

NOTICE OF INTENT
For
CABOT CAR HOUSE STAGING AREA

Located At
MBTA Cabot Car House Yard
WEST FOURTH STREET
BOSTON, MA 02127

Submitted to:
CITY OF BOSTON
CONSERVATION COMMISSION

Prepared For:
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
10 Park Plaza, Boston, MA, 02116

Represented by:
LMH-LANE CABOT YARD JOINT VENTURE
100 Hancock St, Suite 901, Quincy, MA, 02171



NOVEMBER 2018

Prepared by



CONSULTING ENGINEERS AND PLANNERS

WPA FORM 3 – NOTICE OF INTENT



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Provided by MassDEP:

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

Boston

City/Town

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

59 W. 4th Street
a. Street Address

Boston
b. City/Town

02127
c. Zip Code

42 deg, 20' 37.28" N
d. Latitude

71 deg, 03' 35.76"W
e. Longitude

0600002000
f. Assessors Map/Plat Number

g. Parcel /Lot Number

2. Applicant:

Holly
a. First Name

Palmgren
b. Last Name

Massachusetts Bay Transportation Authority
c. Organization

10 Park Plaza, Suite 6720
d. Street Address

Boston
e. City/Town

MA
f. State

02116
g. Zip Code

617-222-1580
h. Phone Number

i. Fax Number

hpalmgren@mbta.com
j. Email Address

3. Property owner (required if different from applicant): Check if more than one owner

a. First Name

b. Last Name

c. Organization

d. Street Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email address

4. Representative (if any):

a. First Name

b. Last Name

LM Heavy Civil Construction (in joint venture with Lane Construction)
c. Company

100 Hancock Street
d. Street Address

Quincy
e. City/Town

MA
f. State

02171
g. Zip Code

1-617-845-8000
h. Phone Number

1-617-845-8001
i. Fax Number

cbucknell@lmheavycivil.com
j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

Fee Exempt
a. Total Fee Paid

Fee Exempt
b. State Fee Paid

Fee Exempt (\$67.50)
c. City/Town Fee Paid



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A. General Information (continued)

6. General Project Description:

The Cabot Carhouse Renovation Project involves site improvements such as surface paving and the installation of temporary staging facilities. Staging facilities will require a water service and wastewater disposal via a tight tank.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

- | | |
|---|---|
| 1. <input type="checkbox"/> Single Family Home | 2. <input type="checkbox"/> Residential Subdivision |
| 3. <input type="checkbox"/> Commercial/Industrial | 4. <input type="checkbox"/> Dock/Pier |
| 5. <input checked="" type="checkbox"/> Utilities | 6. <input type="checkbox"/> Coastal engineering Structure |
| 7. <input type="checkbox"/> Agriculture (e.g., cranberries, forestry) | 8. <input checked="" type="checkbox"/> Transportation |
| 9. <input checked="" type="checkbox"/> Other | |

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. Yes No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR 10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

suffolk

a. County

9127

c. Book

Parcel #0600002000

b. Certificate # (if registered land)

216

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet	2. square feet
	3. cubic yards dredged	

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
d. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	1. square feet	2. square feet
	0	0
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced

f. Riverfront Area

1. Name of Waterway (if available) - **specify coastal or inland** _____

2. Width of Riverfront Area (check one):

25 ft. - Designated Densely Developed Areas only

100 ft. - New agricultural projects only

200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

_____ a. total square feet	_____ b. square feet within 100 ft.	_____ c. square feet between 100 ft. and 200 ft.
----------------------------	-------------------------------------	--

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No

6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
 Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. square feet _____ 2. cubic yards dredged _____	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet _____	2. cubic yards beach nourishment _____
e. <input type="checkbox"/> Coastal Dunes	1. square feet _____	2. cubic yards dune nourishment _____
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input checked="" type="checkbox"/> Coastal Banks	900 1. linear feet _____	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet _____	
h. <input type="checkbox"/> Salt Marshes	1. square feet _____	2. sq ft restoration, rehab., creation _____
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet _____ 2. cubic yards dredged _____	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet _____	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	1. cubic yards dredged _____	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet _____	
4. <input type="checkbox"/> Restoration/Enhancement	If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here. _____ a. square feet of BVW _____ b. square feet of Salt Marsh	
5. <input type="checkbox"/> Project Involves Stream Crossings	_____ a. number of new stream crossings _____ b. number of replacement stream crossings	



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C. Other Applicable Standards and Requirements

- This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

- a. Yes No **If yes, include proof of mailing or hand delivery of NOI to:**

Online Map
 Aug. 1, 2017

Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
 1 Rabbit Hill Road
 Westborough, MA 01581

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

- c. Submit Supplemental Information for Endangered Species Review*

1. Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____ percentage/acreage
 - (b) outside Resource Area _____ percentage/acreage
 2. Assessor's Map or right-of-way plan of site
2. Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <http://www.mass.gov/eea/agencies/dfq/dfw/natural-heritage/regulatory-review/>). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



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C. Other Applicable Standards and Requirements (cont'd)

(c) MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). Make check payable to "Commonwealth of Massachusetts - NHESP" and **mail to NHESP** at above address

Projects altering 10 or more acres of land, also submit:

(d) Vegetation cover type map of site

(e) Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. Project is exempt from MESA review. Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. Separate MESA review ongoing. a. NHESP Tracking # _____ b. Date submitted to NHESP _____

3. Separate MESA review completed. Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. Not applicable – project is in inland resource area only b. Yes No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
 Southeast Marine Fisheries Station
 Attn: Environmental Reviewer
 836 South Rodney French Blvd.
 New Bedford, MA 02744
 Email: DMF.EnvReview-South@state.ma.us

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
 North Shore Office
 Attn: Environmental Reviewer
 30 Emerson Avenue
 Gloucester, MA 01930
 Email: DMF.EnvReview-North@state.ma.us

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.



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C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

- a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

- a. Yes No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, §

- a. Yes No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

- a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
2. A portion of the site constitutes redevelopment
3. Proprietary BMPs are included in the Stormwater Management System.

- b. No. Check why the project is exempt:

1. Single-family house
2. Emergency road repair
3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

- This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.



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Boston

City/Town

D. Additional Information (cont'd)

3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. List the titles and dates for all plans and other materials submitted with this NOI.

Cabot Yard Carhouse- Existing and Proposed

a. Plan Title

Coughlin Environmental Services, LLS

Daniel Coughlin

b. Prepared By

c. Signed and Stamped by

11/07/2018

1"=40'

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

5. If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. Attach NOI Wetland Fee Transmittal Form

9. Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

0203184

2. Municipal Check Number

11/07/2018

3. Check date

Fee Exempt

4. State Check Number

5. Check date

Elizabeth

Coughlin

6. Payor name on check: First Name

7. Payor name on check: Last Name



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

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Provided by MassDEP:

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Boston
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	<i>Holly Palmgren</i>	2. Date	<i>11/6/18</i>
3. Signature of Property Owner (if different)	<i>[Signature]</i>	4. Date	<i>11/7/2018</i>
5. Signature of Representative (if any)	<i>[Signature]</i>	6. Date	

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a copy of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

**TRANSMITTAL FORM FOR PERMIT
APPLICATION AND PAYMENT**



Enter your transmittal number



X281805
Transmittal Number

Your unique Transmittal Number can be accessed online:

<http://www.mass.gov/eea/agencies/massdep/service/approvals/transmittal-form-for-payment.html>

Massachusetts Department of Environmental Protection Transmittal Form for Permit Application and Payment

1. Please type or print. A separate Transmittal Form must be completed for each permit application.

2. Make your check payable to the Commonwealth of Massachusetts and mail it with a copy of this form to: MassDEP, P.O. Box 4062, Boston, MA 02211.

3. Three copies of this form will be needed.

Copy 1 - the original must accompany your permit application. **Copy 2** must accompany your fee payment. **Copy 3** should be retained for your records

4. Both fee-paying and exempt applicants must mail a copy of this transmittal form to:

MassDEP
P.O. Box 4062
Boston, MA
02211

* **Note:**
For BWSC Permits, enter the LSP.

A. Permit Information

WPA Form 3

1. Permit Code: 4 to 7 character code from permit instructions
Site work without a house.

3. Type of Project or Activity

Notice of Intent

2. Name of Permit Category

B. Applicant Information – Firm or Individual

Massachusetts Bay Transportation Authority

1. Name of Firm - Or, if party needing this approval is an individual enter name below:

2. Last Name of Individual
10 Park Plaza, Suite 6720

3. First Name of Individual

4. MI

5. Street Address

Boston

MA

02116

617-222-1580

6. City/Town

7. State

8. Zip Code

9. Telephone #

10. Ext. #

Holly Palmgren

hpalmgren@mbta.com

11. Contact Person

12. e-mail address

C. Facility, Site or Individual Requiring Approval

Cabot Yard Carhouse

1. Name of Facility, Site Or Individual

59 West Fourth Street

2. Street Address

Boston

MA

02127

3. City/Town

4. State

5. Zip Code

6. Telephone #

7. Ext. #

8. DEP Facility Number (if Known)

9. Federal I.D. Number (if Known)

10. BWSC Tracking # (if Known)

D. Application Prepared by (if different from Section B)*

Coughlin Environmental Services, LLC

1. Name of Firm Or Individual

62 Montvale Avenue, Suite H

2. Address

Stoneham

MA

02180

781-832-1002

3. City/Town

4. State

5. Zip Code

6. Telephone #

7. Ext. #

Daniel Coughlin, PE

8. Contact Person

9. LSP Number (BWSC Permits only)

E. Permit - Project Coordination

1. Is this project subject to MEPA review? yes no
If yes, enter the project's EOEA file number - assigned when an Environmental Notification Form is submitted to the MEPA unit:

EOEA File Number

F. Amount Due

DEP Use Only

Special Provisions:

1. Fee Exempt (city, town or municipal housing authority)(state agency if fee is \$100 or less).
There are no fee exemptions for BWSC permits, regardless of applicant status.
2. Hardship Request - payment extensions according to 310 CMR 4.04(3)(c).
3. Alternative Schedule Project (according to 310 CMR 4.05 and 4.10).
4. Homeowner (according to 310 CMR 4.02).

Permit No:

Rec'd Date:

Reviewer:

0203184

Fee Exempt (\$67.50)

11/07/2018

Check Number

Dollar Amount

Date

NOI WETLANDS FEE TRANSMITTAL FORM



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Applicant Information

1. Location of Project:

<u>59 W. 4th Street</u>		<u>Boston</u>
a. Street Address		b. City/Town
<u>0203184</u>		<u>\$67.50 (City share of MassDEP filing fee)</u>
c. Check number		d. Fee amount

2. Applicant Mailing Address:

<u>Holly</u>		<u>Palmgren</u>
a. First Name		b. Last Name
<u>Massachusetts Bay Transportation Authority</u>		
c. Organization		
<u>10 Park Plaza, Suite 6720</u>		
d. Mailing Address		
<u>Boston</u>	<u>MA</u>	<u>02116</u>
e. City/Town	f. State	g. Zip Code
<u>617-222-1580</u>	<u>hpalmgren@mbta.com</u>	
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

<u></u>		
a. First Name	b. Last Name	
<u></u>		
c. Organization		
<u></u>		
d. Mailing Address		
<u></u>	<u></u>	<u></u>
e. City/Town	f. State	g. Zip Code
<u></u>	<u></u>	<u></u>
h. Phone Number	i. Fax Number	j. Email Address

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

B. Fees

Fee should be calculated using the following process & worksheet. **Please see Instructions before filling out worksheet.**

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.



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B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Cat. 1: Site Work without a house.	1	\$110	\$110
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee:	<u>Exempt</u>
	a. Total Fee from Step 5
State share of filing Fee:	<u>Exempt</u>
	b. 1/2 Total Fee less \$12.50
City/Town share of filing Fee:	<u>Exempt (\$67.50)</u>
	c. 1/2 Total Fee plus \$12.50

C. Submittal Requirements

- a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
 Box 4062
 Boston, MA 02211

- b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

VERIFY THE AUTHENTICITY OF THIS MULTI-TONE SECURITY DOCUMENT. CHECK BACKGROUND AREA CHANGES COLOR GRADUALLY FROM TOP TO BOTTOM.

0203184

DRAWEE: SANTANDER BANK, N.A.



PERSONAL MONEY ORDER

NOT TO EXCEED \$1,000.00

PAY TO THE ORDER OF: DOLLARS \$

TO THE ORDER OF

PURCHASER INFORMATION NAME (PRINT)

Mr. & Mrs. J. J. ...

ADDRESS

...

PURCHASER'S SIGNATURE

[Handwritten Signature]

100203184 10238372696

767576372610

PROJECT NARRATIVE

PROJECT NARRATIVE
CABOT YARD CARHOUSE STAGING AREA
SOUTH BOSTON, MASSACHUSETTS

Project Description

The project consists of Site Renovations to the Cabot Yard Carhouse Staging Yard located at 59 West Fourth Street in South Boston. Renovations include consolidation of miscellaneous construction materials and debris currently on-site, paving of the gravel surface, installation of eight (8) trailer field offices, and installation of utilities including a water service and on-site wastewater disposal system. The goal of the project is to construct temporary staging facilities for MBTA and LMH-Lane Cabot Yard Joint Venture (LMH-Lane JV) employees.

Site Description

The site of the proposed renovation project is located on the banks at the southern most point of the Fort Point Channel in South Boston. Fort Point Channel separates South Boston from downtown Boston and feeds into Boston Harbor. The project site address is at 59 West Fourth Street in South Boston. The project involves renovations and upgrades to the MBTA Cabot Rapid Transit Maintenance facility which was constructed in 1973. The site runs along approximately 900 feet of the southeastern side of the Fort Point Channel. The coastal barrier consists of concrete and stone seawalls and stone swales. Along most of the site there is a 20 to 30 foot wide strip of vegetation between the coastal barriers and the gravel lot. Vegetation consists of grasses, medium sized brush, and small to medium sized woody vegetation and trees. A chain link fence separates the vegetation from the gravel lot. On its other side the site is lined by railroad tracks. There is a paved access ramp leading down to the site from West Fourth Street. The pavement ends at the bottom of the ramp and transitions into a gravel and dirt surface. The New Broadway Bridge crosses over the project site.

The site is currently mainly used as a parking facility for MBTA employees. Employees park on the existing level gravel surfaces. The site is also being used as a storage location for miscellaneous materials left over from other MBTA projects. There are piles of gravel, concrete jersey barriers, lumber for rail construction, and other debris.



Flood Conditions

The March 16, 2016 FEMA Flood Insurance Rate Maps (FIRM) (Map Numbers 25025C0081J AND 25025C0083J) indicate the 100-year flood level to be at an elevation of 10 feet. The site is partially located within the Zone AE (1% annual chance of flooding) and Zone X (0.2% annual chance of flooding) Flood Hazard Areas. Most of the project site is not located within any Flood Hazard Areas. The project site has an elevation ranging from 10 to 18 feet.

Surficial Geology

The soils located at 59 West Fourth Street are identified as Udorthents, wet substratum (655) by the Natural Resource Conservation Services (NRCS). Udorthents consist primarily of moderately coarse textured soil material and a few small areas of medium textured material. This map unit consists of filled areas that were previously tidal marshes, river flood plains, bays, harbors, or swamps. The fill consists of rubble, refuse, and mixed soil material (typically sand, gravel, and channel dredgings. This soil has slow to moderate permeability with percolation rates ranging from 5 to 15 minutes per inch and low to moderate available water capacity. Due to the well compacted surface, water will tend to pond on the surface following an intense rainfall.

Current Condition

The site mainly consists of a fenced in gravel lot. There are no formal parking spaces but MBTA employees use the site as a parking lot. The employees park on any open, level gravel throughout the site. The materials and miscellaneous debris are mainly located along the sides of the northern end of the gravel lot. Due to the unorganized parking and placement of stored materials a lot of the space is unutilized and left open. Consolidating the construction materials and designating certain areas for parking would increase the amount of available space.

Proposed Improvements and Anticipated Maintenance

The Cabot Carhouse Renovation project involves site improvements such as surface paving and the installation of temporary staging facilities. The staging facilities are anticipated to be in use for three to five years depending on the rate at which the MBTA projects are completed.

The site improvements include adding new pavement where gravel/stone currently exists. The extent of the new pavement can be seen on the plans. The proposed extent of the pavement will add 34,562 square feet of new impervious surface to the site. Parking and area pavement markings will be added to the pavement to direct traffic and designate specific areas for parking. The amount of parking will be sufficient to accommodate all of the MBTA employees who currently use the gravel lot and the MBTA and LMH-Lane Cabot Yard Joint Venture (LMH-Lane JV) employees who will use the trailers. The existing compacted gravel and stone driving surface would be regraded and leveled to allow proposed paving to meeting existing grades and to pitch it slightly toward the stormwater infiltration trench. Currently most runoff flow at the site is in this general direction, away from Fort Point Channel.

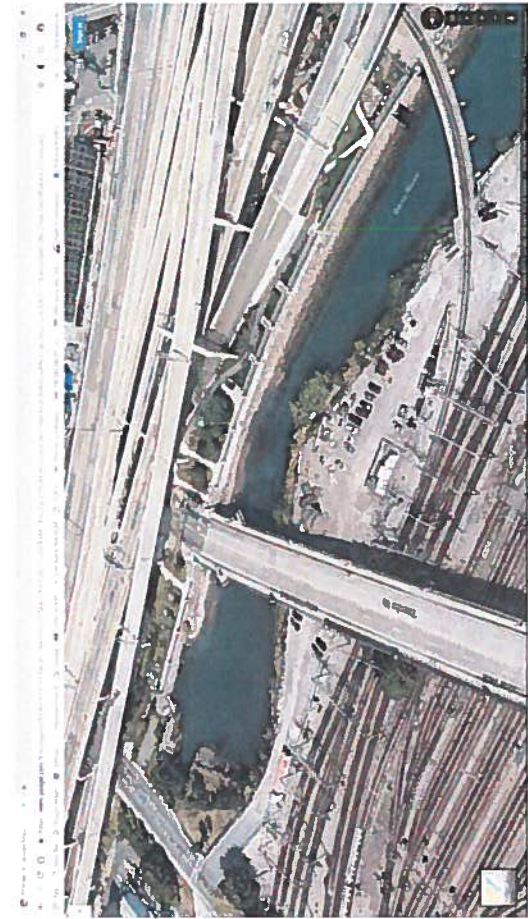
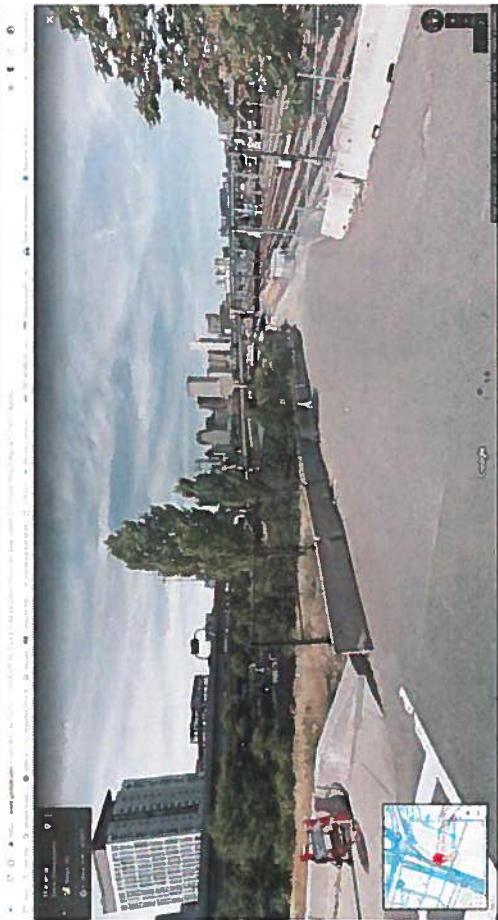
The temporary staging area site renovations include the installation of eight (8) trailers, each one 60' long by 12' wide, to act as field offices for MBTA and LMH-Lane JV employees. There will be three (3) trailers for MBTA employees and five (5) trailers for the LMH-Lane JV. A deck will be located between the two sets of trailers. The proposed locations of the trailers and deck can be seen on the plans. The MBTA trailers and portions of the deck are located beneath the New Broadway Bridge. The miscellaneous construction materials currently on site will be consolidated and moved towards the northern side of the site for MBTA future use. Consolidating the lumber, jersey barriers, stockpiled stone, and other materials will open up space for the trailers and additional parking.

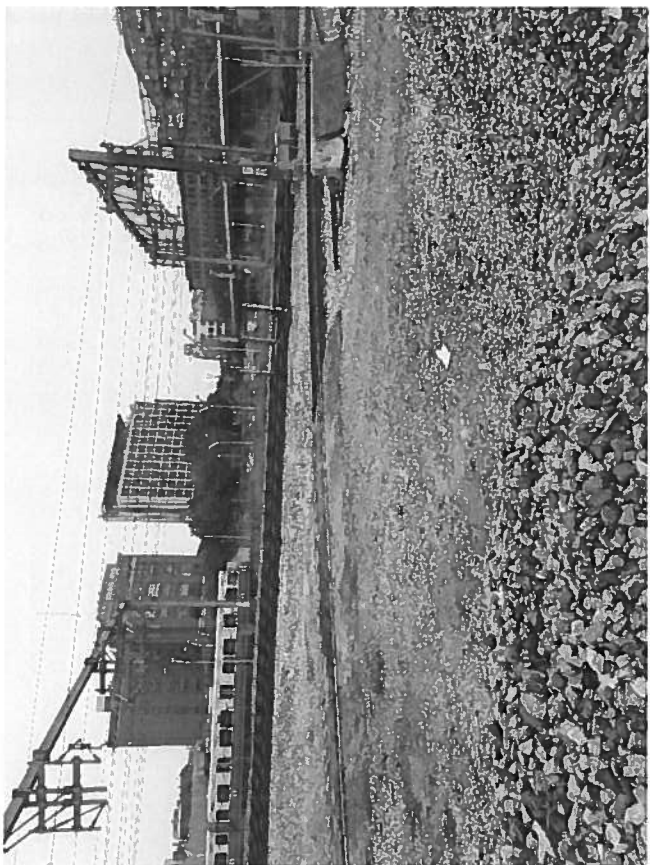
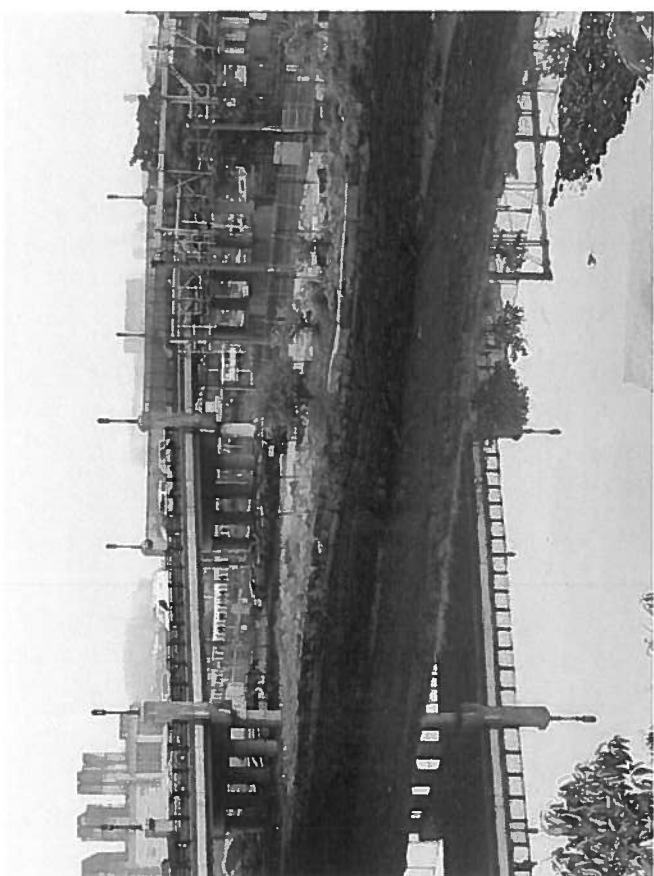
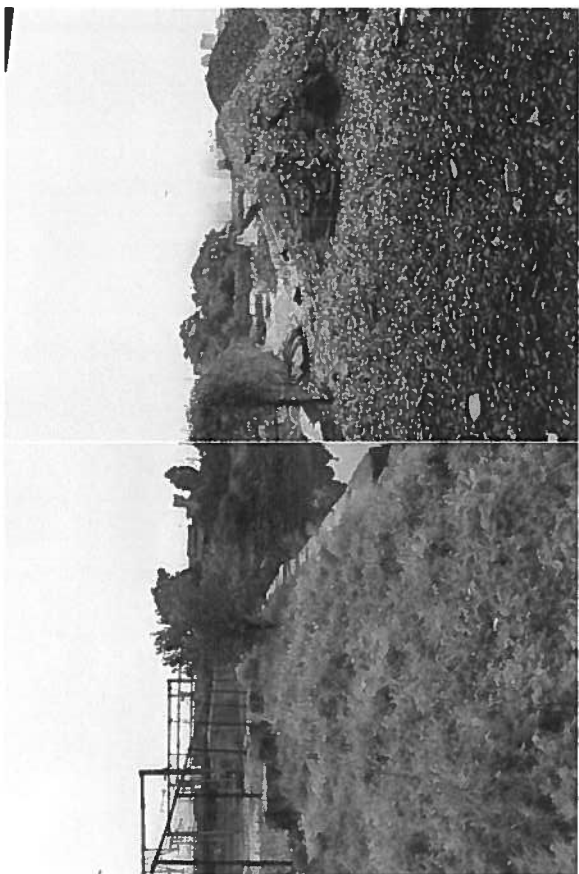
The trailers will require a water service to be installed. The proposed service is a 3" HDPE pipe that ties into an existing water service on West Fourth Street close to where it passes under Interstate-93. The water line then runs along the northern side of West Fourth Street and down the paved access ramp to the site. Wastewater will be stored in the trailer tight tank on-site and be pumped out regularly.

Other site utilities such as electric, telecommunication and/or cable will be brought to the site trailers aerially to reduce site excavation and disturbance. It is anticipated that up to three service poles may be needed to accommodate the utilities from West Fourth Street.

To handle the runoff generated by the increased impervious surface, a stone swale will be added along the southeastern side of the site. The site will be graded and paved to direct flow to the swale. The swale will provide storage and infiltration for stormwater runoff. The treatment swale has been sized to accept the first 2" rainfall and store the flow allowing it to filter and infiltrate. The estimated volume of the swale is about 6,800 CF, ample to allow detention of a 25 year storm event. Above that storm intensity level the parking lot would begin to flood and additional storage within the parking area would allow for containment of the 100 Year flood event with an average flood depth of 6 inches over the parking area. A stormwater containment berm will be constructed along the perimeter of the site to contain the water within the parking lot. The extent of the stormwater containment berm can be seen on the plans. Combining the storage and infiltration, the proposed facilities will fully contain the 100 year event.

Before construction begins a wire-backed silt fence and 8" staked straw wattles are to be installed, as detailed on the plans, on the inside of the existing chain link fence along the entire length of the project area. The chain link fence will not be altered, damaged, or removed during or after construction. The silt fence and straw wattles shall meet the standards of and be installed as detailed in the Environmental Specification attached to the Stormwater Report. The silt fence and straw wattles will remain in place post-construction as a permanent sediment and erosion control barrier.





**FEMA
FLOOD INSURANCE RATE MAP**

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where Base Flood Elevations (BFEs) and/or floodways have been determined, users should consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIR. Users should be aware that BFEs shown on the FIR represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIR for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only to landward of 0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIR should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIR.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

The AE Zone category has been divided by a Limit of Moderate Wave Action (LMWA). The LMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LMWA (or between the shoreline and the LMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Massachusetts State Plane Meters Zone (FIPS zone 2001). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid projection or UTM zones used in the production of FIRs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIR.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations may differ from elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NGS Information Services
 NGA, NNGS12
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, Maryland 20910-3282
 (301) 713-3242

To obtain current elevation, description and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Base map information shown on this FIR is derived from Massachusetts Geographic Information System (MassGIS) digital ortho-photography produced at 45 centimeter (2005) and 30 centimeter (2008) resolution. Aerial photography is dated Spring 2005 and Spring 2008.

The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data the profile baselines, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIR for this jurisdiction. As a result, the Flood Profiles and Floodway Data Tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unreviewed streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed Map Index for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIR visit the Map Service Center (MSC) website at <http://msc.fema.gov>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have questions about this map, how to order products, or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FIMX) at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/fimx>.

Only coastal structures that are certified to provide protection from the 1-percent-annual chance flood are shown on this panel. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.

- KEY TO NUMBERED STREETS**
1. FRIZES WHARF
 2. HENRYMAN STREET
 3. GREENOUGH LANE
 4. BELGRAVA PLACE
 5. CONSTITUTION WHARF
 6. BATTERY WHARF
 7. BOODDOCK CT
 8. MICHELANGELO STREET
 9. PORTER COURT
 10. COMMERCIAL COURT
 11. POWERS COURT
 12. HANOVER AVENUE
 13. MURPHY COURT
 14. LINCOLN WHARF
 15. FAIRFIELD PLACE
 16. WALSH PLACE
 17. SUN COURT STREET
 18. FLEET STREET
 19. NORTH BENNET COURT
 20. WOODIN STREET
 21. NORTH BENNET PLACE
 22. PARMENTER STREET
 23. JERUSALEM PLACE
 24. BARRETT STREET
 25. NORTH HANOVER COURT
 26. NOYER PLACE
 27. LONGFORD PLACE
 28. NORTH MARGIN STREET
 29. ENDICOTT STREET
 30. THACHER COURT
 31. LYNN STREET
 32. ENDICOTT COURT
 33. LAFFAYETTE AVENUE
 34. BLACKSTONE STREET
 35. CREEK SQUARE
 36. MARSHALL STREET
 37. SCOTT ALLEY
 38. MERCHANTS ROW
 39. CHATHAM ROW
 40. LIBERTY SQUARE
 41. BATTERYMARCH STREET
 42. CUSTOM HOUSE STREET
 43. WHARF STREET
 44. ANTHONY RAY VALENTE HWY
 45. LINCOLN ST
 46. MARSH LN
 47. BAIT LN
 48. CHATHAM ST
 49. MERCANTILE ST
 50. MCKINLEY RD



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD
 The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, AV, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AD** Flood depths of 1 to 3 feet (usually short flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently derelict. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE
 The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS
ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
ZONE D Areas determined to be outside the 0.2% annual chance floodplain.
ZONE B Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)
 CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% Annual Chance Floodplain Boundary
- 0.2% Annual Chance Floodplain Boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
- Limit of Moderate Wave Action
- Limit of Moderate Wave Action coincident with Zone Break
- Base Flood Elevation line and value: elevation in feet* (EL 987)
- Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- (2) — (2) — Truncated line
- (C) — (C) — Culvert
- (B) — (B) — Bridge

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere:
 4999000 M
 1997000 N
 1000-meter Universal Transverse Mercator tick values, zone 19N
 0x3310 X

MAP REPOSITORIES
 Refer to Map Repositories list on Map Index.

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
 September 23, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
 March 16, 2016 - to change Base Flood Elevations and Special Flood Hazard Areas, to change zone designations, to update the effects of wave action, to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision and to modify Coastal Barrier Resources System units.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-438-6633.

MAP SCALE 1" = 500'
 250 0 500 1000
 150 0 150 300
 FEET METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0081J

FIRM
FLOOD INSURANCE RATE MAP
SUFFOLK COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 81 OF 176
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
 COMMUNITY NUMBER: 25025C0081J
 BOE ON, CITY OF

MAP NUMBER
25025C0081J
 MAP REVISED
MARCH 16, 2016
 Federal Emergency Management Agency

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

NOTES TO USERS

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Certain areas not in Special Flood Hazard Areas may be protected by flood control structures. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The projection used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The horizontal datum was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

NCS Information Services
 NOAA/NMCS/12
 National Geodetic Survey
 SSMC-3, #9202
 1315 East-West Highway
 Silver Spring, Maryland 20910-3282
 (301) 713-3242

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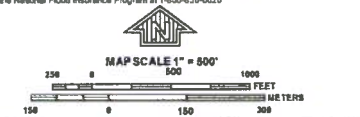
If you have questions about this map, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA-MAP (1-877-336-2827) or visit the FEMA website at <http://www.fema.gov/business/firm>.

Only coastal structures that are certified to provide protection from the 1-percent-annual-chance flood are shown on this panel. However, all structures taken into consideration for the purpose of coastal flood hazard analysis and mapping are present in the DFIRM database in S_Gen_Struct.



LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
 The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AD, AR, AV, VE, and V. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
 - ZONE AE** Base Flood Elevations determined.
 - ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
 - ZONE AD** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of shallow fan flooding, velocities also determined.
 - ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently determined. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
 - ZONE AV** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
 - ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
 - ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
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 - ZONE D** Areas determined to be outside the 0.2% annual chance floodplain.
 - ZONE B** Areas in which flood hazards are undetermined, but possible.
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- OTHERWISE PROTECTED AREAS (OPAs)**
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- 1% Annual Chance Floodplain Boundary
 - 0.2% Annual Chance Floodplain Boundary
 - Floodway boundary
 - Zone D boundary
 - CBRS and OPA boundary
 - Boundary dividing Special Flood Hazard Areas and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
 - Limit of Moderate Wave Action
 - Limit of Moderate Wave Action coincident with Zone Break
 - Base Flood Elevation line and value; elevation in feet (EL 987)
 - Base Flood Elevation value where uniform within zone; elevation in feet
- *Referenced to the North American Vertical Datum of 1988
- Cross section line
 - Transect line
 - Culvert
 - Bridge
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
- 1000-meter grid; Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
 - 1000-meter Universal Transverse Mercator box values, zone 19N
 - Bench mark (see explanation in Notes to Users section of this FIRM panel)
- MAP REPOSITORIES**
 Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**
 September 25, 2008
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**
 March 16, 2016 - to change Base Flood Elevations and Special Flood Hazard Areas, to change zone designations, to update the effects of wave action, to update corporate limits, to add roads and most names, to incorporate previously issued Letters of Map Revision and to modify Coastal Barrier Resources System areas
- For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.
- To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-438-6629.



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0083J

FIRM
FLOOD INSURANCE RATE MAP
SUFFOLK COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 83 OF 176
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS	COMMUNITY	NUMBER	PANEL	SUFFIX
	BOSTON, CITY OF	25098	888	J

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

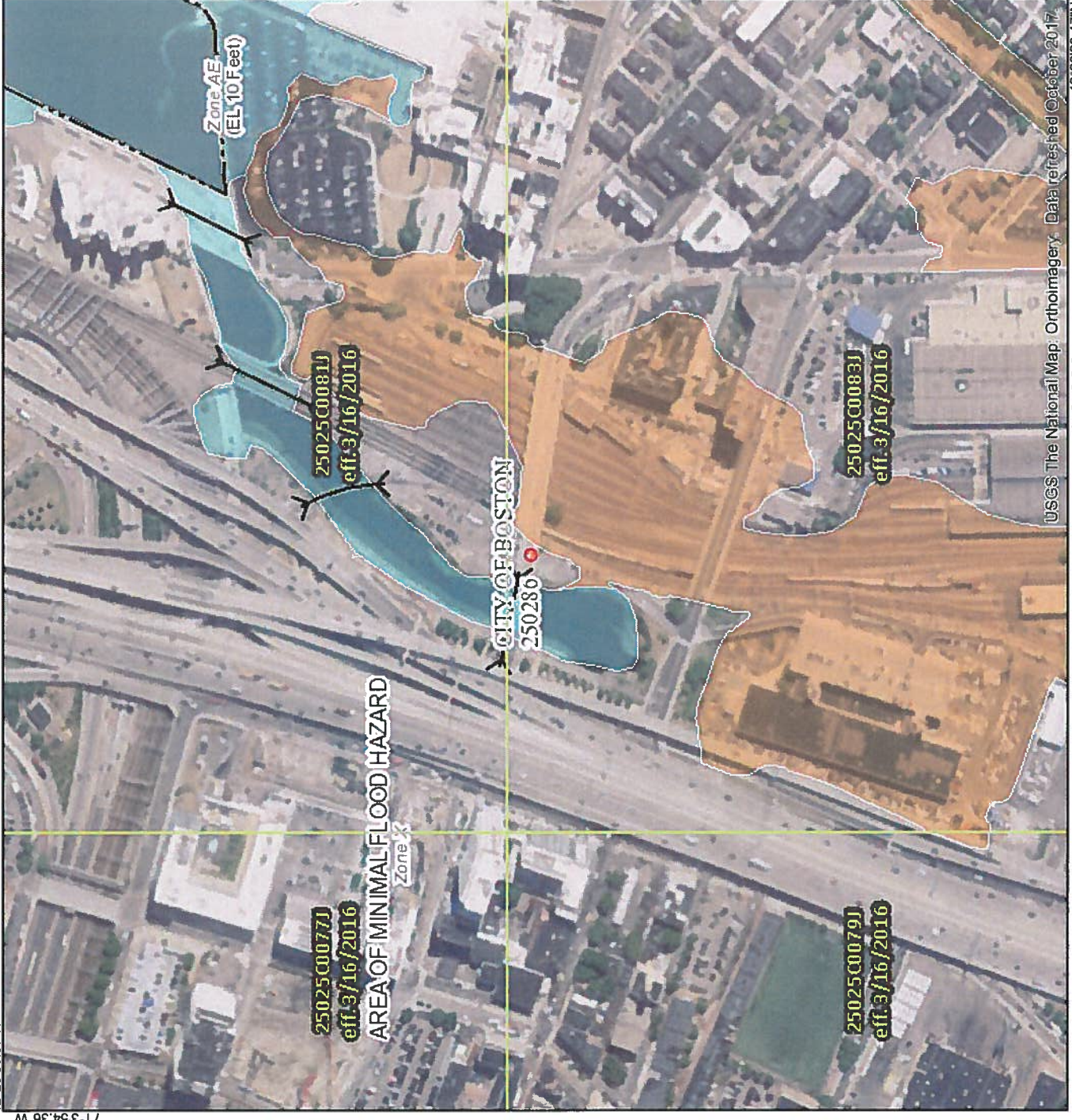
MAP NUMBER
 25025C0083J
MAP REVISED
 MARCH 16, 2016

Federal Emergency Management Agency

National Flood Hazard Layer FIRMette



42°20'50.07"N



71°34.36'W

USGS The National Map: Orthoimagery. Data refreshed October 2017. 42°20'23.47"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

<p>SPECIAL FLOOD HAZARD AREAS</p> <ul style="list-style-type: none"> Without Base Flood Elevation (BFE) Zone A, V, A99 With BFE or Depth Zone AE, AO, AH, VE, AR Regulatory Floodway 	<p>OTHER AREAS OF FLOOD HAZARD</p> <ul style="list-style-type: none"> 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X Future Conditions 1% Annual Chance Flood Hazard Zone X Area with Reduced Flood Risk due to Levee. See Notes. Zone X Area with Flood Risk due to Levee Zone D 	<p>OTHER AREAS</p> <ul style="list-style-type: none"> Area of Minimal Flood Hazard Zone X Effective LOMRs Area of Undetermined Flood Hazard Zone D 	<p>GENERAL STRUCTURES</p> <ul style="list-style-type: none"> Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall 	<p>OTHER FEATURES</p> <ul style="list-style-type: none"> Cross Sections with 1% Annual Chance Water Surface Elevation Coastal Transect Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary Coastal Transect Baseline Profile Baseline Hydrographic Feature 	<p>MAP PANELS</p> <ul style="list-style-type: none"> Digital Data Available No Digital Data Available Unmapped
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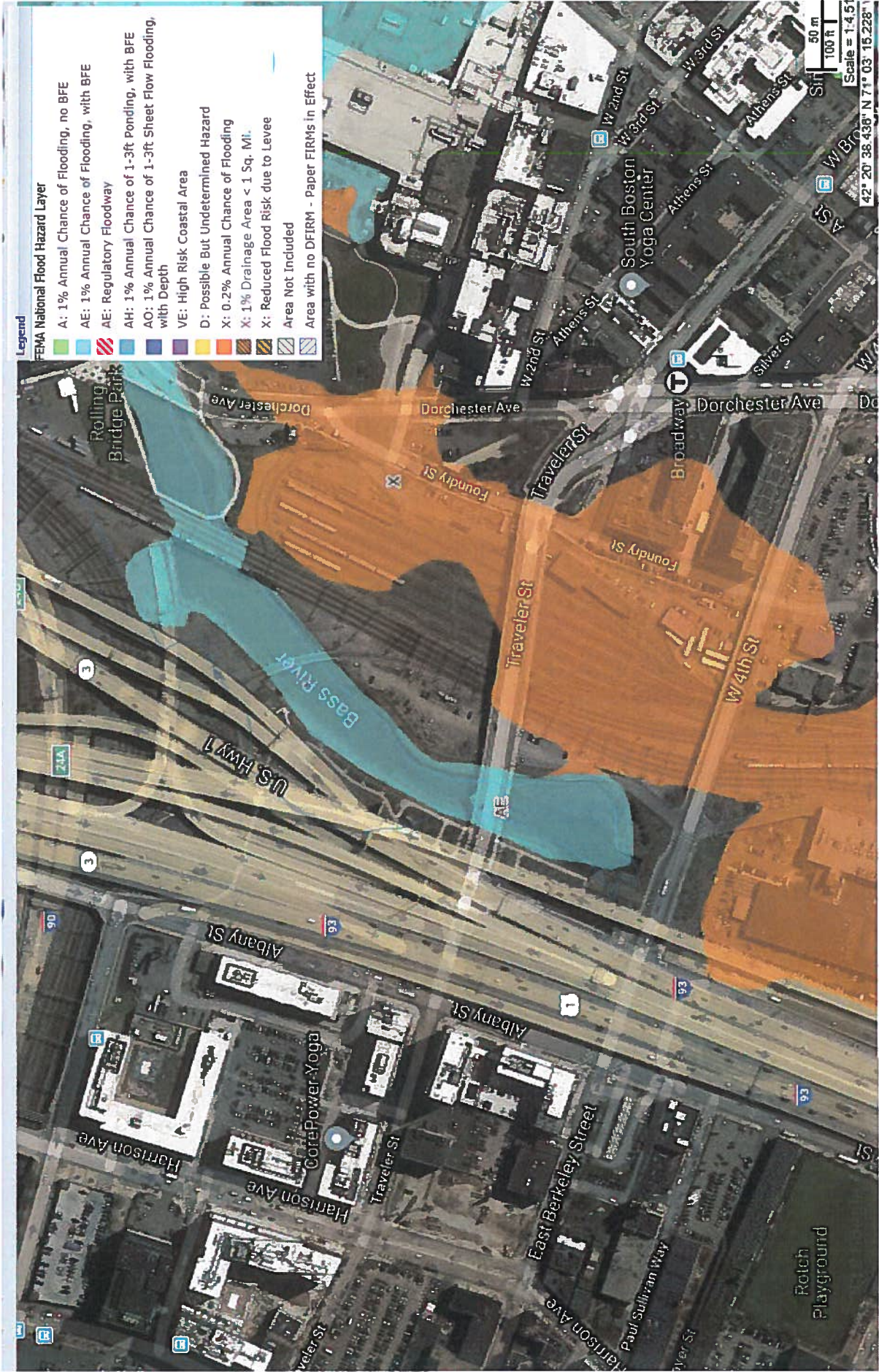
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/22/2018 at 10:00:30 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Massachusetts Ocean Resource Information System (MORIS) FEMA Flood Hazard



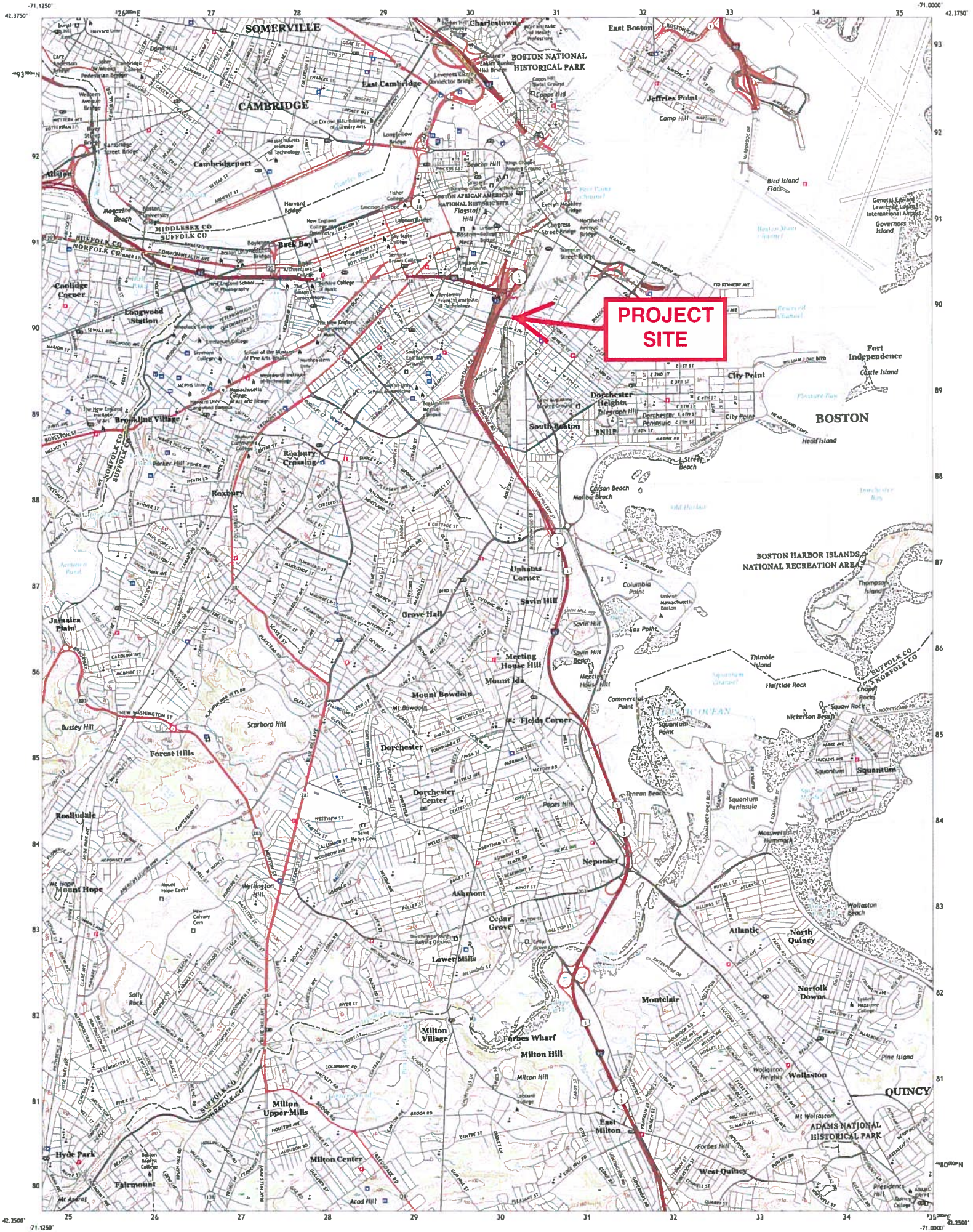
USGS MAP



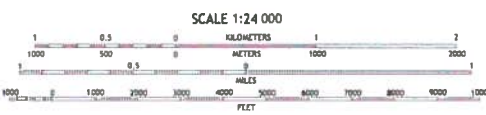
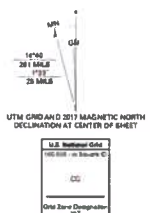
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



BOSTON SOUTH QUADRANGLE
MASSACHUSETTS
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1:250,000-meter grid Universal Transverse Mercator, Zone 18T
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.



ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD
Interstate Route	US Route
	State Route

1	2	3	4	5	6	7	8
1	2	3	4	5	6	7	8

ADJOINING QUADRANGLES

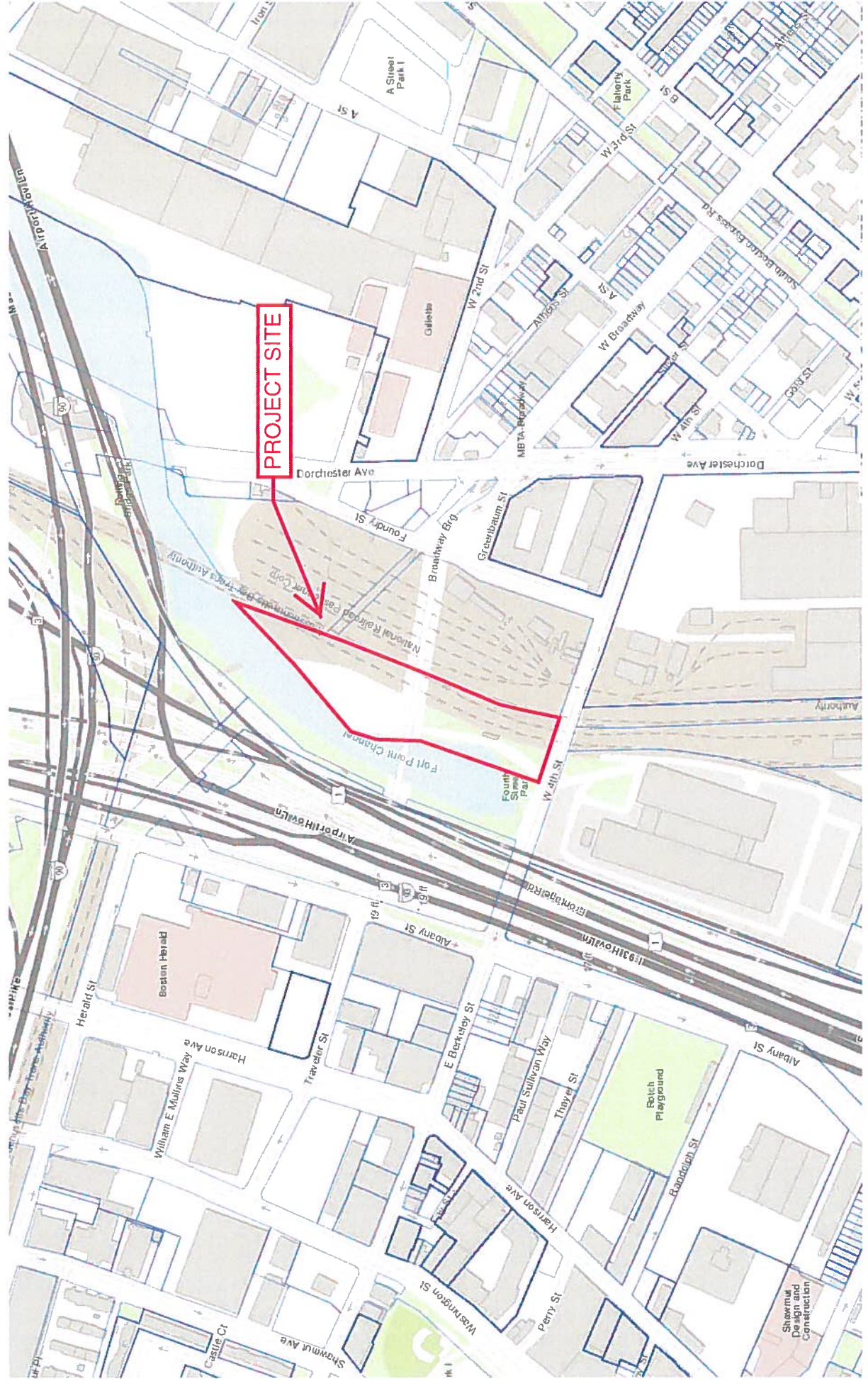
BOSTON SOUTH, MA
2018



ASSESSOR'S MAP

Boston Assessor's Map

Mapped with Assessing Online: Boston Tax Parcel Viewer



ABUTTER LISTS

Project Site Abutters

Obtained using the City of Boston's Assessing website

(<http://www.boston.gov/assessing/>)

Parcel ID	Address	Parcel Owner	Mailing Address	Mailing State/City	Mailing Zip Code
600002001	71 FOUNDRY ST	MASS BAY TRANSP. AUTH.	71 FOUNDRY	SOUTH BOSTON MA	02127
600005000	W FOURTH ST	MASS BAY TRANSP. AUTH.	WEST FOURTH	SOUTH BOSTON MA	02127
600004003	W FOURTH ST	COMMONWEALTH OF MASS	WEST FOURTH	SOUTH BOSTON MA	02127
600005001	163 DORCHESTER AVE	MASS BAY TRANSP. AUTH.	163 DORCHESTER AVE	SOUTH BOSTON MA	02127
600002000	W FOURTH ST	MASS BAY TRANSP. AUTH.	BROADWAY	SOUTH BOSTON MA	02127
600001003	FOUNDRY ST	MASS BAY TRANSP. AUTH.	DORCHESTER AVE	SOUTH BOSTON MA	02127
801024040	400 FRONTAGE RD	CITY OF BOSTON	400 FRONTAGE RD	BOSTON MA	02118

NOTICE TO ABUTTERS

Notification to Abutters Under the Massachusetts Wetlands Protection Act

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40 and the City of Revere Wetland Ordinance, you are hereby notified of the following.

