER @112"<br>NO REFUSAL<br>REDOX @72" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=156.6' |
| DATE: JULY 31, 2014 | | | | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | | | | |
| INSPECTOR: BILL MURPHY, WAYLAND BOARD OF HEALTH | | | | |

## SOIL TEST RESULTS

SOIL LOGS No:

| DTH-6 ELEV=167.7' | DTH-7 ELEV=166.8' | DTH-8 ELEV=168.2' | DTH-9 ELEV=163.0' | DTH-10 ELEV=160.75' |
|---|---|---|---|---|
| 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-26" Bw FINE SANDY LOAM 10YR5/6<br>26"-64" C1 SANDY LOAM 2.5Y5/3<br>64"-122" C2 SANDY LOAM 2.5Y4/4<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX @70" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.87' | 0"-14" Ap FINE SANDY LOAM 10YR3/3<br>14"-32" Bw FINE SANDY LOAM 10YR5/6<br>32"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-114" C2 SANDY LOAM 2.5Y5/4<br>NO STANDING OR WEEPING WATER<br>LENSES OF SILT LOAM FROM 76" DOWN<br>ESTIMATED DESIGN GROUNDWATER=NONE | 0"-26" FILL<br>26"-40" Bw FINE SANDY LOAM 10YR5/6<br>40"-78" C1 SANDY LOAM 2.5Y5/4<br>78"-108" C2 LOAMY SAND 2.5Y5/3<br>108"-126" C3 SILT LOAM 2.5Y6/3<br>C3 HORIZON IS DAMP<br>NO REFUSAL<br>REDOX @80" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=161.53' | 0"-16" Ap FINE SANDY LOAM 10YR3/3<br>16"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-46" Bc SANDY LOAM 2.5Y5/4<br>46"-98" C1 SANDY LOAM 2.5Y5/3<br>98"-118" C2 SANDY LOAM 2.5Y4/4<br>WATER STANDING @108"<br>WATER WEEPING @88"<br>REDOX SEEN @62", NO REFUSAL<br>ESTIMATED DESIGN GROUNDWATER=157.8' | 0"-15" Ap FINE SANDY LOAM 10YR3/3<br>15"-30" Bw FINE SANDY LOAM 10YR5/6<br>30"-66" C1 LOAMY SAND 2.5Y5/3<br>66"-112" C2 SILT LOAM 2.5Y5/4<br>WATER STANDING @100"<br>WATER WEEPING @98"<br>NO REFUSAL<br>REDOX SEEN @68" 7.5YR5/8 10%<br>ESTIMATED DESIGN GROUNDWATER=155.08' |

| DTH-11 ELEV=166.0' | DTH-12 ELEV=168.2' |
|---|---|
| 0"-18" FILL<br>18"-30" Ap FINE SANDY LOAM 10YR3/3<br>30"-36" Bw FINE SANDY LOAM 10YR5/6<br>36"-58" C1 SANDY LOAM 2.5Y5/3<br>58"-128" C2 SANDY LOAM 2.5Y6/3<br>WATER STANDING @125"<br>NO WEEPING WATER<br>REDOX SEEN @60" 7.5YR5/8 5%<br>ESTIMATED DESIGN GROUNDWATER=161.0' | 0"-54" FILL<br>58"-82" C1 SANDY LOAM 2.5Y4/4<br>82"-114" C2 SANDY LOAM 2.5Y5/4<br>C2 HORIZON HAS LENSES OF SILT LOAM<br>NO STANDING OR WEEPING WATER<br>NO REFUSAL<br>REDOX SEEN @64" 7.5YR5/8<br>ESTIMATED DESIGN GROUNDWATER=161.0' |
| DATE: AUGUST 21, 2014 | |
| BY: BRIAN T. NELSON, SOIL EVALUATOR (METROWEST ENGINEERING, INC.) | |
| INSPECTOR: JULIA JUNGHANNS, WAYLAND BOARD OF HEALTH | |

## POST-DEVELOPMENT BASIN PROPERTIES:

### POST-DEVELOPMENT BASIN 1 (P.D.B.-1)

TOTAL BASIN AREA = 5,991 S.F. (0.138 ACRES)
HYDRAULIC LENGTH = 222 FEET
CHANGE IN ELEVATION = 9.7 FEET
BASIN SLOPE = 0.044 (4.4%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 857 S.F. (0.020 ACRES) | 98 | 0.020 | 1.960 |
| LAWN AREA (GOOD COND.) = 3,815 S.F. (0.087 ACRES) | 61 | 0.087 | 5.307 |
| LANDSCAPED AREA (GOOD COND.) = 1,323 S.F. (0.031 ACRES) | 61 | 0.031 | 1.891 |
| | | SUM 0.138 | SUM 9.158 |