- A. The name of the applicant is **Massachusetts Bay Transportation Authority**
- B. The applicant has filed a Notice of Intent with the municipality of the **City of Boston** seeking permission to remove, fill, dredge, or alter an Area Subject to Protection Under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

The project consists of installing eight (8) office trailers to be used as temporary staging facilities, converting a portion of the gravel lot to a paved surface, utility connections, and incidental site work.

- C. The address of the lot where activity is proposed is **59 West Fourth Street (Parcel/Lot Number 0600002000)**
- D. Copies if the Notice of Intent may be examined at:

**Boston Conservation Commission
City Hall
1 City Hall Square, Room 709
Boston, MA 02201**

between the hours of **8:00 AM and 12:00 PM** on the following days of the week: **Monday, Tuesday, Wednesday, and Thursday**. For more information or an appointment call: **(617) 635-3850**. This is the **number for the local Conservation Commission**

- E. Copies of the Notice of Intent may be obtained from the applicant's representative by calling this telephone number **(781) 832-1002** between the hours of **9:00 AM and 4:00 PM** on the following days of the week: **Monday, Tuesday, Wednesday, Thursday, and Friday**.
- F. Information regarding the date, time, and place of the Public Hearing may be obtained from **The Boston Conservation Commission** by calling this telephone number **(617) 635-3850** between the hours of **8:00 AM and 12:00 PM** on the following days of the week: **Monday, Tuesday, Wednesday, and Thursday**. This is the Local Conservation Commission.

NOTE: Notice of the Public Hearing, including its date, time, and place will be published at least five (5) days in advance in the **Boston Globe**.

NOTE: Notice of the Public Hearing, including its date, time, and place will be posted in the **Boston City Hall** not less than forty-eight (48) hours in advance.

NOTE: You may also contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. To contact DEP call:

Central Region: (508) 792-7650

Northeast Region: (978) 661-7600

Southeast Region: (508) 946-2800

Western Region: (413) 784-1100

**METHODS FOR IDENTIFYING RESOURCE
BOUNDARY DELINEATIONS**



NORSE ENVIRONMENTAL SERVICES, INC.

92 Middlesex Road, Unit 4

Tyngsboro, MA 01879

TEL. (978) 649-9932 • FAX (978) 649-7582

Website: www.norseenvironmental.com

September 18, 2018

Daniel J. Coughlin, P.E.
Principal Engineer
Coughlin Environmental Services, LLC
62 Montvale Avenue, Suite H
Stoneham, MA 02180-3637

Re: Cabot Office Yard
Fort Point Channel

Sir;

Resource areas were determined on the above site on 9/17/18 by this office. There are no vegetated wetlands on or near the property. USGS Mapping shows no perennial streams or "rivers" on or near the property. Natural Heritage mapping of the site does not show any priority habitat on or near the property.

Resource areas on site include coastal bank as defined in 310 CMR 10.30(2) defined as the seaward face of any elevated landform. The boundary of the Bank becomes the top surface consisting of seawalls in this instance. No physical delineation was necessary, the determination of the bank is dependent on topographic survey.

The channel itself is Land Under the Ocean defined under 310 CMR 10.25(2) as:

"Land under the Ocean means land extending from the mean low water line seaward to the boundary of the municipality's jurisdiction and includes land under estuaries."

The property is also bounded by Land Subject to Tidal Action and Land Subject to Coastal Storm Flowage as defined in 310 CMR 10.04 as:

"Land Subject to Tidal Action means land subject to the periodic rise and fall of a coastal water body, including spring tides"

"Land Subject to Coastal Storm Flowage means land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater."

Both boundaries are determined by elevation, and neither resource area has a buffer zone associated with it. The top of the coastal bank does have a 100' buffer zone associated with it as does land under the ocean.

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'Steven Eriksen', written over the word 'Sincerely,'.

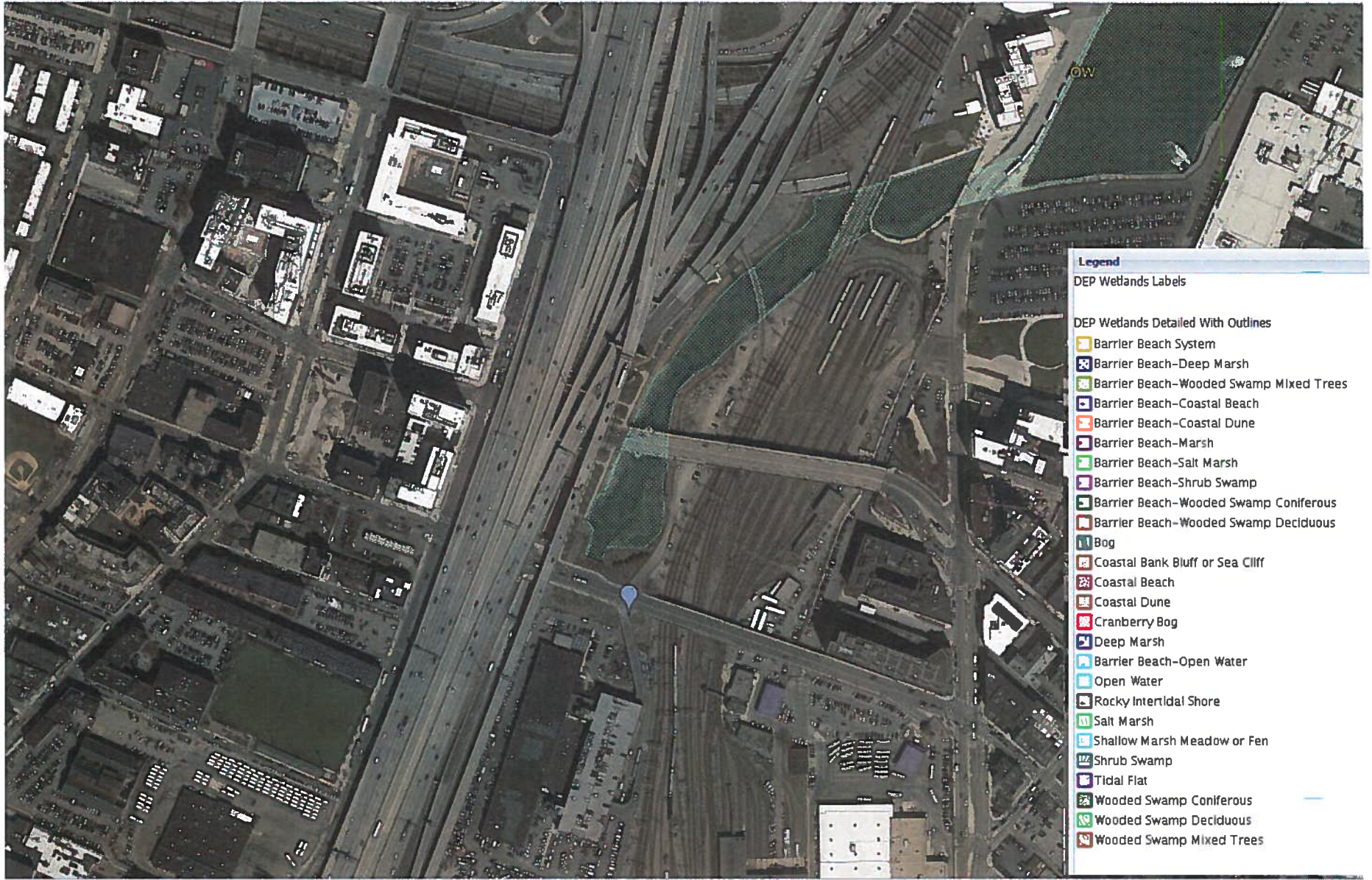
Steven Eriksen

Certified Soil Scientist

Certified Wetland Scientist

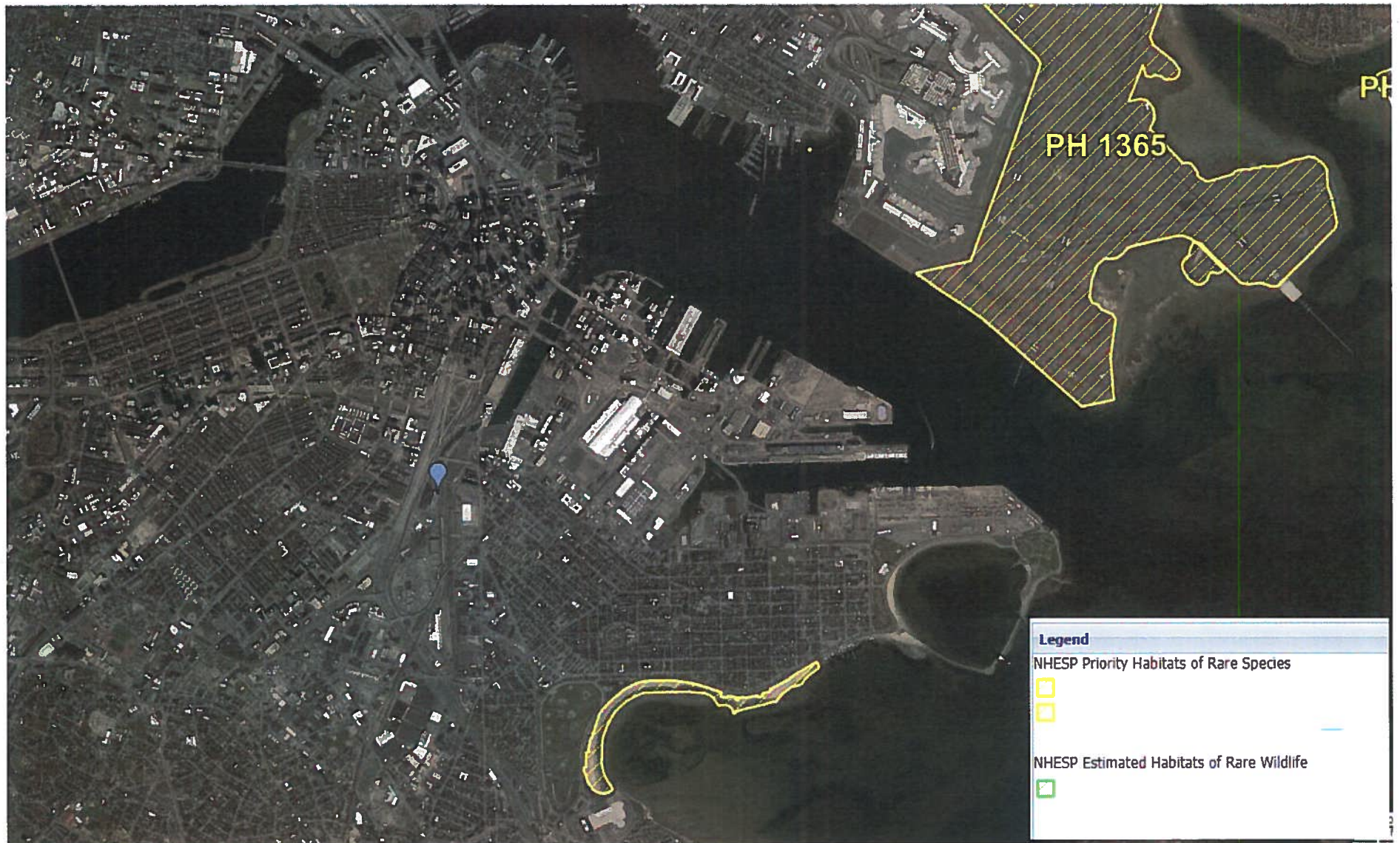
MassDEP Wetlands Detailed with Outlines

Mapped with OLIVER: MassGIS's Online Mapping Tool

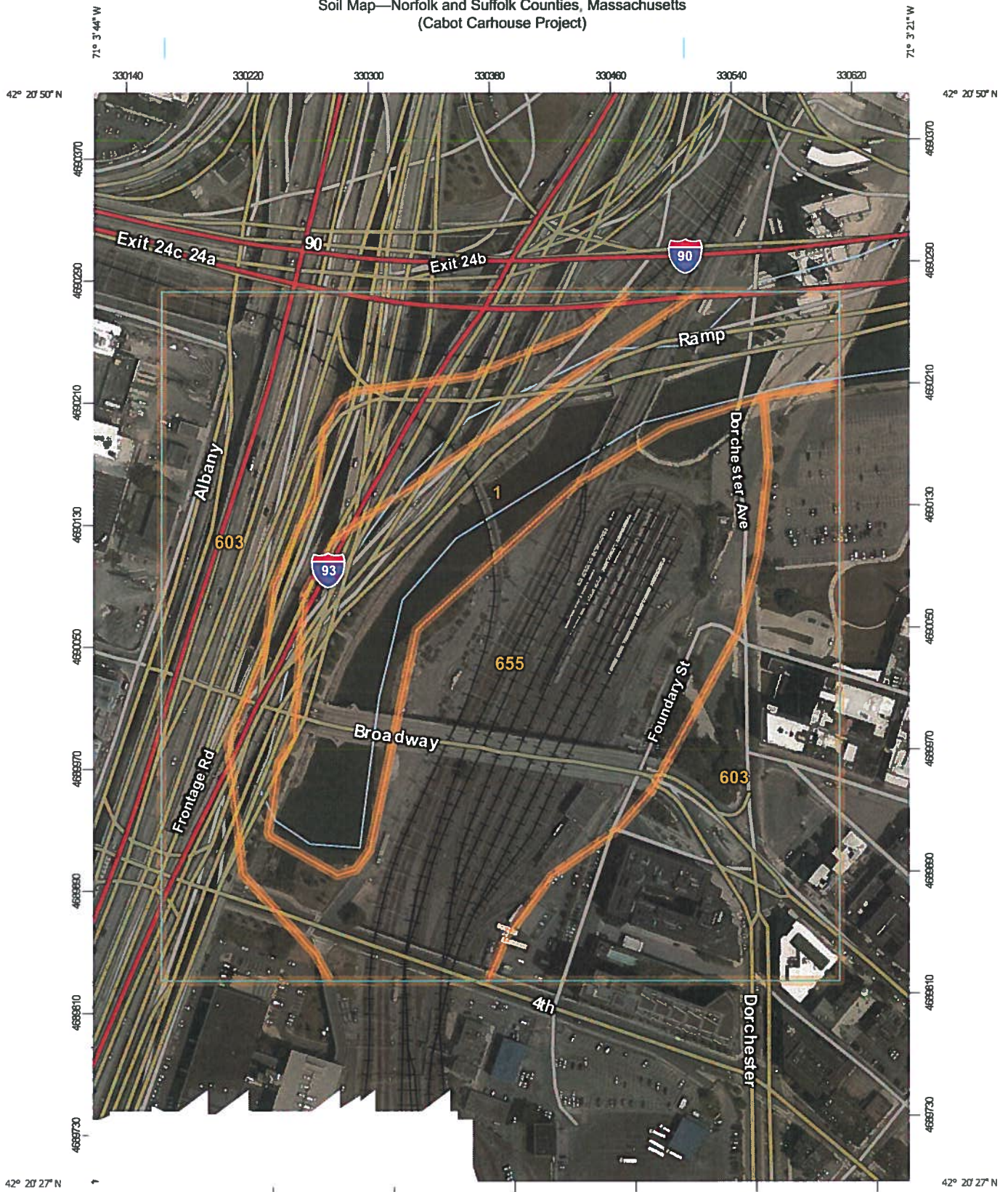


NHESP Estimated Habitats of Rare Wildlife and Priority Habitats of Rare Species

Mapped with OLIVER: MassGIS's Online Mapping Tool



Soil Map—Norfolk and Suffolk Counties, Massachusetts
(Cabot Carhouse Project)









































Map Scale: 1:3,480 if printed on a portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters

0 150 300 600 900 Feet

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

MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	Water Features
 Borrow Pit	 Streams and Canals
 Clay Spot	Transportation
 Closed Depression	 Rails
 Gravel Pit	 Interstate Highways
 Gravelly Spot	 US Routes
 Landfill	 Major Roads
 Lava Flow	 Local Roads
 Marsh or swamp	Background
 Mine or Quarry	 Aerial Photography
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 13, 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: Aug 10, 2014—Aug 11, 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
1	Water	9.2	18.3%
603	Urban land, wet substratum, 0 to 3 percent slopes	21.7	43.1%
655	Udorthents, wet substratum	19.4	38.6%
Totals for Area of Interest		50.3	100.0%

STORMWATER REPORT CHECKLIST



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

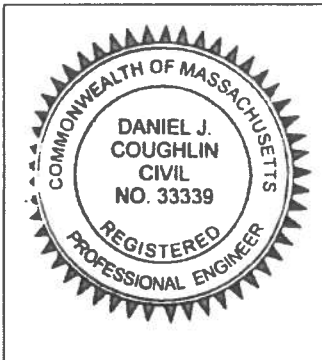
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Daniel J. Coughlin 10/29/18
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) *N/A*

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior* to the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas *N/A*

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
- Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has *not* been included in the Stormwater Report but will be submitted *before* land disturbance begins.
- The project is *not* covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

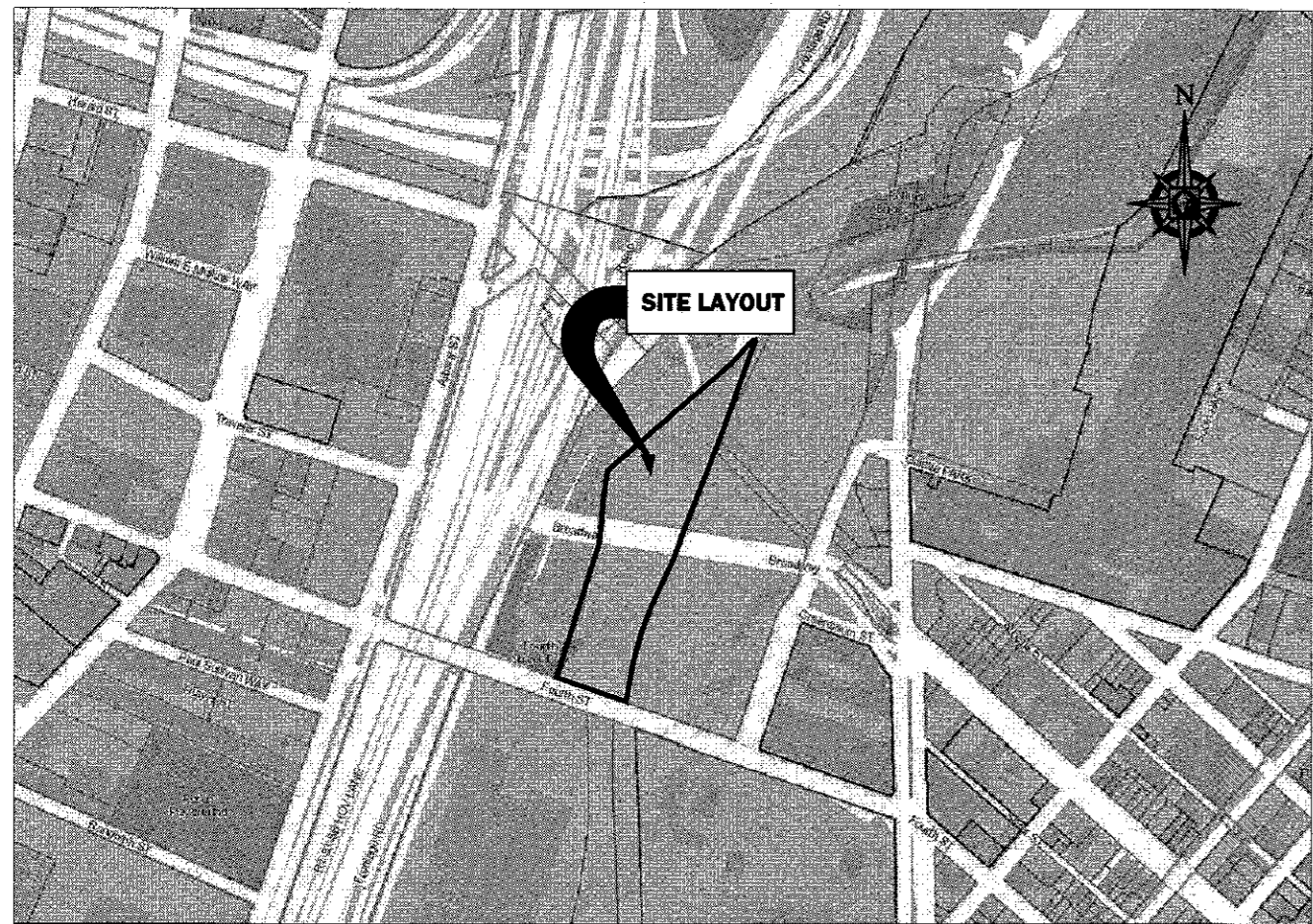
Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is *not* the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

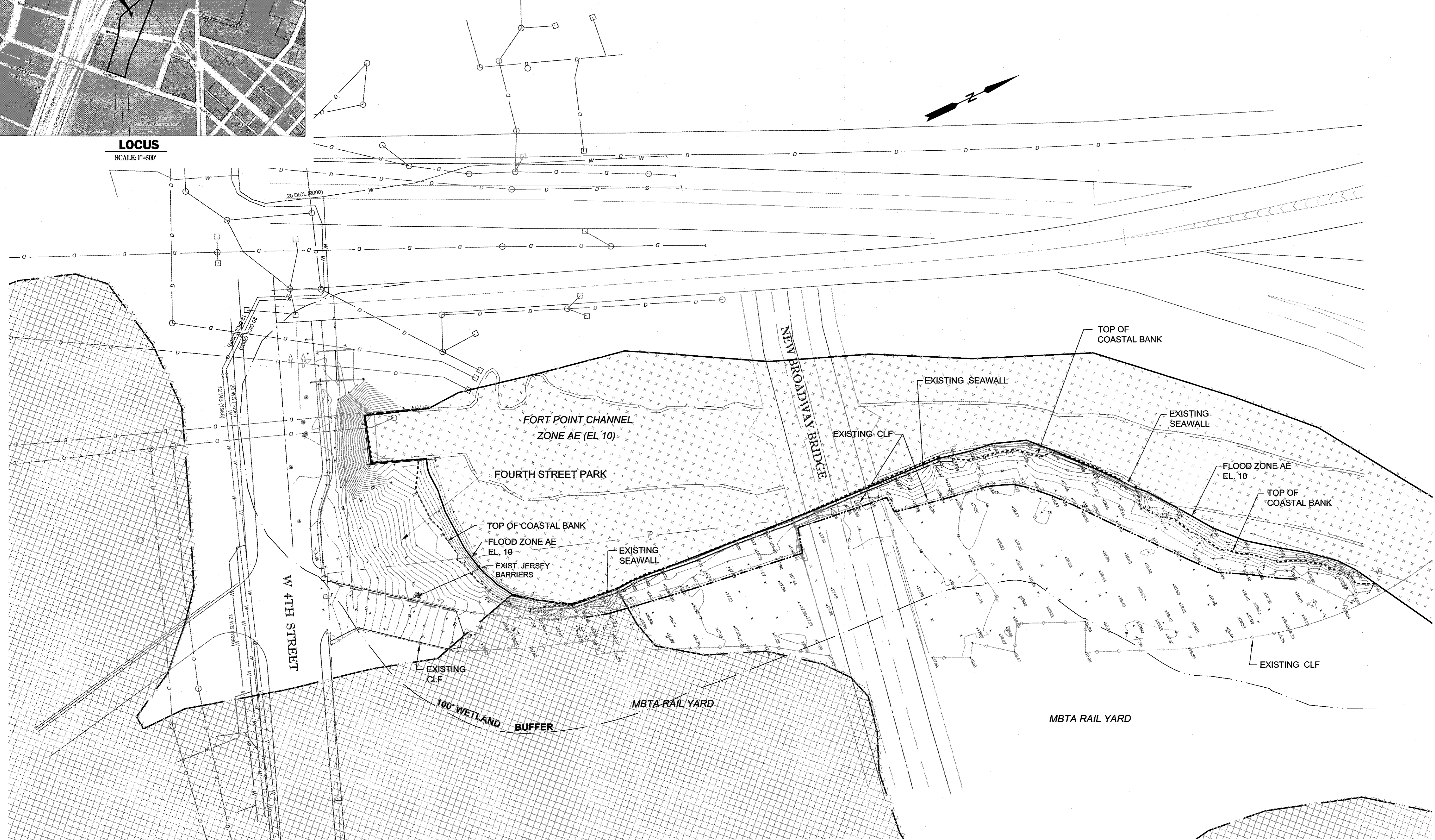
- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted *prior to* the discharge of any stormwater to post-construction BMPs.

PROJECT PLANS



LOCUS
SCALE: 1" = 500'

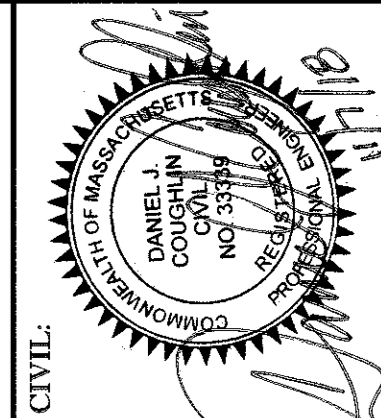
PARCEL ID: 060000 2000
 ADDRESS: 59 W. FOURTH STREET, 02127
 OWNER: MASS BAY TRANSPORTATION AUTHORITY



EXISTING SITE PLAN
1" = 40'

LEGEND

- TOP OF COASTAL BANK
- 100' WETLAND BUFFER
- CHAIN LINK FENCE
- FLOOD ZONE AE
- FLOOD ZONE X



REV.	DESCRIPTION	DATE

CABOT CARHOUSE EXISTING SITE

CABOT YARD CARHOUSE
 59 WEST 4TH STREET
 BOSTON, MA 02127

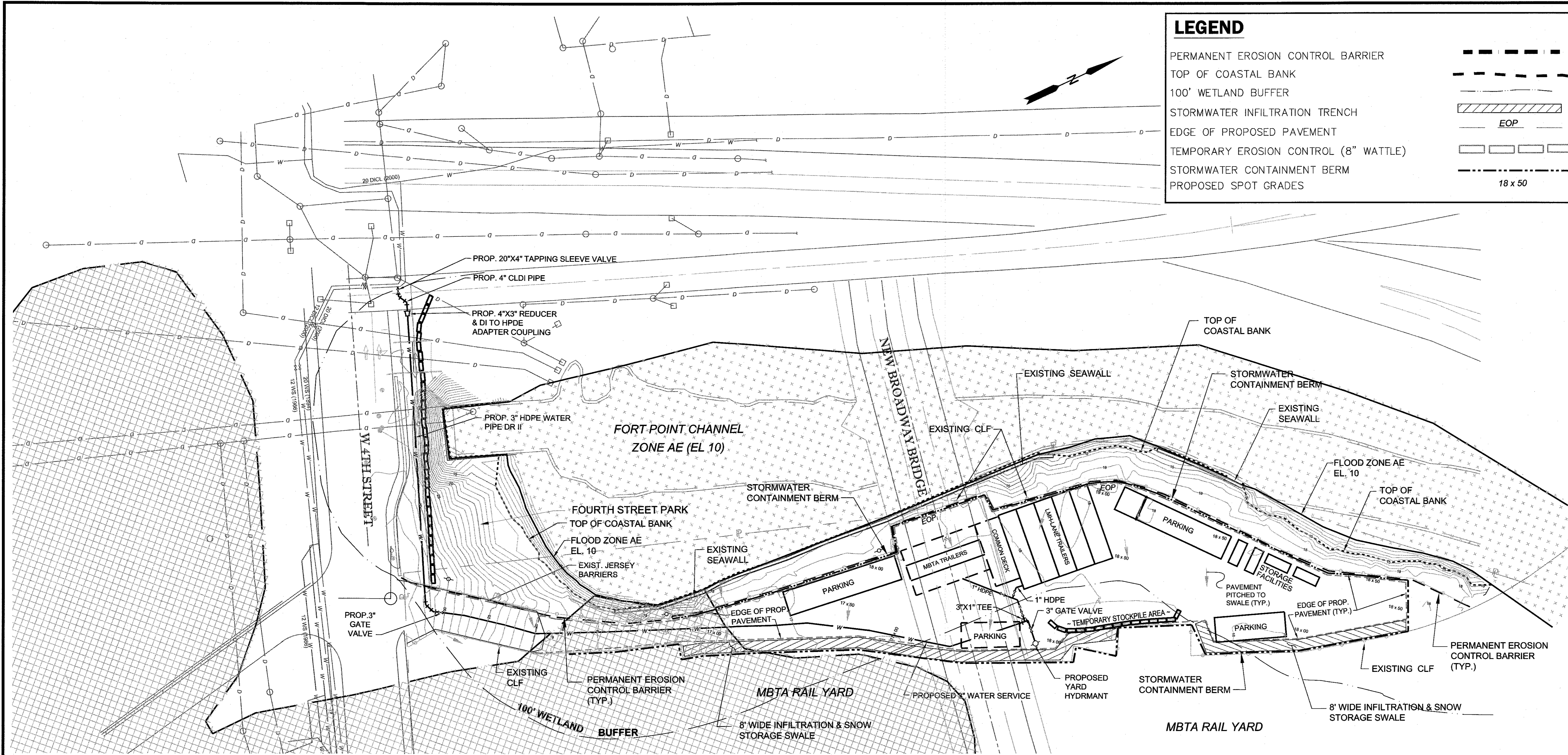
Prepared For
 MASSACHUSETTS BAY
 TRANSPORTATION AUTHORITY
 10 PARK PLAZA, SUITE 6720
 BOSTON, MA 02116

COUGHLIN ENVIRONMENTAL SERVICES, LLC

CONSULTING ENGINEERS AND PLANNERS

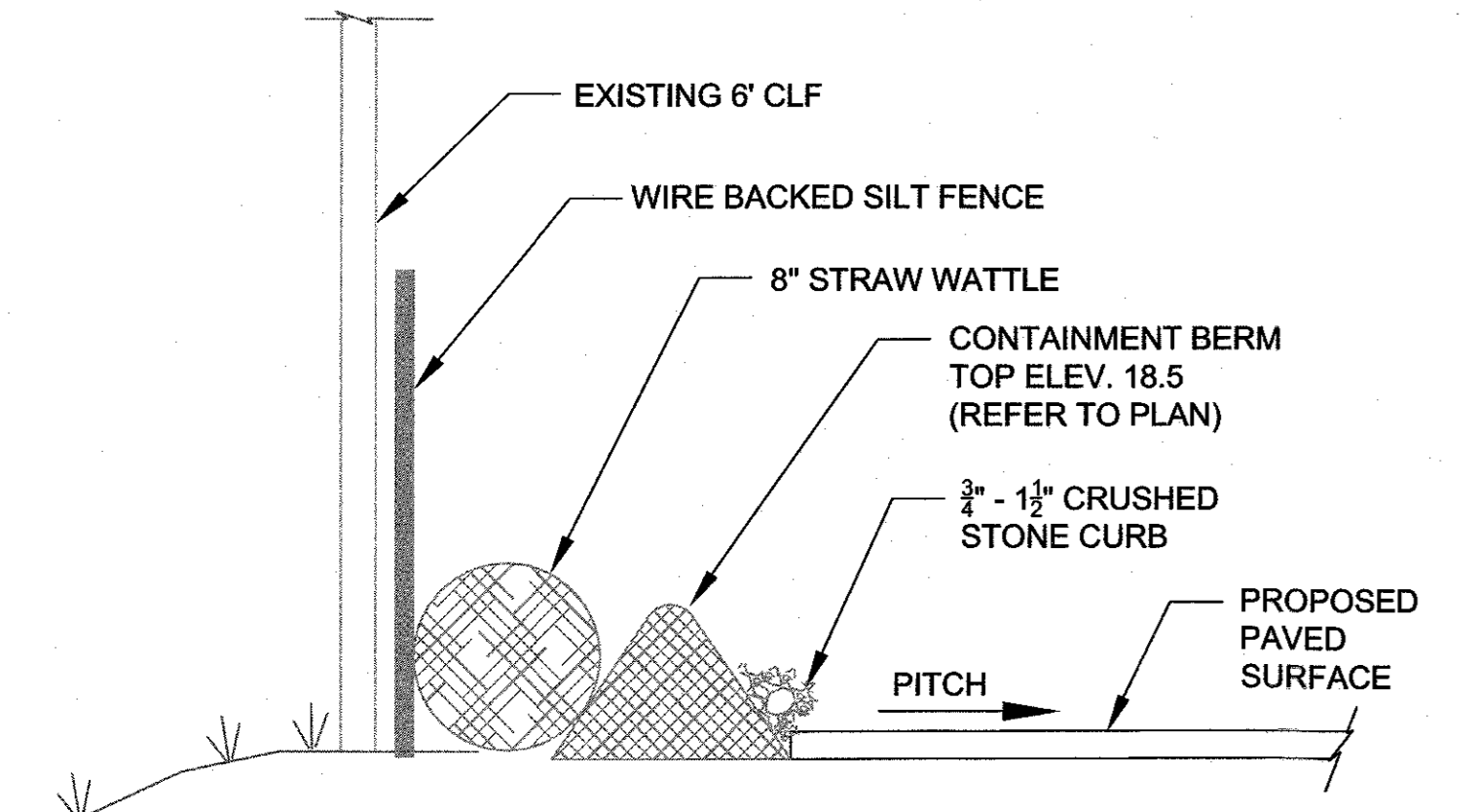
62 Montvale Avenue Stoneham, MA 02180-3637 Phone: (781) 832-1002
 Fax: (781) 438-9654
 Email: mail@coughlinenvironmental.com

VERTICAL DATUM: NAVD 88

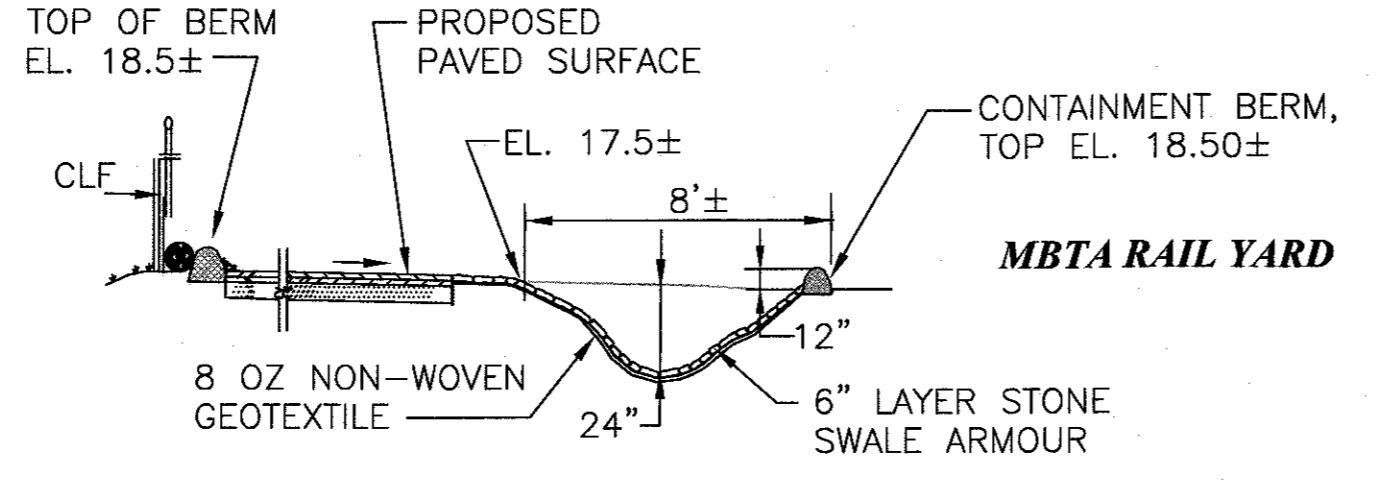


PROPOSED SITE PLAN
1" = 40'

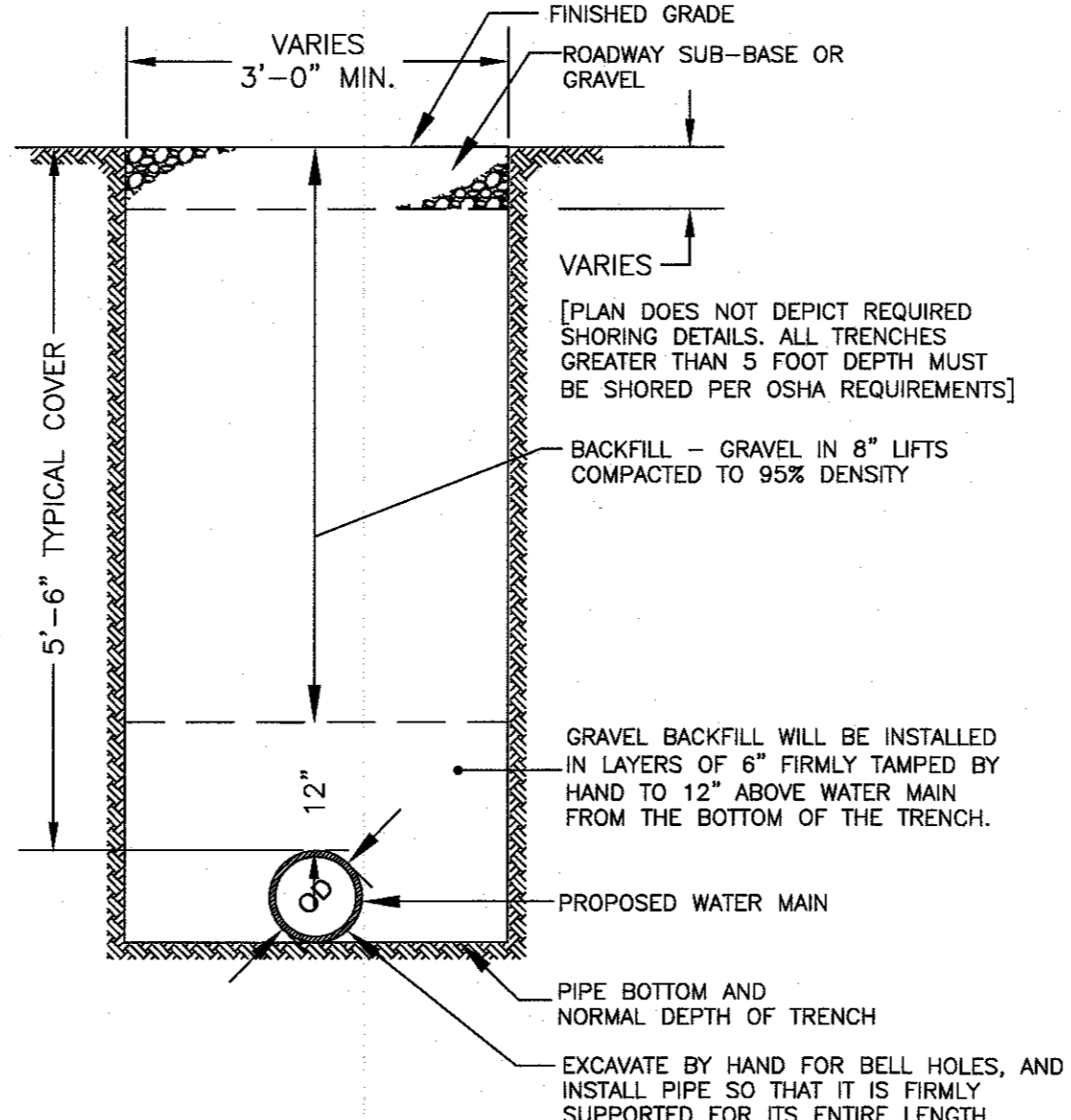
- NOTES:**
- CONCRETE THRUST BLOCK TO BE USED ONLY WHERE IT WILL BEAR ON UNDISTURBED EARTH
 - USE RESTRAINED JOINT FITTINGS OR TIE RODS WHERE CONCRETE THRUST BLOCK IS UNACCEPTABLE
 - SIZE OF BLOCK OR MEGALUG TO BE DESIGNED FOR SPECIFIC CONDITIONS



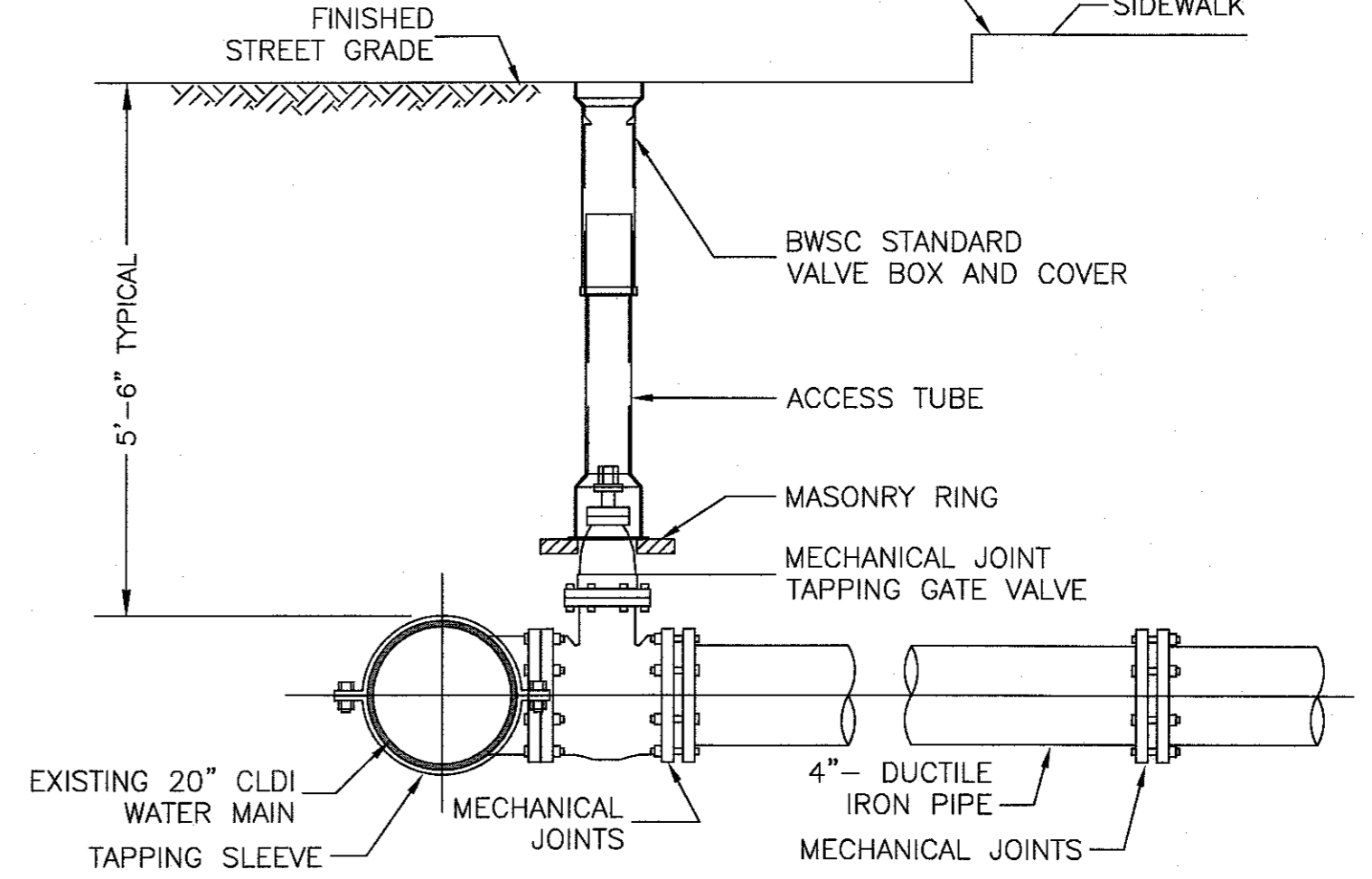
PERMANENT EROSION CONTROL
N.T.S.



TYPICAL INFILTRATION TRENCH
N.T.S.



TYPICAL TRENCH DETAIL OF WATER MAIN IN FIRM GROUND
NOT TO SCALE



TYPICAL WATER PIPE CONNECTION WITH TAPPING SLEEVE AND GATE VALVE MAIN
NOT TO SCALE

NOTE:
1. EARTHEN CONTAINMENT BERM TO BE CONSTRUCTED WITH EXCAVATION MATERIAL & GRAVEL FROM PROPOSED SWALE TO EFFECTUATE A ZERO-NET CUT/FILL FOR SITE. EXISTING STONE FROM LOT SURFACE TO BE STOCKPILED FOR MBTA FUTURE USES IN TEMPORARY STOCK PILE AREA SO THAT PAVING DOES NOT CONSTITUTE FILLING WITHIN FLOOD ZONE AREAS.

VERTICAL DATUM: NAVD 88

CHK:	DJC
DSG:	GML
DRW:	EA
REV:	DESCRIPTION

CABOT CARHOUSE
PROPOSED TEMPORARY STAGING AREA

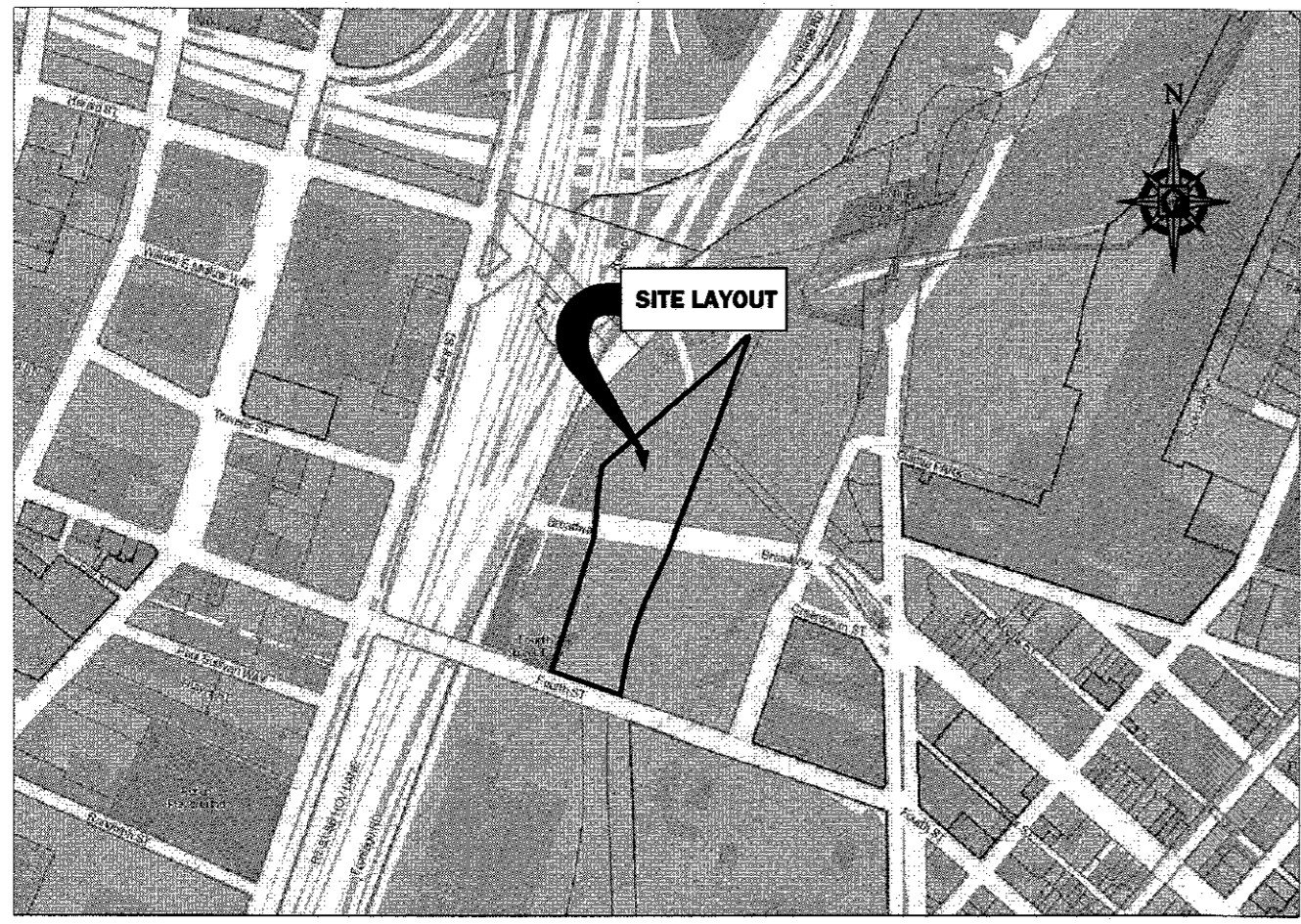
CABOT YARD CARHOUSE
59 WEST 4TH STREET
BOSTON, MA 02127

Prepared For
MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
10 PARK PLAZA, SUITE 6720
BOSTON, MA 02116

COUGHLIN ENVIRONMENTAL SERVICES, LLC
CONSULTING ENGINEERS AND PLANNERS

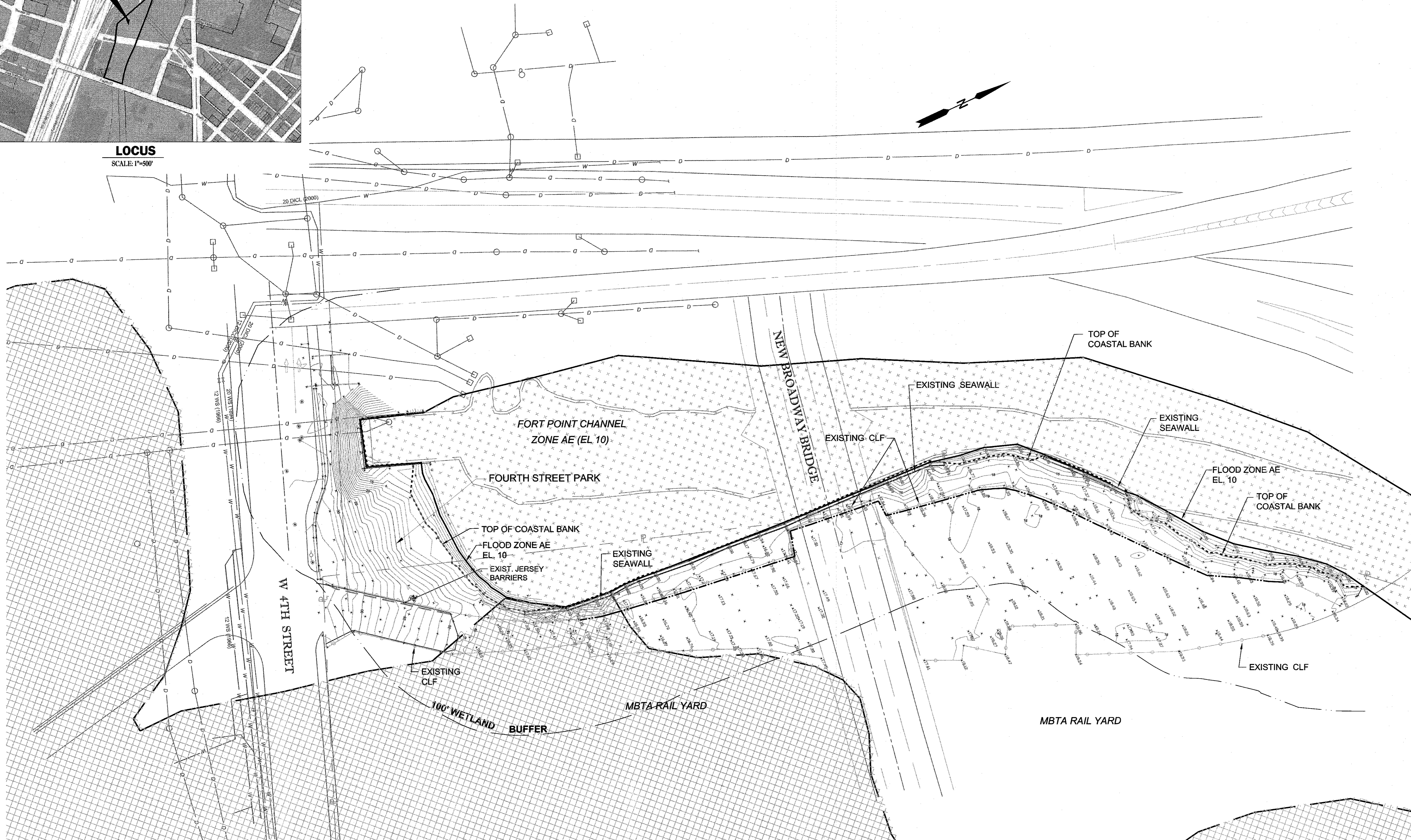
62 Montvale Avenue
Stoneham, MA 02180-3637
Email: mail@coughlinenvironmental.com

Phone: (781) 832-1002
Fax: (781) 438-9654



LOCUS
SCALE: 1" = 500'

PARCEL ID: 060000 2000
ADDRESS: 59 W. FOURTH STREET, 02127
OWNER: MASS BAY TRANSPORTATION AUTHORITY

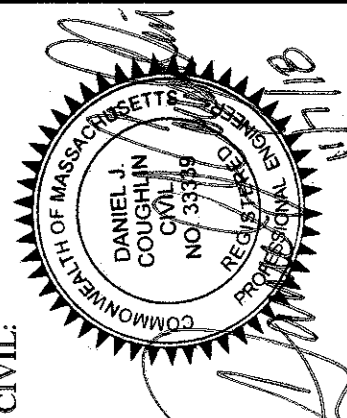


EXISTING SITE PLAN
1" = 40'

LEGEND

- TOP OF COASTAL BANK
- 100' WETLAND BUFFER
- CHAIN LINK FENCE
- FLOOD ZONE AE
- FLOOD ZONE X

VERTICAL DATUM: NAVD 88



REV.	DESCRIPTION	DATE

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CABOT YARD CARHOUSE
59 WEST 4th STREET
BOSTON, MA 02127

Prepared For

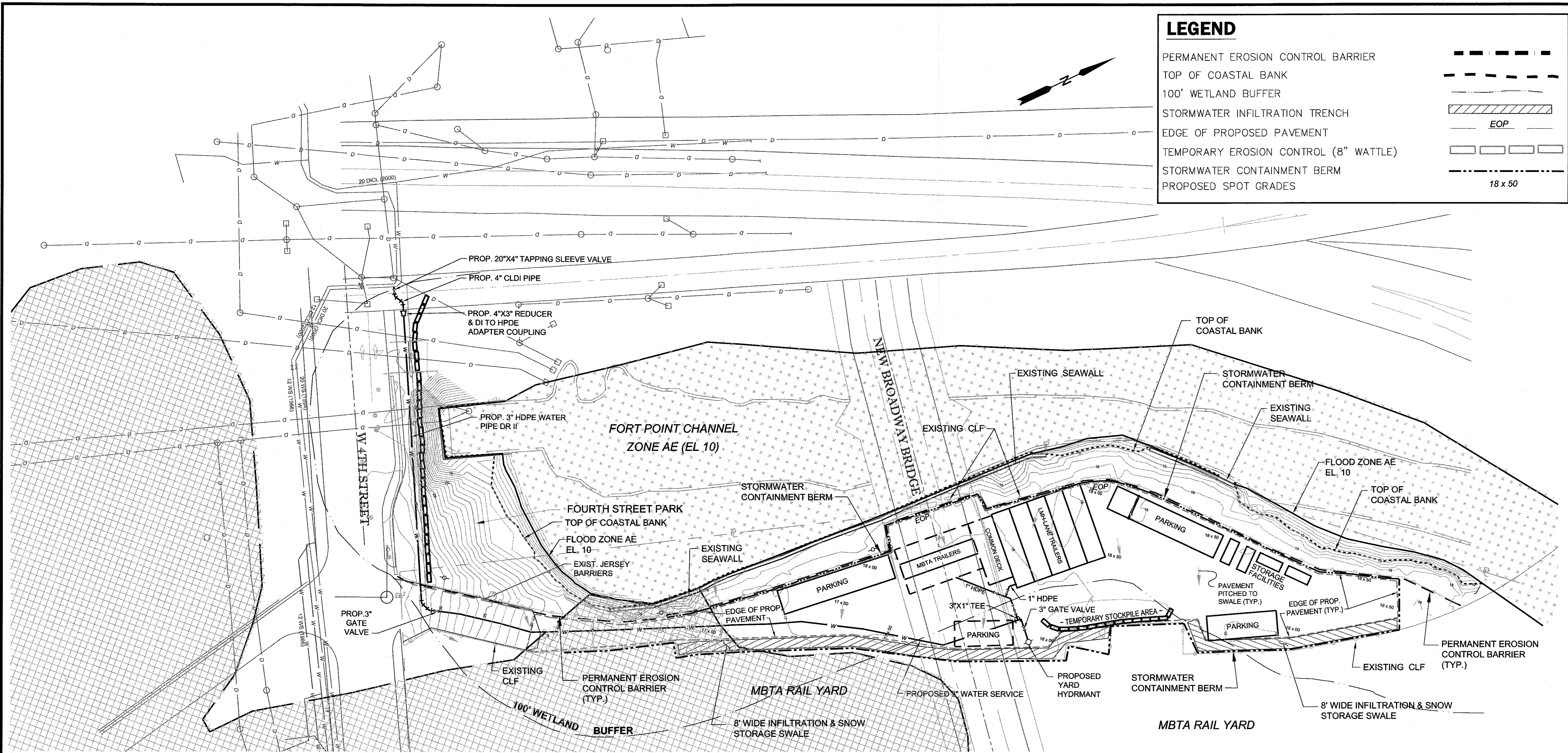
MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
10 PARK PLAZA, SUITE 6720
BOSTON, MA 02116



CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue Phone: (781) 832-1002
Stoneham, MA 02180-3637 Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

DATE: SEPTEMBER 2018
Q:\Projects\2590-09 LMHC Cabot Yard Site facilities\CAD\Cabot Office Yard NAVD 88.dwg
CES NO. 2590-09 SCALE: 1" = 40'

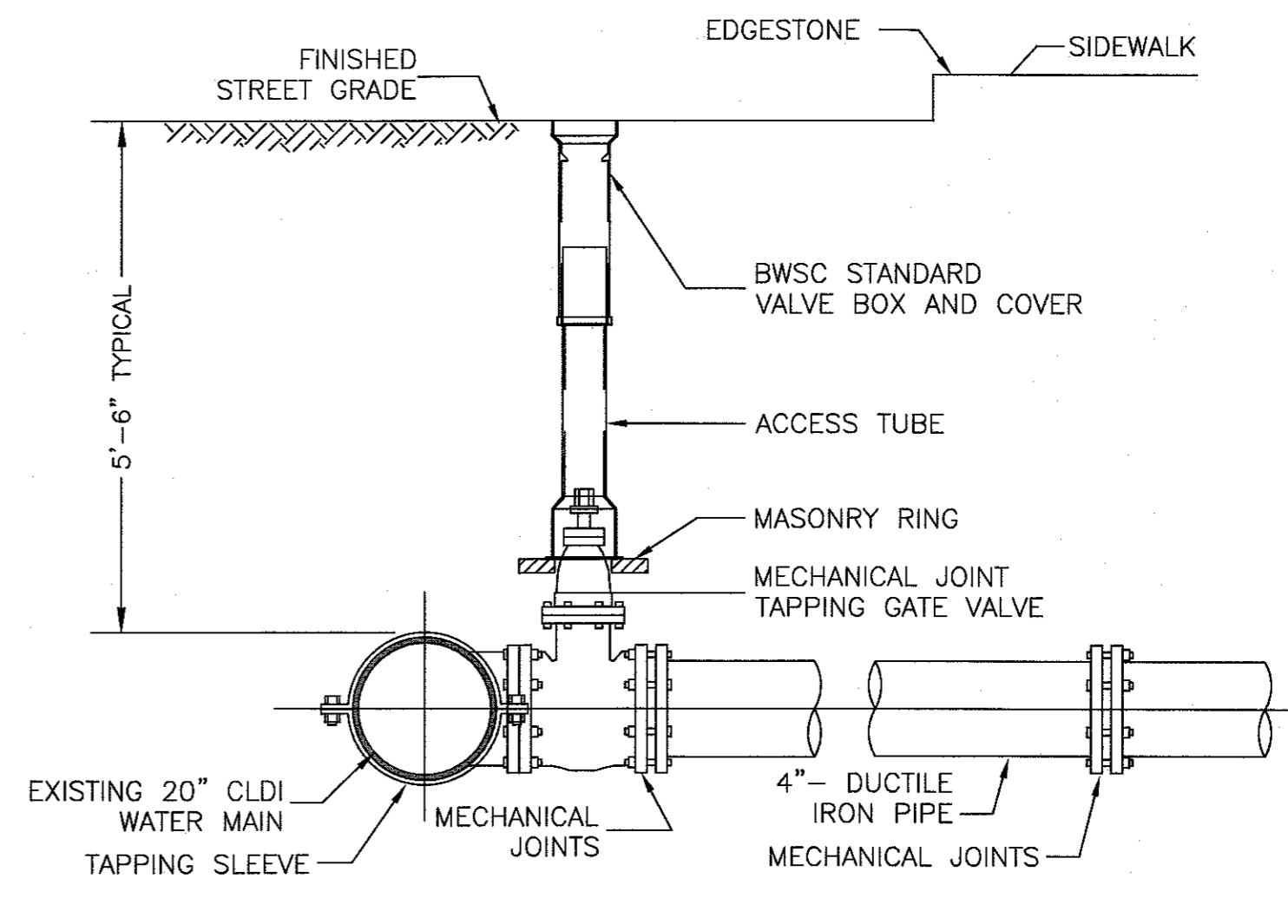
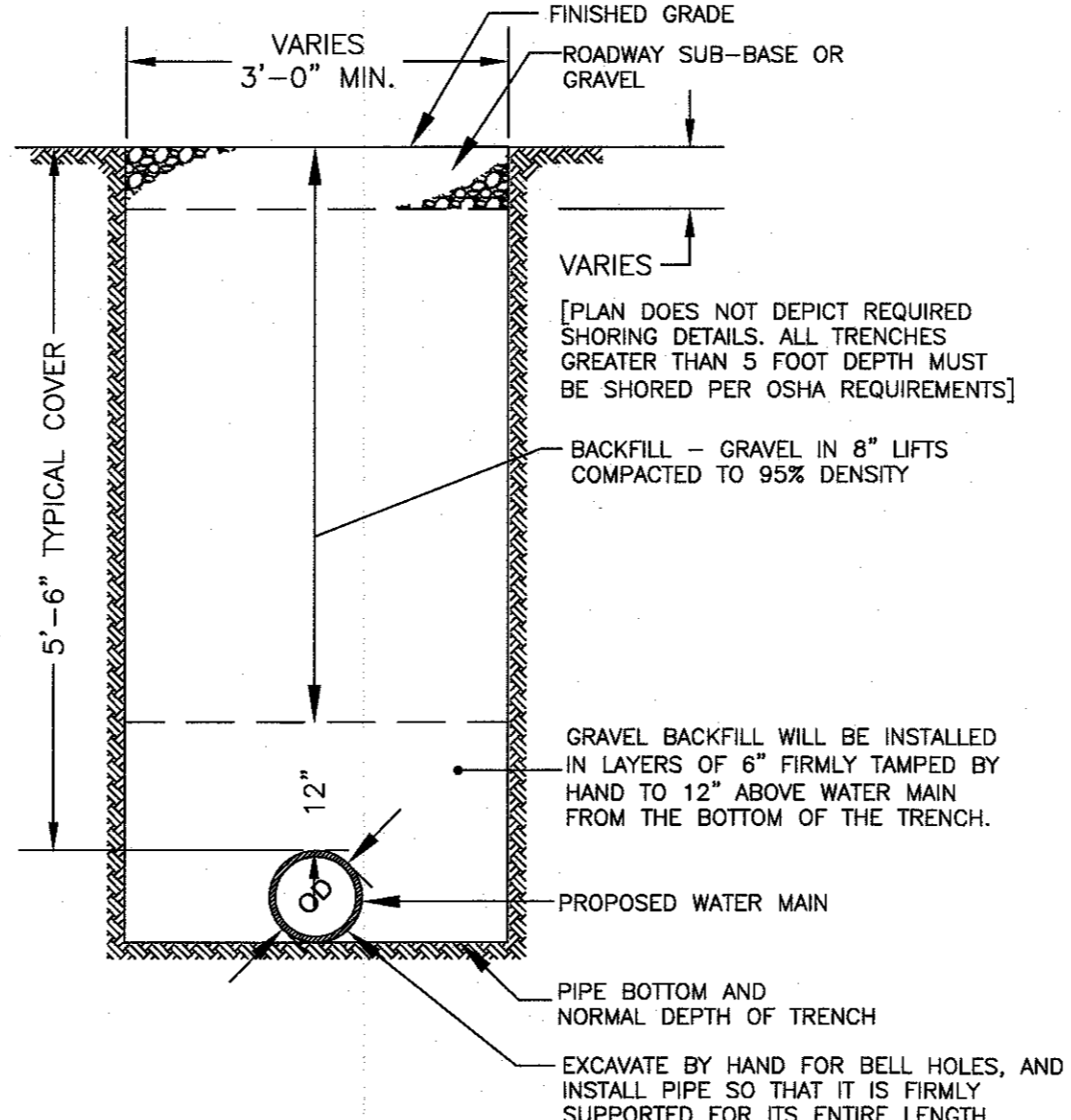
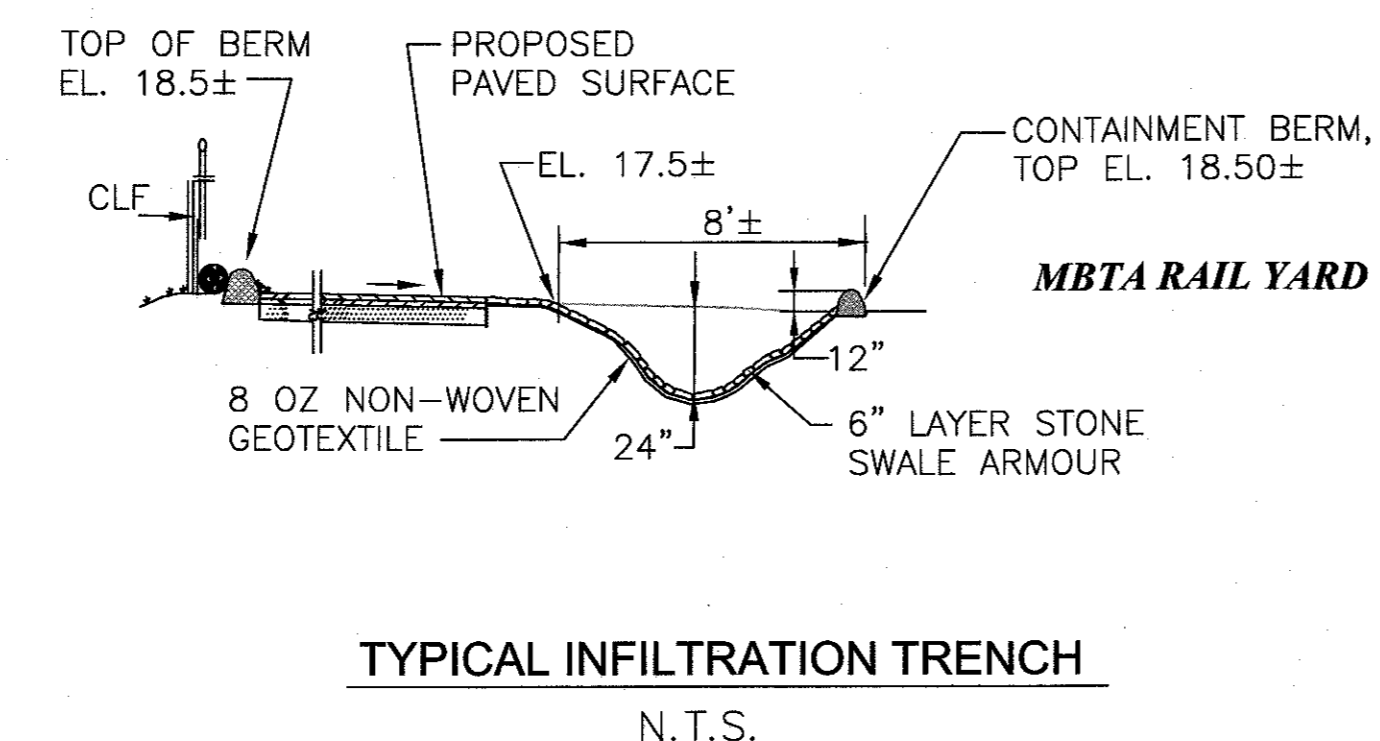
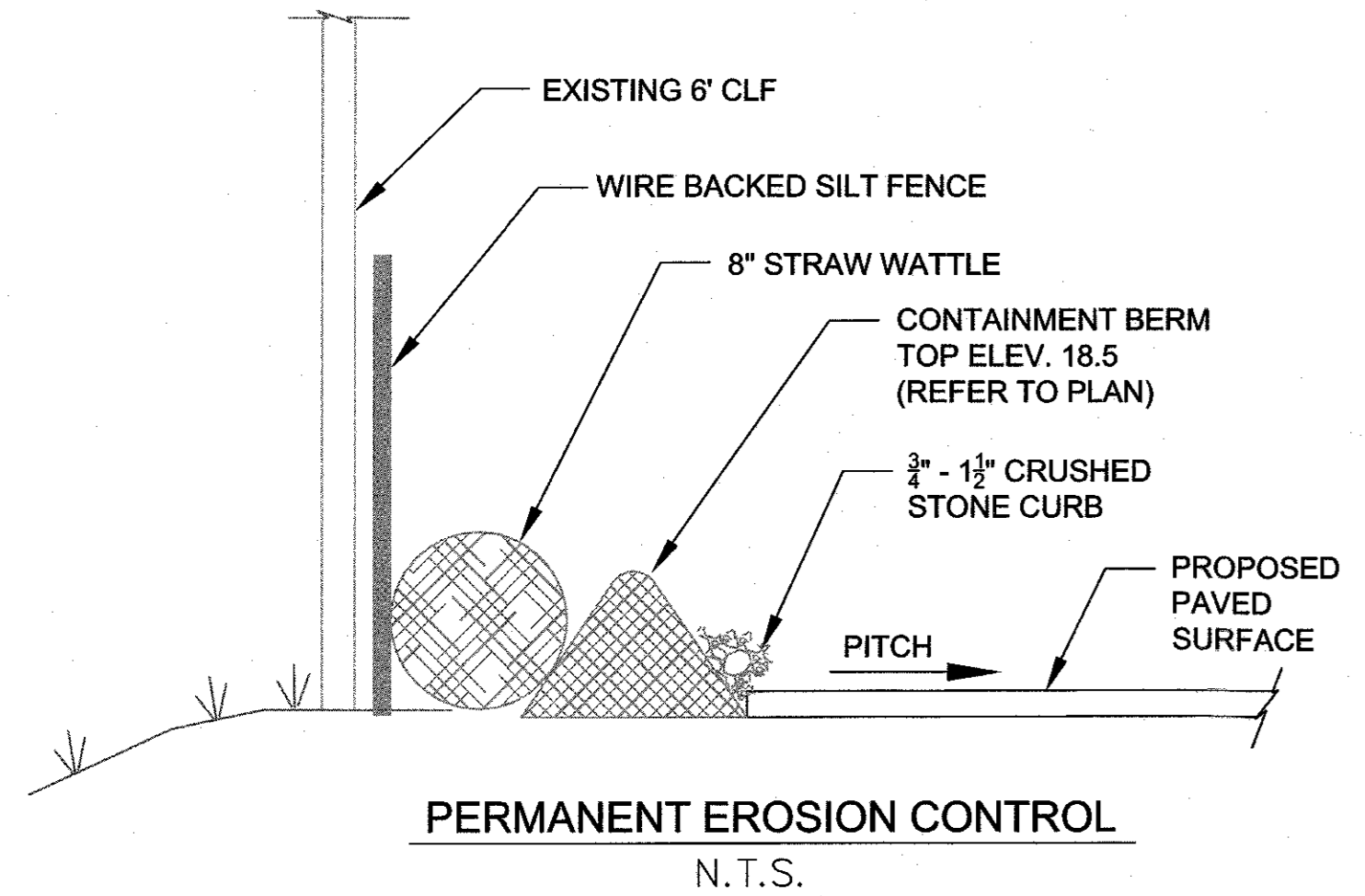


PROPOSED SITE PLAN

1" = 40'

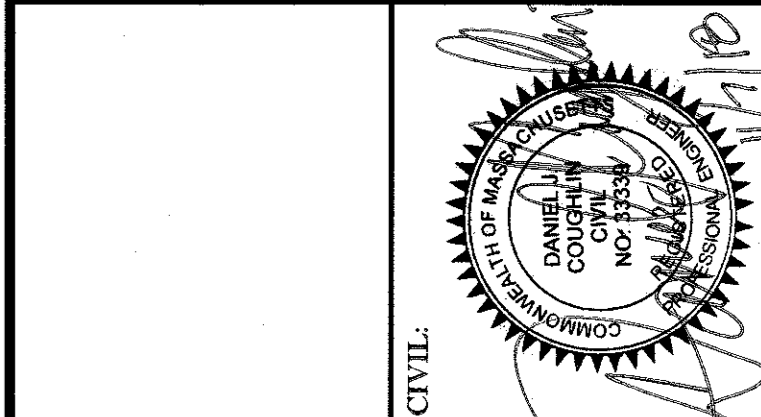
NOTES:

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VERTICAL DATUM: NAVD 88



CHK: DJC		DATE
DSG: GML		DESCRIPTION
DRW: EA		REV.

**CABOT CARHOUSE
PROPOSED TEMPORARY STAGING AREA**

CABOT YARD CARHOUSE
59 WEST 4th STREET
BOSTON, MA 02127

Prepared For
MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
10 PARK PLAZA, SUITE 6720
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CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue Stoneham, MA 02180-3637 Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

**STORMWATER REPORT
For
CABOT CAR HOUSE STAGING AREA**

**Located at
MBTA Cabot Car House Yard
WEST FOURTH STREET
BOSTON, MA 02127**

**Submitted to:
CITY OF BOSTON
CONSERVATION COMMISSION**

**Prepared for:
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
10 Park Plaza, Boston, MA 02116**

**Represented by:
LMH-LANE CABOT YARD JOINT VENTURE
100 Hancock St, Suite 901, Quincy, MA, 02171**



NOVEMBER 2018

Prepared by



CONSULTING ENGINEERS AND PLANNERS

STORMWATER REPORT CHECKLIST



Checklist for Stormwater Report

A. Introduction

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

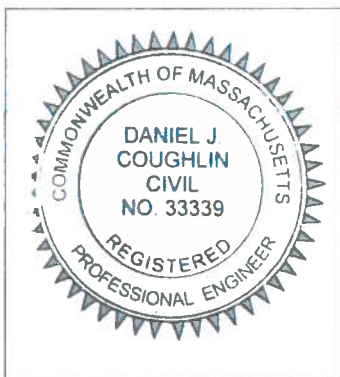
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Daniel J. Coughlin 10/29/18
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) **N/A**

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior** to the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas **N/A**

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has *not* been included in the Stormwater Report but will be submitted *before* land disturbance begins.
- The project is *not* covered by a NPDES Construction General Permit.
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Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
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 - Plan showing the location of all stormwater BMPs maintenance access areas;
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- The responsible party is *not* the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted *prior to* the discharge of any stormwater to post-construction BMPs.

**NATIONAL OCEANIC AND ATMOSPHERIC
ADMINISTRATION POINT PRECIPITATION
FREQUENCY ESTIMATE**



NOAA Atlas 14, Volume 10, Version 2
 Location name: South Boston, Massachusetts,
 USA*
 Latitude: 42.3439°, Longitude: -71.0599°
 Elevation: 11.54 ft**
 * source ESRI Maps
 ** source USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sarja Perica Sandra Pavlovic, Michael St Laurent, Carl Trypaluk Dale Unruh Orian Wilhite

NOAA, National Weather Service Silver Spring Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aeriels](#)

PF tabular

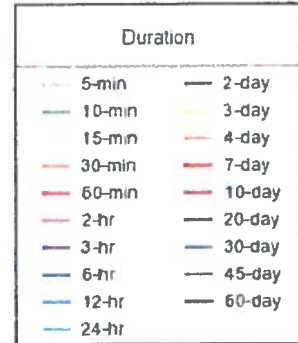
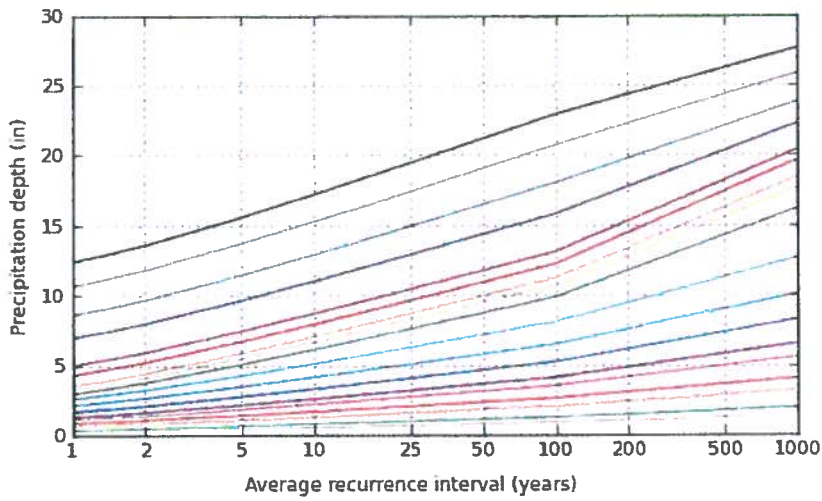
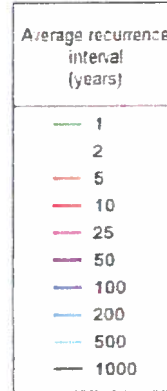
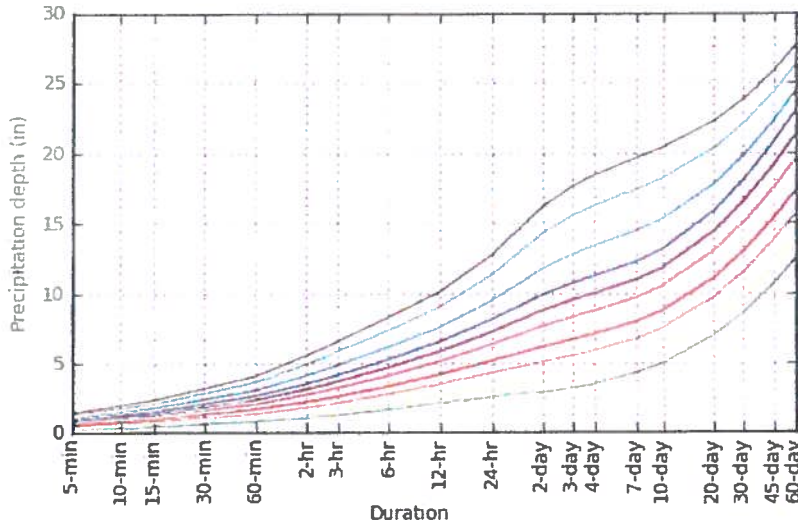
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.299 (0.245-0.365)	0.370 (0.302-0.452)	0.485 (0.395-0.595)	0.581 (0.470-0.718)	0.713 (0.555-0.935)	0.815 (0.619-1.10)	0.916 (0.673-1.30)	1.06 (0.723-1.54)	1.25 (0.814-1.89)	1.40 (0.883-2.16)
10-min	0.424 (0.347-0.517)	0.524 (0.429-0.640)	0.688 (0.560-0.843)	0.823 (0.666-1.02)	1.01 (0.786-1.33)	1.15 (0.877-1.56)	1.30 (0.954-1.84)	1.50 (1.02-2.17)	1.77 (1.15-2.68)	1.98 (1.25-3.06)
15-min	0.499 (0.408-0.608)	0.616 (0.504-0.753)	0.809 (0.659-0.992)	0.969 (0.783-1.20)	1.19 (0.925-1.56)	1.36 (1.03-1.83)	1.53 (1.12-2.17)	1.77 (1.21-2.56)	2.09 (1.36-3.15)	2.33 (1.47-3.60)
30-min	0.676 (0.554-0.825)	0.837 (0.685-1.02)	1.10 (0.896-1.35)	1.32 (1.07-1.63)	1.62 (1.26-2.12)	1.85 (1.41-2.50)	2.08 (1.53-2.95)	2.41 (1.65-3.49)	2.85 (1.86-4.31)	3.18 (2.01-4.92)
60-min	0.854 (0.700-1.04)	1.06 (0.865-1.29)	1.39 (1.13-1.71)	1.67 (1.35-2.06)	2.05 (1.60-2.69)	2.34 (1.78-3.16)	2.64 (1.94-3.74)	3.06 (2.09-4.43)	3.62 (2.35-5.46)	4.04 (2.56-6.25)
2-hr	1.10 (0.907-1.33)	1.38 (1.13-1.67)	1.83 (1.50-2.23)	2.21 (1.80-2.71)	2.72 (2.13-3.56)	3.12 (2.39-4.20)	3.52 (2.61-4.98)	4.13 (2.83-5.93)	4.93 (3.22-7.38)	5.54 (3.52-8.48)
3-hr	1.28 (1.06-1.55)	1.61 (1.33-1.94)	2.14 (1.76-2.59)	2.58 (2.11-3.15)	3.18 (2.51-4.14)	3.65 (2.81-4.89)	4.12 (3.07-5.81)	4.84 (3.32-6.91)	5.80 (3.79-8.62)	6.53 (4.15-9.92)
6-hr	1.67 (1.39-2.01)	2.08 (1.73-2.50)	2.75 (2.28-3.32)	3.31 (2.72-4.01)	4.07 (3.22-5.25)	4.66 (3.60-6.18)	5.25 (3.93-7.33)	6.16 (4.24-8.69)	7.35 (4.82-10.8)	8.26 (5.27-12.4)
12-hr	2.16 (1.81-2.57)	2.66 (2.23-3.17)	3.48 (2.90-4.16)	4.16 (3.44-5.01)	5.09 (4.05-6.50)	5.81 (4.51-7.62)	6.53 (4.89-8.99)	7.60 (5.26-10.6)	9.01 (5.93-13.1)	10.1 (6.45-15.0)
24-hr	2.61 (2.20-3.09)	3.24 (2.73-3.83)	4.26 (3.58-5.07)	5.11 (4.26-6.12)	6.29 (5.03-7.97)	7.19 (5.62-9.37)	8.09 (6.11-11.1)	9.47 (6.58-13.1)	11.3 (7.47-16.3)	12.7 (8.14-18.6)
2-day	2.96 (2.52-3.48)	3.75 (3.19-4.42)	5.05 (4.27-5.96)	6.12 (5.14-7.28)	7.60 (6.14-9.60)	8.74 (6.89-11.4)	9.88 (7.55-13.5)	11.8 (8.20-16.1)	14.3 (9.46-20.3)	16.2 (10.4-23.5)
3-day	3.25 (2.77-3.80)	4.10 (3.50-4.81)	5.50 (4.67-6.47)	6.66 (5.61-7.88)	8.25 (6.69-10.4)	9.48 (7.51-12.3)	10.7 (8.22-14.6)	12.8 (8.93-17.4)	15.6 (10.3-22.0)	17.6 (11.4-25.4)
4-day	3.52 (3.02-4.11)	4.40 (3.76-5.14)	5.84 (4.97-6.85)	7.04 (5.94-8.30)	8.68 (7.05-10.9)	9.94 (7.89-12.8)	11.2 (8.62-15.2)	13.4 (9.35-18.1)	16.2 (10.8-22.9)	18.4 (11.9-26.4)
7-day	4.27 (3.68-4.96)	5.18 (4.45-6.02)	6.67 (5.71-7.77)	7.90 (6.71-9.26)	9.60 (7.84-11.9)	10.9 (8.69-13.9)	12.2 (9.42-16.4)	14.4 (10.1-19.4)	17.4 (11.6-24.2)	19.6 (12.7-27.9)
10-day	4.96 (4.29-5.73)	5.89 (5.08-6.82)	7.41 (6.37-8.61)	8.68 (7.39-10.1)	10.4 (8.52-12.8)	11.8 (9.37-14.9)	13.1 (10.1-17.4)	15.3 (10.8-20.4)	18.2 (12.2-25.2)	20.4 (13.2-28.8)
20-day	6.94 (6.04-7.97)	7.96 (6.91-9.14)	9.62 (8.32-11.1)	11.0 (9.43-12.8)	12.9 (10.6-15.6)	14.4 (11.4-17.8)	15.8 (12.1-20.4)	17.8 (12.6-23.4)	20.3 (13.7-27.8)	22.3 (14.5-31.1)
30-day	8.58 (7.49-9.80)	9.66 (8.43-11.1)	11.4 (9.93-13.1)	12.9 (11.1-14.9)	14.9 (12.3-17.9)	16.5 (13.1-20.2)	18.0 (13.7-22.9)	19.8 (14.1-25.9)	22.1 (14.9-29.9)	23.8 (15.5-33.0)
45-day	10.6 (9.32-12.1)	11.8 (10.3-13.4)	13.7 (11.9-15.6)	15.2 (13.2-17.5)	17.4 (14.3-20.7)	19.1 (15.2-23.1)	20.7 (15.7-25.9)	22.3 (15.9-28.9)	24.3 (16.5-32.7)	25.8 (16.9-35.6)
60-day	12.4 (10.9-14.0)	13.6 (11.9-15.4)	15.6 (13.6-17.7)	17.2 (14.9-19.7)	19.4 (16.0-23.0)	21.2 (16.9-25.5)	22.9 (17.3-28.4)	24.3 (17.5-31.5)	26.2 (17.8-35.1)	27.6 (18.1-37.9)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

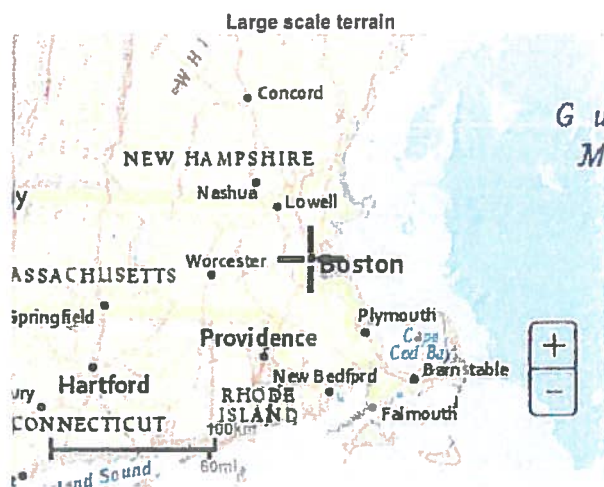
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PF graphical

PDS-based depth-duration-frequency (DDF) curves
 Latitude: 42.3439°, Longitude: -71.0599°



Maps & aeriels



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring MD 20910
Questions? HDSC_Questions@noaa.gov

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**HYDRAFLOW HYDROGRAPHS
PRESENT CONDITIONS**

Worksheet 2: Runoff curve number and runoff

Project Carbot Yard Carhouse Renovation	By JMM	Date 10/23/18
Location Subcatchment A: Paved Ramp	Checked DJC	Date 10/23/18

Check one: Present Developed

1 Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Paved	98			100	9800

^{1/} Use only one CN source per line

Totals ➔ **100** **9800**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{9800}{100} = 98$; Use CN ➔ **98**

2. Runoff

	Storm #1	Storm #2	Storm #3		
Frequency	2	10	25	50	100
Rainfall, P (24-hour)	3.24	5.11	6.29	7.19	8.09
Runoff, Q	3.01	4.87	6.05	6.95	7.85

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment B: Gravel Area 1	Checked DJC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Gravel	87			100	8700

^{1/} Use only one CN source per line

Totals ➡ **100** **8700**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8700}{100} = 87$; Use CN ➡ **87**

2. Runoff

		Storm #1		Storm #2		Storm #3
Frequency	yr	2	10	25	50	100
Rainfall, P (24-hour)	in	3.24	5.11	6.29	7.19	8.09
Runoff, Q	in	1.95	3.67	4.80	5.66	6.54

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovation	By JMM	Date 10/23/18
Location Subcatchment C: Gravel Area 2	Checked DJC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Gravel	87			100	8700

^{1/} Use only one CN source per line

Totals ➔ **100** **8700**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8700}{100} = 87$; **Use CN** ➔ **87**

2. Runoff

	Storm #1		Storm #2		Storm #3
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	1.95	3.67	4.80	5.66	6.54

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project <i>Cabot Yard Carhouse</i>	By <i>JMM</i>	Date <i>10/23/18</i>
Location <i>Subcatchment D: Vegetated Area 1</i>	Checked <i>DJC</i>	Date <i>10/23/18</i>

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
<i>Group B-C</i>	<i>Brush, fair</i>	<i>63</i>			<i>100</i>	<i>6300</i>

^{1/} Use only one CN source per line

Totals ➔ **100** **6300**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{6300}{100} = 63$$
 ; **Use CN** ➔ *63*

2. Runoff

	Storm #1	Storm #2	Storm #3		
Frequency yr	<i>2</i>	<i>10</i>	<i>25</i>	<i>50</i>	<i>100</i>
Rainfall, P (24-hour) in	<i>3.24</i>	<i>5.11</i>	<i>6.29</i>	<i>7.19</i>	<i>8.09</i>
Runoff, Q in	<i>0.54</i>	<i>1.58</i>	<i>2.38</i>	<i>3.04</i>	<i>3.74</i>

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovation	By JMM	Date 10/23/18
Location Subcatchment E: Vegetated Area 2	Checked DJC	Date 10/23/18

Check one: Present Developed

1 Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Brush, fair	63			100	6300

^{1/} Use only one CN source per line

Totals ➔ **100 6300**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{6300}{100} = 63$; **Use CN** ➔ 63

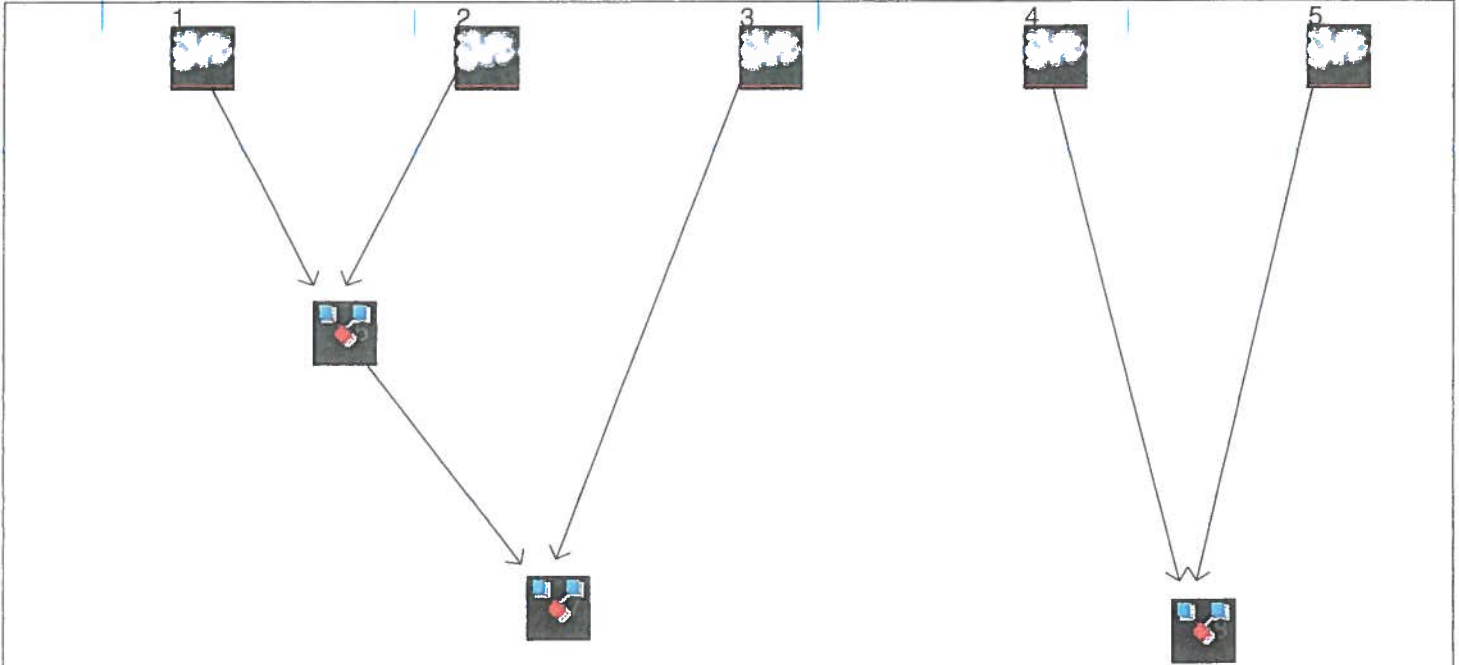
2. Runoff

	Storm #1		Storm #2		Storm #3
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	0.54	1.58	2.38	3.04	3.74

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.2



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff A. Paved Ramp
2	SCS Runoff B. Gravel Area 1
3	SCS Runoff C. Gravel Area 2
4	SCS Runoff D. Vegetated Area 1
5	SCS Runoff E. Vegetated Area 2
6	Combine Ramp and Gravel
7	Combine All Gravel Area
8	Combine Exist. Discharge to Channel

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	0.262	-----	-----	0.416	0.514	0.588	0.662	A. Paved Ramp
2	SCS Runoff	-----	-----	0.656	-----	-----	1.211	1.563	1.831	2.097	B. Gravel Area 1
3	SCS Runoff	-----	-----	1.643	-----	-----	3.033	3.915	4.585	5.252	C. Gravel Area 2
4	SCS Runoff	-----	-----	0.051	-----	-----	0.192	0.300	0.388	0.480	D. Vegetated Area 1
5	SCS Runoff	-----	-----	0.115	-----	-----	0.435	0.680	0.880	1.088	E. Vegetated Area 2
6	Combine	1, 2,	-----	0.916	-----	-----	1.627	2.077	2.418	2.759	Ramp and Gravel
7	Combine	3, 6	-----	2.559	-----	-----	4.660	5.992	7.003	8.011	All Gravel Area
8	Combine	4, 5,	-----	0.166	-----	-----	0.626	0.979	1.268	1.568	Exist. Discharge to Channel

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.262	1	724	906	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	0.656	1	725	2,027	----	-----	-----	B. Gravel Area 1	
3	SCS Runoff	1.643	1	725	5,078	----	-----	-----	C. Gravel Area 2	
4	SCS Runoff	0.051	1	726	213	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.115	1	726	484	----	-----	-----	E. Vegetated Area 2	
6	Combine	0.916	1	725	2,934	1, 2,	-----	-----	Ramp and Gravel	
7	Combine	2.559	1	725	8,011	3, 6	-----	-----	All Gravel Area	
8	Combine	0.166	1	726	697	4, 5,	-----	-----	Exist. Discharge to Channel	
Pre.gpw					Return Period: 2 Year			Tuesday, Oct 23, 2018		

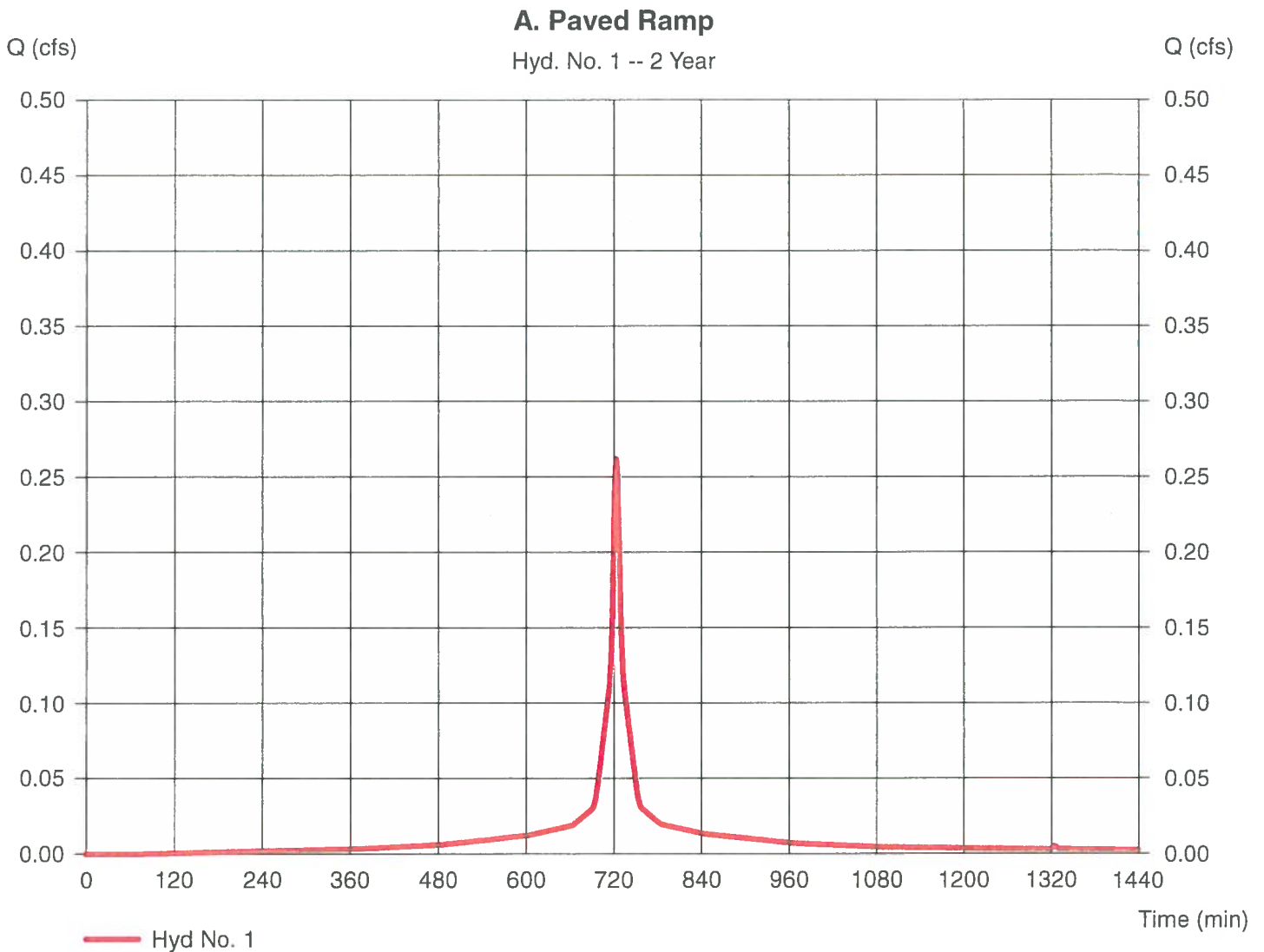
Hydrograph Report

Hyd. No. 1

A. Paved Ramp

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.081 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.262 cfs
Time to peak = 724 min
Hyd. volume = 906 cuft
Curve number = 98
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

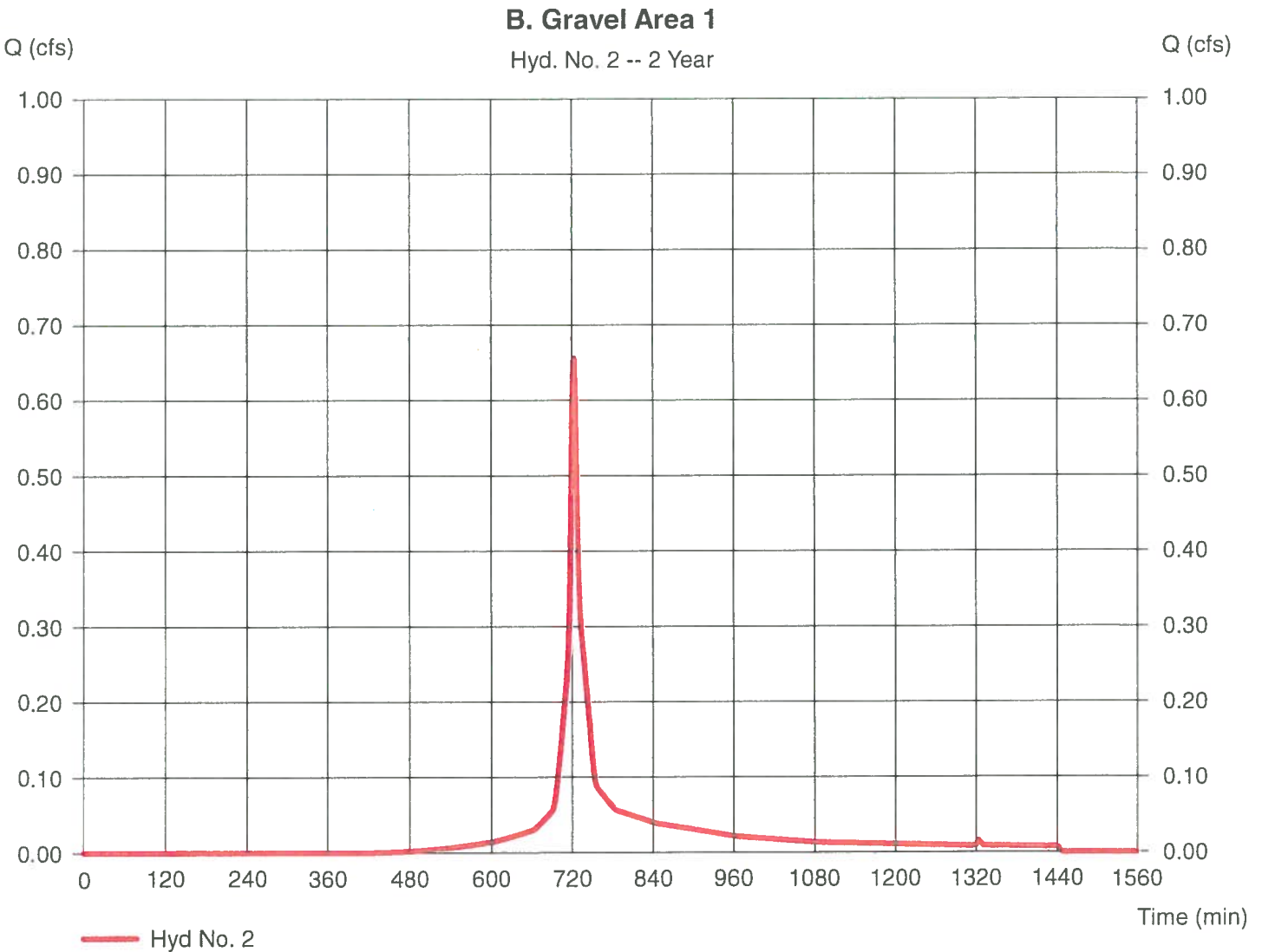
Tuesday, Oct 23, 2018

Hyd. No. 2

B. Gravel Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.278 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 0.656 cfs
 Time to peak = 725 min
 Hyd. volume = 2,027 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



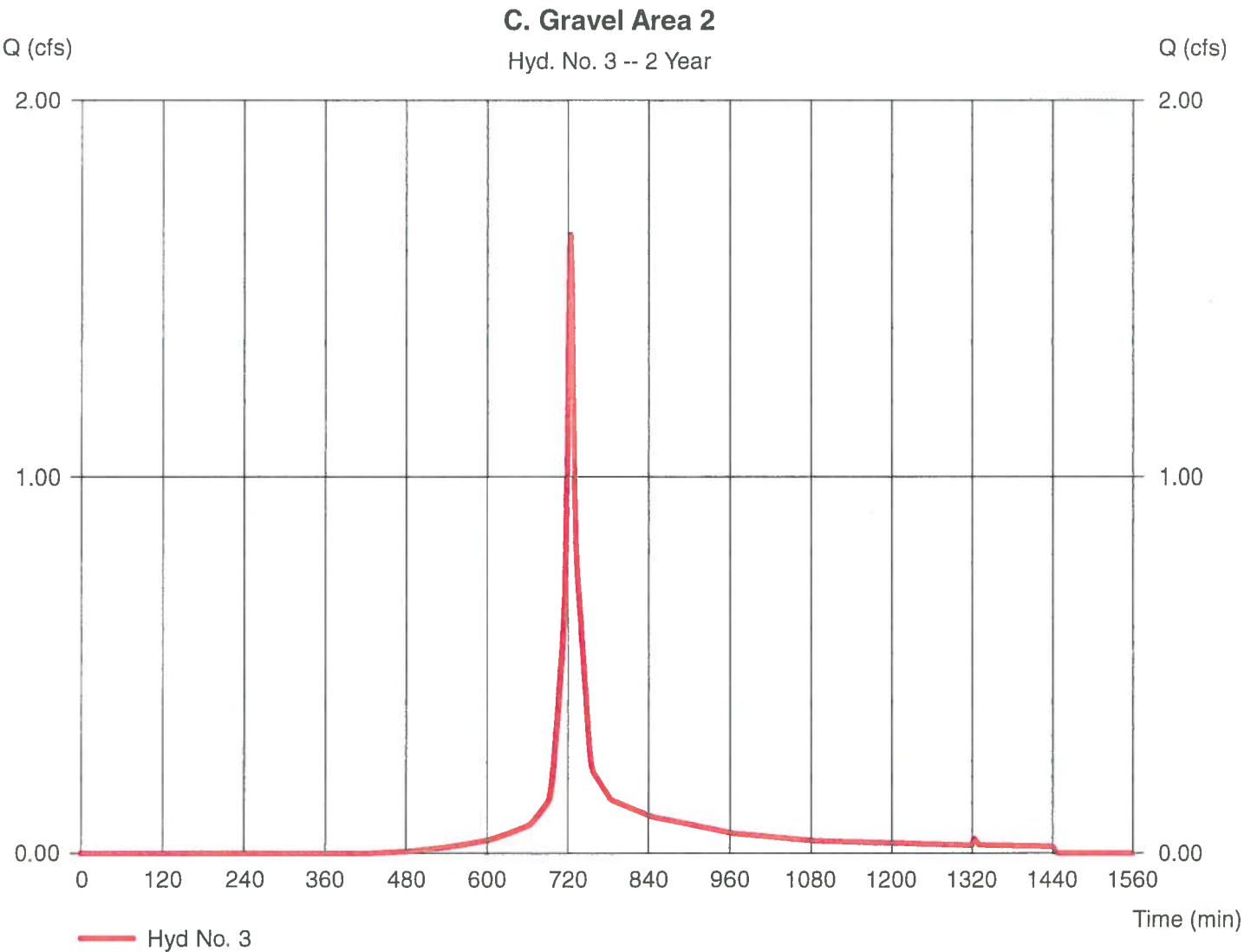
Hydrograph Report

Hyd. No. 3

C. Gravel Area 2

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.696 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 1.643 cfs
Time to peak = 725 min
Hyd. volume = 5,078 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hyd. No. 4