WEIGHTED CURVE NUMBER ($C_N$) = (9.158/0.138) = 66.4

### POST-DEVELOPMENT BASIN 2 (P.D.B.-2)

TOTAL BASIN AREA = 1,877 S.F. (0.043 ACRES)
HYDRAULIC LENGTH = 49 FEET
CHANGE IN ELEVATION = 0.5 FEET
BASIN SLOPE = 0.010 (1.0%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 356 S.F. (0.008 ACRES) | 98 | 0.008 | 0.784 |
| LAWN AREA (GOOD COND.) = 880 S.F. (0.020 ACRES) | 61 | 0.020 | 1.220 |
| LANDSCAPED AREA (GOOD COND.)= 640 S.F. (0.015 ACRES) | 61 | 0.015 | 0.915 |
| | | SUM 0.043 | SUM 2.919 |

WEIGHTED CURVE NUMBER ($C_N$) = (2.919/0.043) = 67.9

### POST-DEVELOPMENT BASIN 3 (P.D.B.-3)

TOTAL BASIN AREA = 7,081 S.F. (0.163 ACRES)
HYDRAULIC LENGTH = 196 FEET
CHANGE IN ELEVATION = 7.5 FEET
BASIN SLOPE = 0.038 (3.8%)

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 2,745 S.F. (0.063 ACRES) | 98 | 0.063 | 6.174 |
| LAWN AREA (GOOD COND.) = 2,391 S.F. (0.055 ACRES) | 61 | 0.055 | 3.355 |
| LANDSCAPED AREA (GOOD COND.)= 1,946 S.F. (0.045 ACRES) | 61 | 0.045 | 2.745 |
| | | SUM 0.163 | SUM 12.274 |

WEIGHTED CURVE NUMBER ($C_N$) = (12.274/0.163) = 75.3

### POST-DEVELOPMENT BASIN 3A (P.D.B.-3A)

TOTAL BASIN AREA = 5,856 S.F. (0.133 ACRES)
HYDRAULIC LENGTH = N.A.
CHANGE IN ELEVATION = N.A.
BASIN SLOPE = N.A.

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 1,960 S.F. (0.045 ACRES) | 98 | 0.045 | 4.410 |
| LAWN AREA (GOOD COND.) = 1,914 S.F. (0.044 ACRES) | 61 | 0.044 | 2.684 |
| LANDSCAPED AREA (GOOD COND.) = 1,983 S.F. (0.045 ACRES) | 61 | 0.045 | 2.684 |
| | | SUM 0.134 | SUM 9.778 |

WEIGHTED CURVE NUMBER ($C_N$) = (9.778/0.133) = 73.5

### POST-DEVELOPMENT BASIN 4 (P.D.B.-4)

TOTAL BASIN AREA = 17,059 S.F. (0.392 ACRES)
HYDRAULIC LENGTH = N.A.
CHANGE IN ELEVATION = N.A.
BASIN SLOPE = N.A.

| GROUND COVER | Cn | AREA (ACRES) | PRODUCT |
|---|---|---|---|
| IMPERVIOUS AREA = 14,145 S.F. (0.325 ACRES) | 98 | 0.325 | 31.850 |
| LAWN AREA (GOOD COND.) = 1,402 S.F. (0.032 ACRES) | 61 | 0.032 | 1.952 |
| LANDSCAPED AREA (GOOD COND.) = 1,511 S.F. (0.035 ACRES) | 61 | 0.035 | 2.135 |
| | | SUM 0.392 | SUM 35.937 |

WEIGHTED CURVE NUMBER ($C_N$) = (35.937/0.392) = 91.7

## USDA SOIL CLASSIFICATION

| SOIL NUMBER | SOIL SERIES | HYDROLOGIC SOIL GROUP |
|---|---|---|
| 51A | SWANSEA MUCK | B/D |
| 253C | HINCKLEY LOAMY SAND | A |
| 415B | NARRAGANSETT SILT LOAM | B |

HYDROLOGIC SOIL GROUP B USED FOR ANALSYIS
SOILS ON SITE ARE SANDY LOAM TEXTURES AND CLASSIFIED WITHIN HYDROLOGIC SOIL GROUP B.

FOR METROWEST ENGINEERING, INC. DATE
ROBERT A. GEMMA, P.E.(CIVIL) # 31967
P.L.S. # 37046

GRAPHIC SCALE
1 inch = 20 ft.
20 0 10 20 40 ( FEET ) 60
0 4 10 20 ( METERS ) 30

# FIGURE THREE

# POST-DEVELOPMENT WATERSHED DELINEATION PLAN

#24 SCHOOL STREET
IN
WAYLAND, MASS

PREPARED FOR:
WINDSOR PLACE LLC
73 PELHAM ISLAND ROAD
WAYLAND, MA 01778

PROPERTY OF:
WINDSOR PLACE LLC
73 PELHAM ISLAND ROAD
WAYLAND, MA 01778


ENGINEERS & SURVEYORS:
MWE
METROWEST ENGINEERING, INC.
75 FRANKLIN STREET
WAYLAND, MA 01702
TEL.: (508)626-0063
FAX: (508)875-6440


| SHEET 1 OF 1 | | DATE: APRIL 23, 2018 |
|---|---|---|
| CALC'D BY: RAG | FIELD BK: 621 | CAD FILE: PD_HYDRO.dwg |
| DRAFTER: | PROJECT: WY_SCH | DWG FILE: SK042318.dwg |