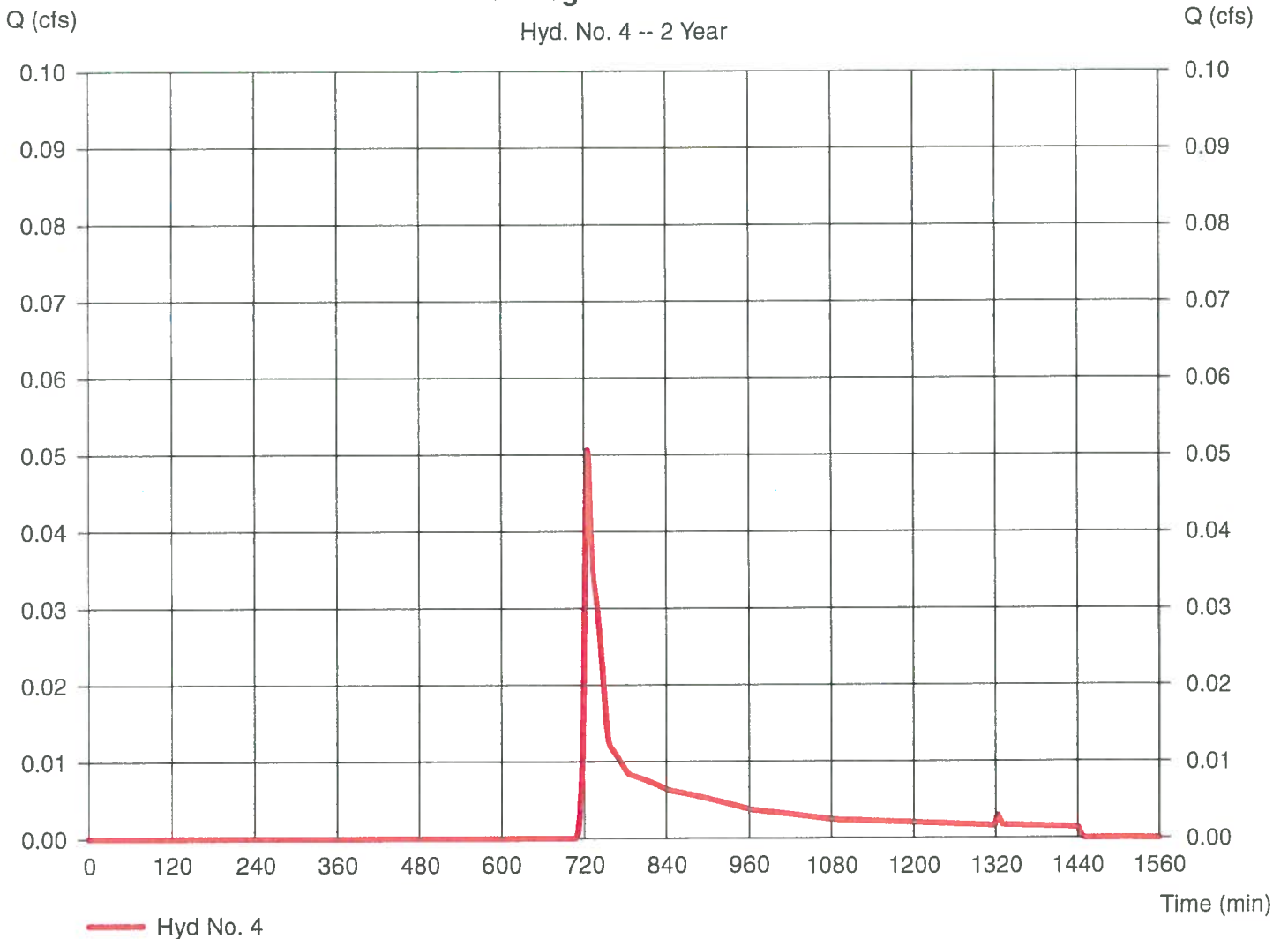
D. Vegetated Area 1

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.106 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.051 cfs
Time to peak = 726 min
Hyd. volume = 213 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

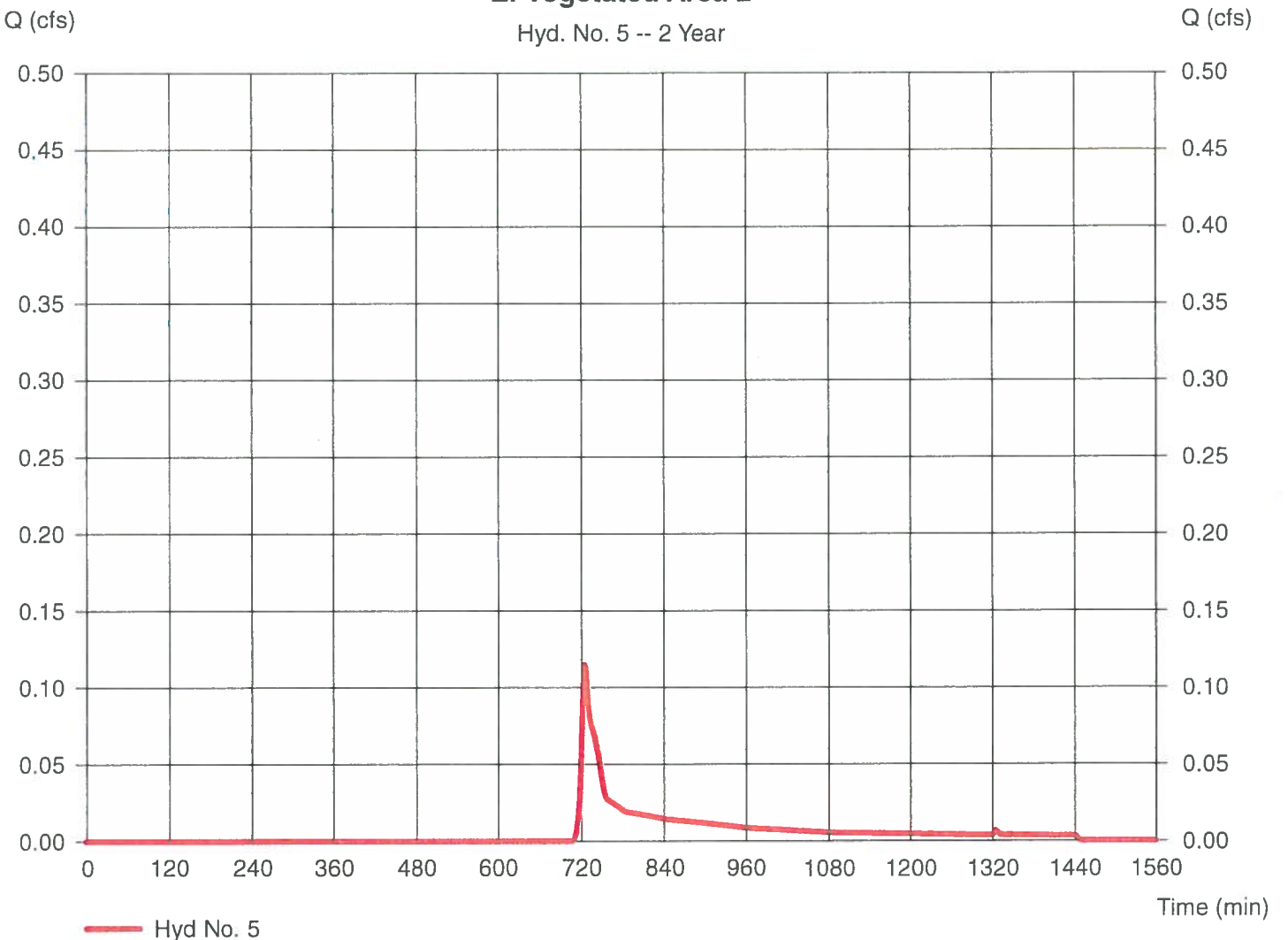
E. Vegetated Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.241 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 0.115 cfs
 Time to peak = 726 min
 Hyd. volume = 484 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

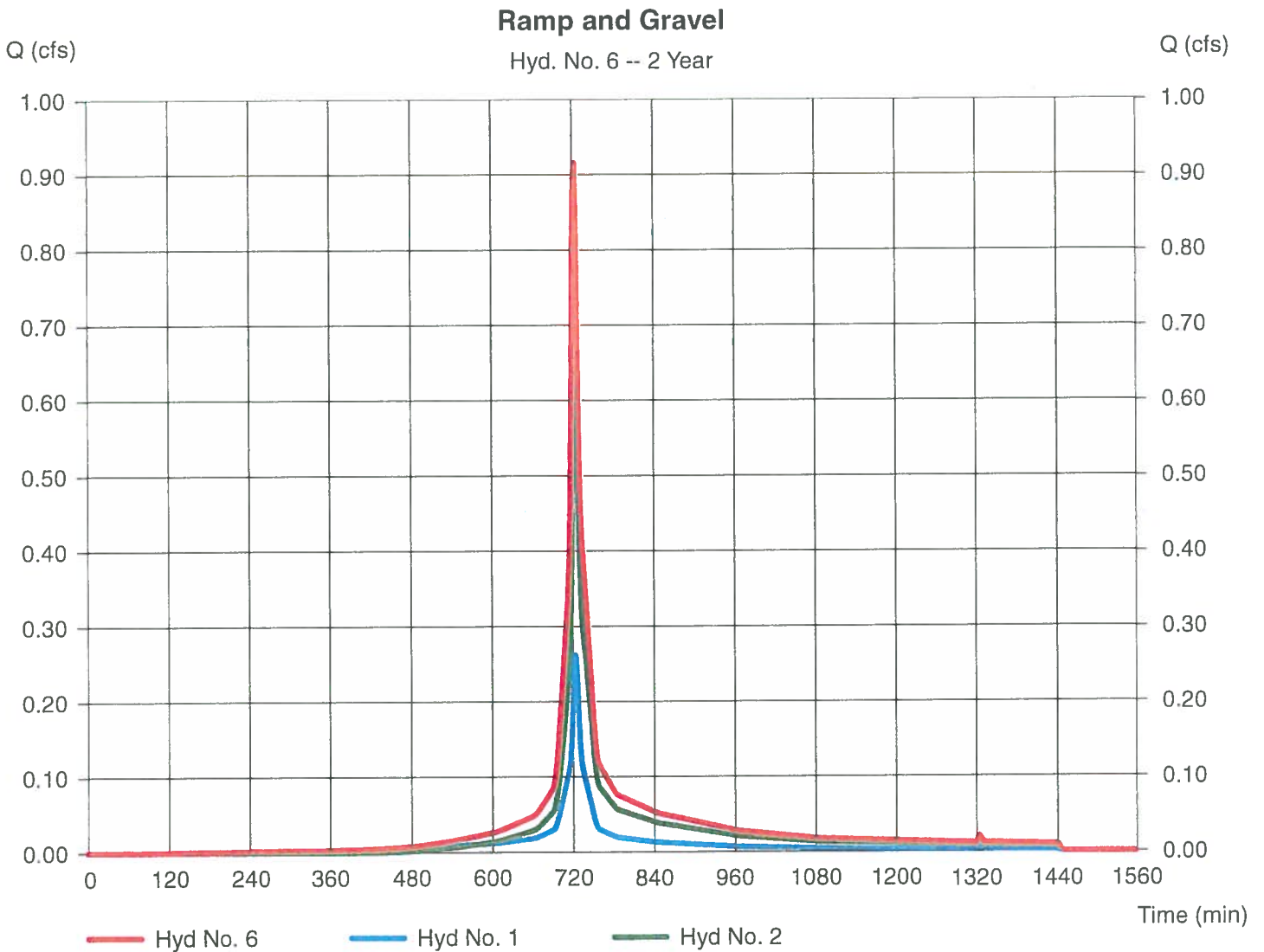
Tuesday, Oct 23, 2018

Hyd. No. 6

Ramp and Gravel

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 1, 2

Peak discharge = 0.916 cfs
Time to peak = 725 min
Hyd. volume = 2,934 cuft
Contrib. drain. area = 0.358 ac



Hydrograph Report

Hyd. No. 7

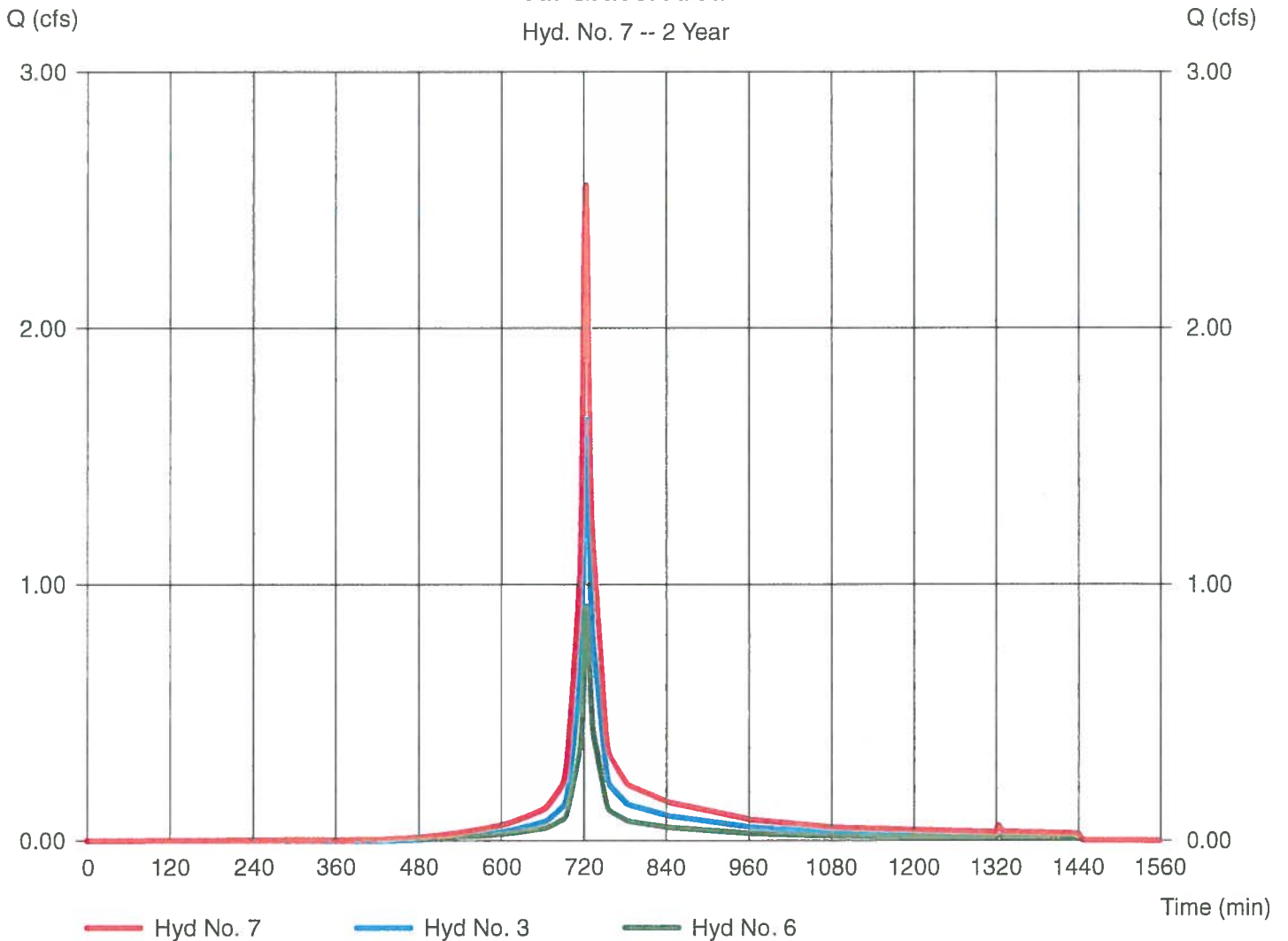
All Gravel Area

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 3, 6

Peak discharge = 2.559 cfs
Time to peak = 725 min
Hyd. volume = 8,011 cuft
Contrib. drain. area = 0.696 ac

All Gravel Area

Hyd. No. 7 -- 2 Year



Hydrograph Report

Hyd. No. 8

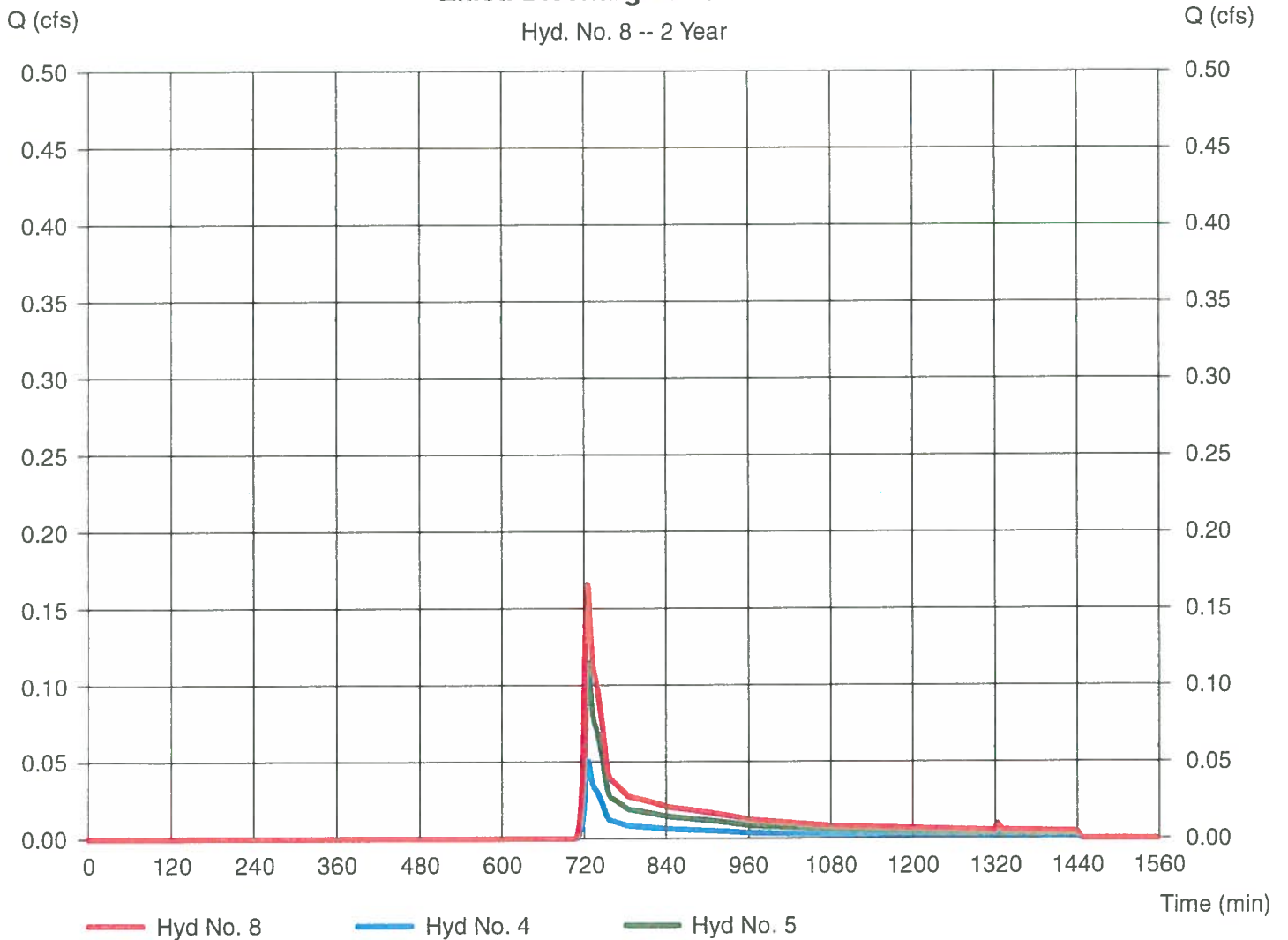
Exist. Discharge to Channel

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 0.166 cfs
Time to peak = 726 min
Hyd. volume = 697 cuft
Contrib. drain. area = 0.347 ac

Exist. Discharge to Channel

Hyd. No. 8 -- 2 Year



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.416	1	724	1,468	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.211	1	724	3,816	----	-----	-----	B. Gravel Area 1	
3	SCS Runoff	3.033	1	724	9,558	----	-----	-----	C. Gravel Area 2	
4	SCS Runoff	0.192	1	725	627	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.435	1	725	1,422	----	-----	-----	E. Vegetated Area 2	
6	Combine	1.627	1	724	5,285	1, 2,	-----	-----	Ramp and Gravel	
7	Combine	4.660	1	724	14,842	3, 6	-----	-----	All Gravel Area	
8	Combine	0.626	1	725	2,048	4, 5,	-----	-----	Exist. Discharge to Channel	
Pre.gpw					Return Period: 10 Year		Tuesday, Oct 23, 2018			

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

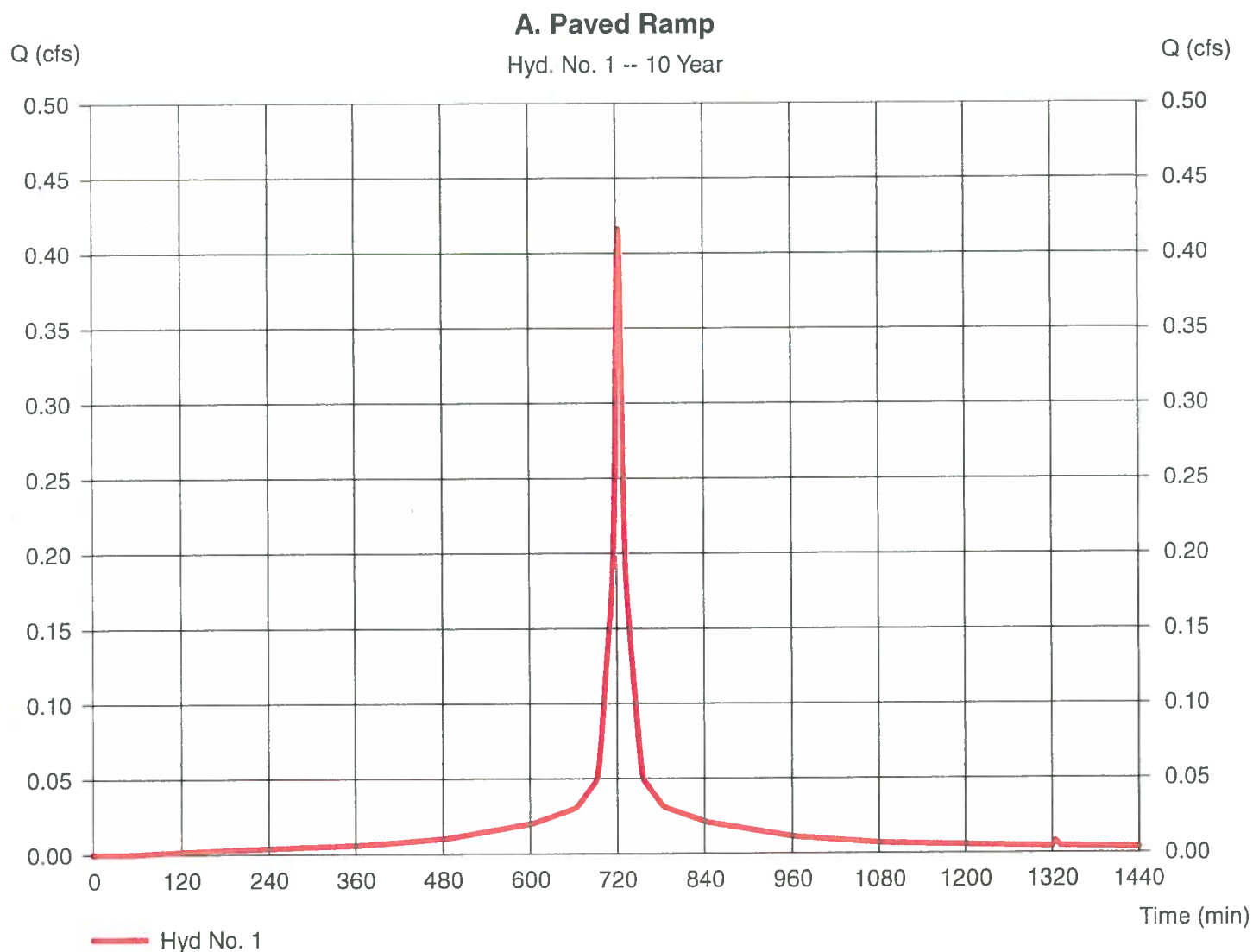
Tuesday, Oct 23, 2018

Hyd. No. 1

A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.416 cfs
 Time to peak = 724 min
 Hyd. volume = 1,468 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hyd. No. 2

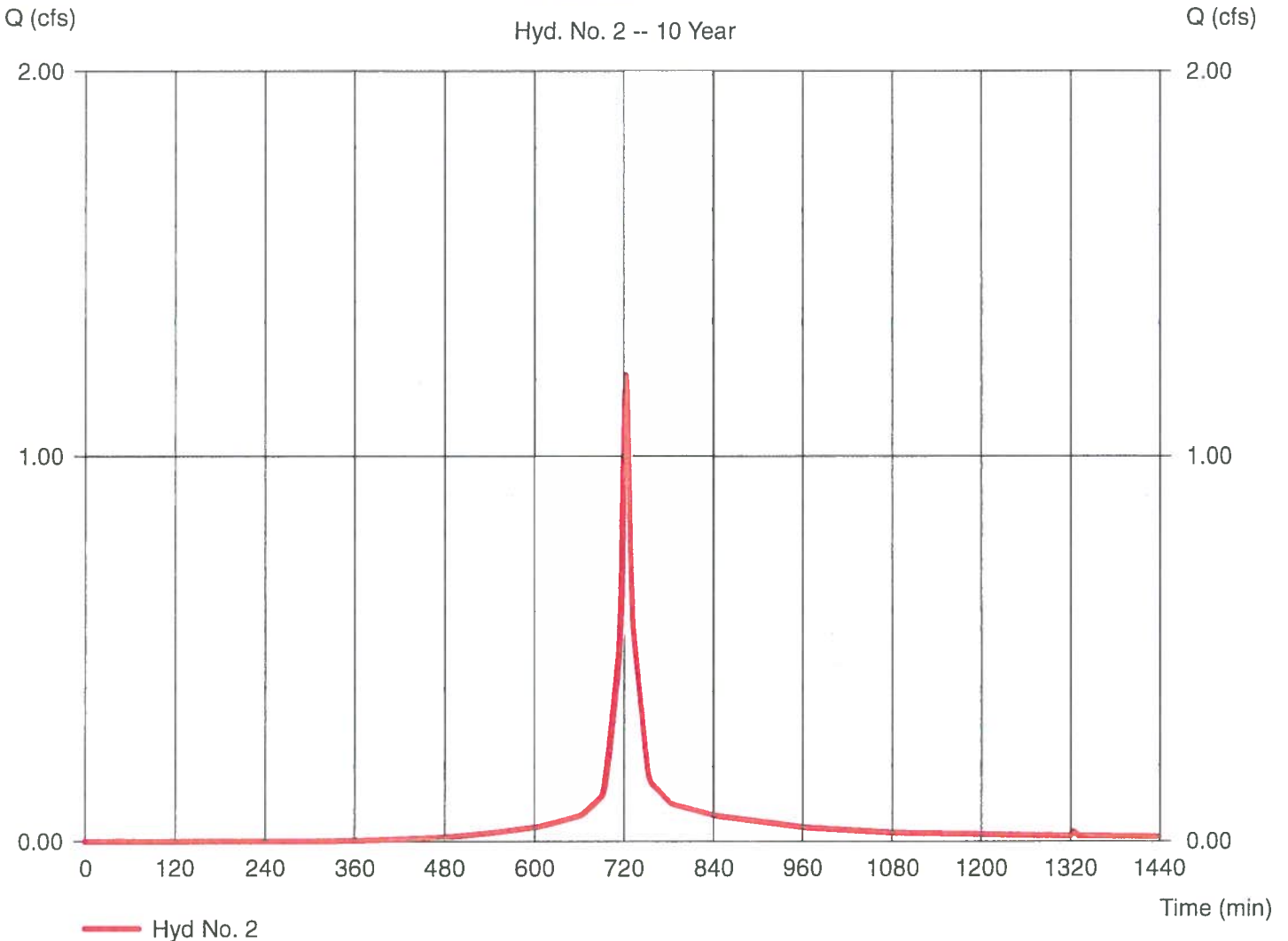
B. Gravel Area 1

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 0.278 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 5.11 in
Storm duration = 24 hrs

Peak discharge = 1.211 cfs
Time to peak = 724 min
Hyd. volume = 3,816 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

B. Gravel Area 1

Hyd. No. 2 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

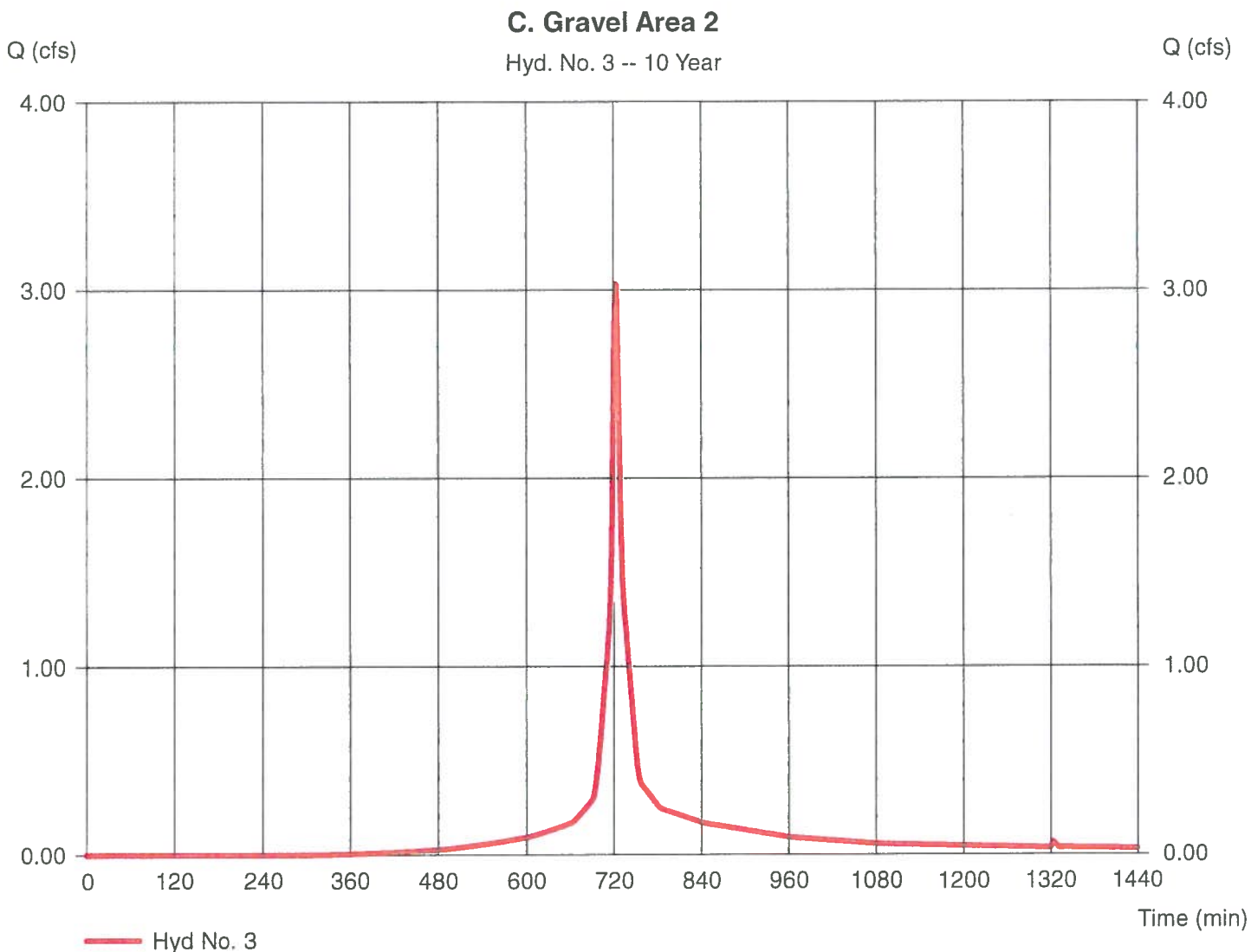
Tuesday, Oct 23, 2018

Hyd. No. 3

C. Gravel Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.696 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 3.033 cfs
 Time to peak = 724 min
 Hyd. volume = 9,558 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hyd. No. 4

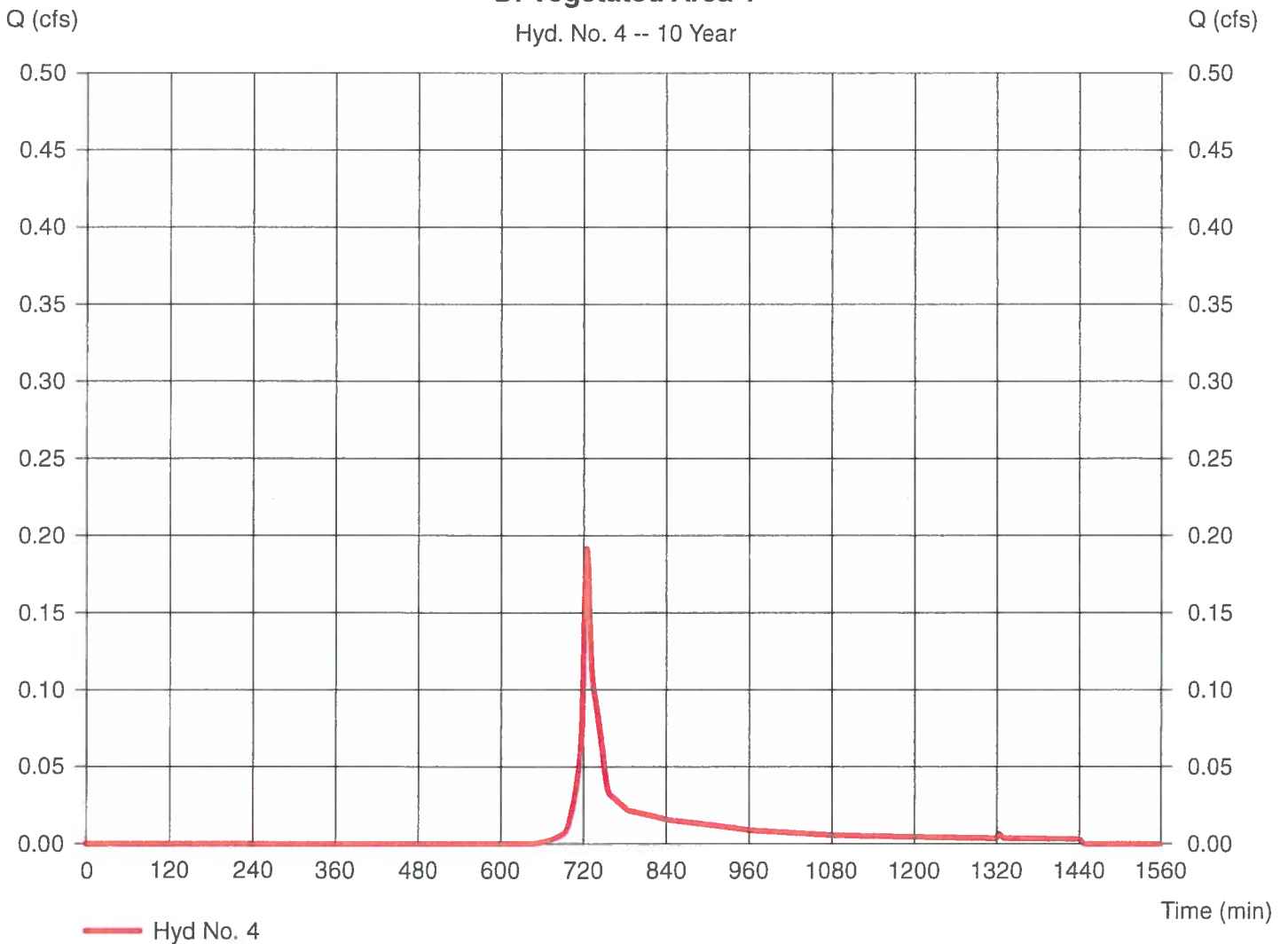
D. Vegetated Area 1

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 0.106 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 5.11 in
Storm duration = 24 hrs

Peak discharge = 0.192 cfs
Time to peak = 725 min
Hyd. volume = 627 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

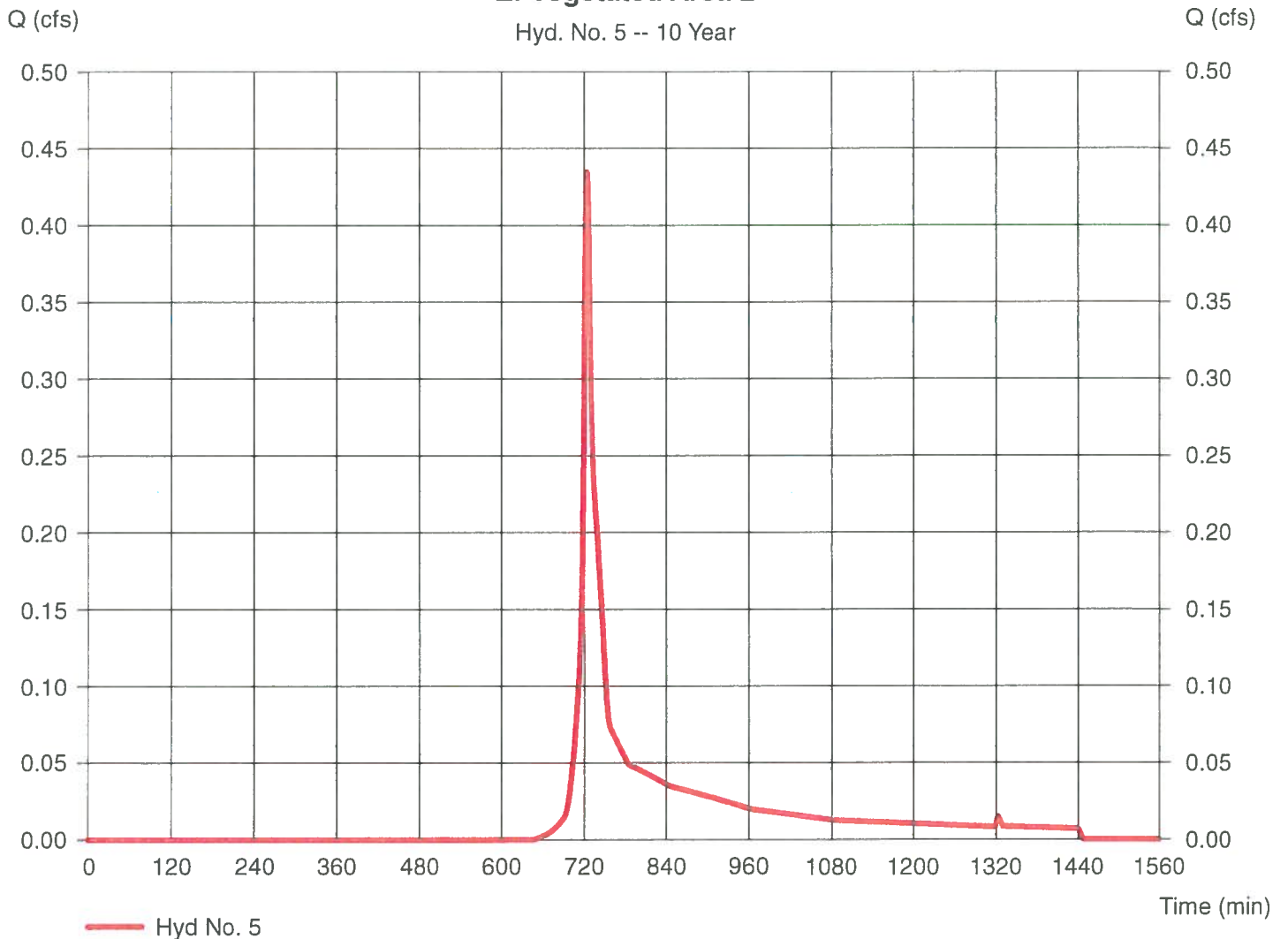
E. Vegetated Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.241 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.435 cfs
 Time to peak = 725 min
 Hyd. volume = 1,422 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 10 Year



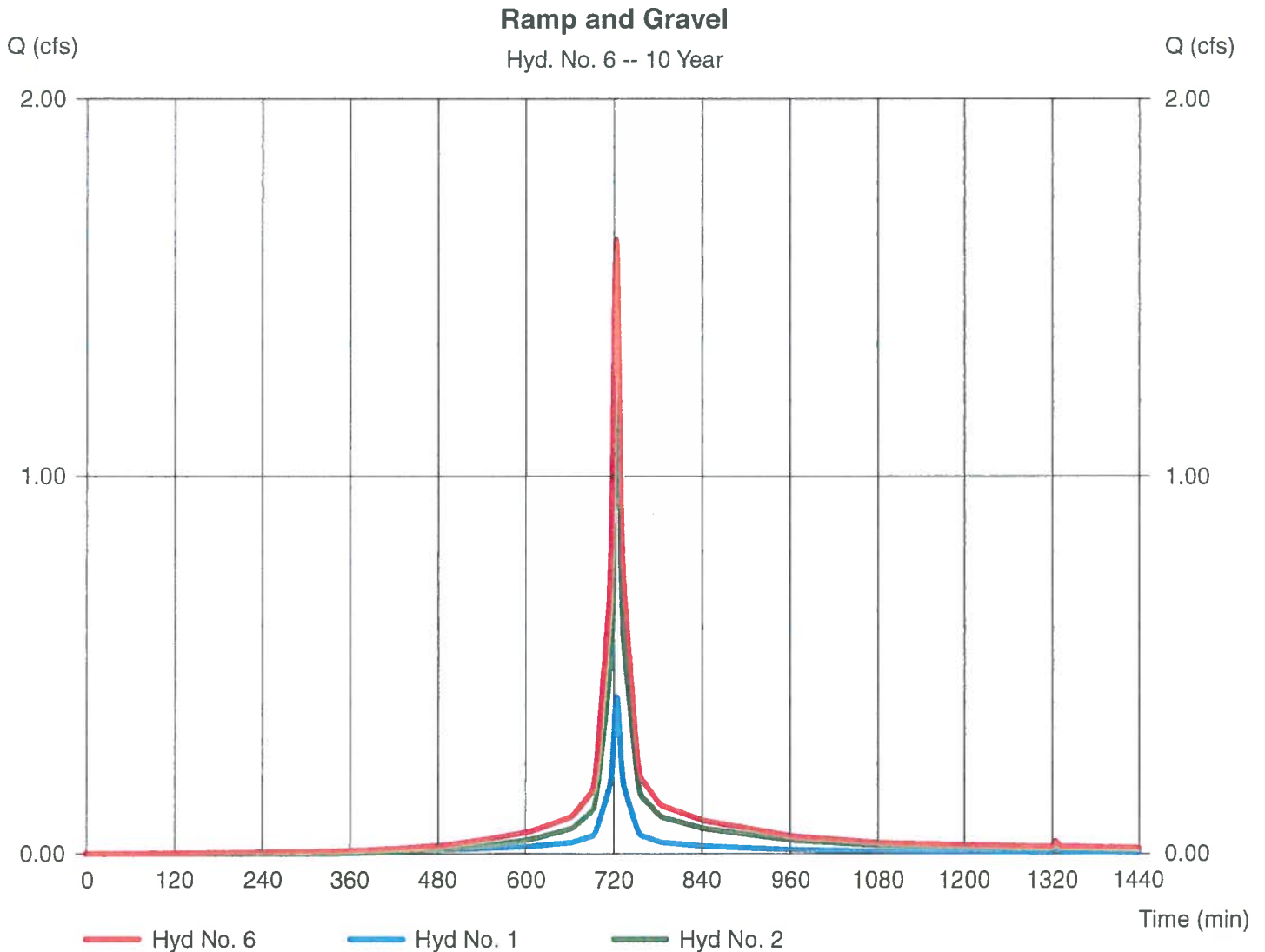
Hydrograph Report

Hyd. No. 6

Ramp and Gravel

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 1, 2

Peak discharge = 1.627 cfs
Time to peak = 724 min
Hyd. volume = 5,285 cuft
Contrib. drain. area = 0.358 ac



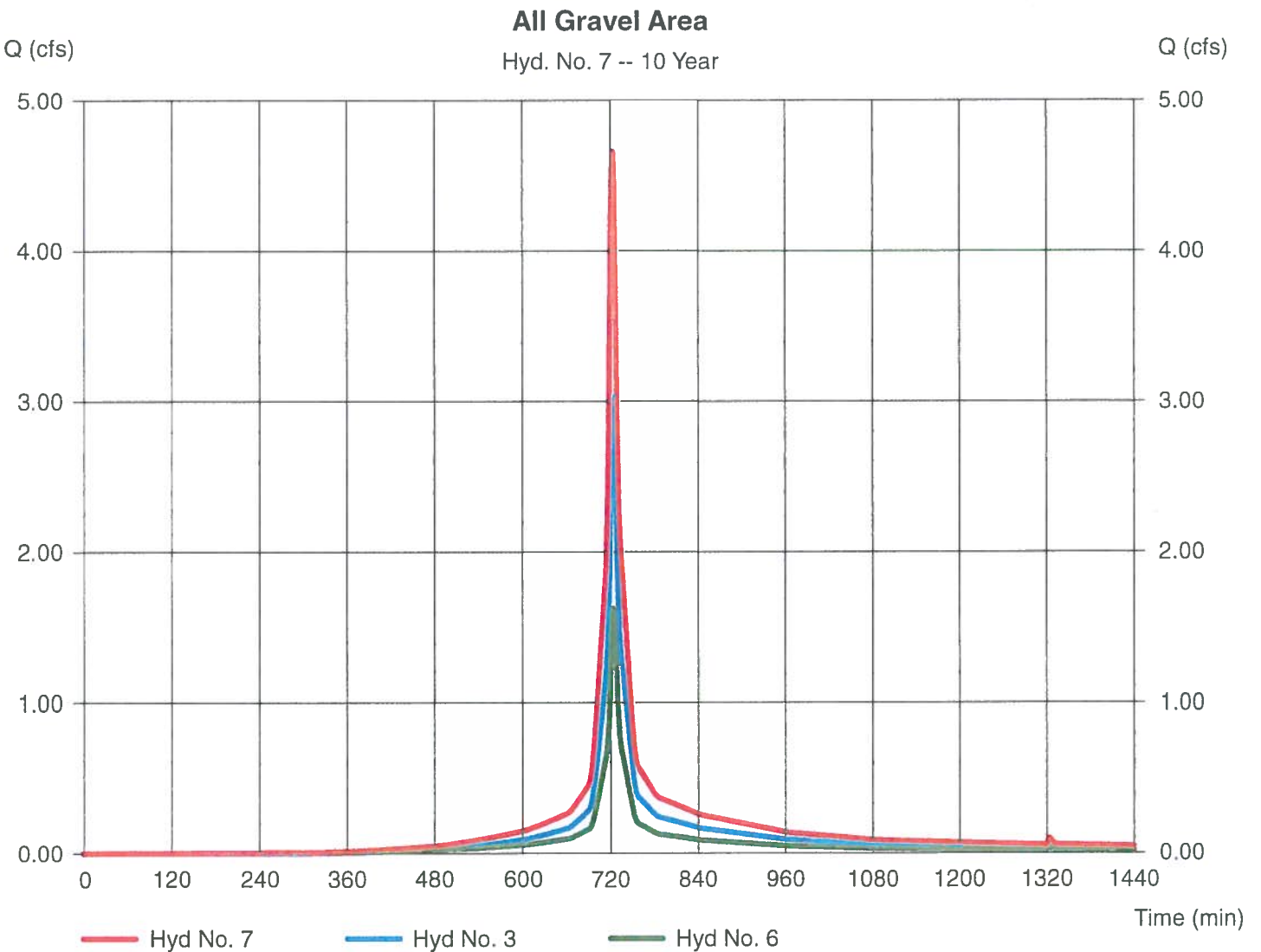
Hydrograph Report

Hyd. No. 7

All Gravel Area

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 3, 6

Peak discharge = 4.660 cfs
Time to peak = 724 min
Hyd. volume = 14,842 cuft
Contrib. drain. area = 0.696 ac



Hydrograph Report

Hyd. No. 8

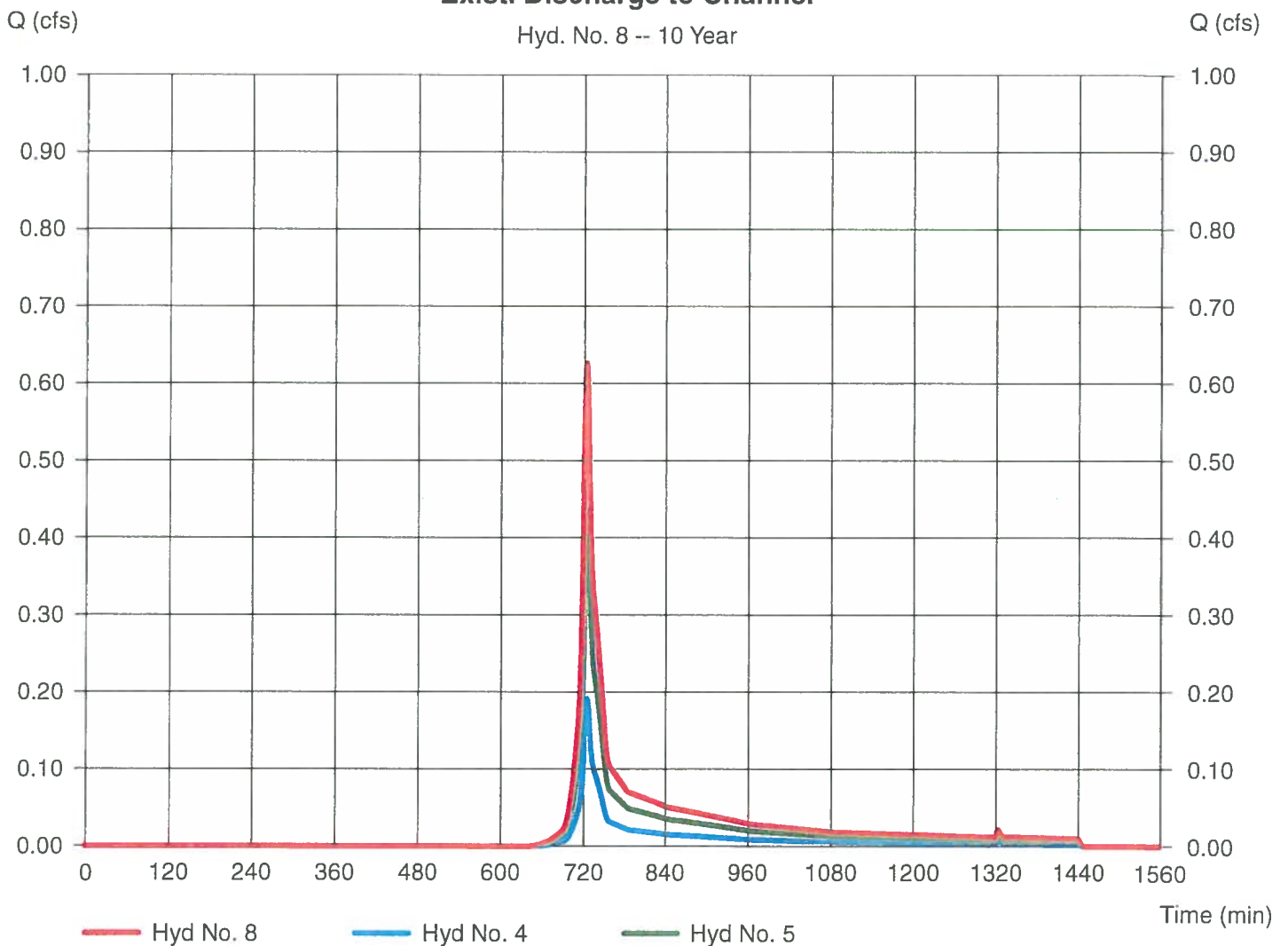
Exist. Discharge to Channel

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 0.626 cfs
Time to peak = 725 min
Hyd. volume = 2,048 cuft
Contrib. drain. area = 0.347 ac

Exist. Discharge to Channel

Hyd. No. 8 -- 10 Year



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.514	1	724	1,824	----	-----	-----	A. Paved Ramp
2	SCS Runoff	1.563	1	724	4,985	----	-----	-----	B. Gravel Area 1
3	SCS Runoff	3.915	1	724	12,485	----	-----	-----	C. Gravel Area 2
4	SCS Runoff	0.300	1	725	945	----	-----	-----	D. Vegetated Area 1
5	SCS Runoff	0.680	1	725	2,144	----	-----	-----	E. Vegetated Area 2
6	Combine	2.077	1	724	6,808	1, 2,	-----	-----	Ramp and Gravel
7	Combine	5.992	1	724	19,293	3, 6	-----	-----	All Gravel Area
8	Combine	0.979	1	725	3,089	4, 5,	-----	-----	Exist. Discharge to Channel
Pre.gpw					Return Period: 25 Year			Tuesday, Oct 23, 2018	

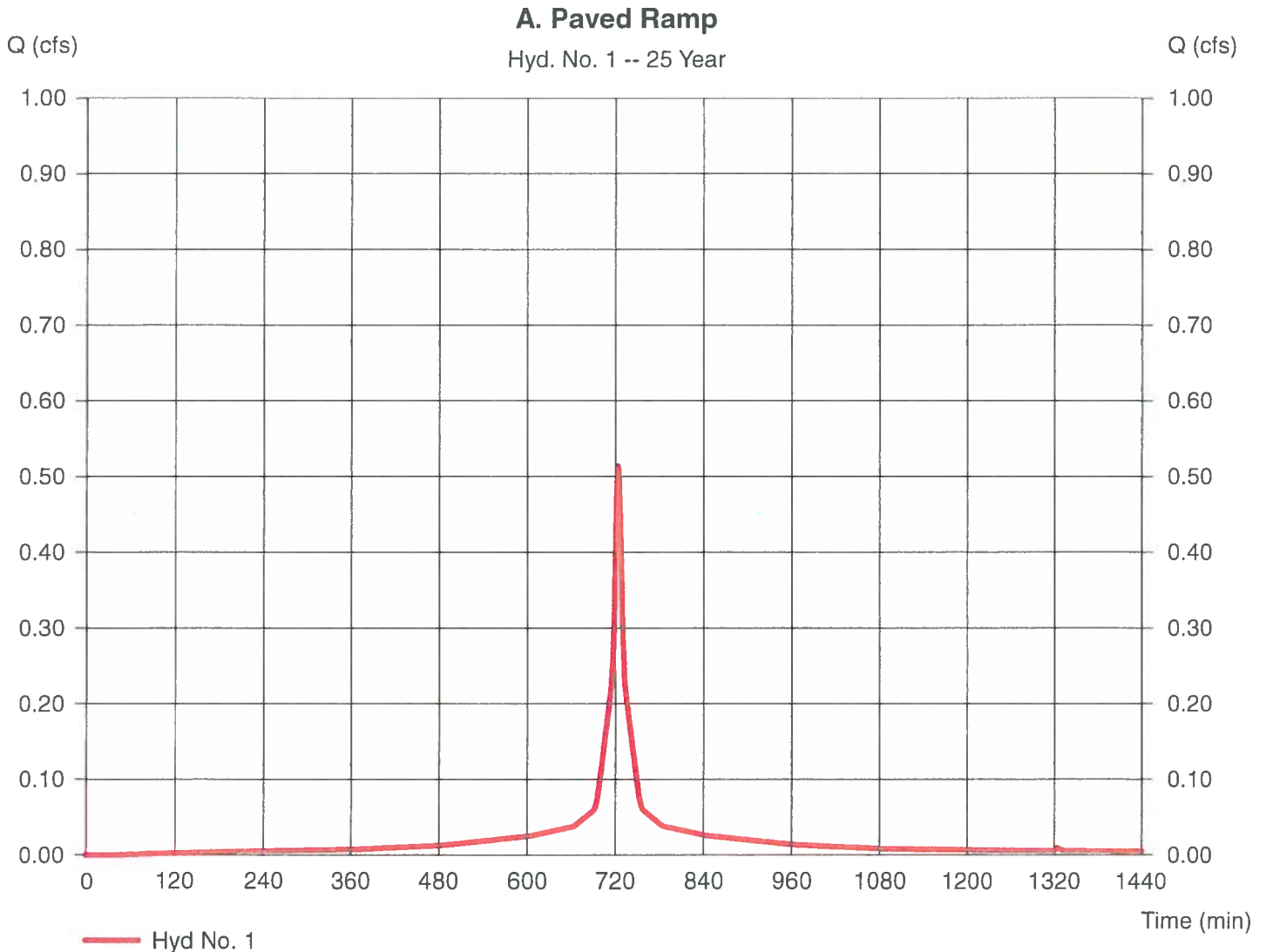
Hydrograph Report

Hyd. No. 1

A. Paved Ramp

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 0.081 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.29 in
Storm duration = 24 hrs

Peak discharge = 0.514 cfs
Time to peak = 724 min
Hyd. volume = 1,824 cuft
Curve number = 98
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 2

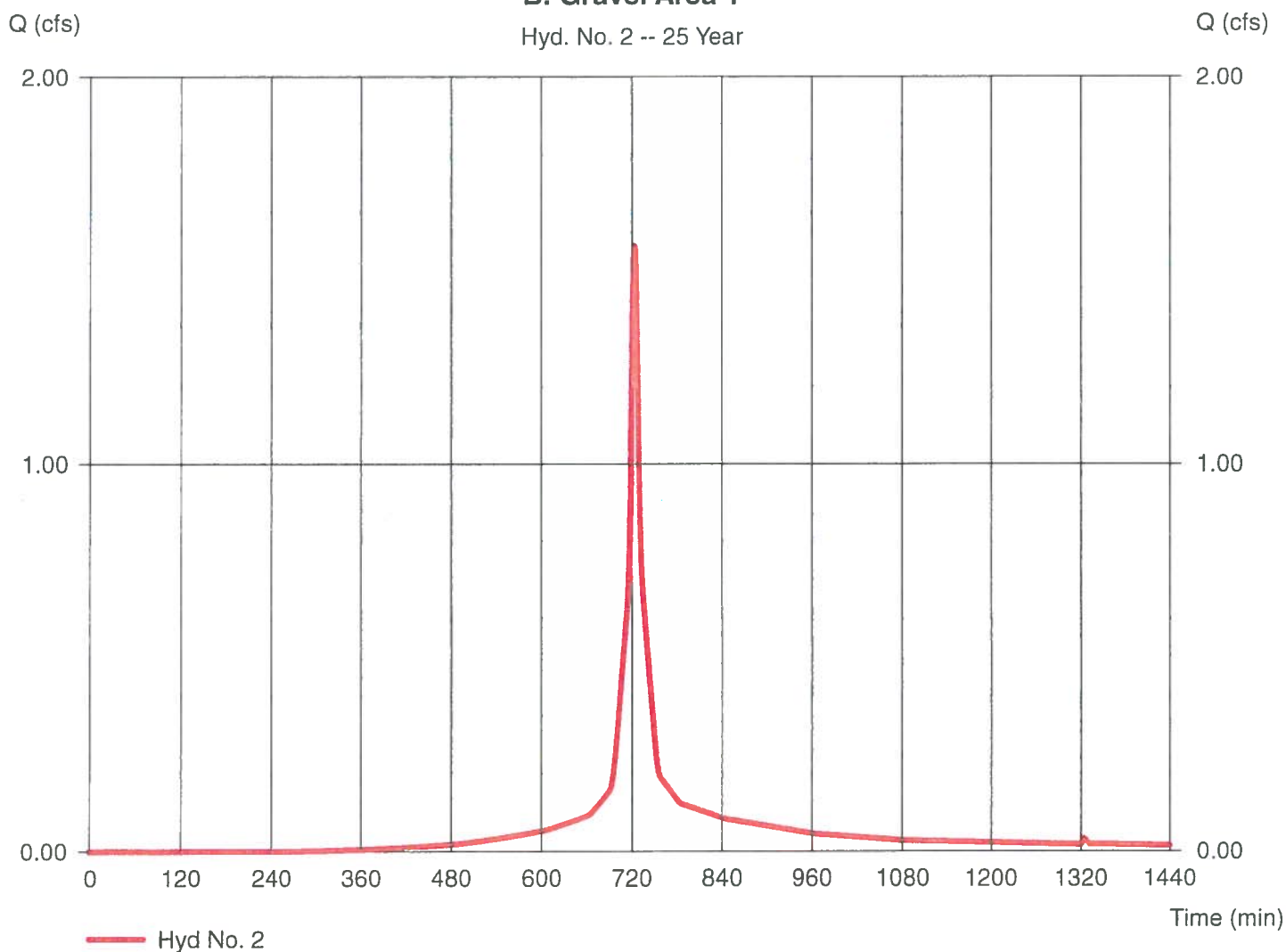
B. Gravel Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.278 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 1.563 cfs
 Time to peak = 724 min
 Hyd. volume = 4,985 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

B. Gravel Area 1

Hyd. No. 2 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

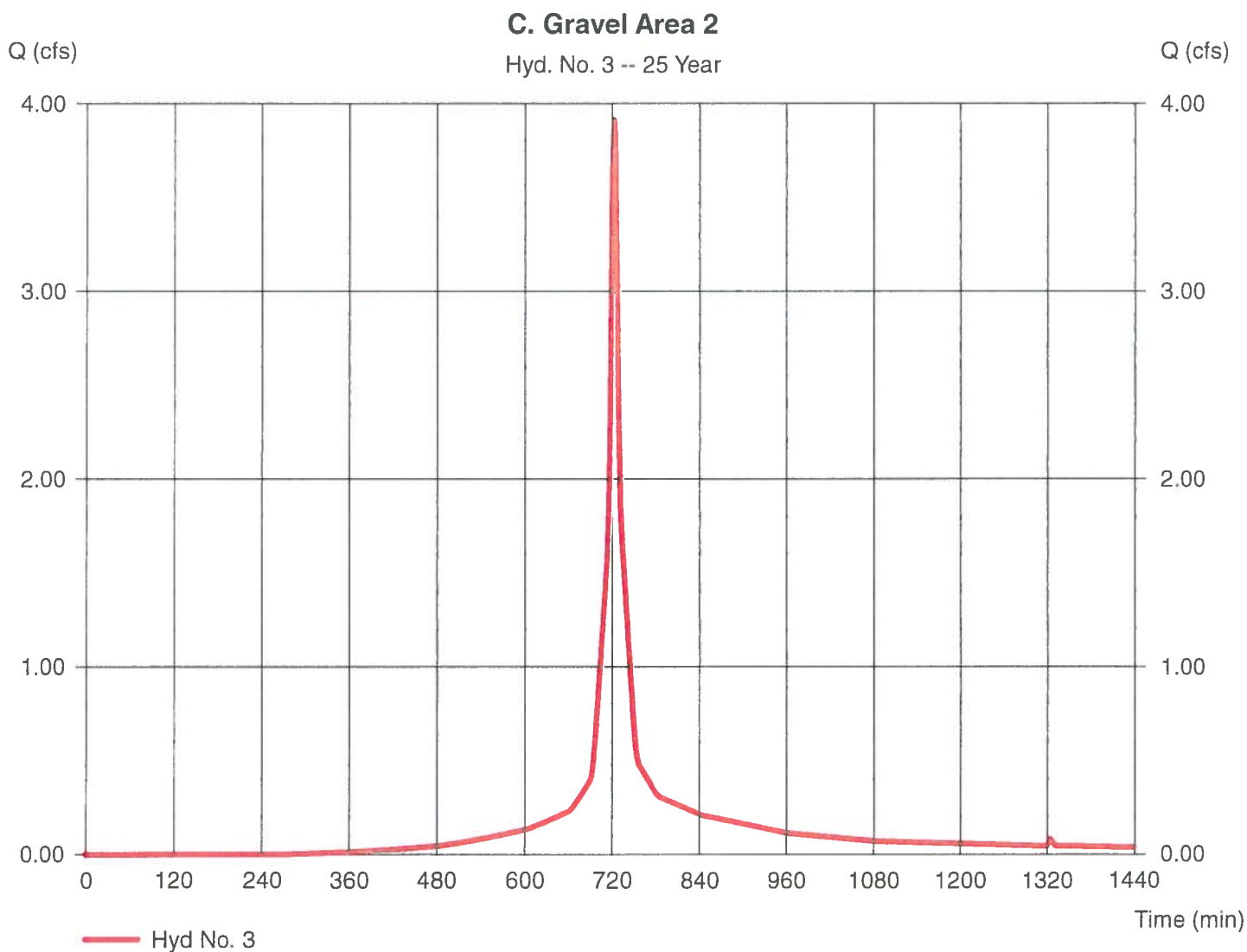
Tuesday, Oct 23, 2018

Hyd. No. 3

C. Gravel Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.696 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 3.915 cfs
 Time to peak = 724 min
 Hyd. volume = 12,485 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

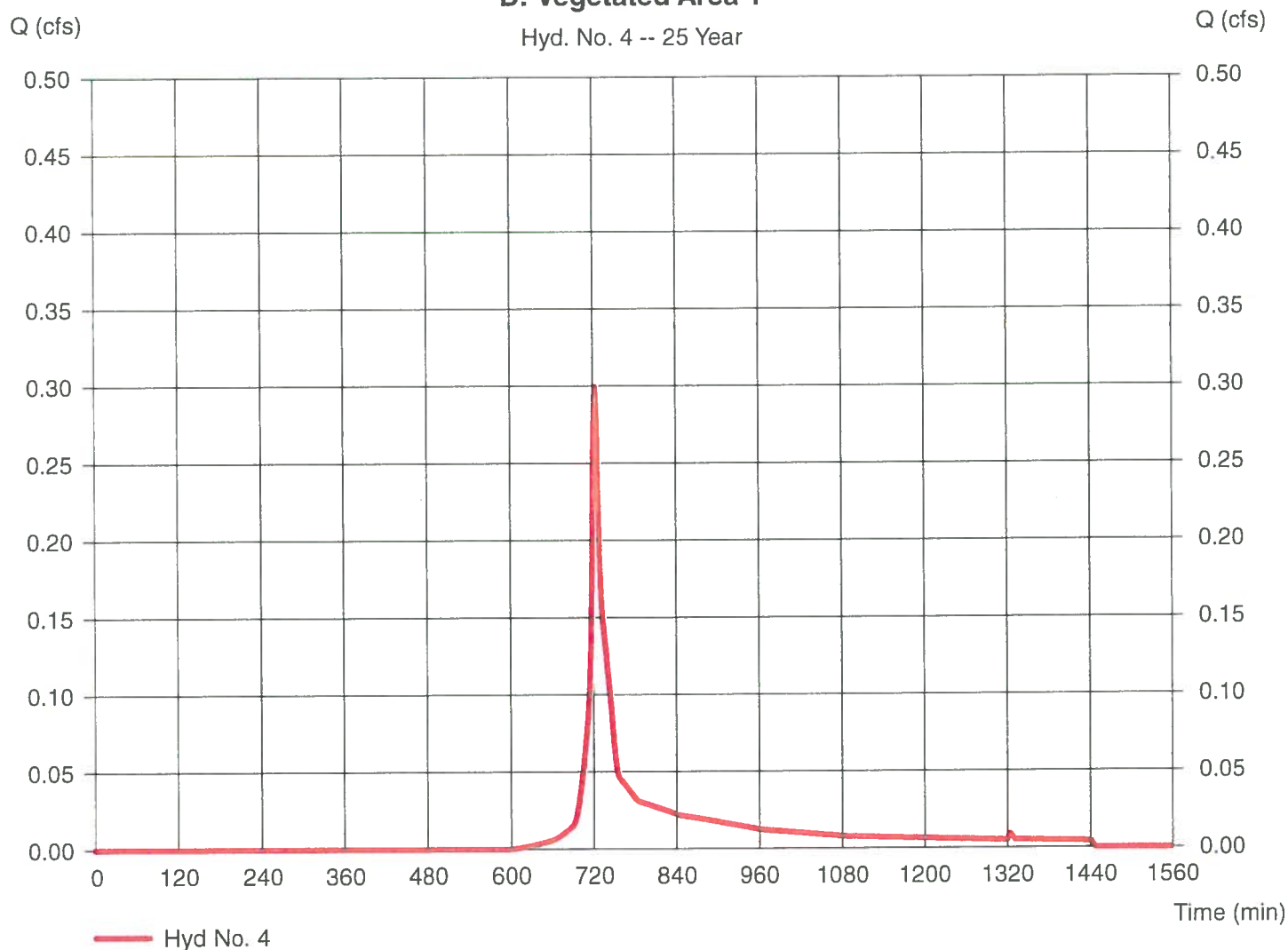
D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 0.300 cfs
 Time to peak = 725 min
 Hyd. volume = 945 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9,2

Tuesday, Oct 23, 2018

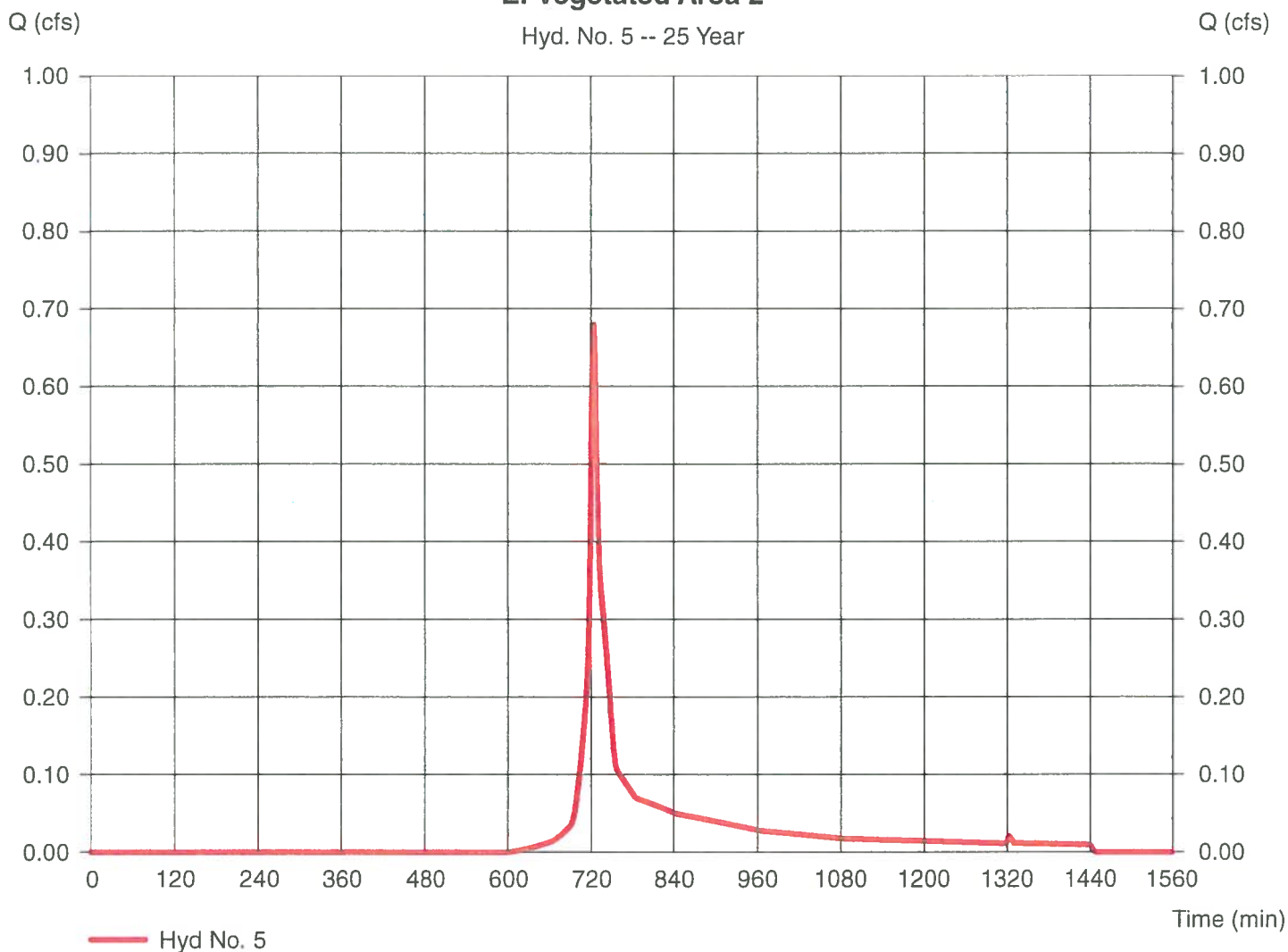
Hyd. No. 5

E. Vegetated Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.680 cfs
Storm frequency	= 25 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 2,144 cuft
Drainage area	= 0.241 ac	Curve number	= 63
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.29 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

E. Vegetated Area 2

Hyd. No. 5 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

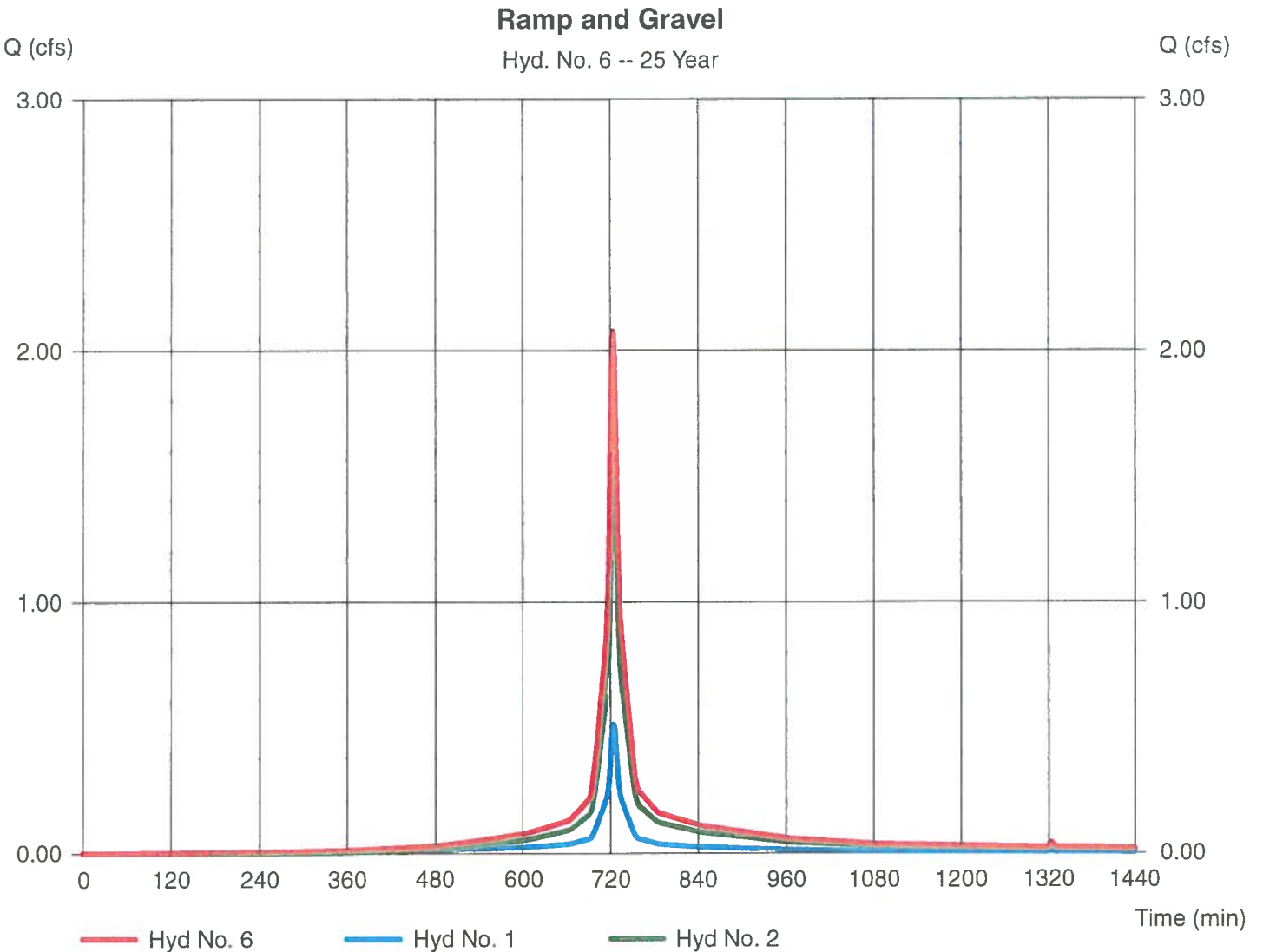
Tuesday, Oct 23, 2018

Hyd. No. 6

Ramp and Gravel

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 1, 2

Peak discharge = 2.077 cfs
Time to peak = 724 min
Hyd. volume = 6,808 cuft
Contrib. drain. area = 0.358 ac



Hydrograph Report

Hyd. No. 7

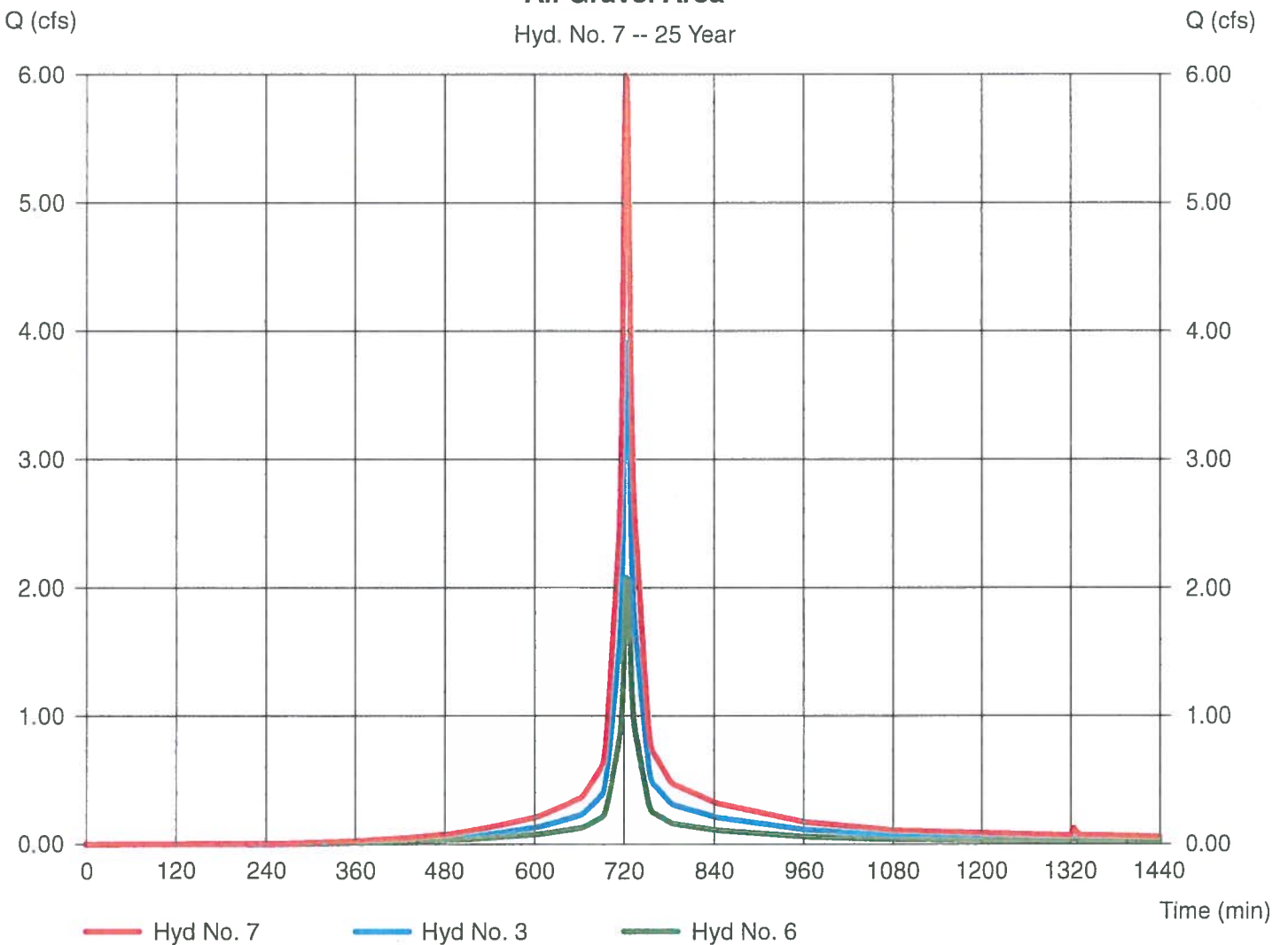
All Gravel Area

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 3, 6

Peak discharge = 5.992 cfs
Time to peak = 724 min
Hyd. volume = 19,293 cuft
Contrib. drain. area= 0.696 ac

All Gravel Area

Hyd. No. 7 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

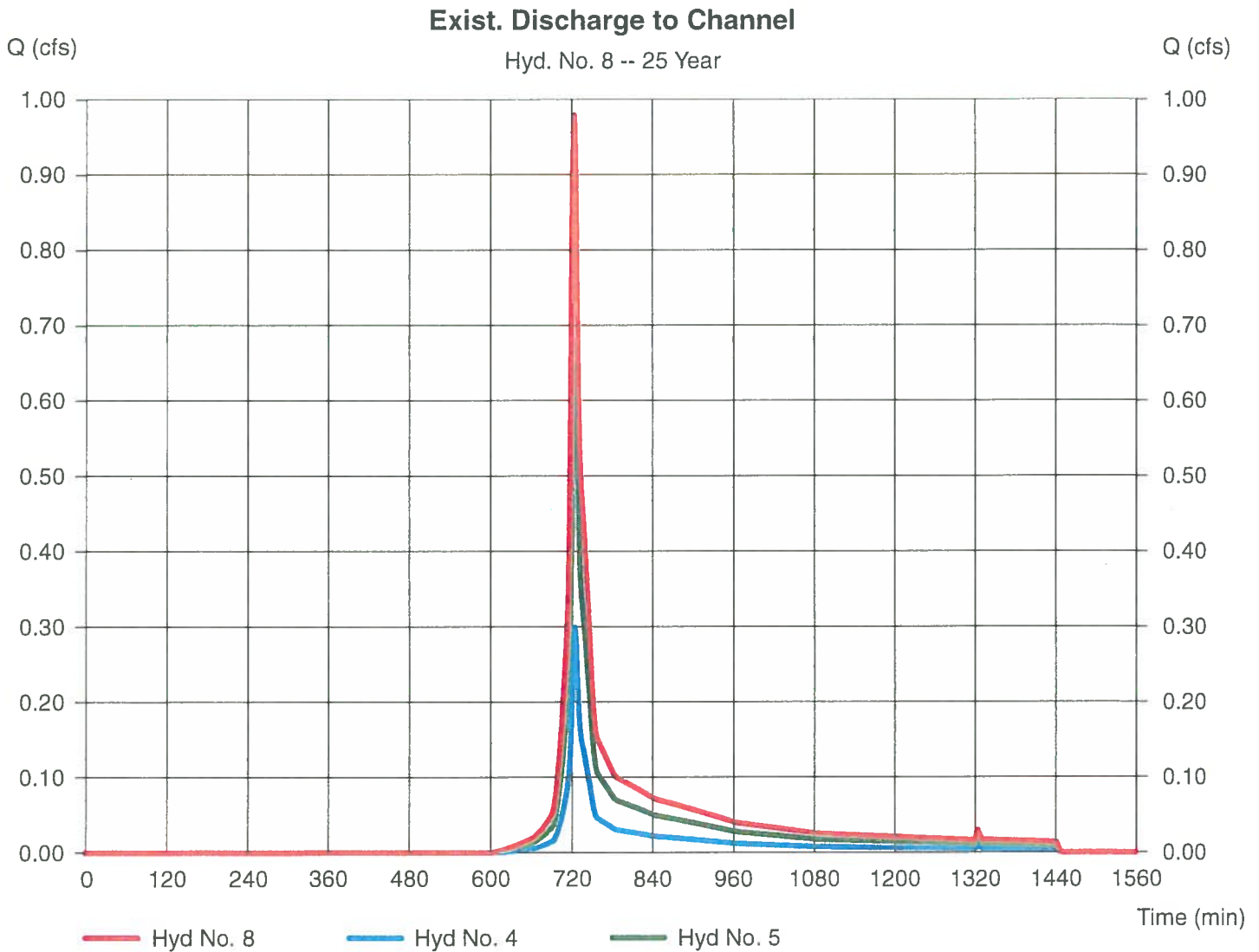
Tuesday, Oct 23, 2018

Hyd. No. 8

Exist. Discharge to Channel

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 1 min
 Inflow hyds. = 4, 5

Peak discharge = 0.979 cfs
 Time to peak = 725 min
 Hyd. volume = 3,089 cuft
 Contrib. drain. area = 0.347 ac



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.588	1	724	2,095	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.831	1	724	5,887	----	-----	-----	B. Gravel Area 1	
3	SCS Runoff	4.585	1	724	14,744	----	-----	-----	C. Gravel Area 2	
4	SCS Runoff	0.388	1	725	1,208	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.880	1	725	2,740	----	-----	-----	E. Vegetated Area 2	
6	Combine	2.418	1	724	7,982	1, 2,	-----	-----	Ramp and Gravel	
7	Combine	7.003	1	724	22,726	3, 6	-----	-----	All Gravel Area	
8	Combine	1.268	1	725	3,948	4, 5,	-----	-----	Exist. Discharge to Channel	
Pre.gpw					Return Period: 50 Year		Tuesday, Oct 23, 2018			

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 1

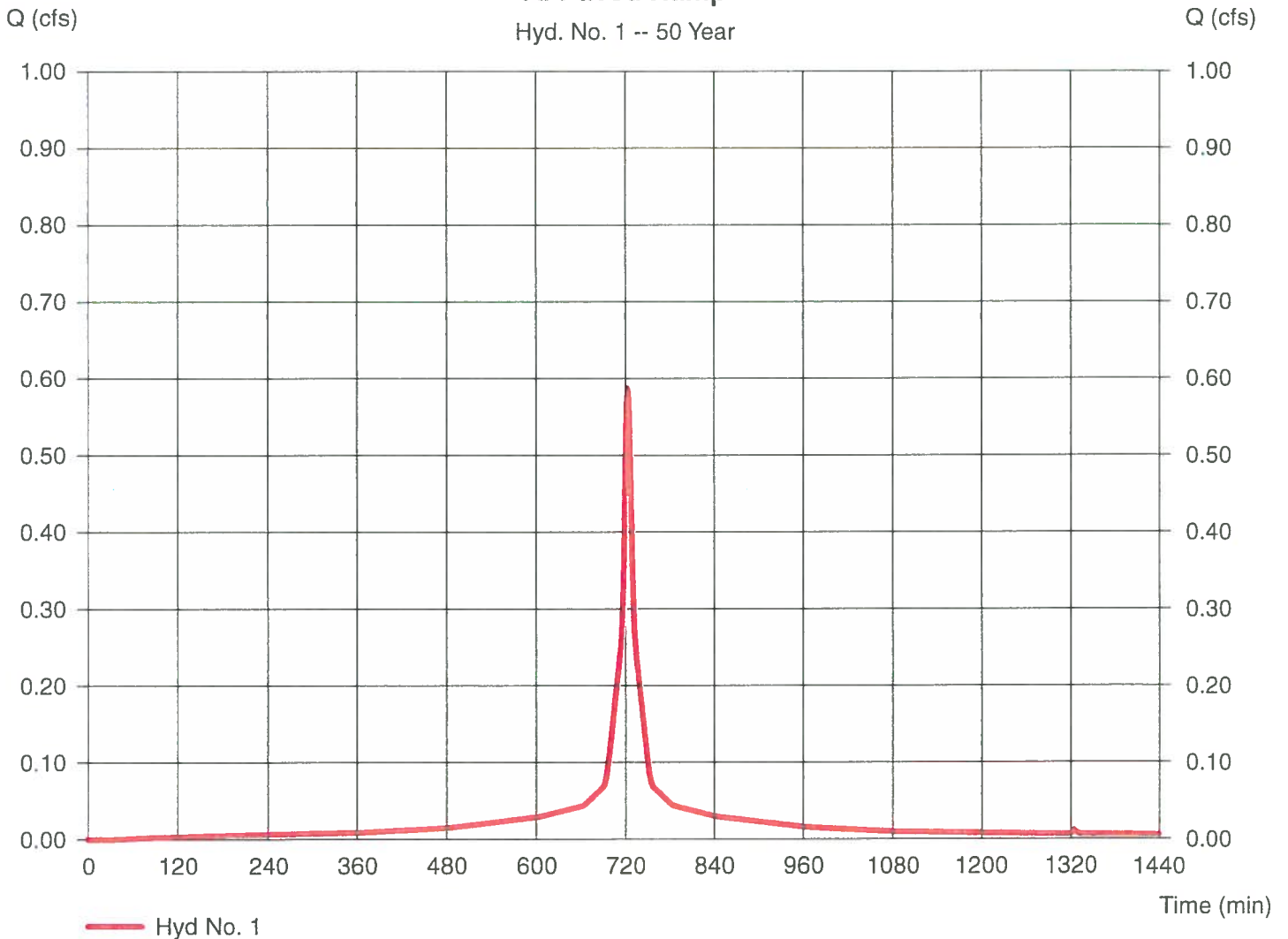
A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.588 cfs
 Time to peak = 724 min
 Hyd. volume = 2,095 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 50 Year



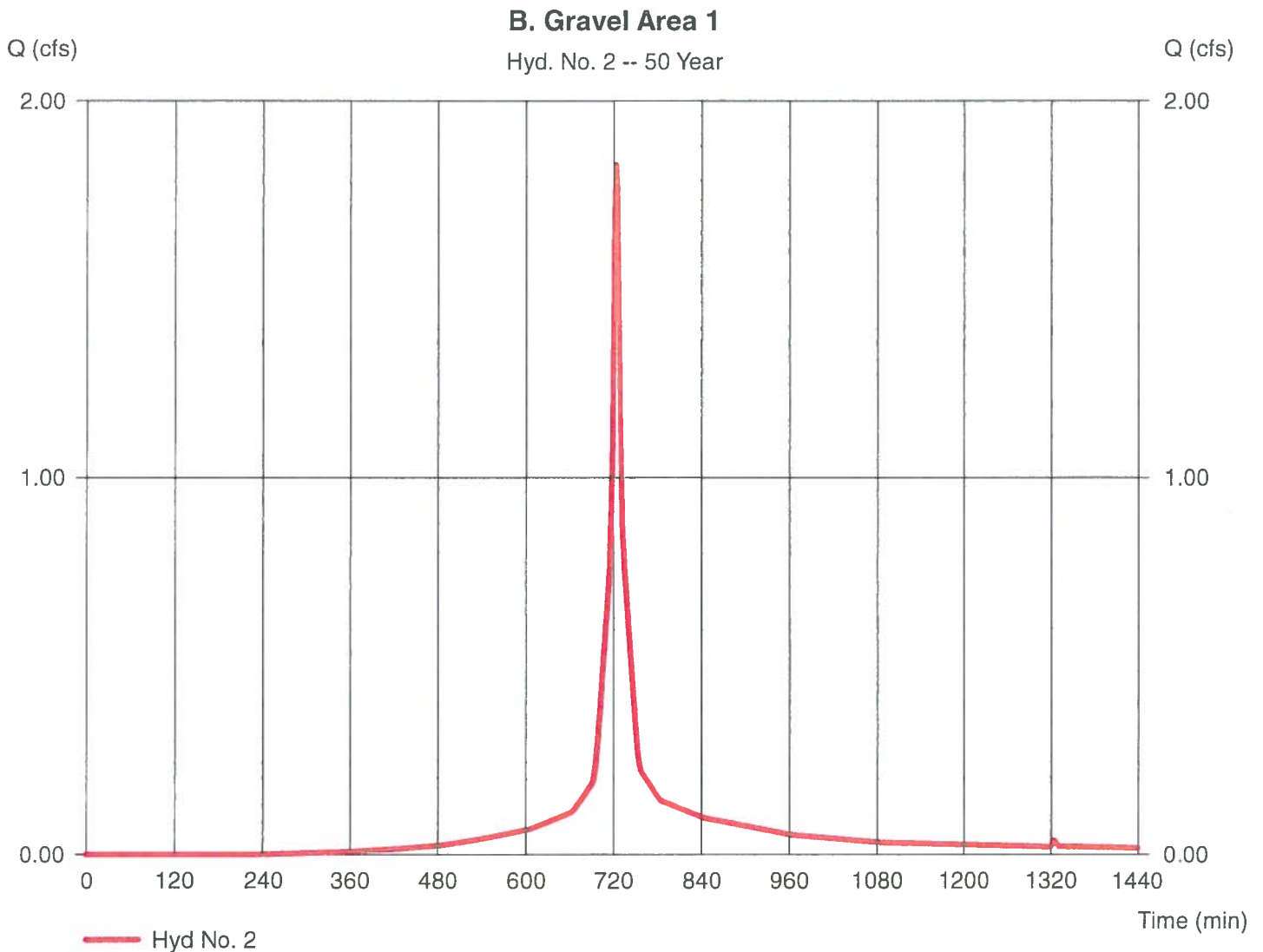
Hydrograph Report

Hyd. No. 2

B. Gravel Area 1

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 0.278 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.19 in
Storm duration = 24 hrs

Peak discharge = 1.831 cfs
Time to peak = 724 min
Hyd. volume = 5,887 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

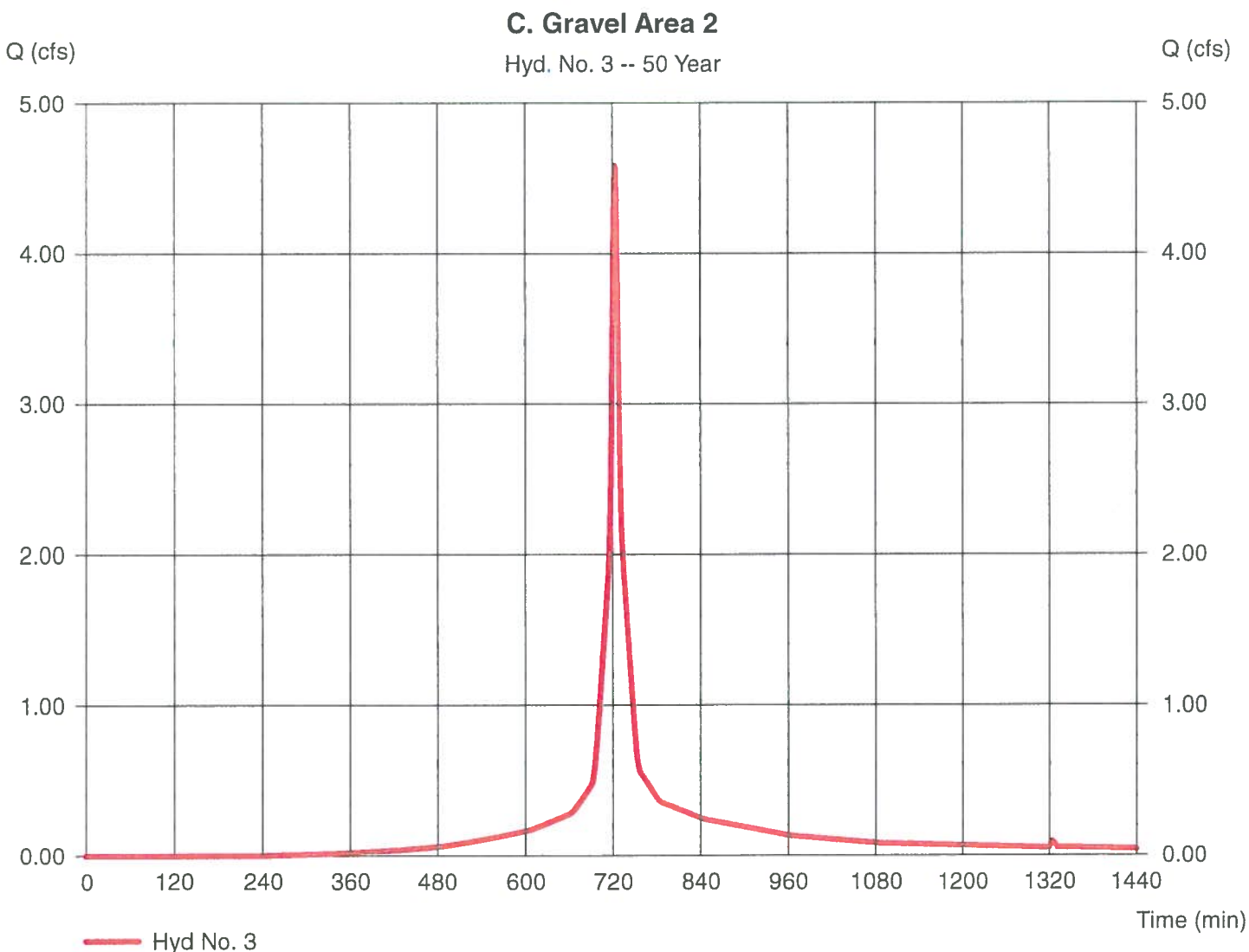
Tuesday, Oct 23, 2018

Hyd. No. 3

C. Gravel Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.696 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 4.585 cfs
 Time to peak = 724 min
 Hyd. volume = 14,744 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

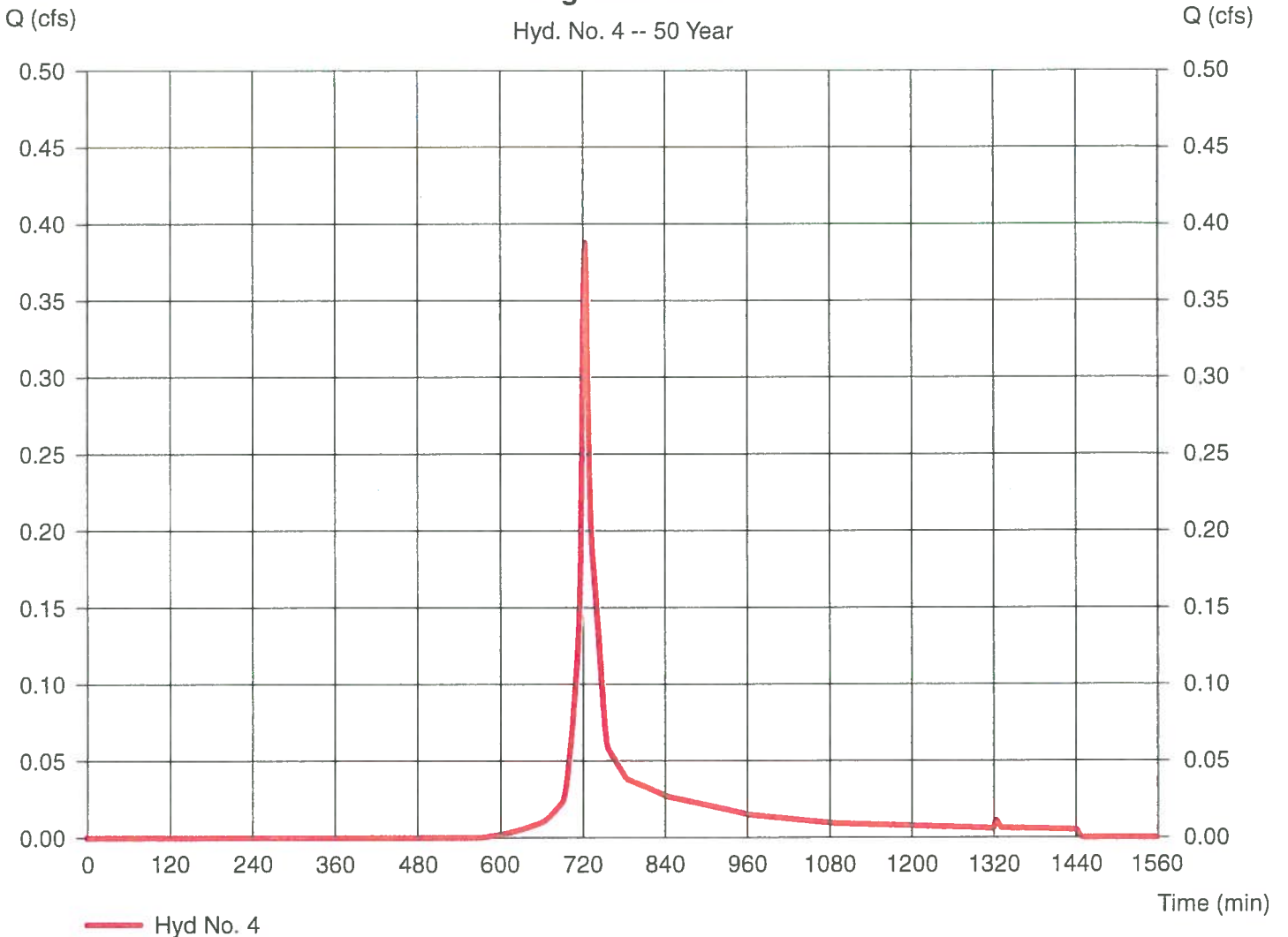
D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.388 cfs
 Time to peak = 725 min
 Hyd. volume = 1,208 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

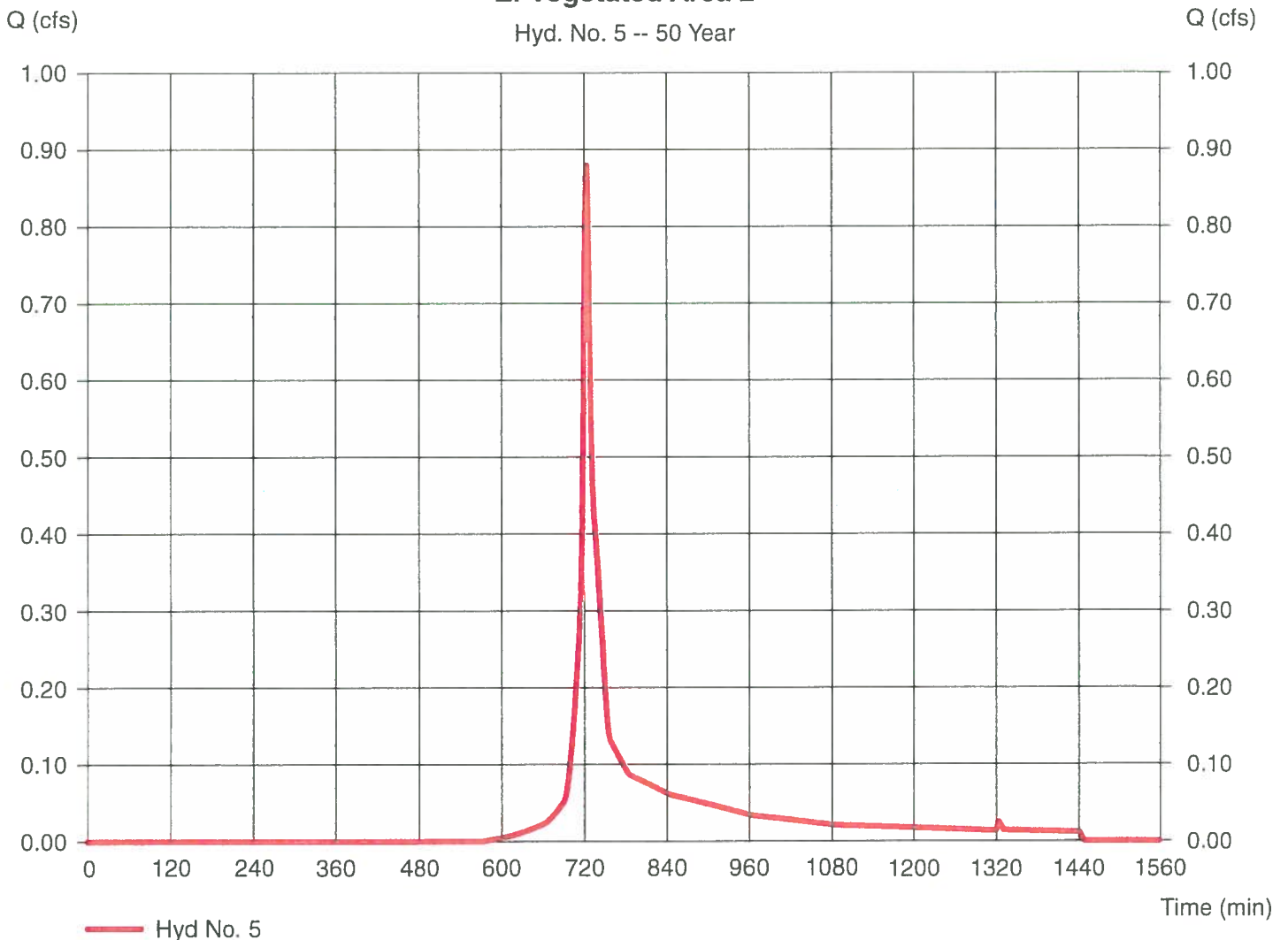
E. Vegetated Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.241 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.880 cfs
 Time to peak = 725 min
 Hyd. volume = 2,740 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 50 Year



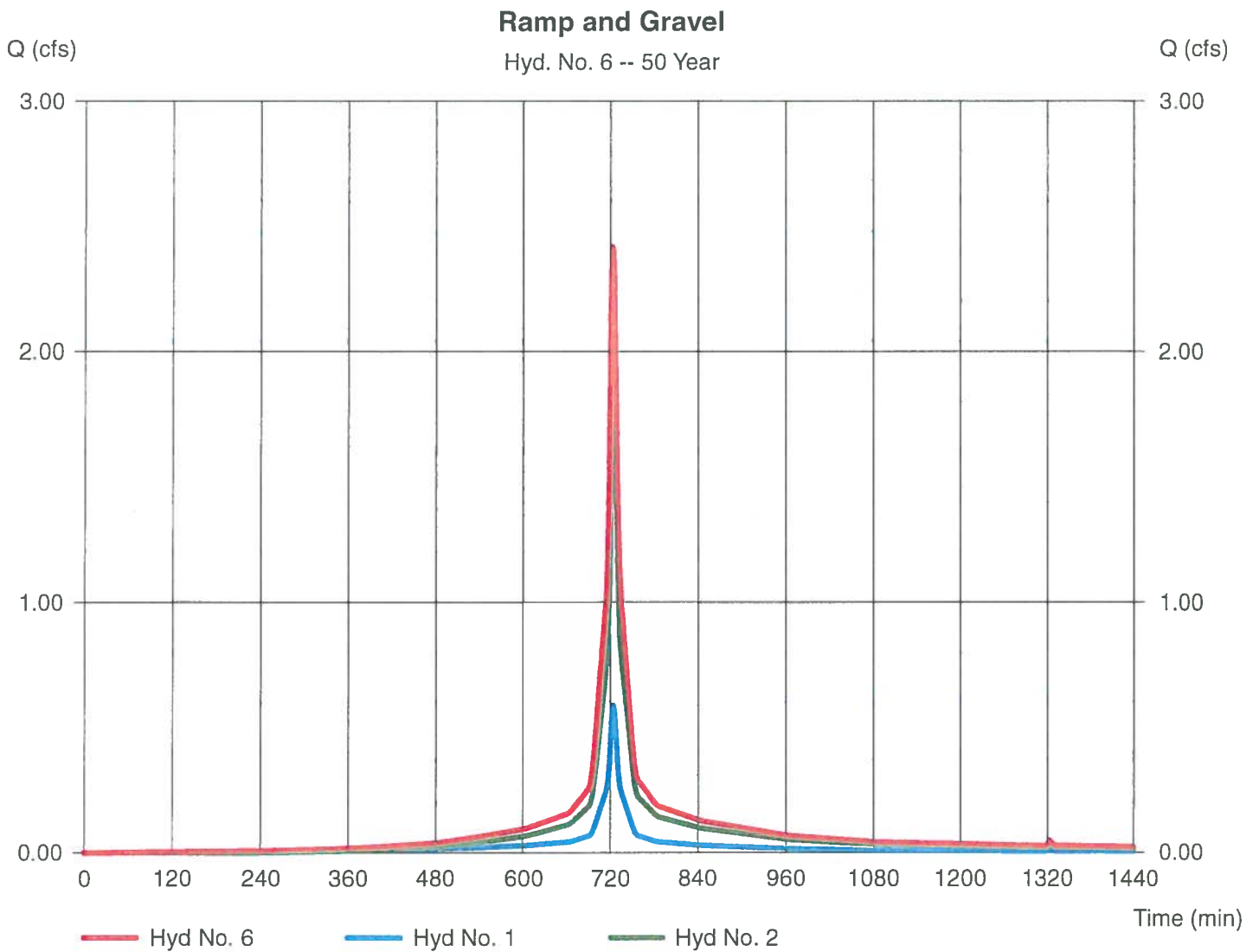
Hydrograph Report

Hyd. No. 6

Ramp and Gravel

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyds. = 1, 2

Peak discharge = 2.418 cfs
Time to peak = 724 min
Hyd. volume = 7,982 cuft
Contrib. drain. area = 0.358 ac



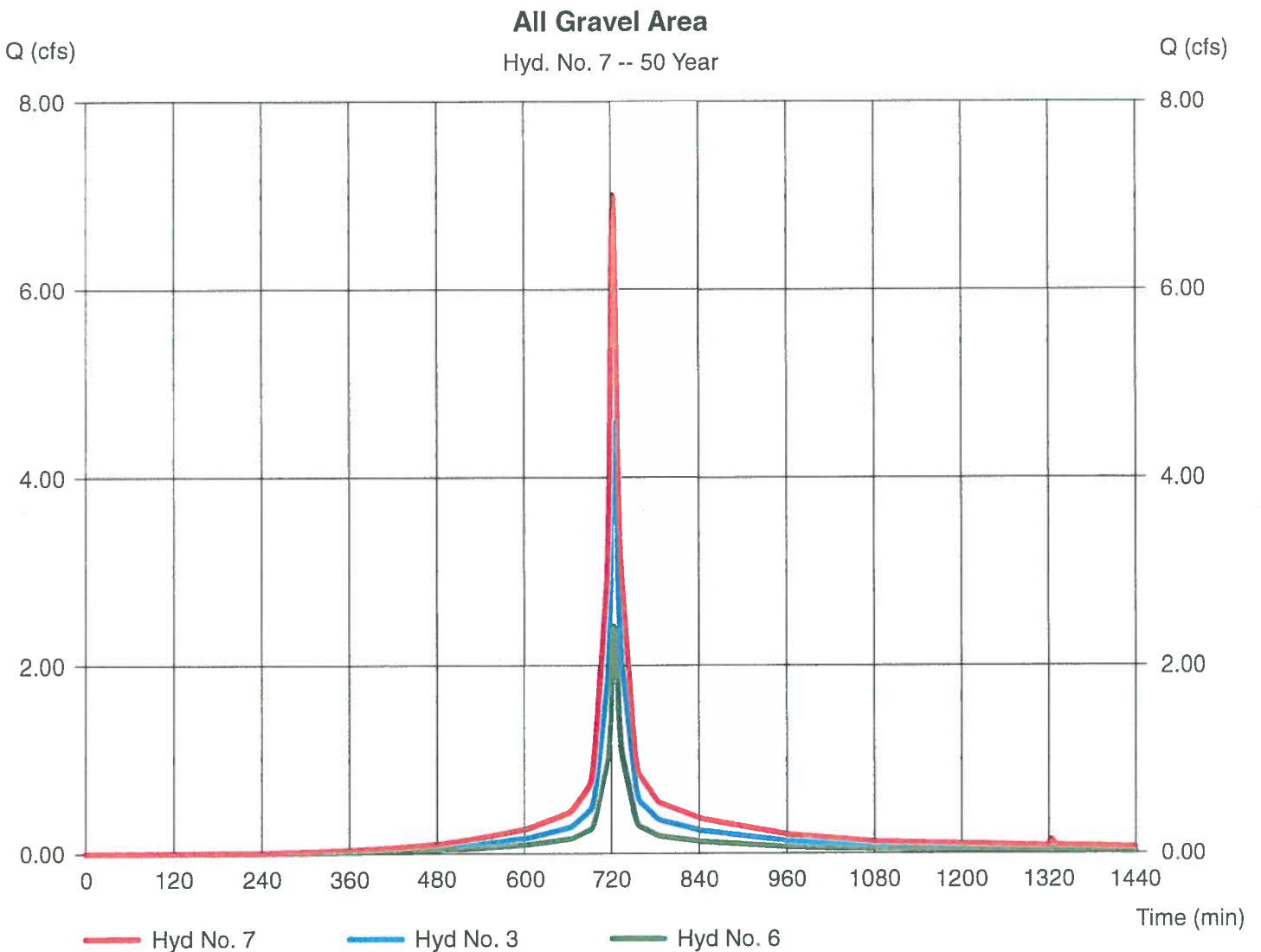
Hydrograph Report

Hyd. No. 7

All Gravel Area

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyds. = 3, 6

Peak discharge = 7.003 cfs
Time to peak = 724 min
Hyd. volume = 22,726 cuft
Contrib. drain. area = 0.696 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

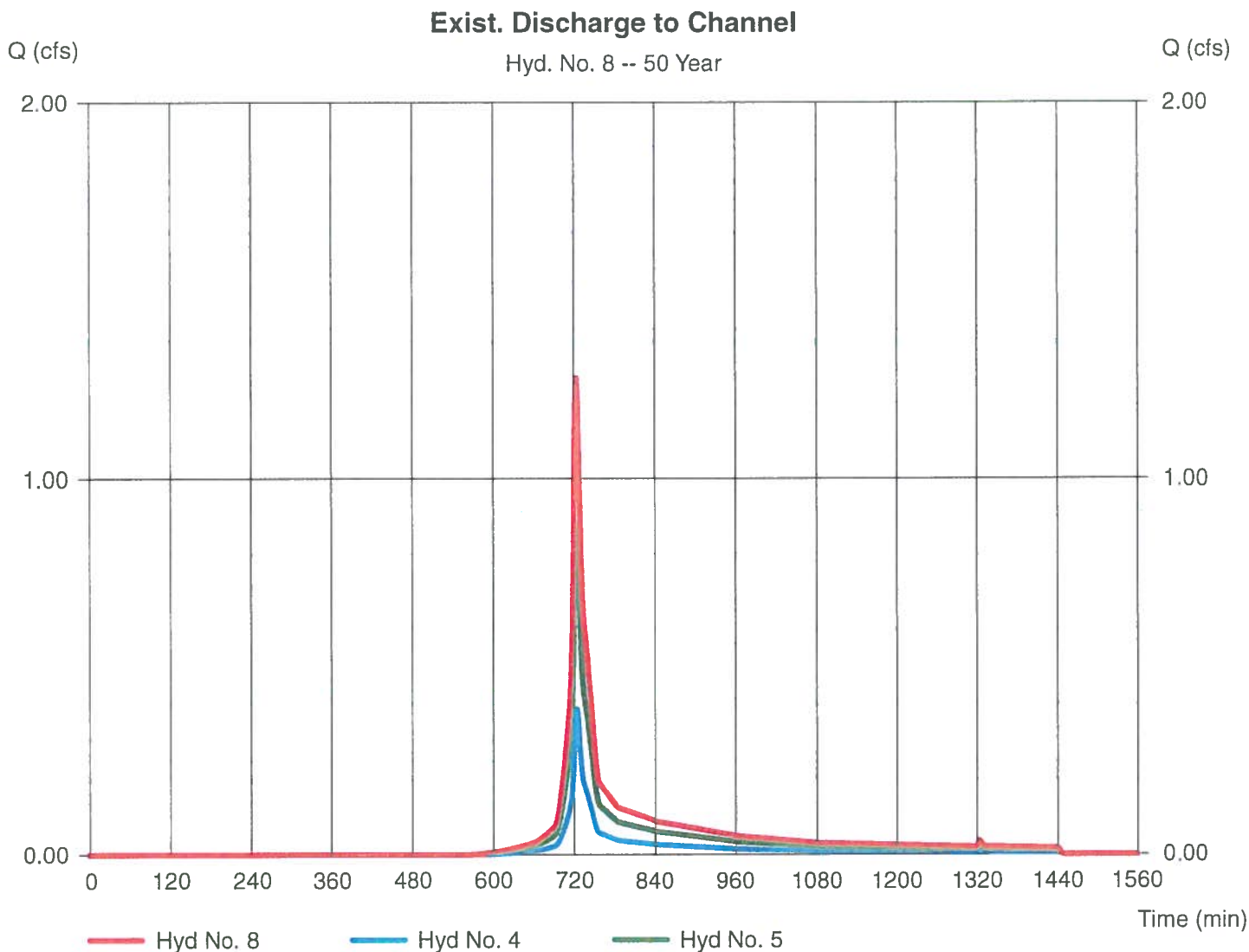
Tuesday, Oct 23, 2018

Hyd. No. 8

Exist. Discharge to Channel

Hydrograph type = Combine
 Storm frequency = 50 yrs
 Time interval = 1 min
 Inflow hyds. = 4, 5

Peak discharge = 1.268 cfs
 Time to peak = 725 min
 Hyd. volume = 3,948 cuft
 Contrib. drain. area = 0.347 ac



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.662	1	724	2,366	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	2.097	1	724	6,796	----	-----	-----	B. Gravel Area 1	
3	SCS Runoff	5.252	1	724	17,020	----	-----	-----	C. Gravel Area 2	
4	SCS Runoff	0.480	1	725	1,484	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	1.088	1	725	3,367	----	-----	-----	E. Vegetated Area 2	
6	Combine	2.759	1	724	9,162	1, 2,	-----	-----	Ramp and Gravel	
7	Combine	8.011	1	724	26,182	3, 6	-----	-----	All Gravel Area	
8	Combine	1.568	1	725	4,851	4, 5,	-----	-----	Exist. Discharge to Channel	
Pre.gpw					Return Period: 100 Year		Tuesday, Oct 23, 2018			

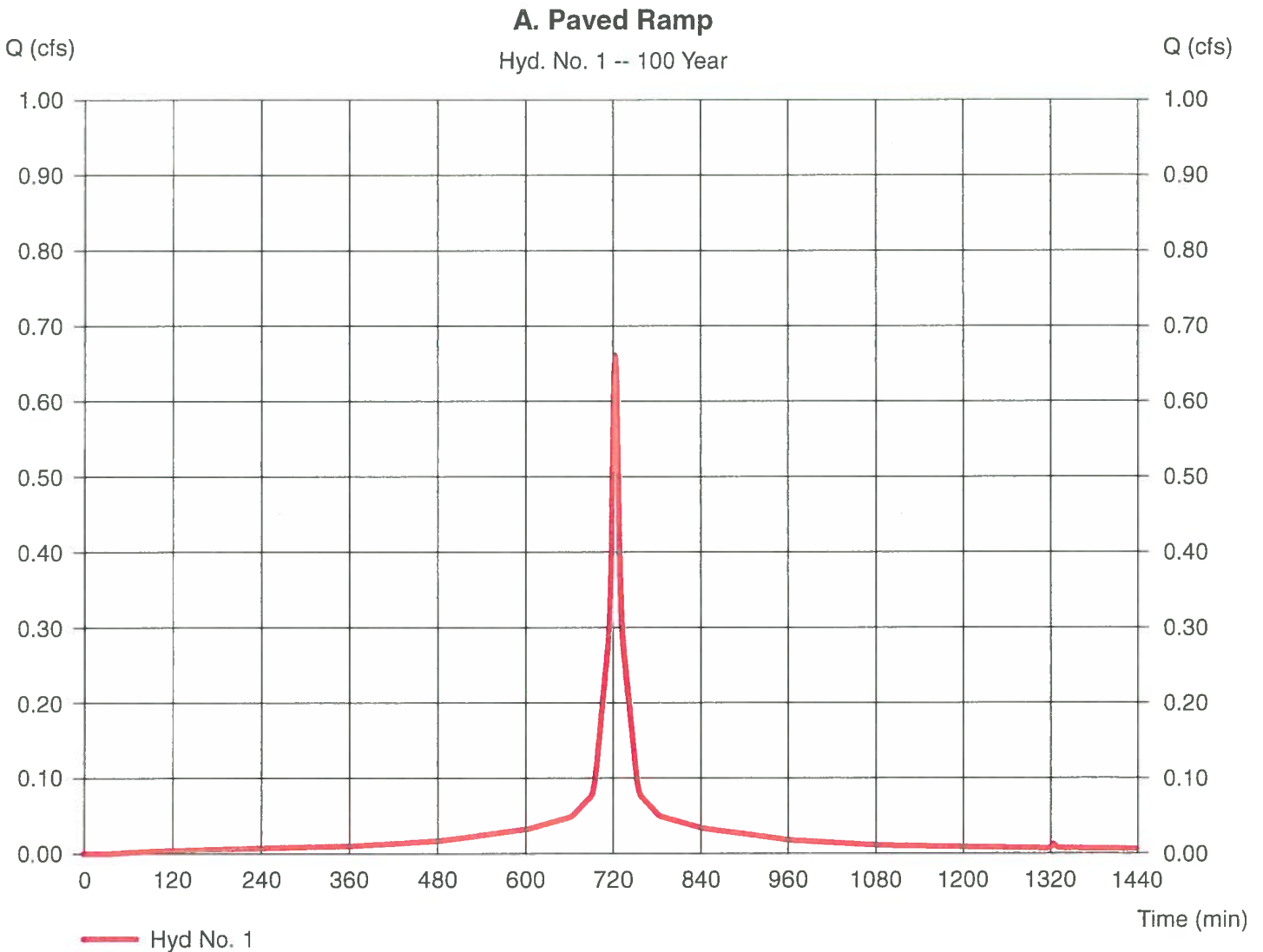
Hydrograph Report

Hyd. No. 1

A. Paved Ramp

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.081 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 0.662 cfs
Time to peak = 724 min
Hyd. volume = 2,366 cuft
Curve number = 98
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

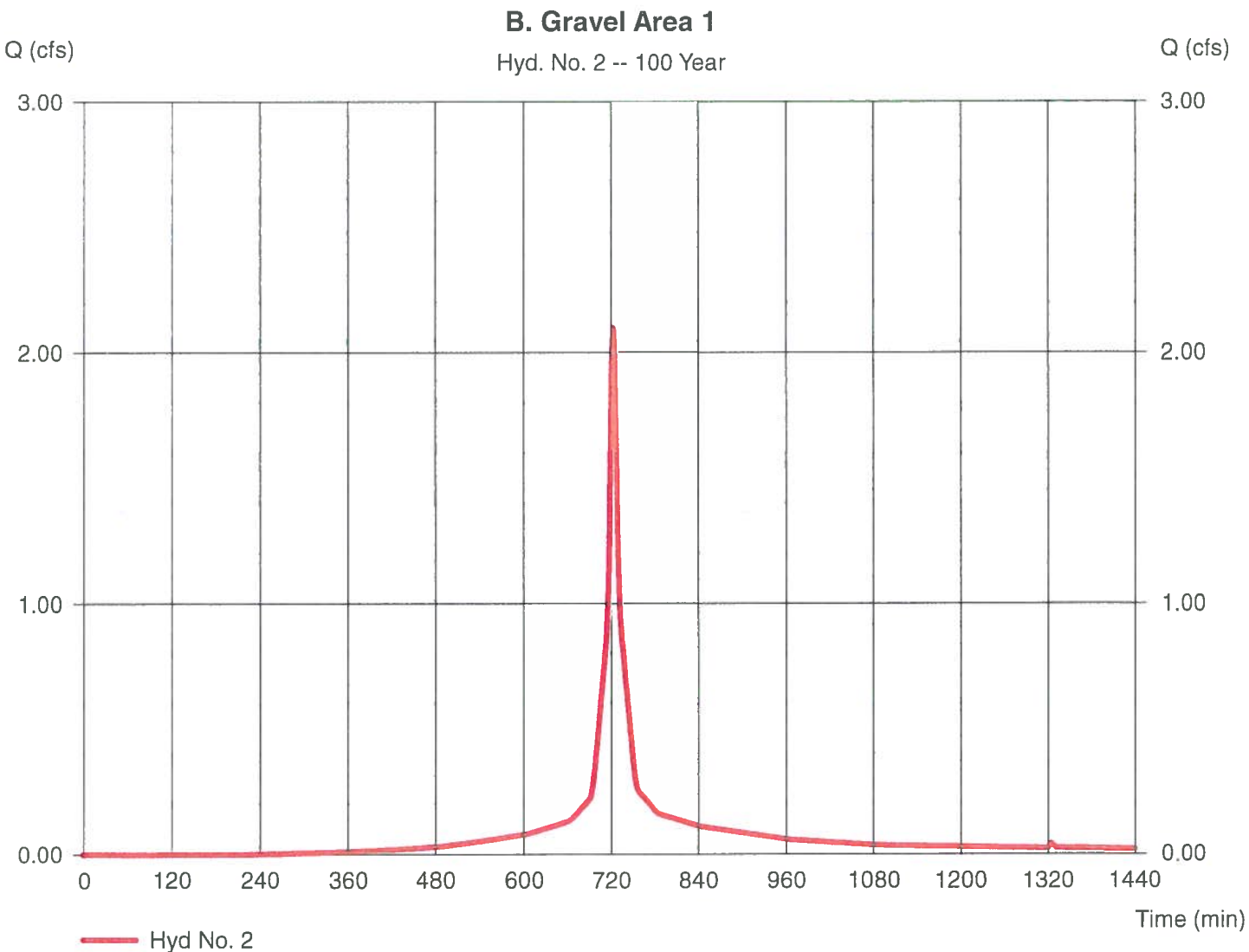
Tuesday, Oct 23, 2018

Hyd. No. 2

B. Gravel Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.278 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 2.097 cfs
 Time to peak = 724 min
 Hyd. volume = 6,796 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

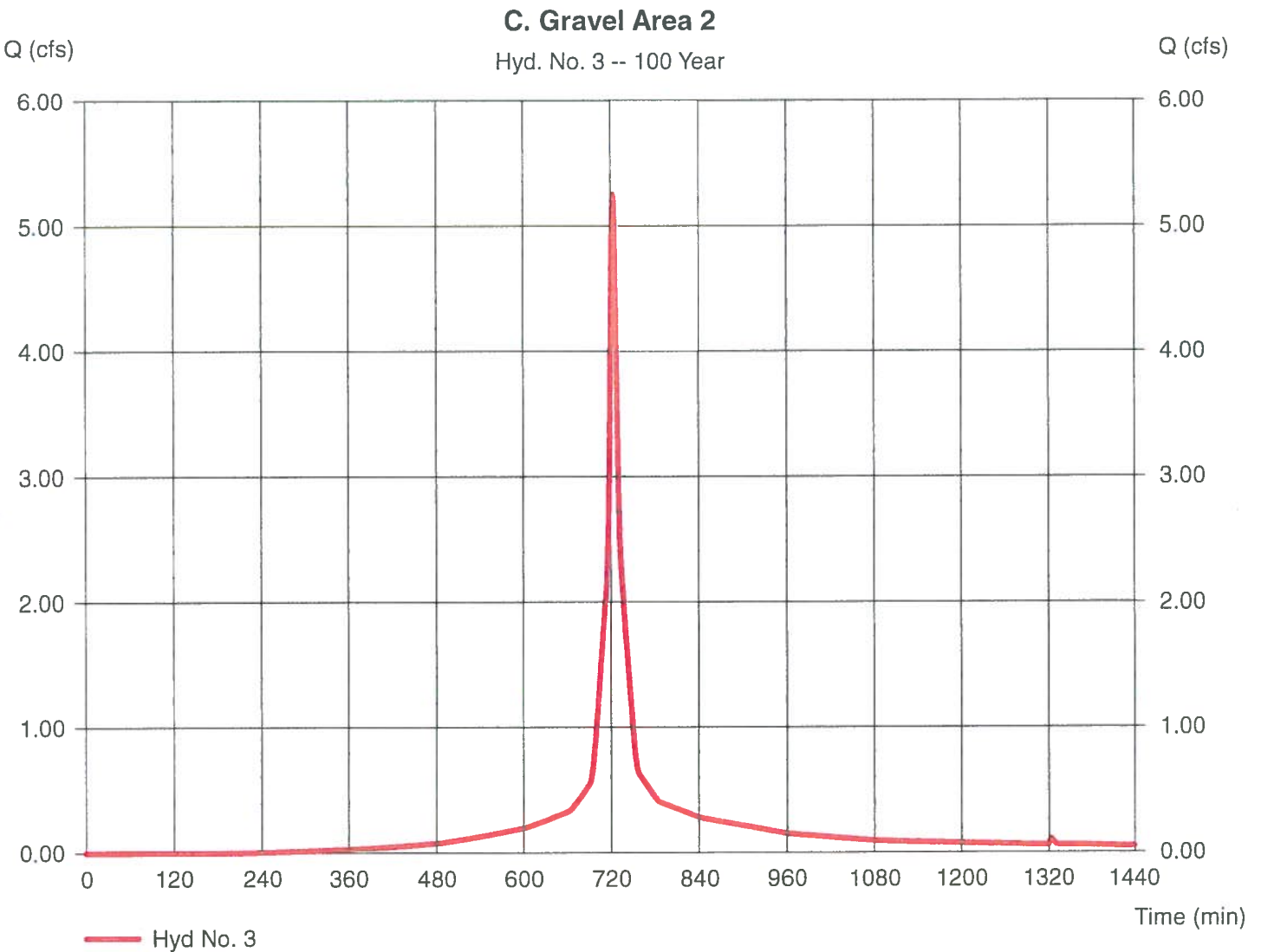
Tuesday, Oct 23, 2018

Hyd. No. 3

C. Gravel Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.696 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 5.252 cfs
 Time to peak = 724 min
 Hyd. volume = 17,020 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

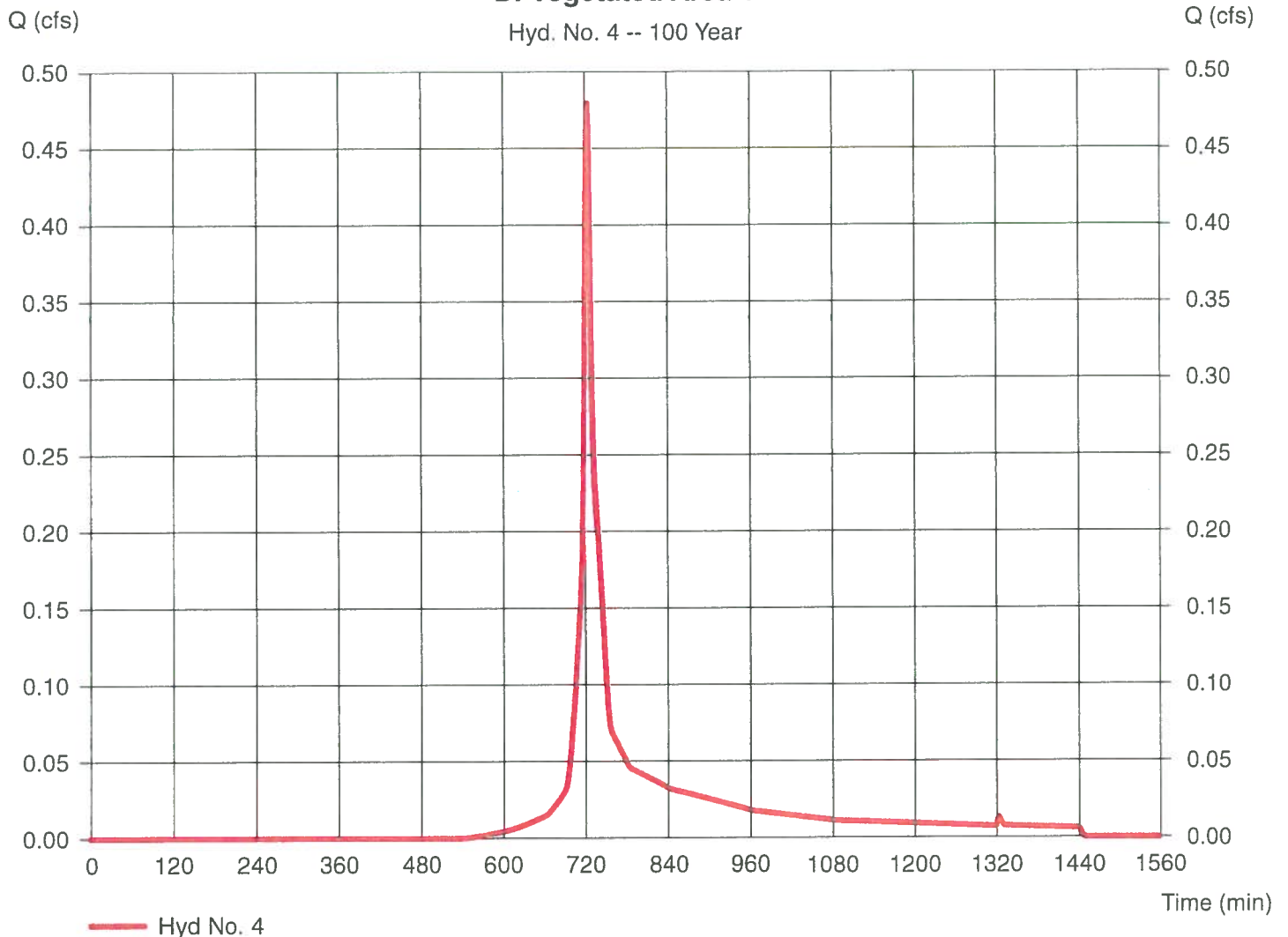
D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 0.480 cfs
 Time to peak = 725 min
 Hyd. volume = 1,484 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

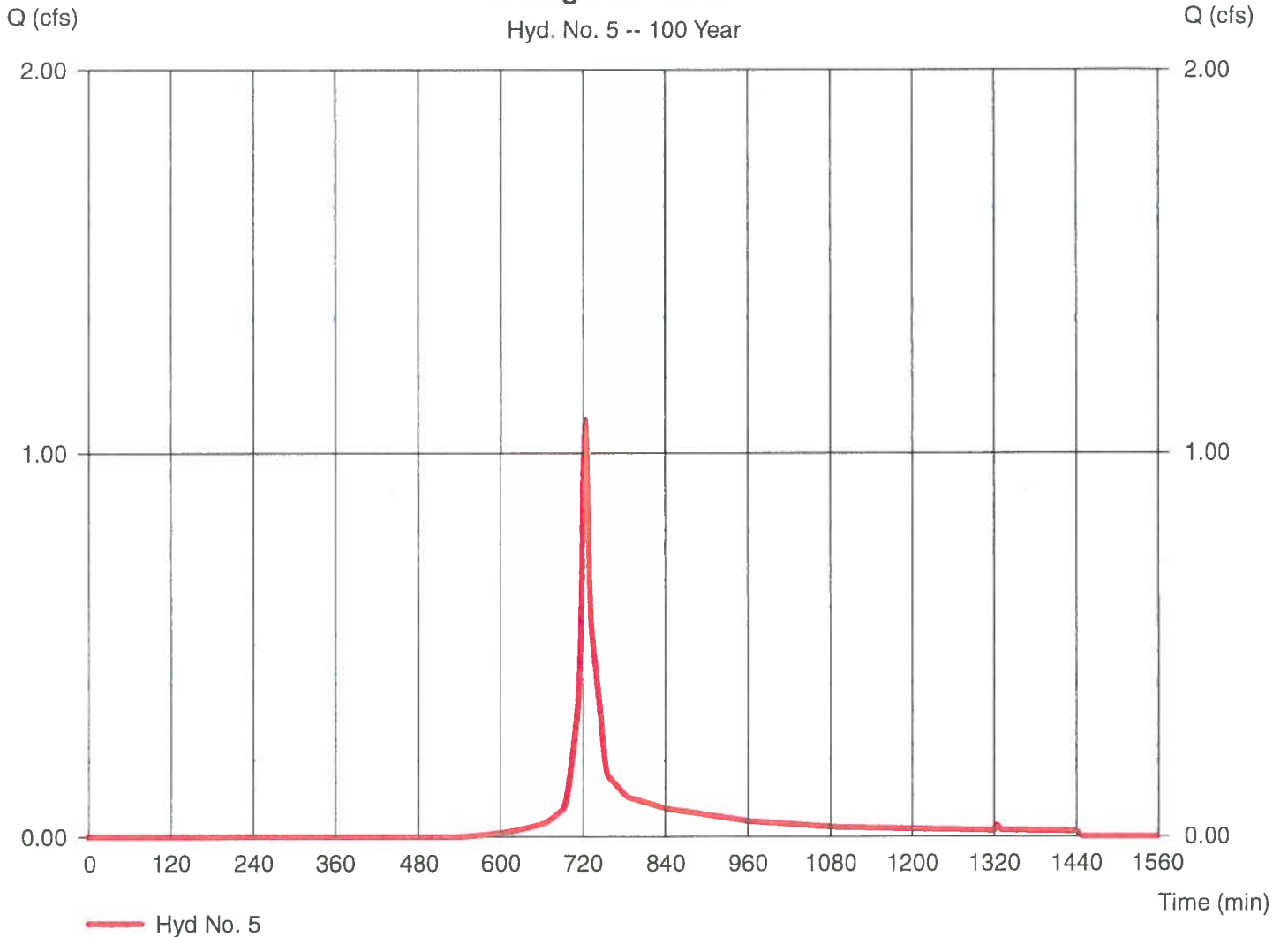
E. Vegetated Area 2

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.241 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 1.088 cfs
Time to peak = 725 min
Hyd. volume = 3,367 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

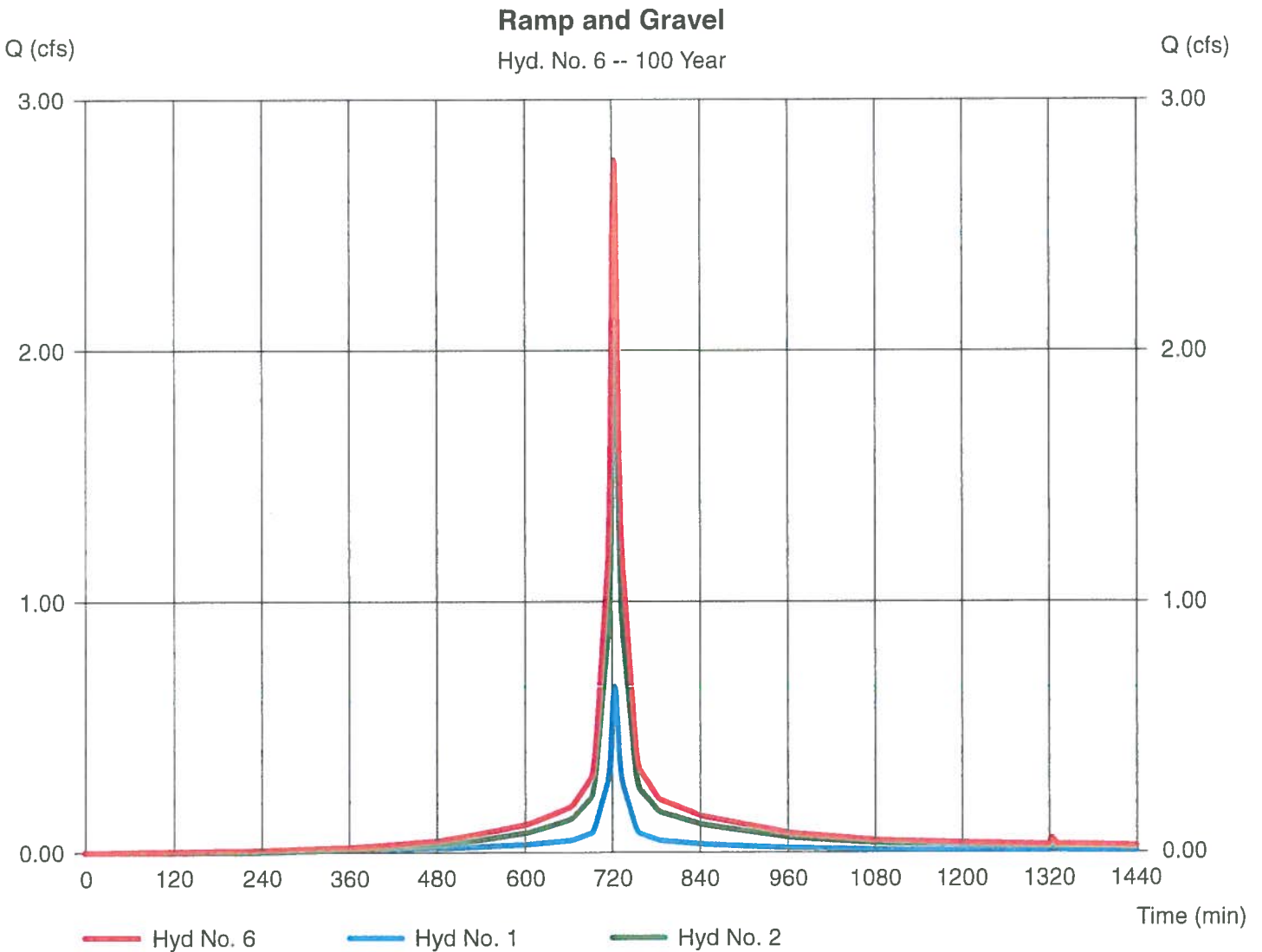
Tuesday, Oct 23, 2018

Hyd. No. 6

Ramp and Gravel

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyds. = 1, 2

Peak discharge = 2.759 cfs
 Time to peak = 724 min
 Hyd. volume = 9,162 cuft
 Contrib. drain. area = 0.358 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 7

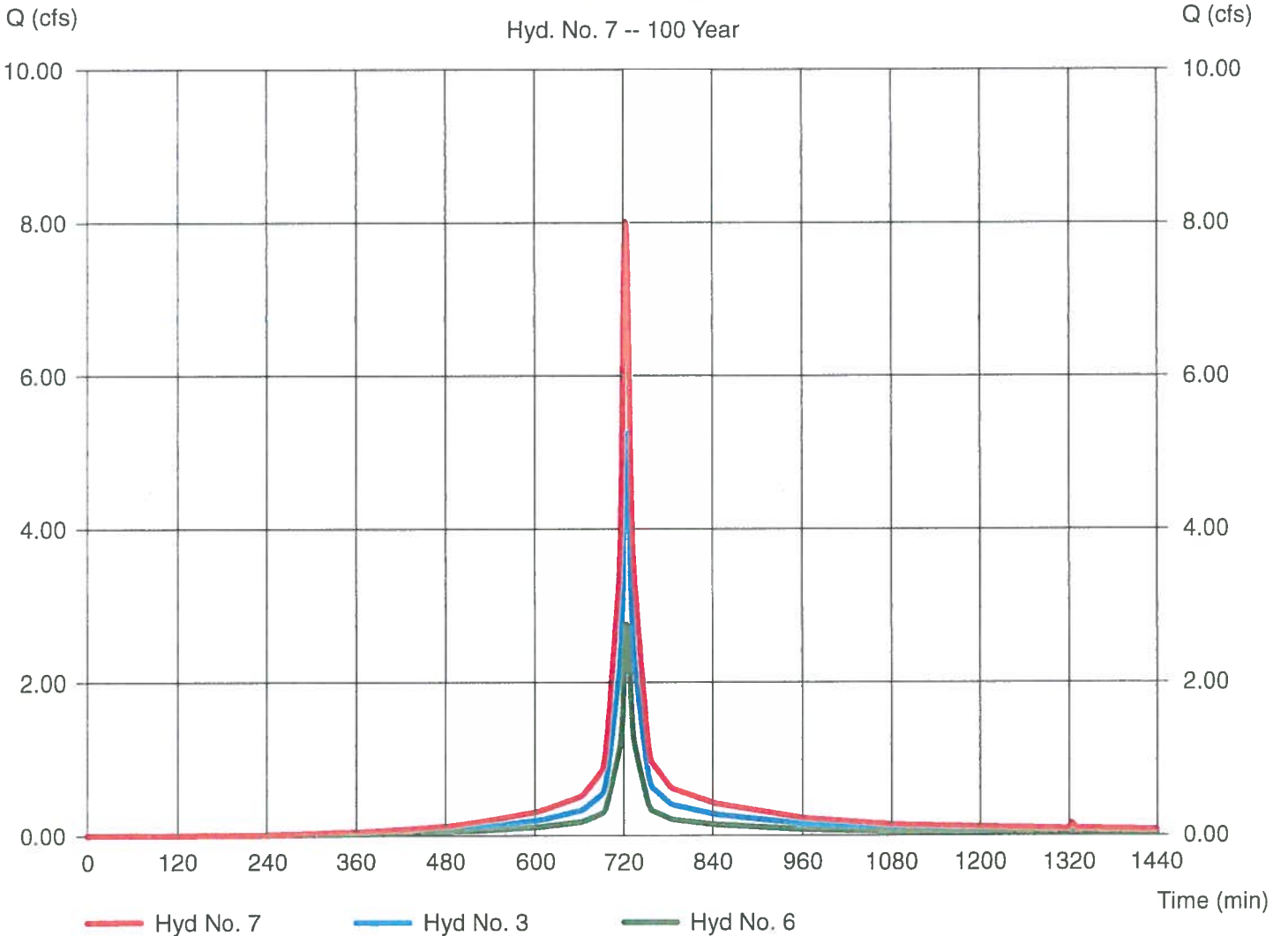
All Gravel Area

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 3, 6

Peak discharge = 8.011 cfs
Time to peak = 724 min
Hyd. volume = 26,182 cuft
Contrib. drain. area = 0.696 ac

All Gravel Area

Hyd. No. 7 -- 100 Year



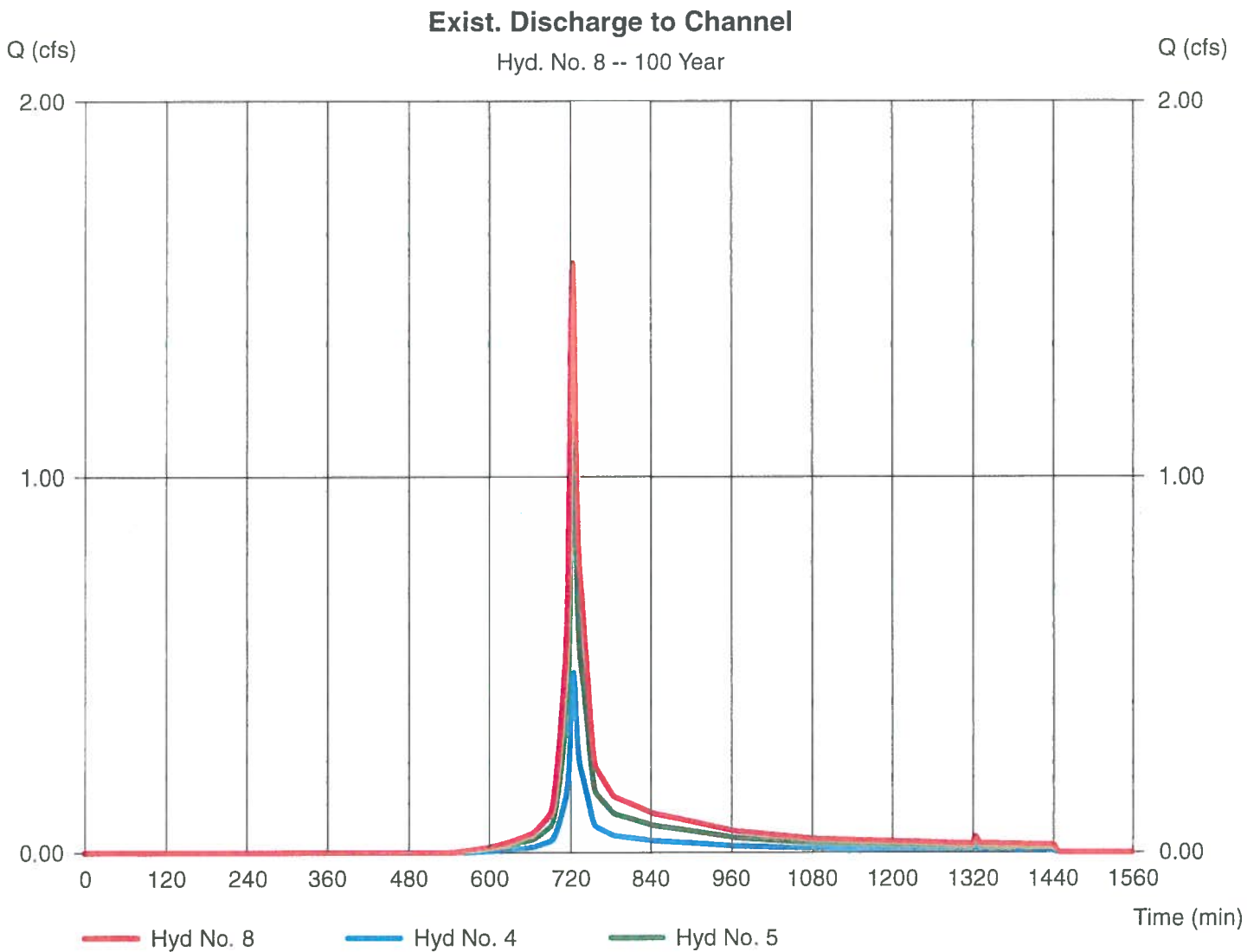
Hydrograph Report

Hyd. No. 8

Exist. Discharge to Channel

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 1.568 cfs
Time to peak = 725 min
Hyd. volume = 4,851 cuft
Contrib. drain. area= 0.347 ac



**HYDRAFLOW HYDROGRAPHS
DEVELOPED CONDITIONS**

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment A: Paved Ramp	Checked DJC	Date 10/23/18

Check one: Present Developed

Runoff Curve Number						
Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Paved	98			100	9800

^{1/} Use only one CN source per line

Totals ➡ 100 9800

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{9800}{100} = 98$; Use CN ➡ 98

2. Runoff

	Storm #1	Storm #2	Storm #3		
Frequency yr	2	10	25	60	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	3.01	4.87	6.05	6.95	7.85

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment B: Paved Area 1	Checked DJC	Date 10/23/18

Check one: Present Developed

1 Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Paved	98			95.45	9354.1
Group B-C	Gravel	87			4.55	395.85

^{1/} Use only one CN source per line

Totals ➡ **100** **9749.95**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{9749.95}{100} = 97.50$$
 ; Use CN ➡ **97.50**

2. Runoff

	Storm #1		Storm #2		Storm #3
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	2.95	4.81	5.99	6.89	7.79

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment C: Paved Area 2	Checked DJC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Paved	98			98.3	9633.4
Group B-C	Gravel	87			1.70	147.9

^{1/} Use only one CN source per line

Totals ➔ **100** **9781.3**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{9781.3}{100} = 97.8$$
 ; Use CN ➔ 97.8

2. Runoff

	Storm #1	Storm #2	Storm #3		
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	2.98	4.85	6.03	6.93	7.83

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment D: Vegetated Area 1	Checked DJC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Brush, fair	63			100	6300

^{1/} Use only one CN source per line

Totals ➡ **100** **6300**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{6300}{100} = 63$$
 ; Use CN ➡ **63**

2. Runoff

	Storm #1	Storm #2	Storm #3		
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	0.54	1.58	2.38	3.04	3.74

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment E: Vegetated Area 2	Checked DSC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Brush, fair	63			100	6300

^{1/} Use only one CN source per line

Totals ➡ 100 6300

$$CN \text{ (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{6300}{100} = 63 ; \text{ Use CN } \boxed{63}$$

2. Runoff

	Storm #1		Storm #2		Storm #3
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.24	7.19	8.09
Runoff, Q in	0.54	1.58	2.38	3.04	3.74

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Caret Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment F: Stone Swale	Checked DJC	Date 10/23/18

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Gravel	87			100	8700

^{1/} Use only one CN source per line

Totals ➡ 100 8700

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{8700}{100} = 87$$
 ; Use CN ➡ 87

2. Runoff

	Storm #1		Storm #2		Storm #3
Frequency yr	2	10	25	50	100
Rainfall, P (24-hour) in	3.24	5.11	6.29	7.19	8.09
Runoff, Q in	1.95	3.67	4.80	5.66	6.54

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project Cabot Yard Carhouse Renovations	By JMM	Date 10/23/18
Location Subcatchment G: Stone Swale	Checked DJC	Date 10/23/18

Check one: Present Developed

Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Group B-C	Gravel	87			100	8700

^{1/} Use only one CN source per line

Totals ➡ **100** **8700**

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8700}{100} = 87$; Use CN ➡ **87**

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	2	10	25 50 100
Rainfall, P (24-hour)	in	3.24	5.11	6.24 7.19 8.09
Runoff, Q	in	1.45	3.67	4.80 5.66 6.54

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 2: Runoff curve number and runoff

Project <i>Cabot Yard Carhouse Renovations</i>	By <i>JMM</i>	Date <i>10/23/18</i>
Location <i>Subcatchment H: Stone Swale/Gravel</i>	Checked <i>DJC</i>	Date <i>10/23/18</i>

Check one: Present Developed

1. Runoff curve number

Soil name and hydrologic group <small>(appendix A)</small>	Cover description <small>(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)</small>	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input checked="" type="checkbox"/> %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
<i>Group B-C</i>	<i>Gravel</i>	<i>87</i>			<i>100</i>	<i>8700</i>

^{1/} Use only one CN source per line

Totals ➡ *100* *8700*

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8700}{100} = 87$; Use CN ➡ *87*

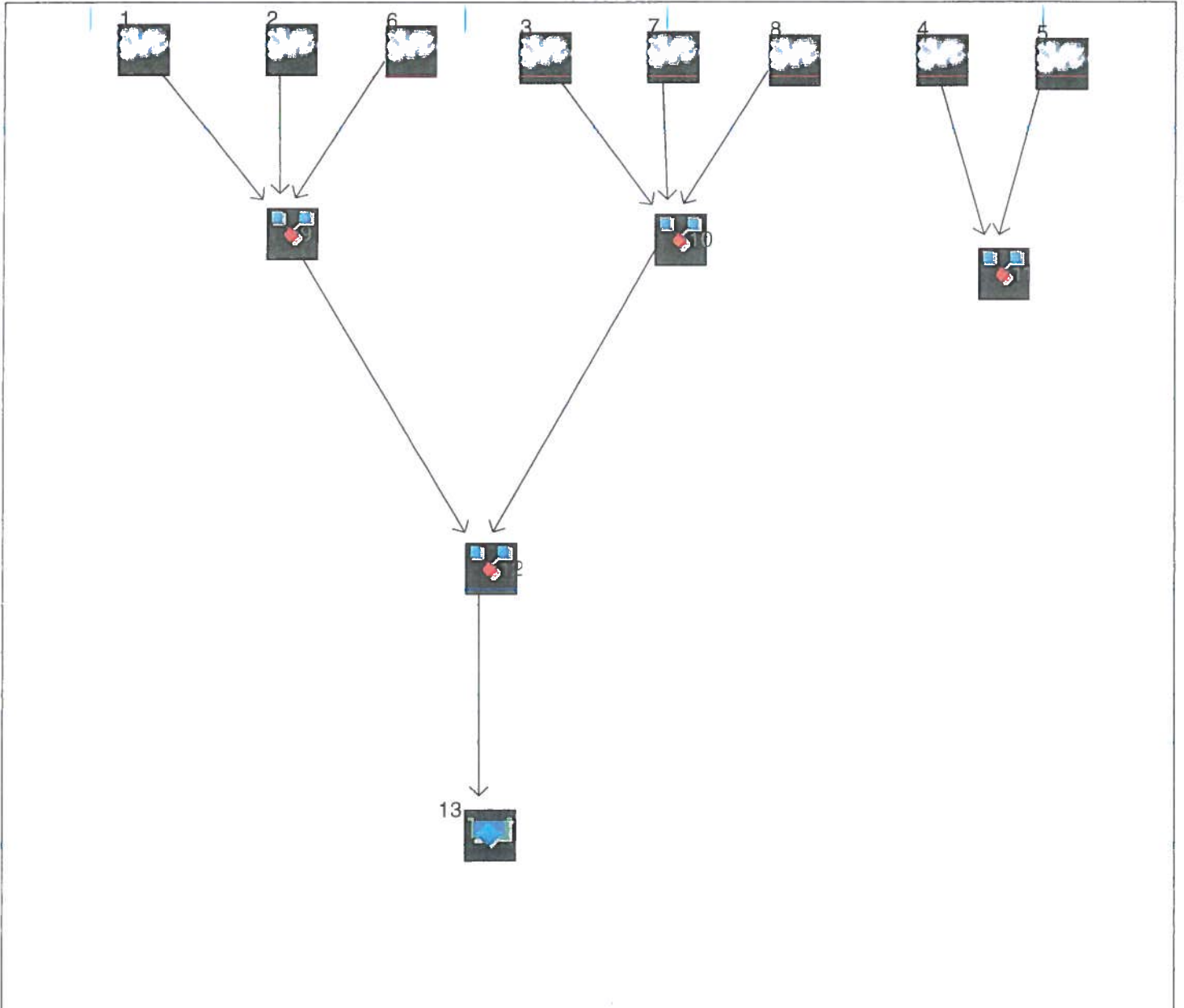
2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency yr	<i>2</i>	<i>10</i>	<i>25</i>
Rainfall, P (24-hour) in	<i>3.24</i>	<i>5.11</i>	<i>6.29</i>
Runoff, Q in	<i>1.45</i>	<i>3.67</i>	<i>4.80</i>

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.2



Legend

Hyd. Origin	Description
1 SCS Runoff	A. Paved Ramp
2 SCS Runoff	B. Paved Area 1
3 SCS Runoff	C. Paved/Gravel Area
4 SCS Runoff	D. Vegetated Area 1
5 SCS Runoff	E. Vegetated Area 2
6 SCS Runoff	F. Stone Swale 1
7 SCS Runoff	G. Stone Swale 2
8 SCS Runoff	H. Swale/gravel
9 Combine	Paved Area 1 and Swale
10 Combine	Paved Area 2 and Swales
11 Combine	Discharge to Channel
12 Combine	Impervious Areas and Swales
13 Reservoir	Total Storage

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	0.262	-----	-----	0.416	0.514	0.588	0.662	A. Paved Ramp
2	SCS Runoff	-----	-----	0.737	-----	-----	1.182	1.461	1.673	1.885	B. Paved Area 1
3	SCS Runoff	-----	-----	1.920	-----	-----	3.052	3.764	4.307	4.849	C. Paved/Gravel Area
4	SCS Runoff	-----	-----	0.051	-----	-----	0.192	0.300	0.388	0.480	D. Vegetated Area 1
5	SCS Runoff	-----	-----	0.115	-----	-----	0.435	0.680	0.880	1.088	E. Vegetated Area 2
6	SCS Runoff	-----	-----	0.122	-----	-----	0.225	0.290	0.340	0.389	F. Stone Swale 1
7	SCS Runoff	-----	-----	0.067	-----	-----	0.123	0.159	0.186	0.213	G. Stone Swale 2
8	SCS Runoff	-----	-----	0.175	-----	-----	0.323	0.416	0.488	0.559	H. Swale/gravel
9	Combine	1, 2, 6,	-----	1.121	-----	-----	1.823	2.264	2.600	2.935	Paved Area 1 and Swale
10	Combine	3, 7, 8,	-----	2.161	-----	-----	3.498	4.339	4.980	5.620	Paved Area 2 and Swales
11	Combine	4, 5,	-----	0.166	-----	-----	0.626	0.979	1.268	1.568	Discharge to Channel
12	Combine	9, 10,	-----	3.282	-----	-----	5.321	6.603	7.580	8.555	Impervious Areas and Swales
13	Reservoir	12	-----	0.000	-----	-----	0.000	0.000	0.000	0.000	Total Storage

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.262	1	724	906	----	-----	-----	A. Paved Ramp
2	SCS Runoff	0.737	1	724	2,494	----	-----	-----	B. Paved Area 1
3	SCS Runoff	1.920	1	724	6,642	----	-----	-----	C. Paved/Gravel Area
4	SCS Runoff	0.051	1	726	213	----	-----	-----	D. Vegetated Area 1
5	SCS Runoff	0.115	1	726	484	----	-----	-----	E. Vegetated Area 2
6	SCS Runoff	0.122	1	725	376	----	-----	-----	F. Stone Swale 1
7	SCS Runoff	0.067	1	725	206	----	-----	-----	G. Stone Swale 2
8	SCS Runoff	0.175	1	725	540	----	-----	-----	H. Swale/gravel
9	Combine	1.121	1	724	3,776	1, 2, 6,	-----	-----	Paved Area 1 and Swale
10	Combine	2.161	1	724	7,388	3, 7, 8,	-----	-----	Paved Area 2 and Swales
11	Combine	0.166	1	726	697	4, 5,	-----	-----	Discharge to Channel
12	Combine	3.282	1	724	11,164	9, 10,	-----	-----	Impervious Areas and Swales
13	Reservoir	0.000	1	n/a	0	12	17.61	11,164	Total Storage
Post.gpw					Return Period: 2 Year			Tuesday, Oct 23, 2018	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 1

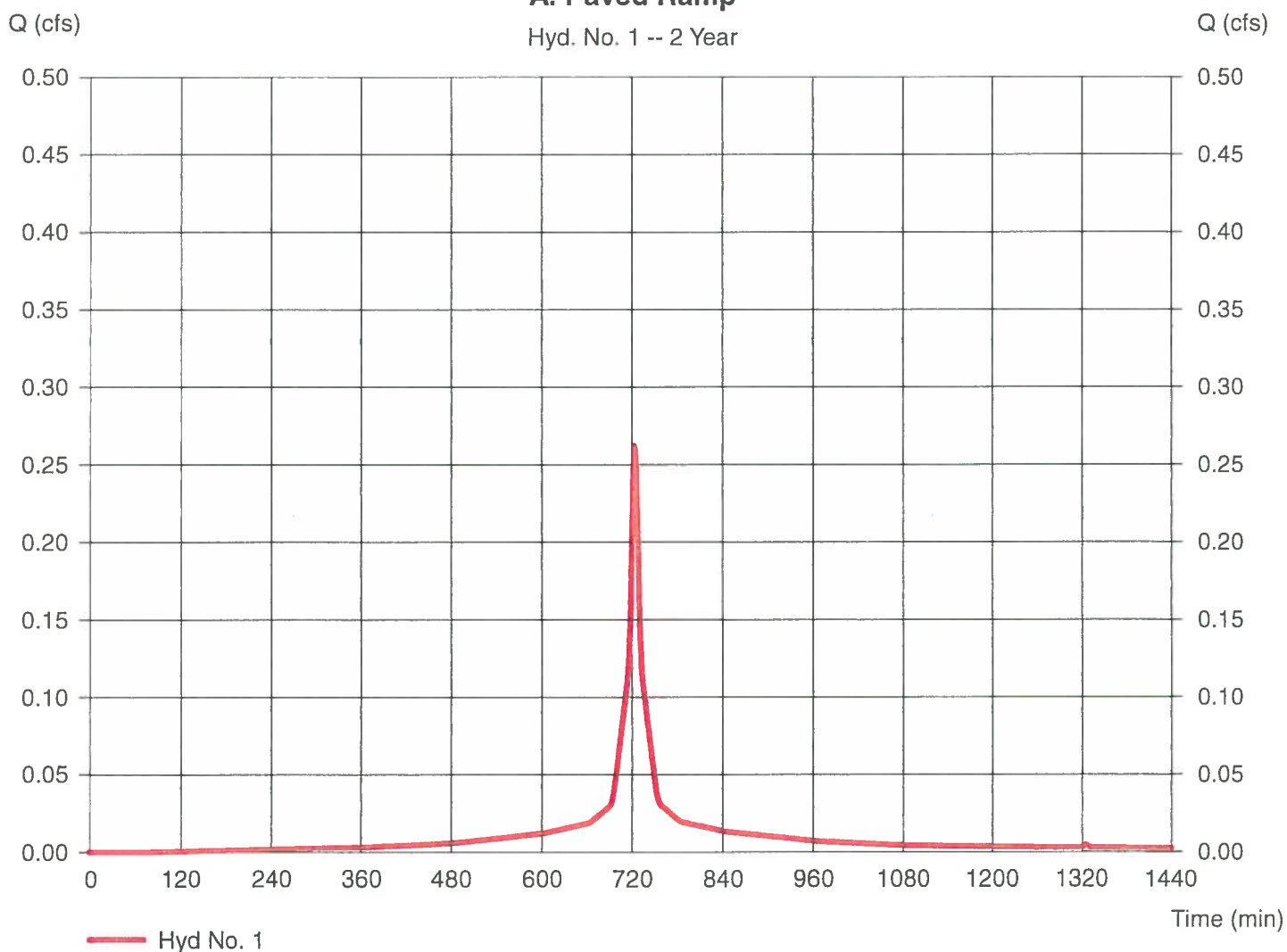
A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 0.262 cfs
 Time to peak = 724 min
 Hyd. volume = 906 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 2

B. Paved Area 1

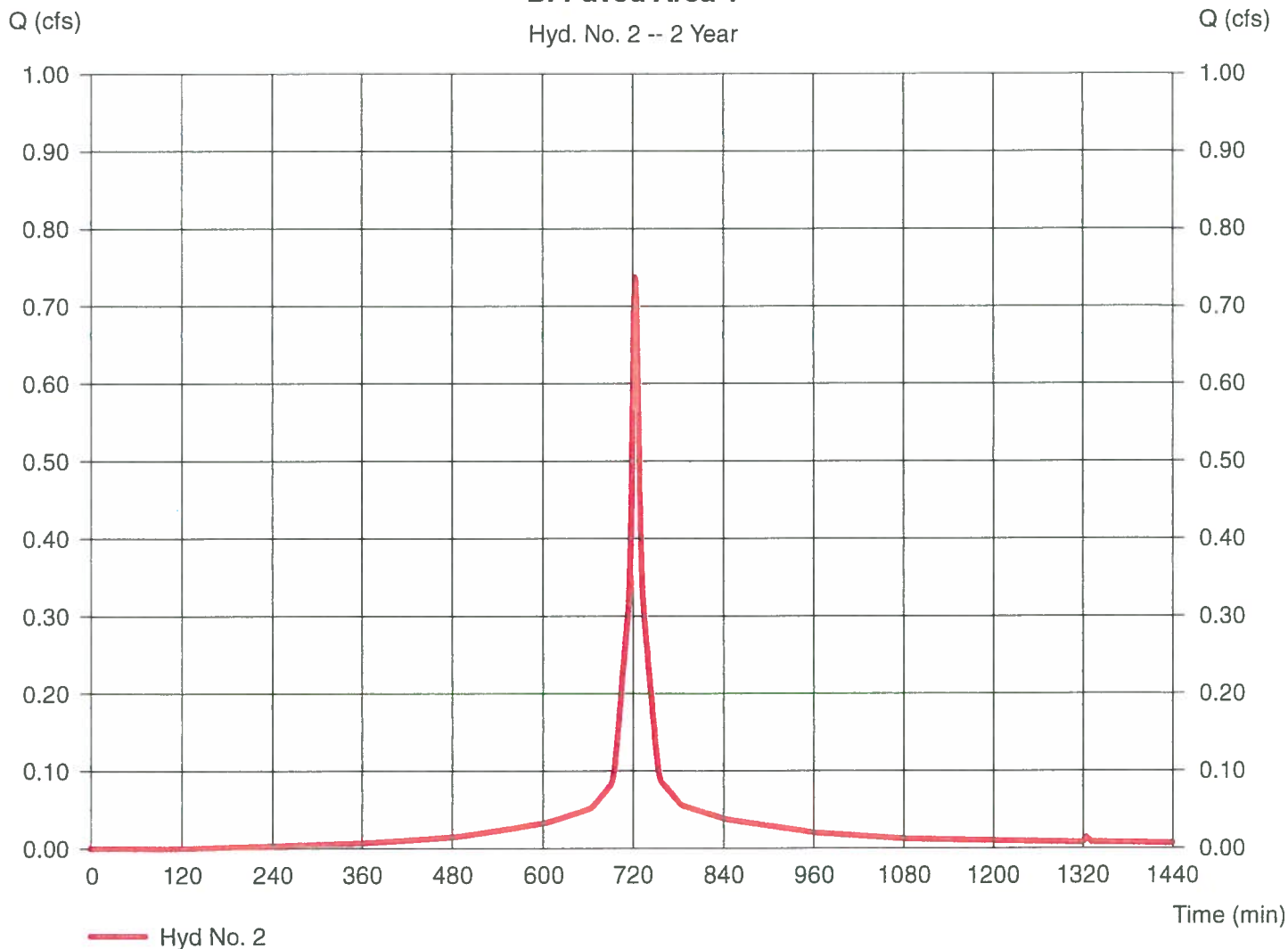
Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 0.737 cfs
 Time to peak = 724 min
 Hyd. volume = 2,494 cuft
 Curve number = 97*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = [(0.214 x 98) + (0.012 x 87)] / 0.230

B. Paved Area 1

Hyd. No. 2 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 3

C. Paved/Gravel Area

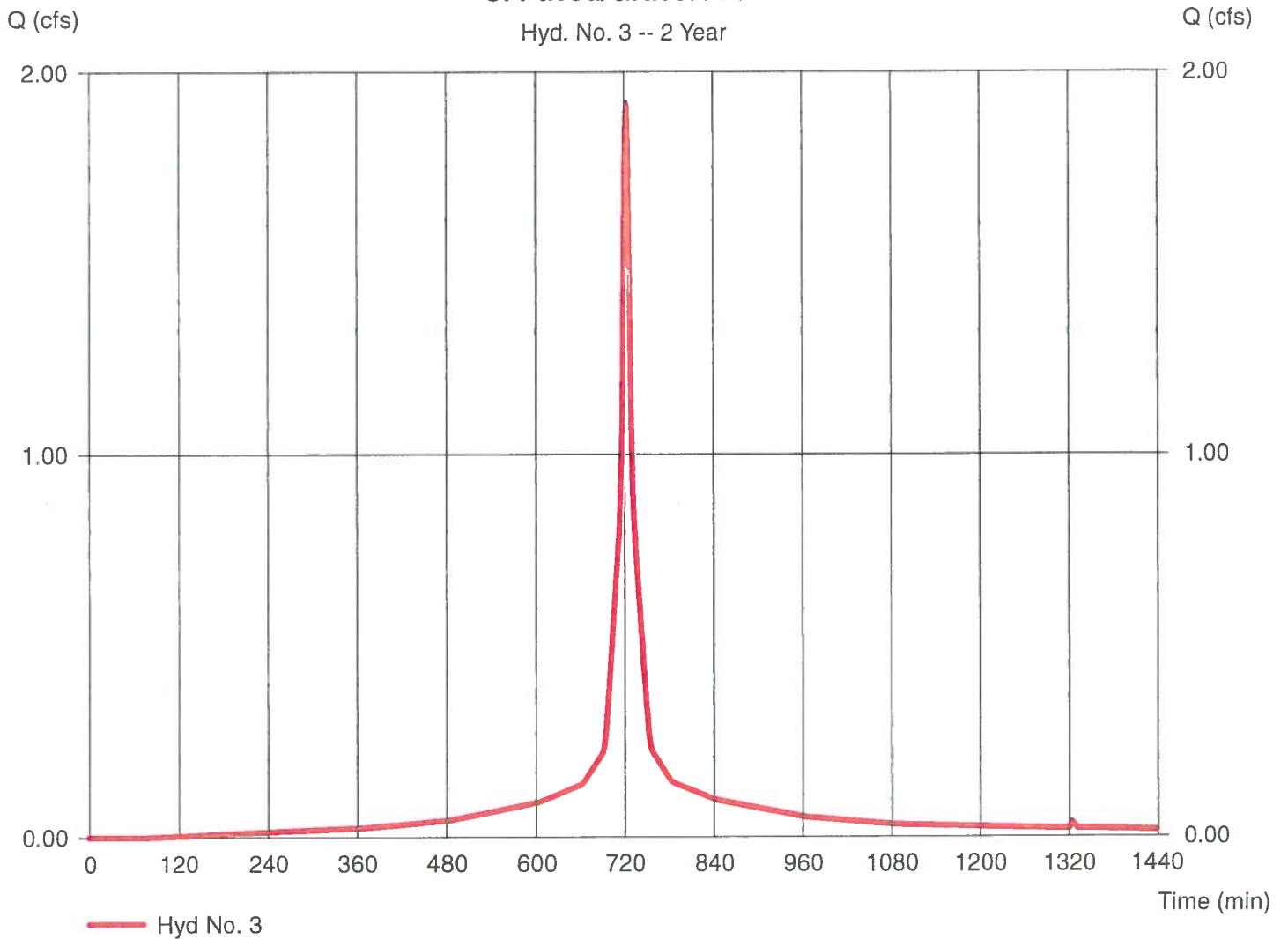
Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.590 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 1.920 cfs
 Time to peak = 724 min
 Hyd. volume = 6,642 cuft
 Curve number = 98*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.579 \times 98) + (0.014 \times 87)] / 0.590$

C. Paved/Gravel Area

Hyd. No. 3 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

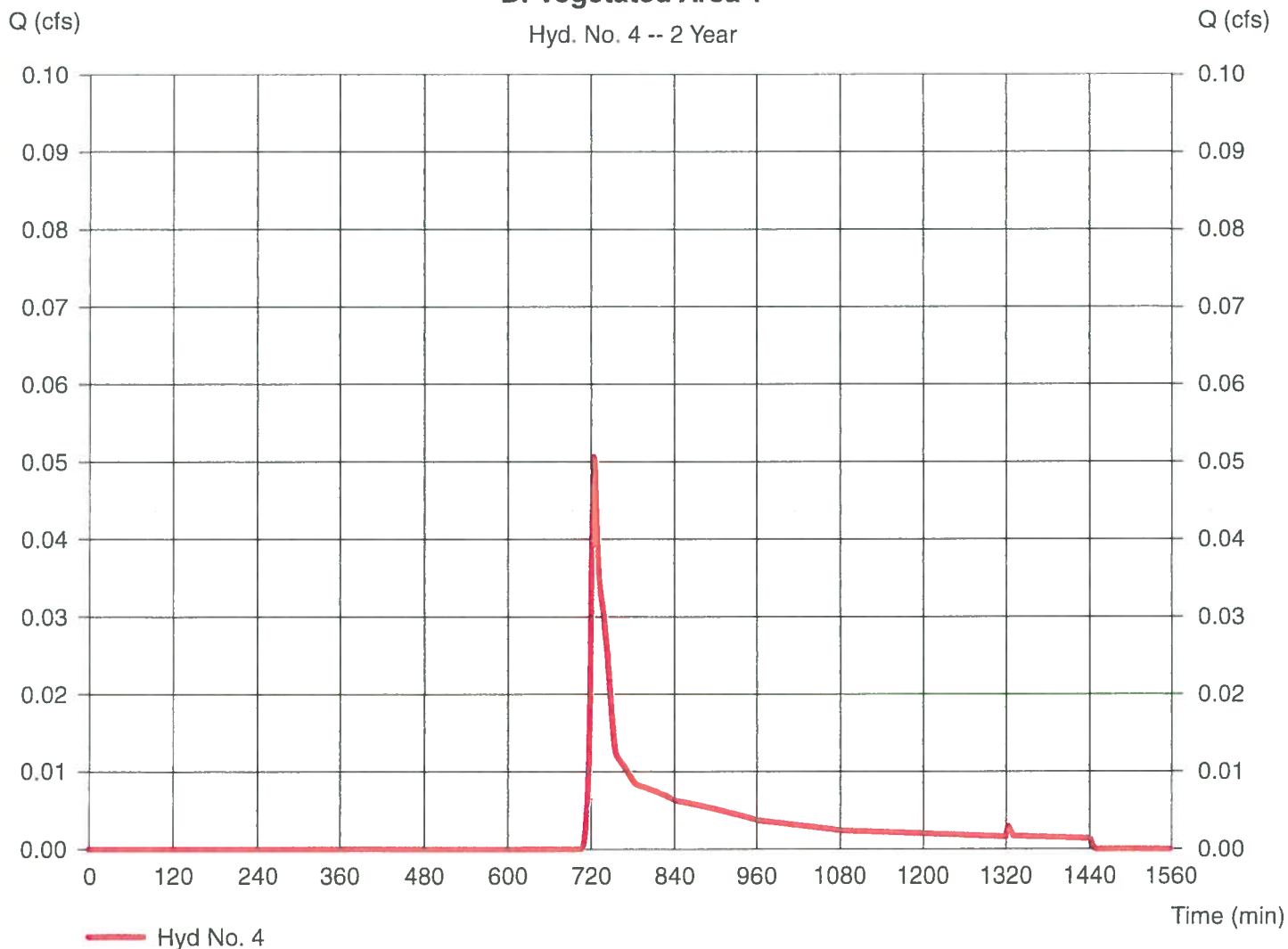
D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.24 in
 Storm duration = 24 hrs

Peak discharge = 0.051 cfs
 Time to peak = 726 min
 Hyd. volume = 213 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

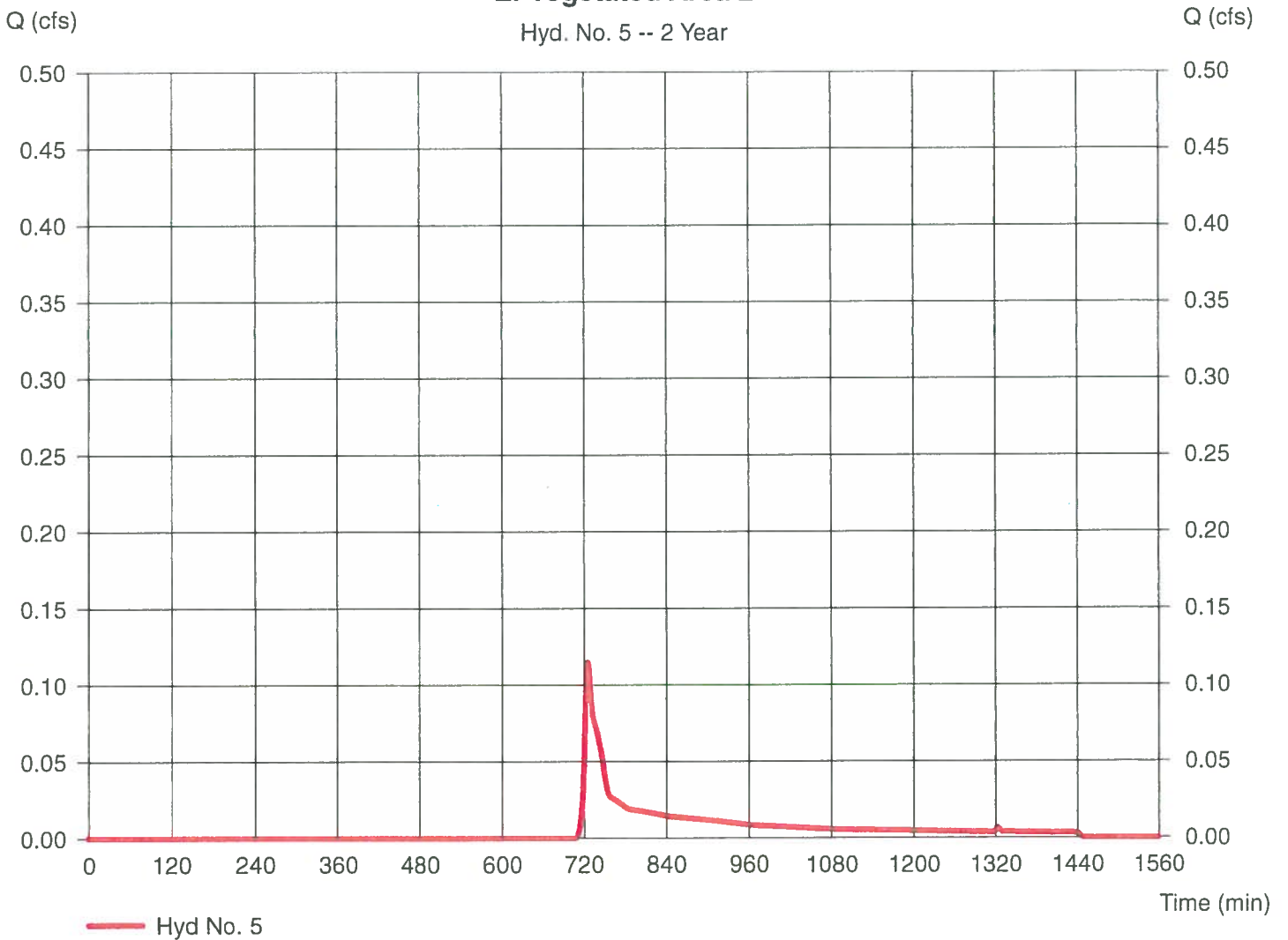
E. Vegetated Area 2

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.241 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.115 cfs
Time to peak = 726 min
Hyd. volume = 484 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

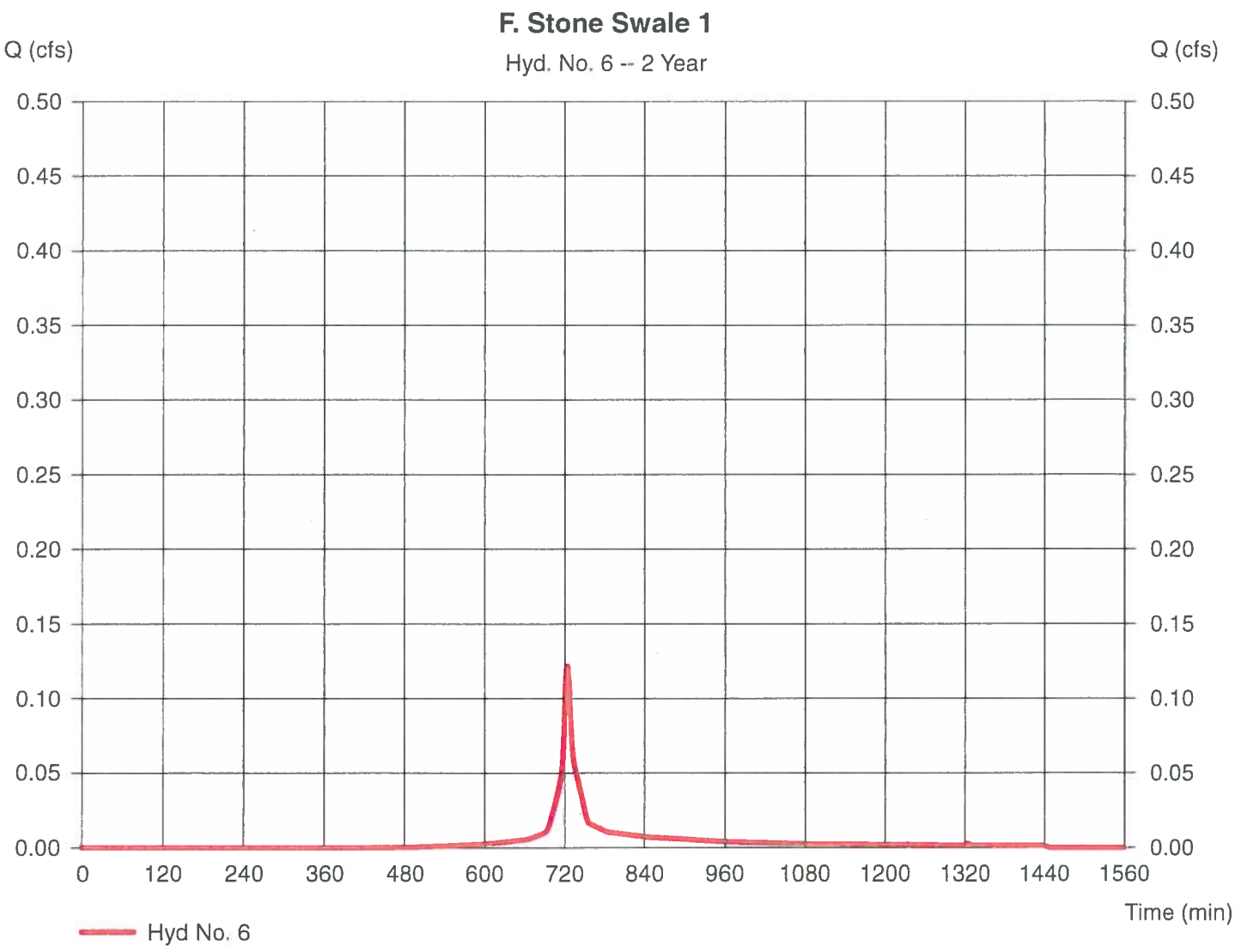
Tuesday, Oct 23, 2018

Hyd. No. 6

F. Stone Swale 1

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.052 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.122 cfs
Time to peak = 725 min
Hyd. volume = 376 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



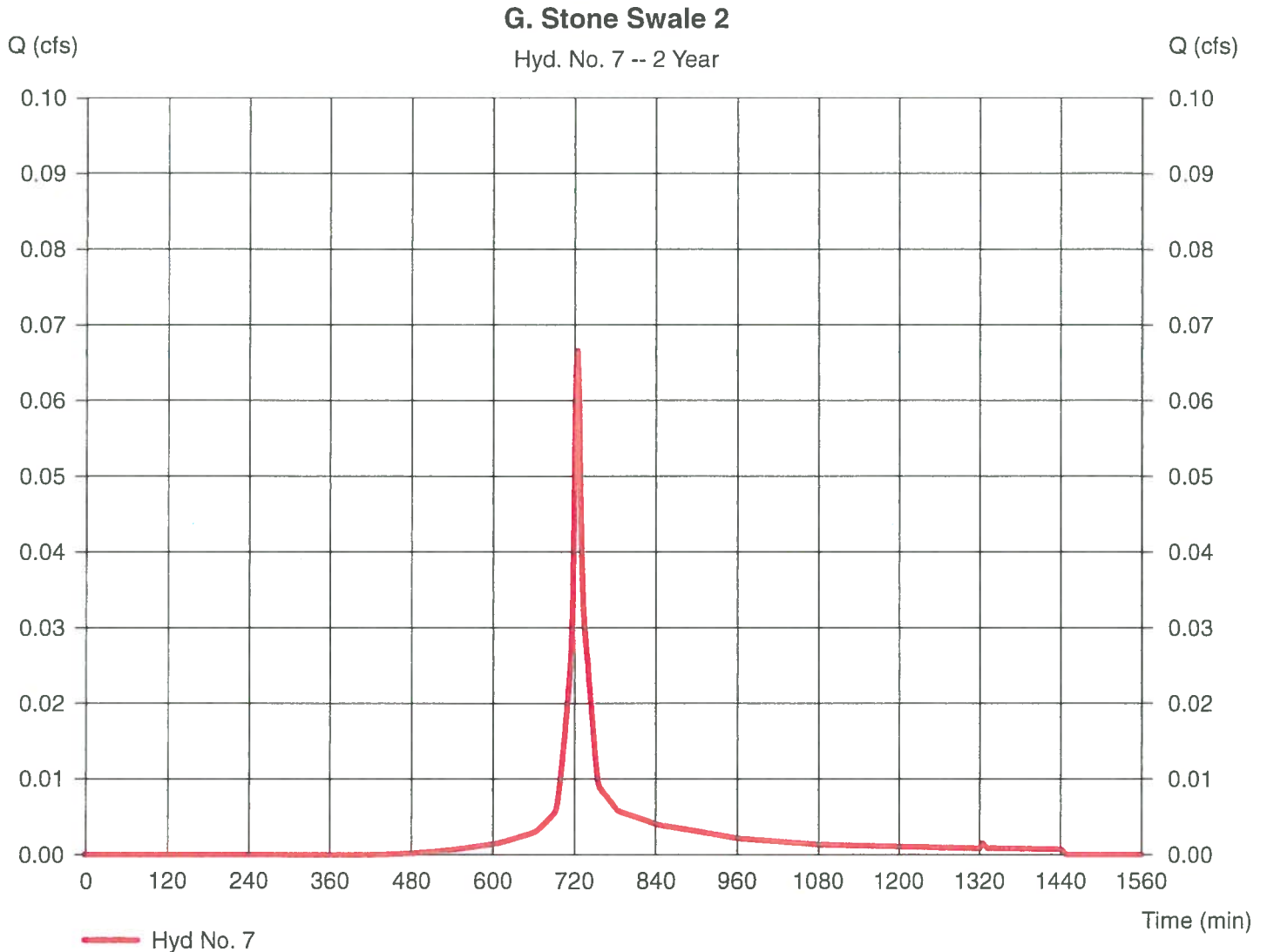
Hydrograph Report

Hyd. No. 7

G. Stone Swale 2

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.028 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.067 cfs
Time to peak = 725 min
Hyd. volume = 206 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 8

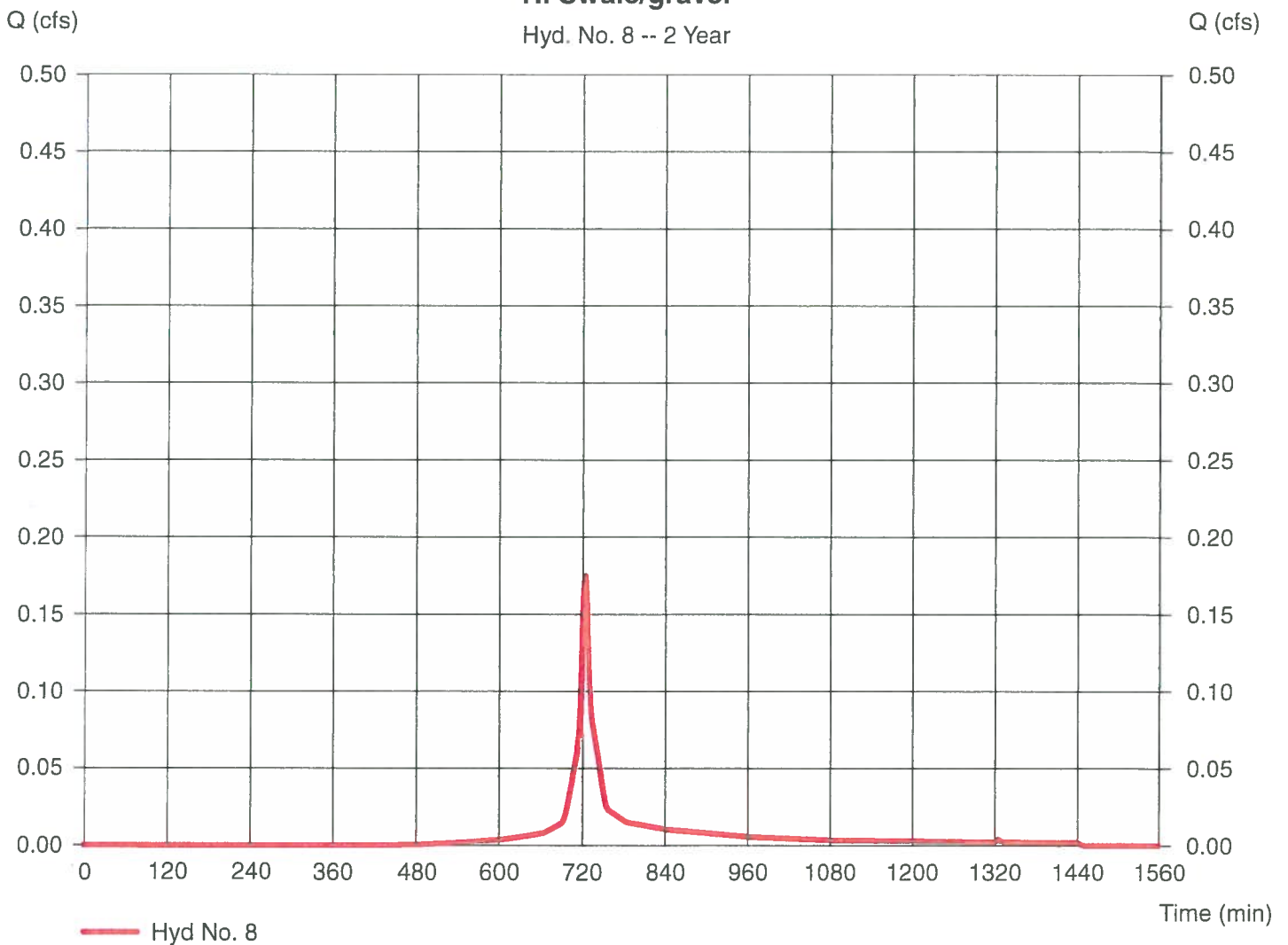
H. Swale/gravel

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 0.074 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 3.24 in
Storm duration = 24 hrs

Peak discharge = 0.175 cfs
Time to peak = 725 min
Hyd. volume = 540 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

H. Swale/gravel

Hyd. No. 8 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

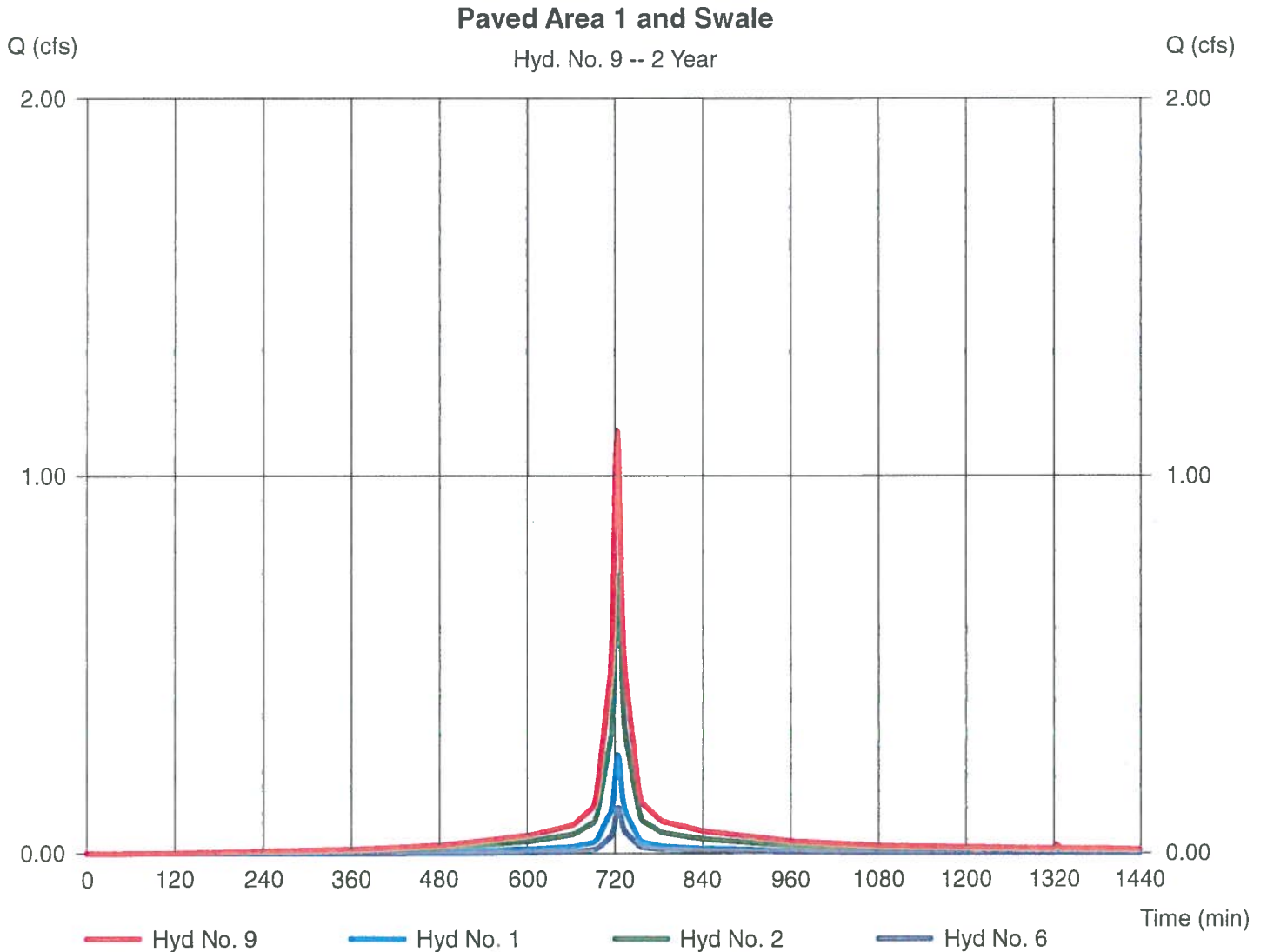
Tuesday, Oct 23, 2018

Hyd. No. 9

Paved Area 1 and Swale

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 6

Peak discharge = 1.121 cfs
Time to peak = 724 min
Hyd. volume = 3,776 cuft
Contrib. drain. area = 0.362 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

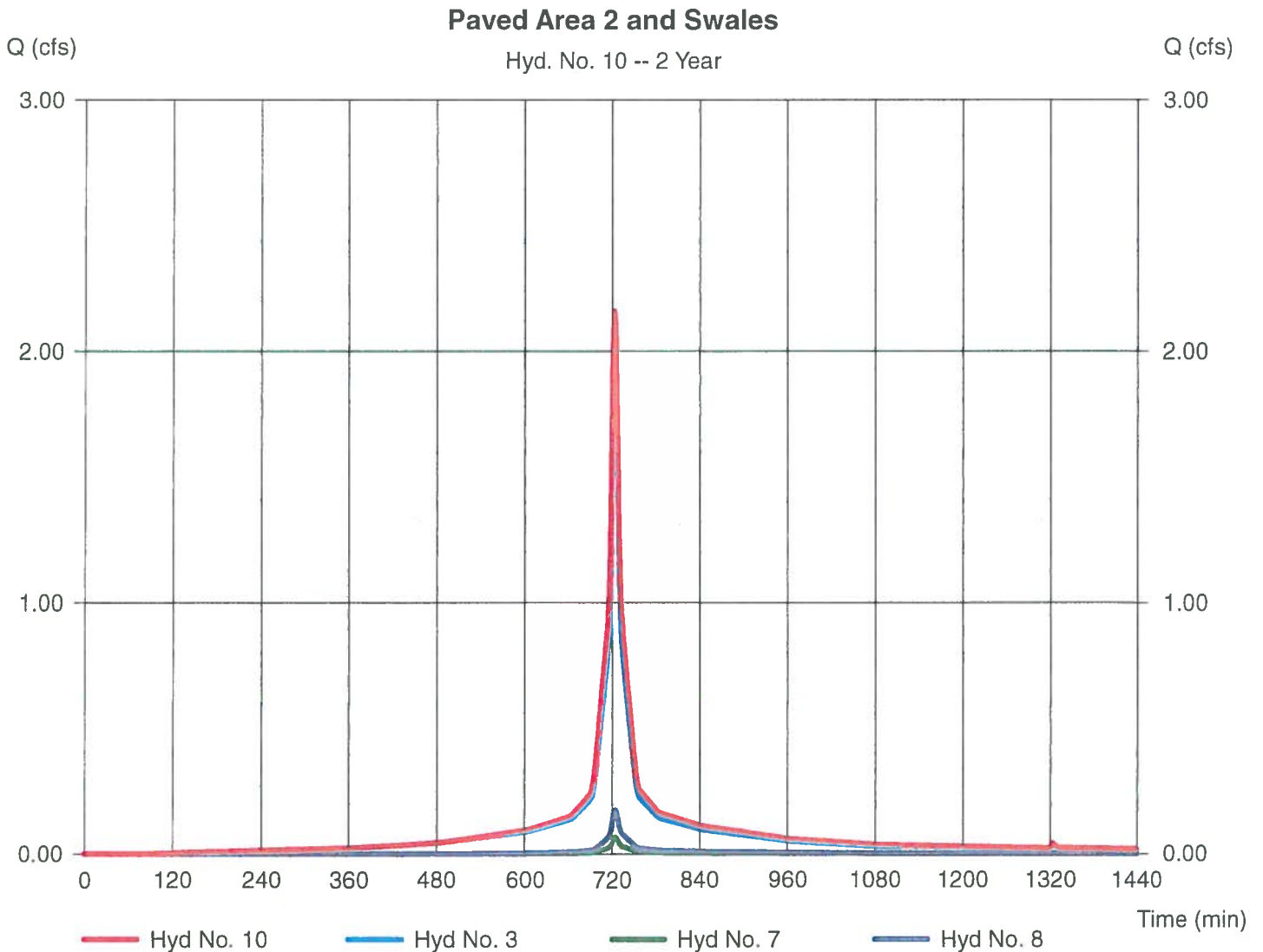
Tuesday, Oct 23, 2018

Hyd. No. 10

Paved Area 2 and Swales

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 3, 7, 8

Peak discharge = 2.161 cfs
Time to peak = 724 min
Hyd. volume = 7,388 cuft
Contrib. drain. area = 0.692 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 11

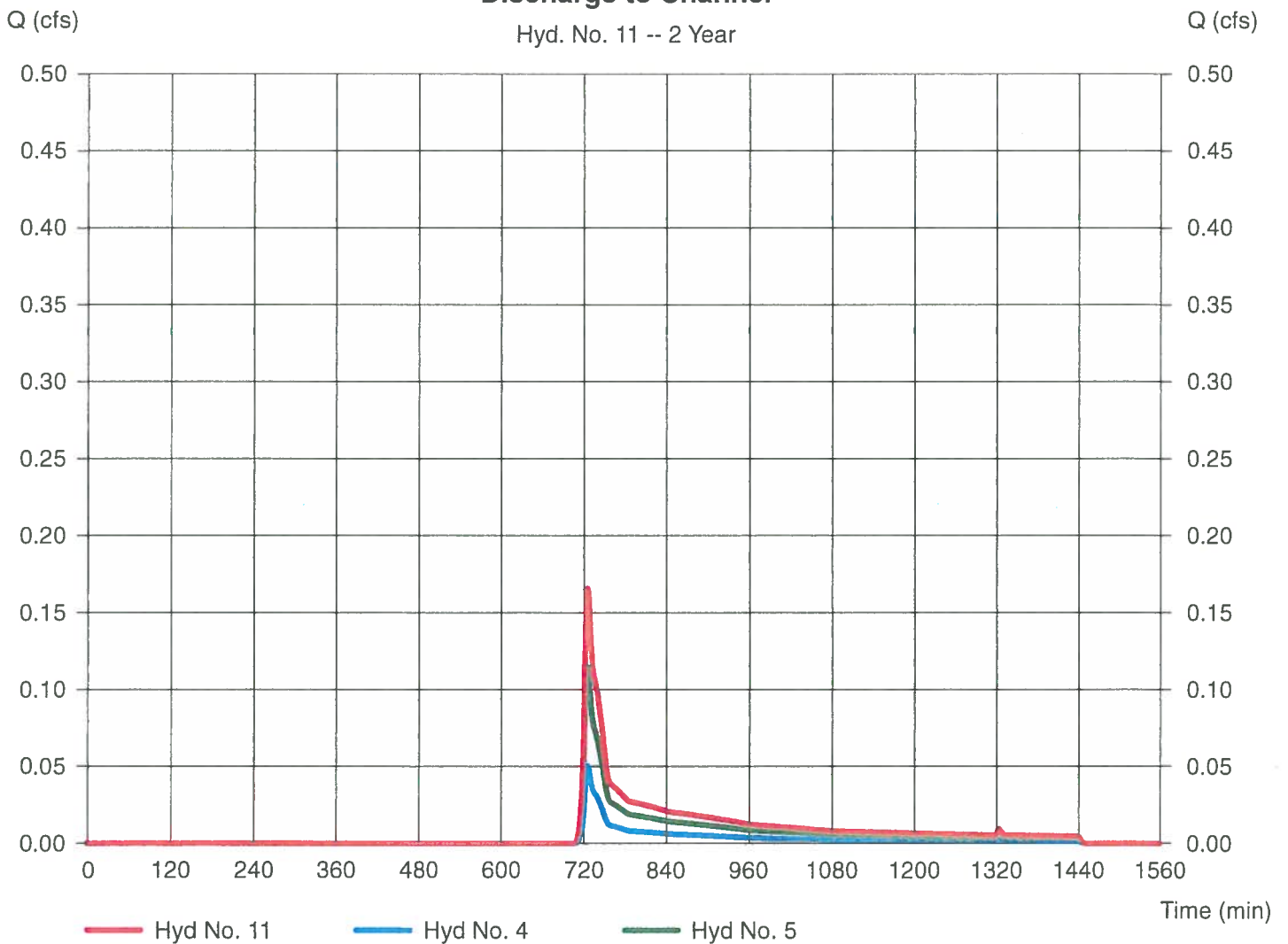
Discharge to Channel

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 0.166 cfs
Time to peak = 726 min
Hyd. volume = 697 cuft
Contrib. drain. area = 0.347 ac

Discharge to Channel

Hyd. No. 11 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 12

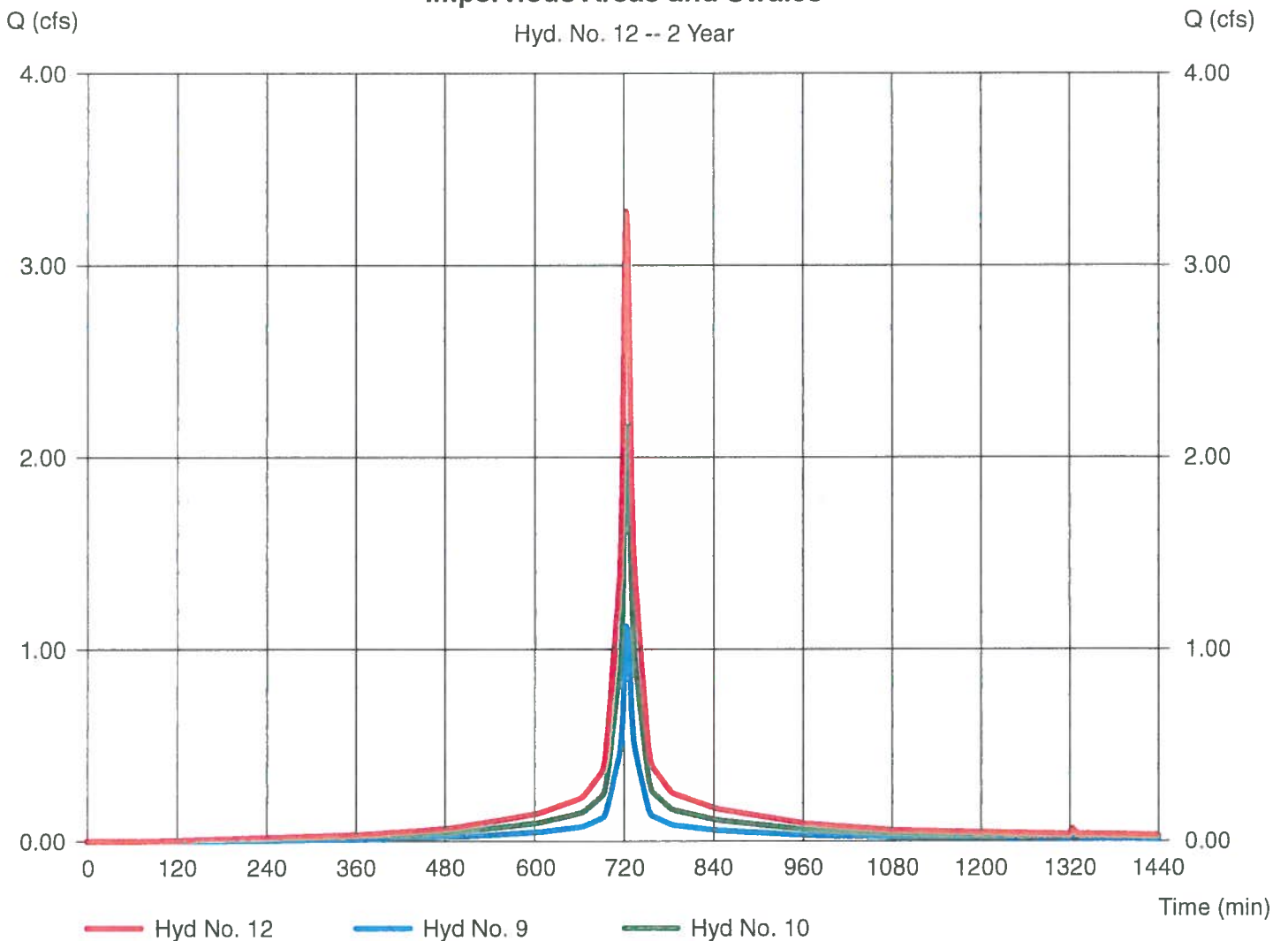
Impervious Areas and Swales

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 9, 10

Peak discharge = 3.282 cfs
Time to peak = 724 min
Hyd. volume = 11,164 cuft
Contrib. drain. area = 0.000 ac

Impervious Areas and Swales

Hyd. No. 12 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 13

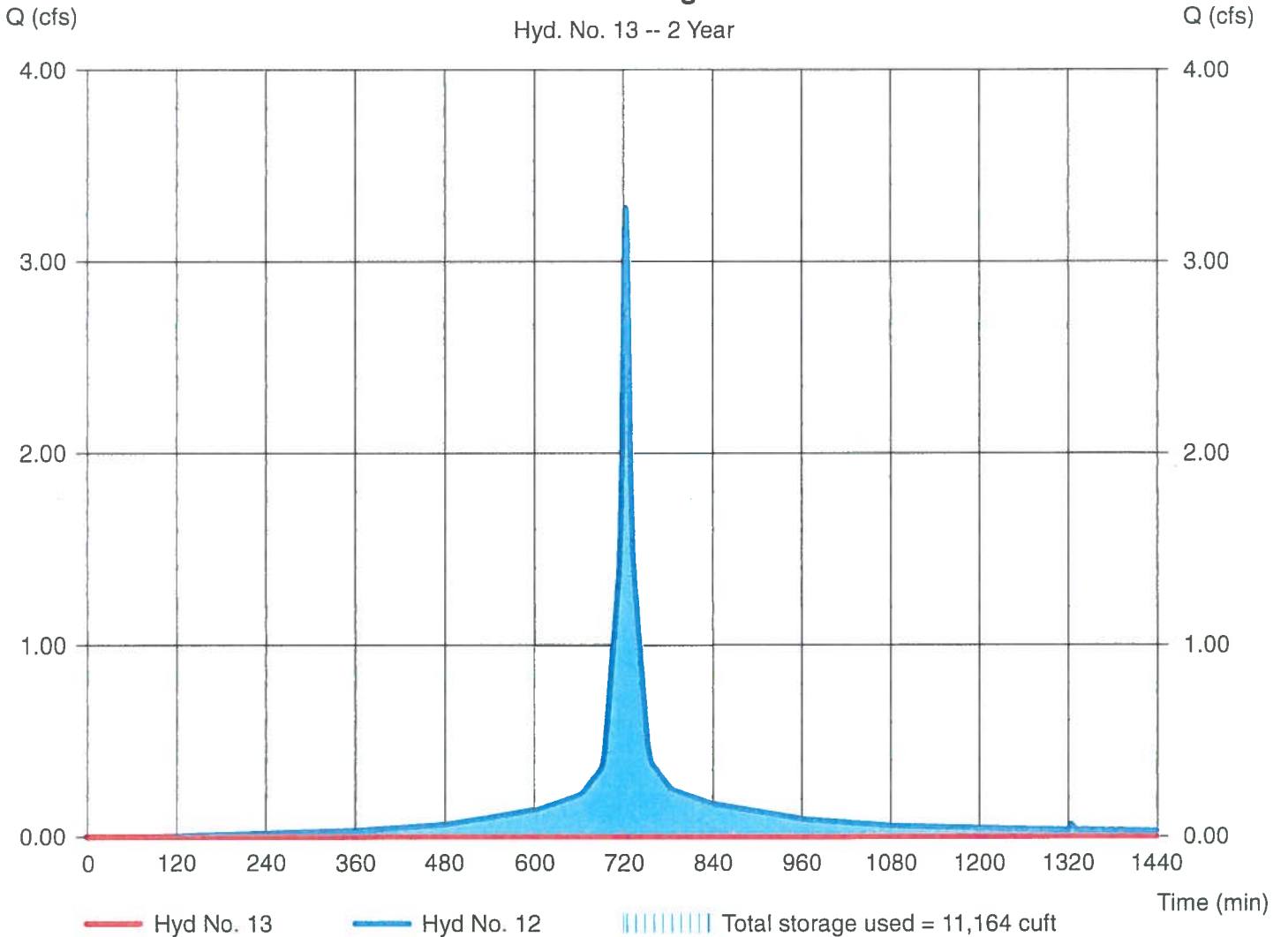
Total Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - Impervious Areas and Swales	Max. Elevation	= 17.61 ft
Reservoir name	= Total	Max. Storage	= 11,164 cuft

Storage Indication method used.

Total Storage

Hyd. No. 13 -- 2 Year



Pond Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Pond No. 3 - Total

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	15.00	n/a	0	0
2.50	17.50	n/a	9,458	9,458
3.00	18.00	n/a	7,963	17,421
3.50	18.50	n/a	18,409	35,831

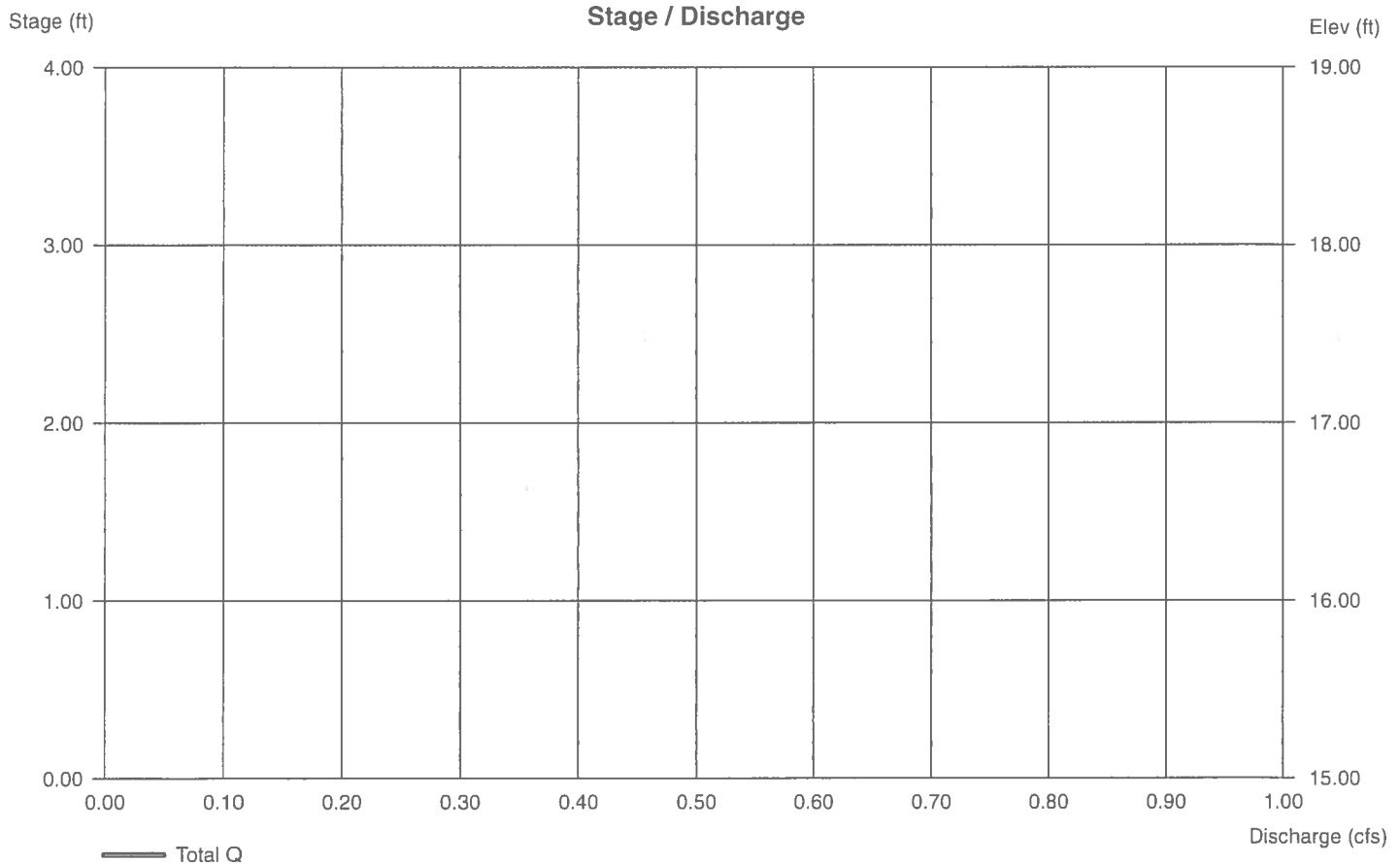
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
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	n/a
N-Value	= .000	.000	.000	n/a
Orifice 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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.416	1	724	1,468	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.182	1	724	4,095	----	-----	-----	B. Paved Area 1	
3	SCS Runoff	3.052	1	724	10,763	----	-----	-----	C. Paved/Gravel Area	
4	SCS Runoff	0.192	1	725	627	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.435	1	725	1,422	----	-----	-----	E. Vegetated Area 2	
6	SCS Runoff	0.225	1	724	708	----	-----	-----	F. Stone Swale 1	
7	SCS Runoff	0.123	1	724	387	----	-----	-----	G. Stone Swale 2	
8	SCS Runoff	0.323	1	724	1,017	----	-----	-----	H. Swale/gravel	
9	Combine	1.823	1	724	6,272	1, 2, 6,	-----	-----	Paved Area 1 and Swale	
10	Combine	3.498	1	724	12,167	3, 7, 8,	-----	-----	Paved Area 2 and Swales	
11	Combine	0.626	1	725	2,048	4, 5,	-----	-----	Discharge to Channel	
12	Combine	5.321	1	724	18,438	9, 10,	-----	-----	Impervious Areas and Swales	
13	Reservoir	0.000	1	n/a	0	12	18.03	18,438	Total Storage	
Post.gpw					Return Period: 10 Year			Tuesday, Oct 23, 2018		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 1

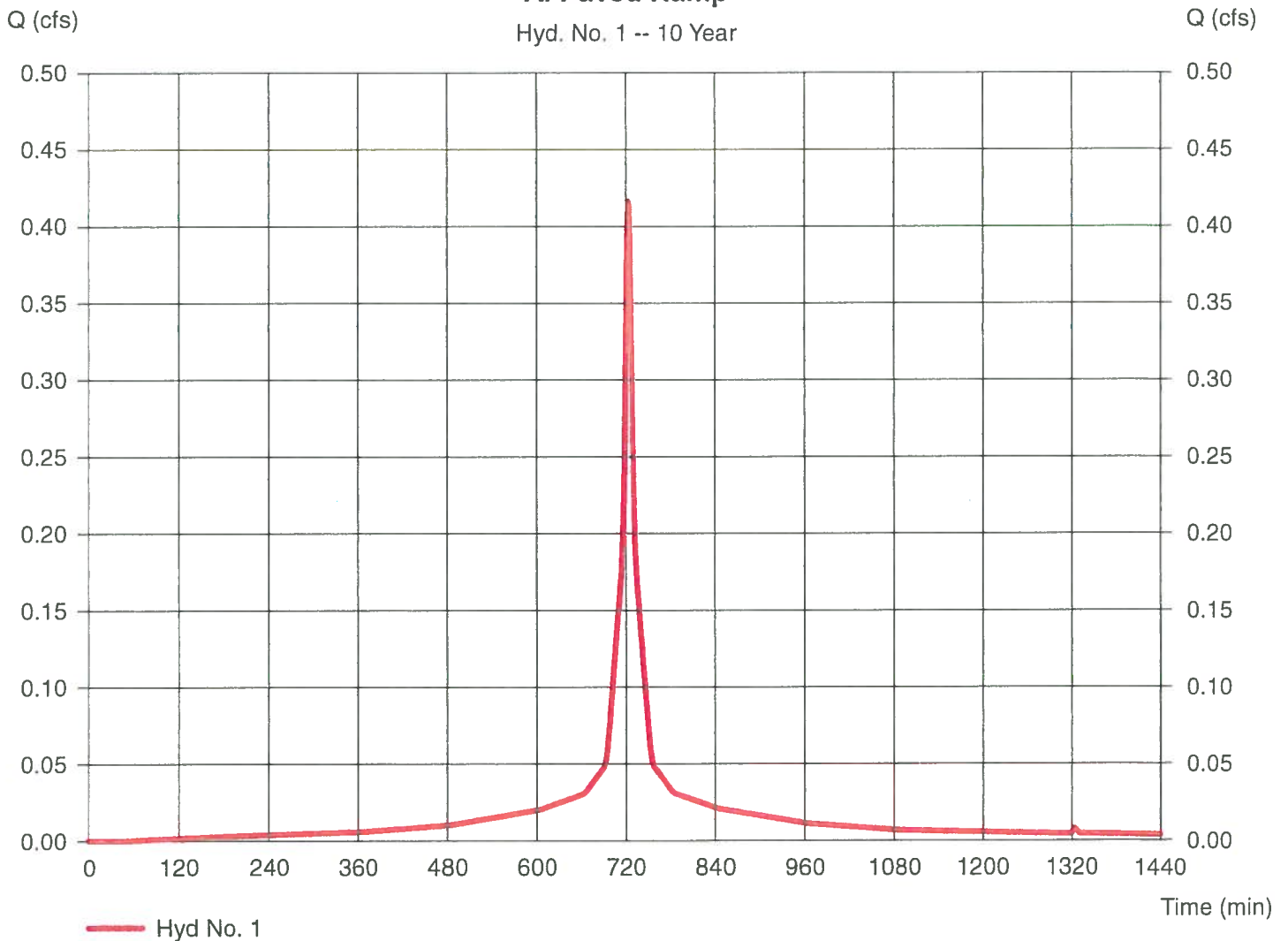
A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.416 cfs
 Time to peak = 724 min
 Hyd. volume = 1,468 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 10 Year



Hydrograph Report

Hyd. No. 2

B. Paved Area 1

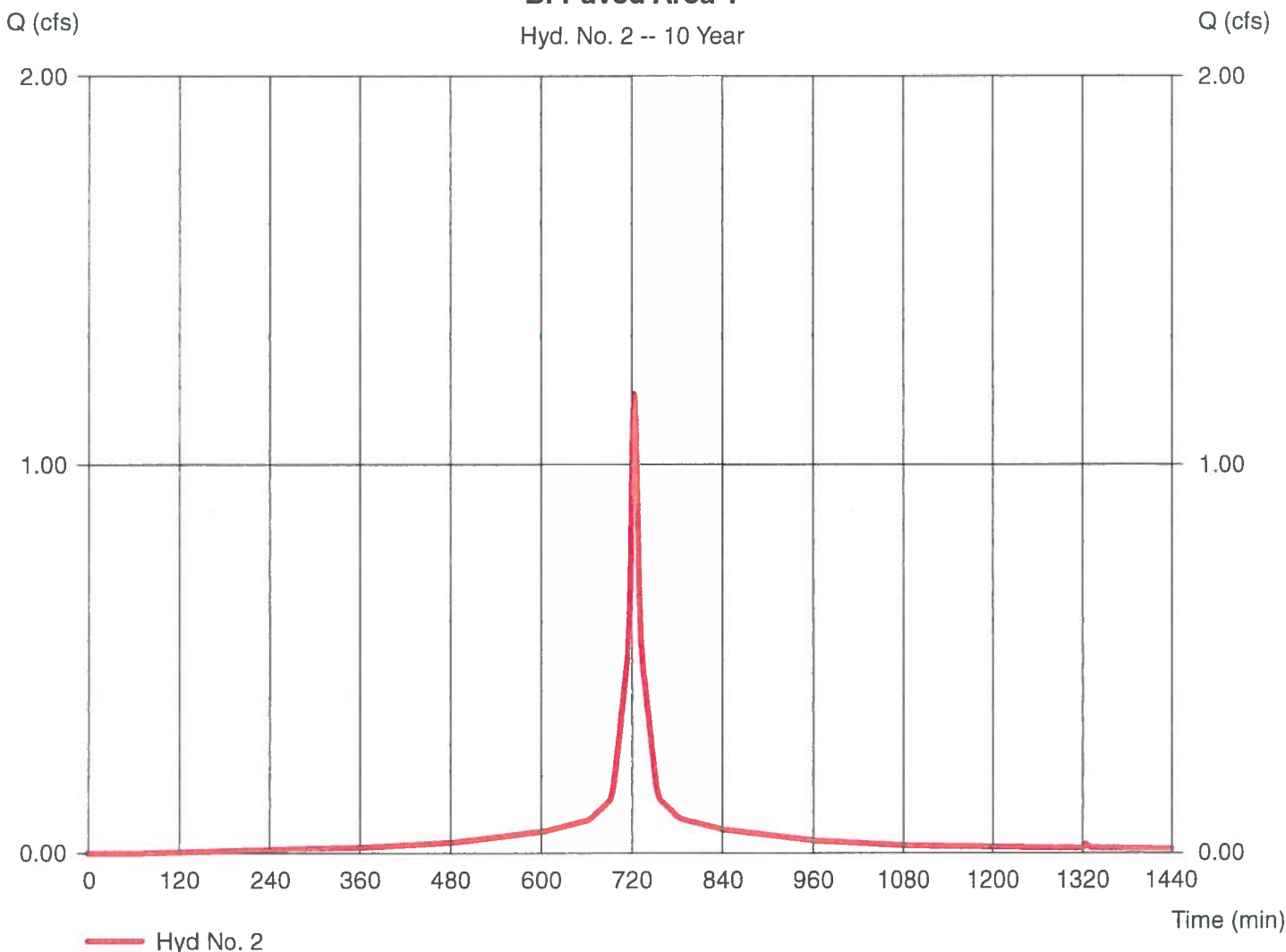
Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 0.230 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 5.11 in
Storm duration = 24 hrs

Peak discharge = 1.182 cfs
Time to peak = 724 min
Hyd. volume = 4,095 cuft
Curve number = 97*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = [(0.214 x 98) + (0.012 x 87)] / 0.230

B. Paved Area 1

Hyd. No. 2 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 3

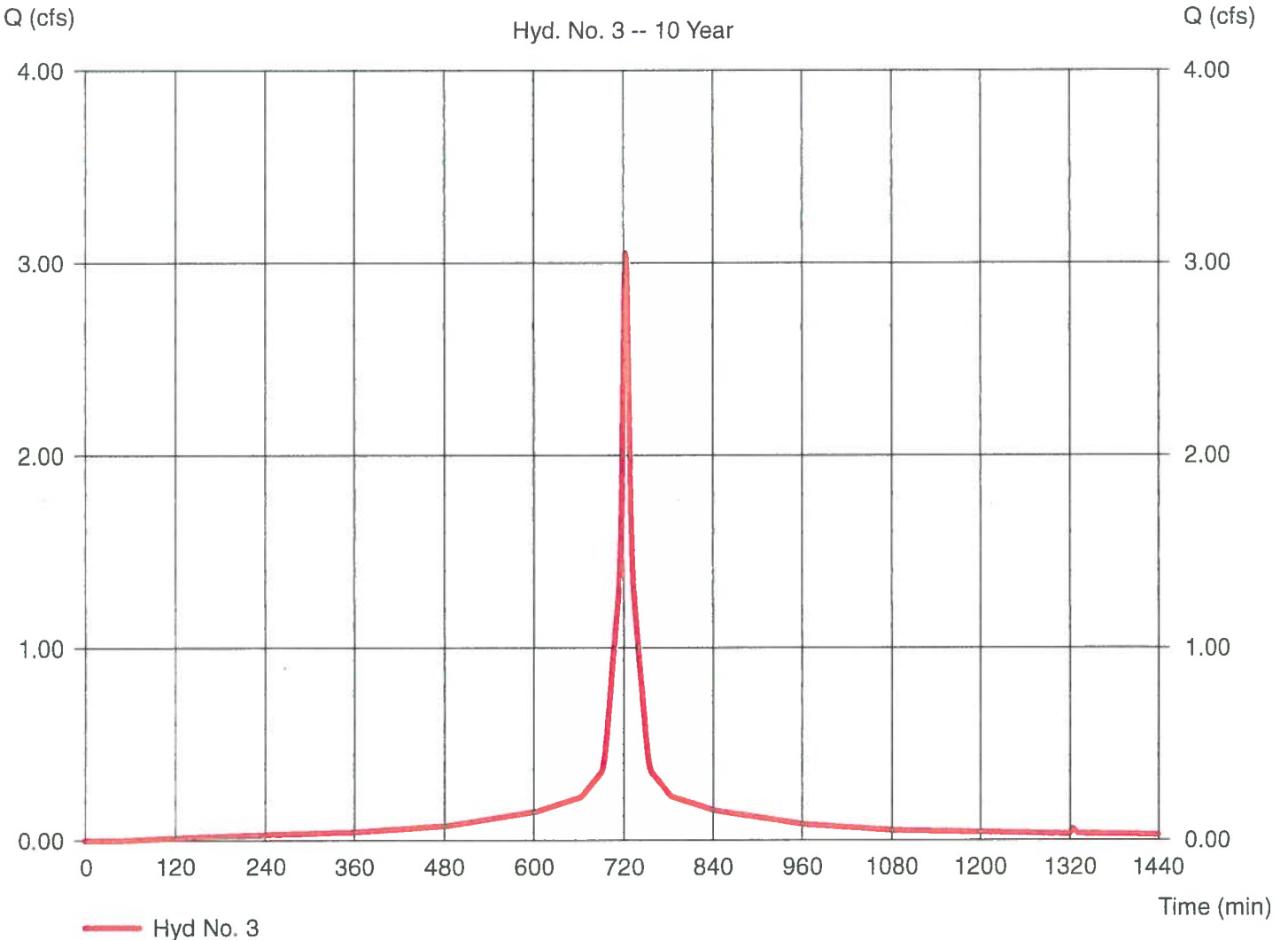
C. Paved/Gravel Area

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.590 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 3.052 cfs
 Time to peak = 724 min
 Hyd. volume = 10,763 cuft
 Curve number = 98*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.579 \times 98) + (0.014 \times 87)] / 0.590$

C. Paved/Gravel Area



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

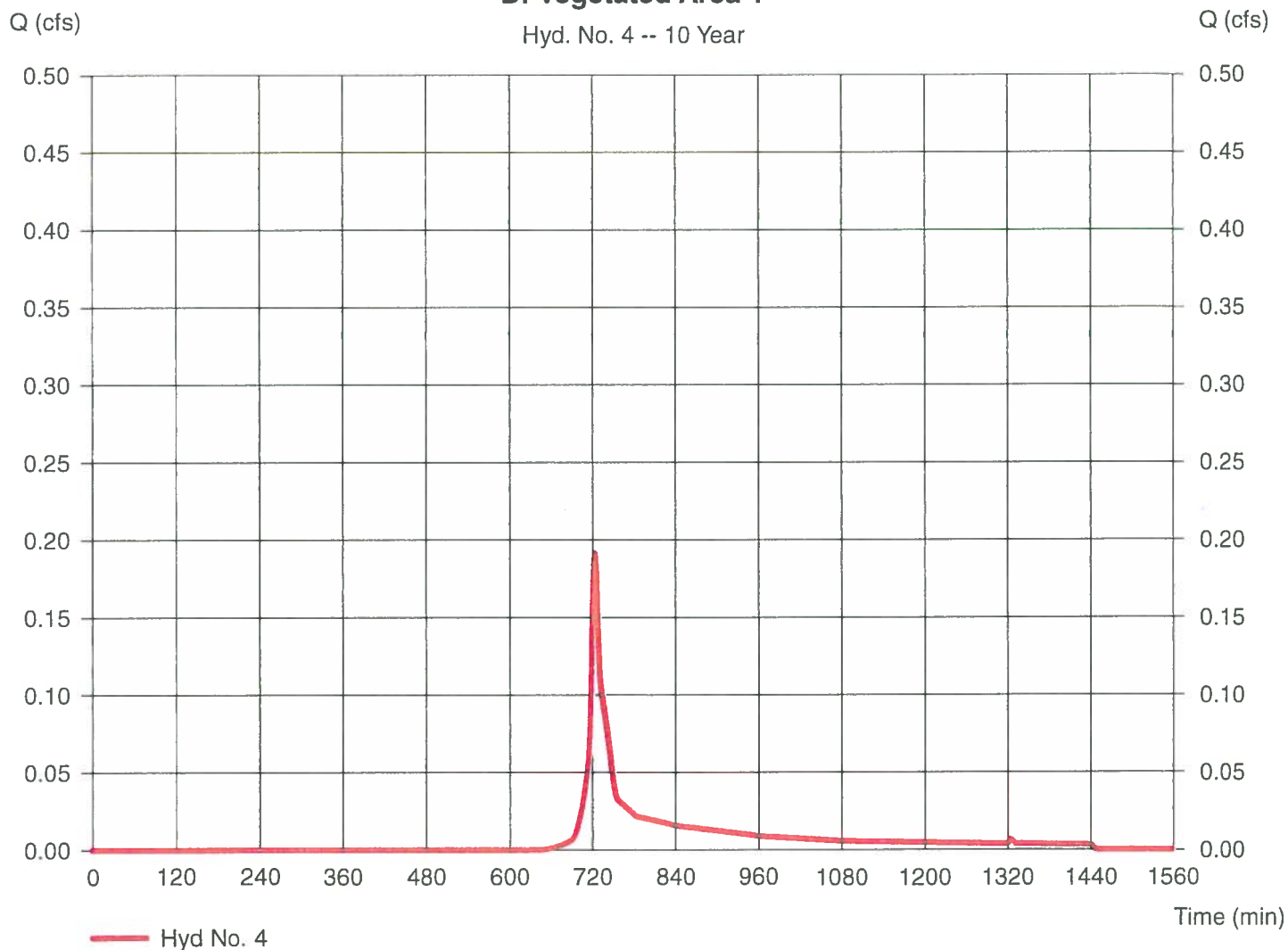
D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.192 cfs
 Time to peak = 725 min
 Hyd. volume = 627 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

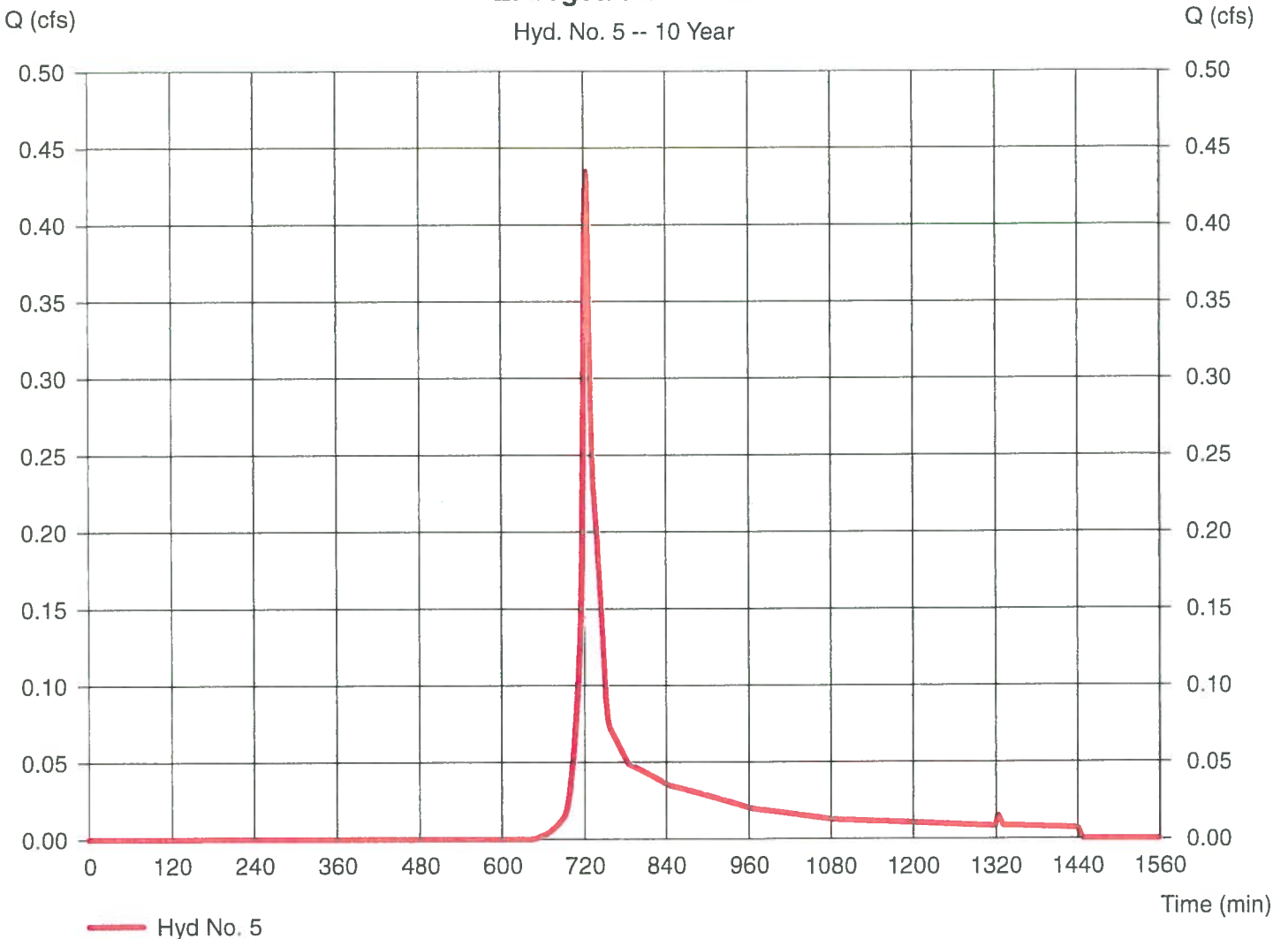
E. Vegetated Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.241 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.435 cfs
 Time to peak = 725 min
 Hyd. volume = 1,422 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

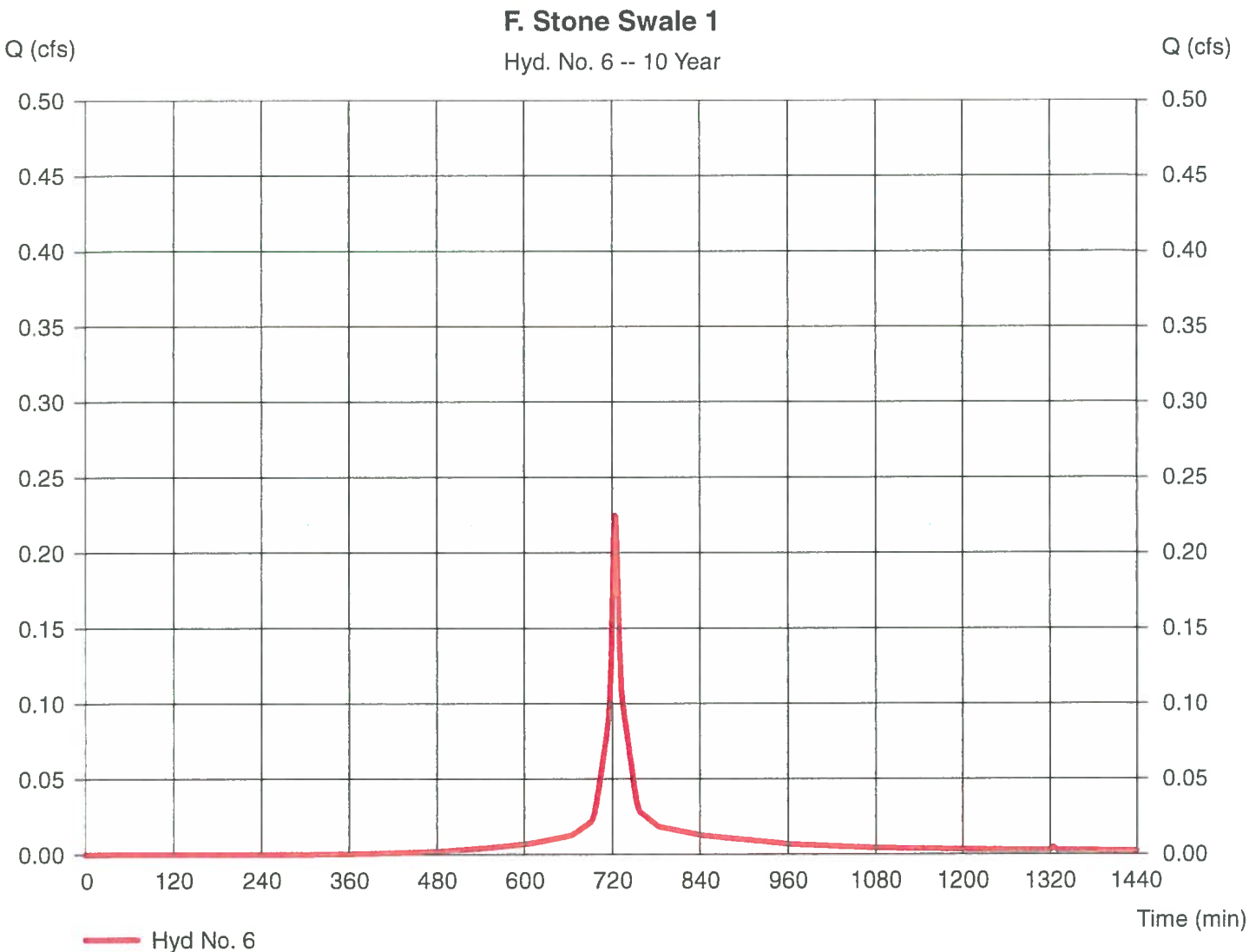
Tuesday, Oct 23, 2018

Hyd. No. 6

F. Stone Swale 1

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.052 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.225 cfs
 Time to peak = 724 min
 Hyd. volume = 708 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 7

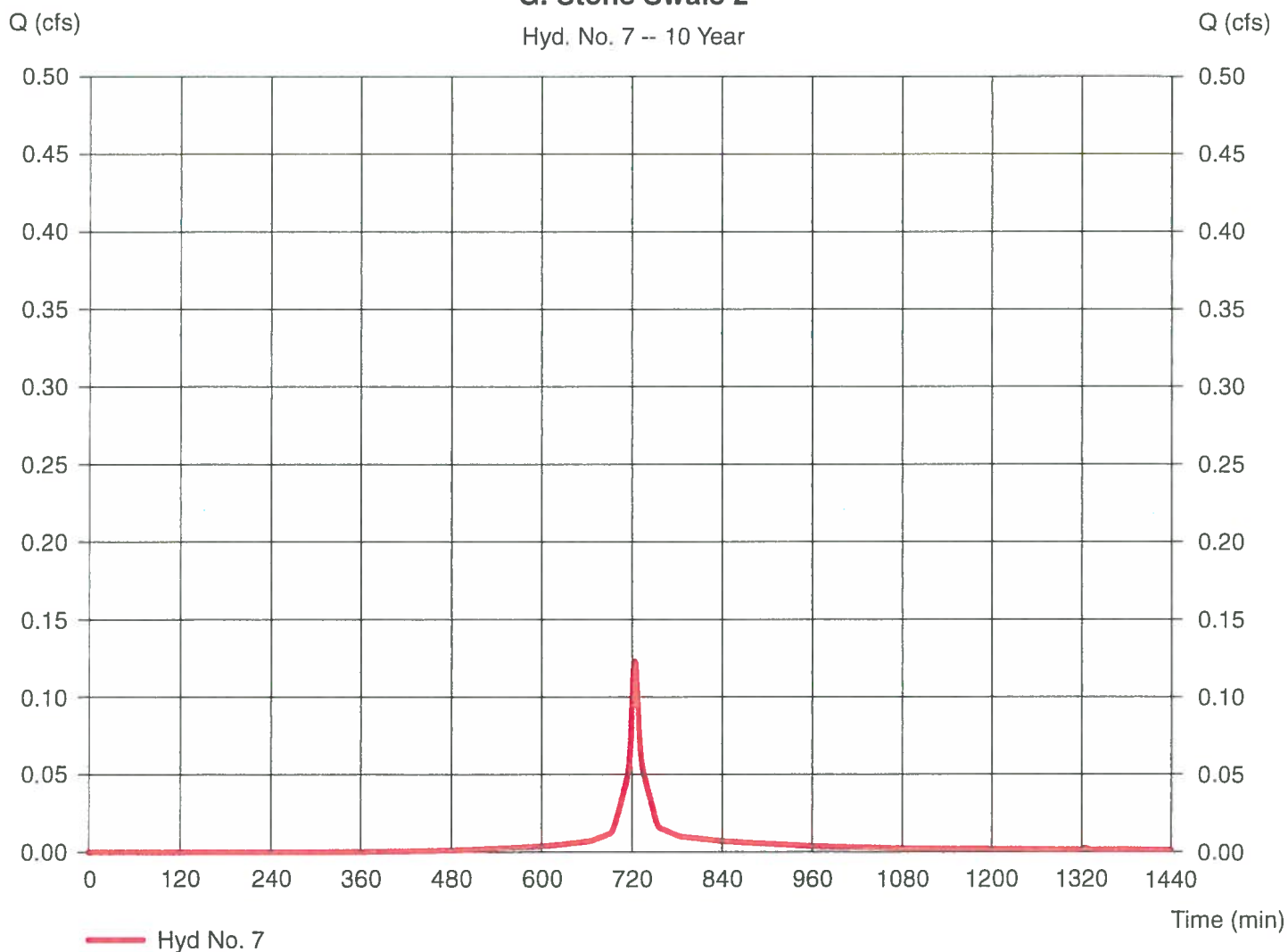
G. Stone Swale 2

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.028 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.123 cfs
 Time to peak = 724 min
 Hyd. volume = 387 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

G. Stone Swale 2

Hyd. No. 7 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 8

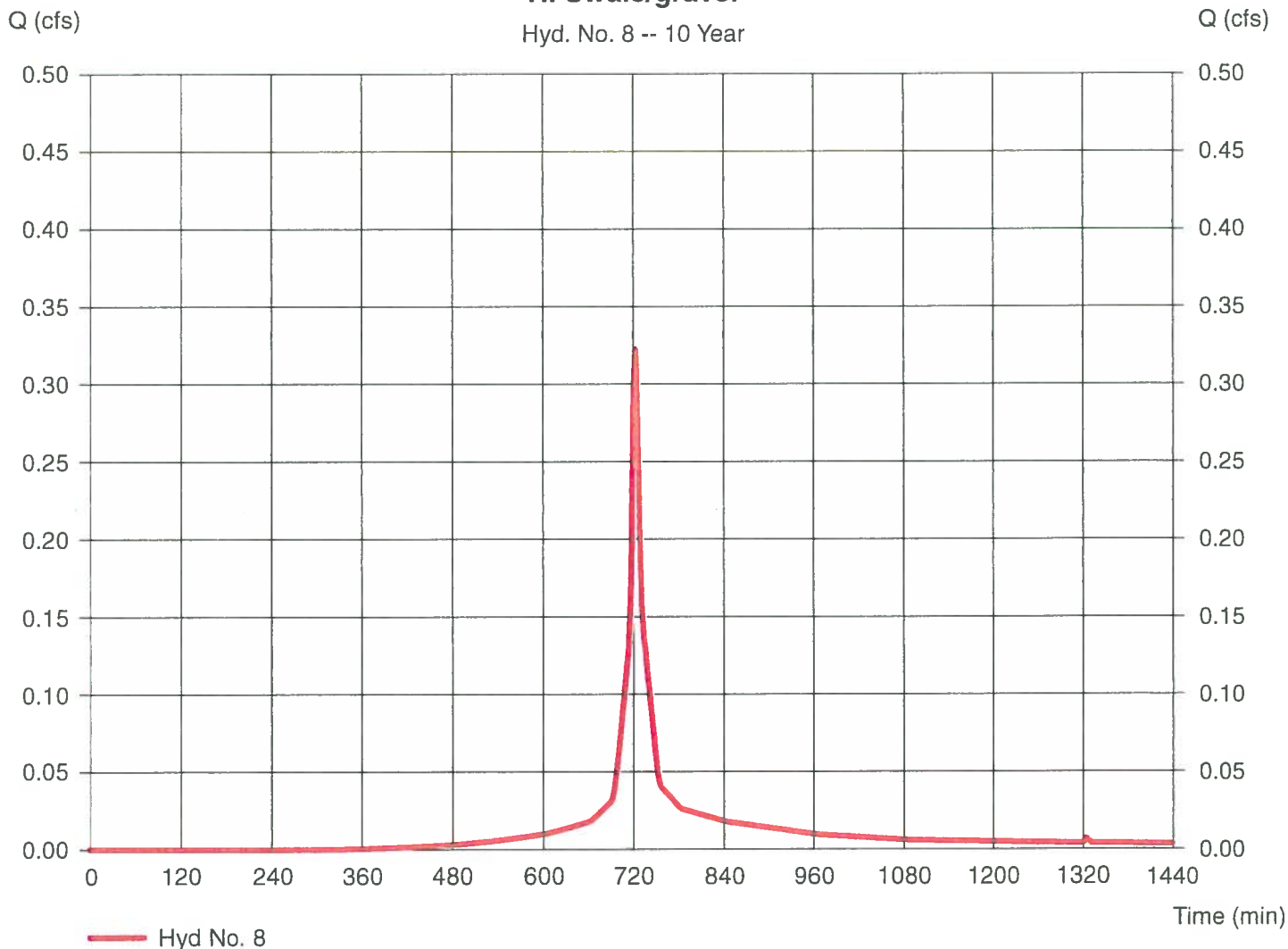
H. Swale/gravel

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.074 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 5.11 in
 Storm duration = 24 hrs

Peak discharge = 0.323 cfs
 Time to peak = 724 min
 Hyd. volume = 1,017 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

H. Swale/gravel

Hyd. No. 8 -- 10 Year



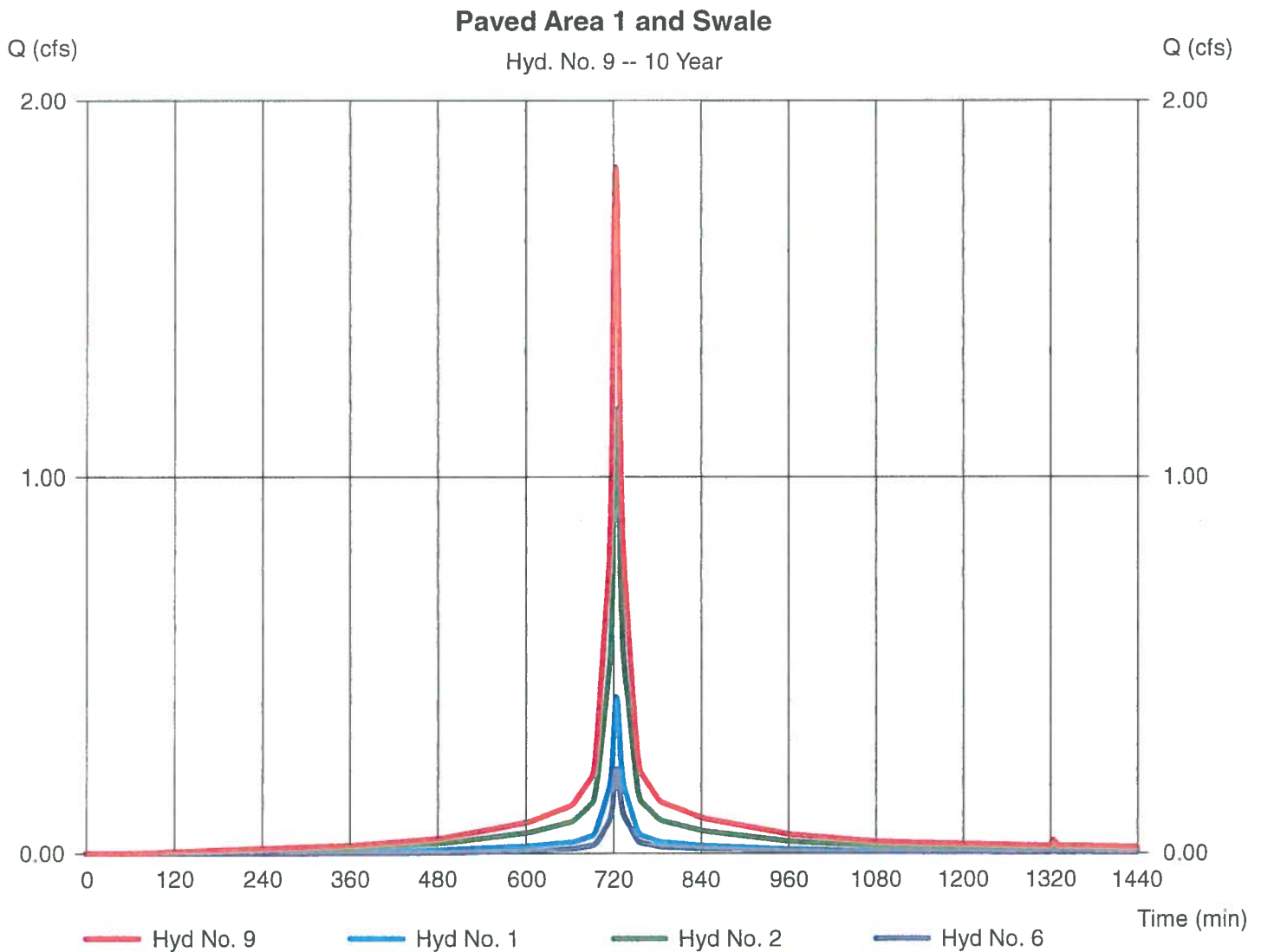
Hydrograph Report

Hyd. No. 9

Paved Area 1 and Swale

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 6

Peak discharge = 1.823 cfs
Time to peak = 724 min
Hyd. volume = 6,272 cuft
Contrib. drain. area = 0.362 ac



Hydrograph Report

Hyd. No. 10

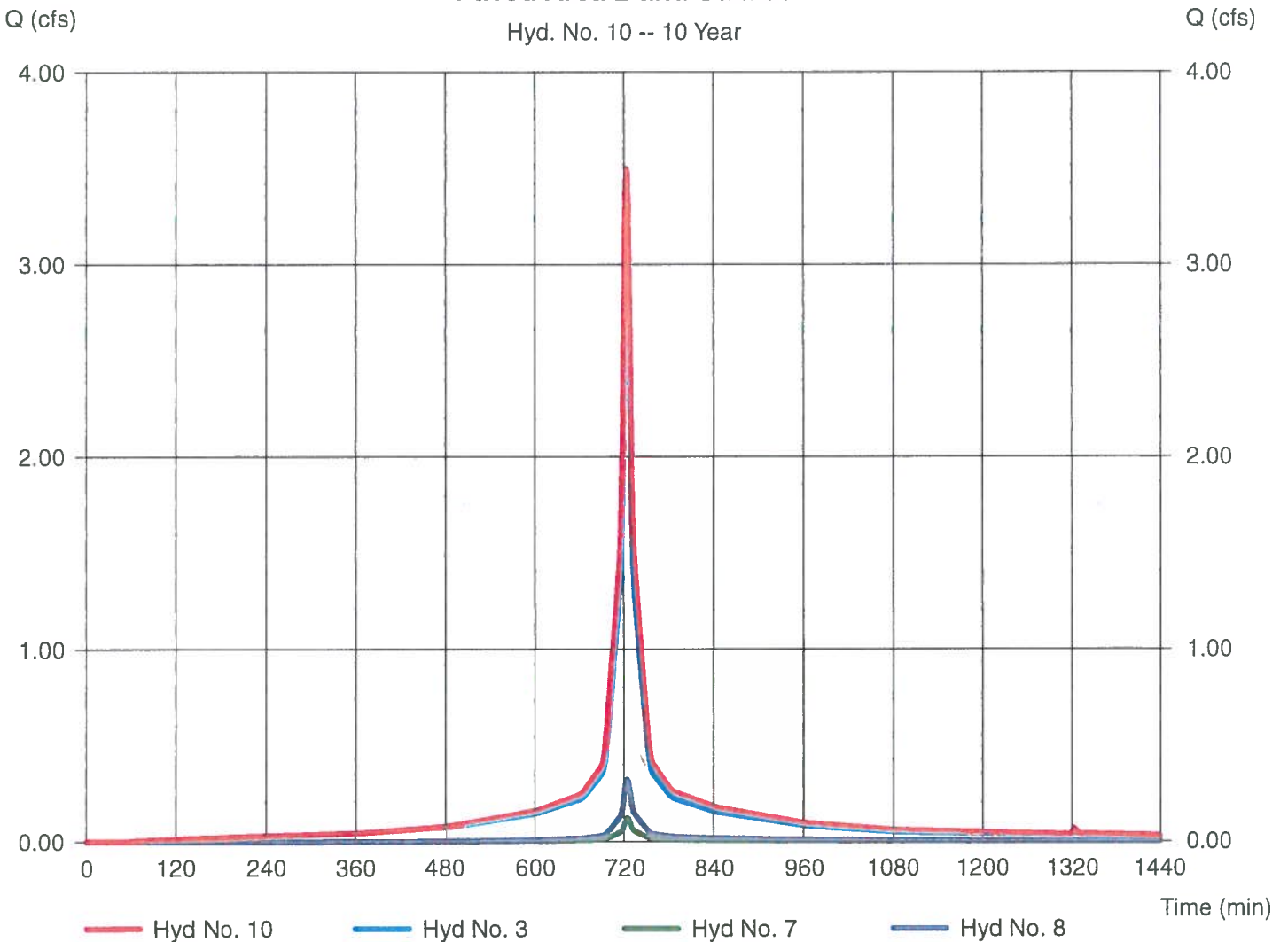
Paved Area 2 and Swales

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 3, 7, 8

Peak discharge = 3.498 cfs
Time to peak = 724 min
Hyd. volume = 12,167 cuft
Contrib. drain. area = 0.692 ac

Paved Area 2 and Swales

Hyd. No. 10 -- 10 Year



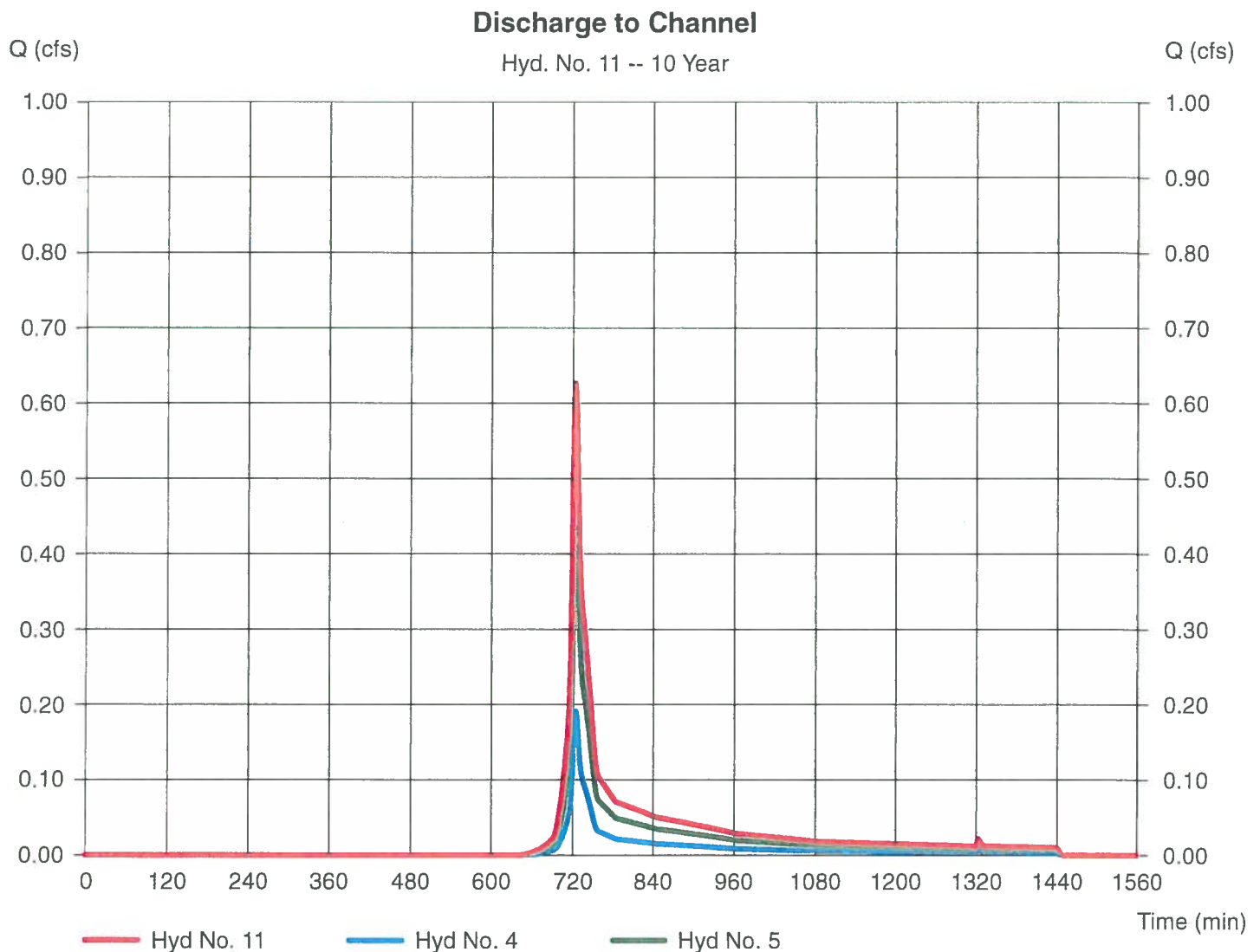
Hydrograph Report

Hyd. No. 11

Discharge to Channel

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 0.626 cfs
Time to peak = 725 min
Hyd. volume = 2,048 cuft
Contrib. drain. area = 0.347 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 12

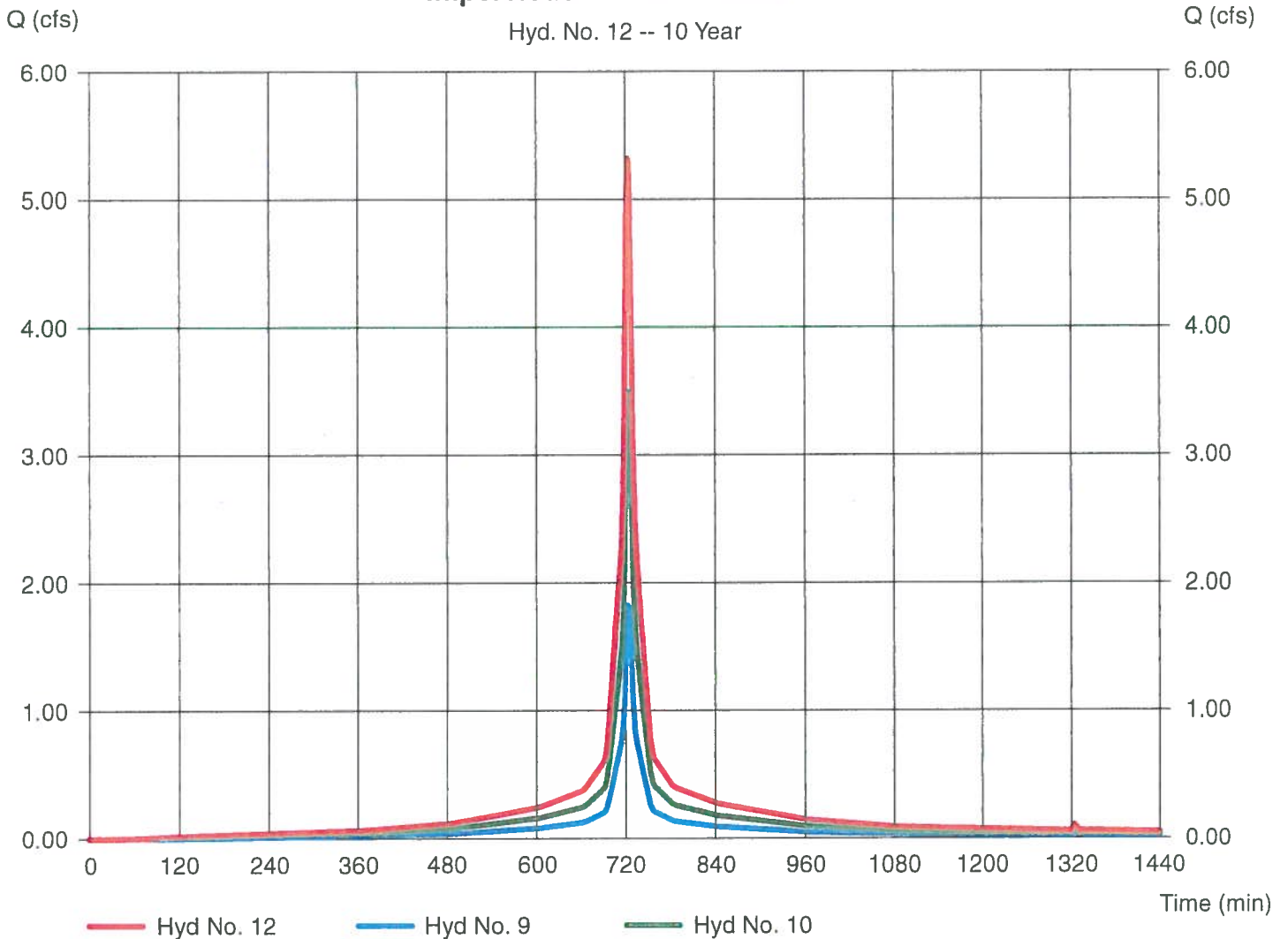
Impervious Areas and Swales

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 9, 10

Peak discharge = 5.321 cfs
Time to peak = 724 min
Hyd. volume = 18,438 cuft
Contrib. drain. area = 0.000 ac

Impervious Areas and Swales

Hyd. No. 12 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

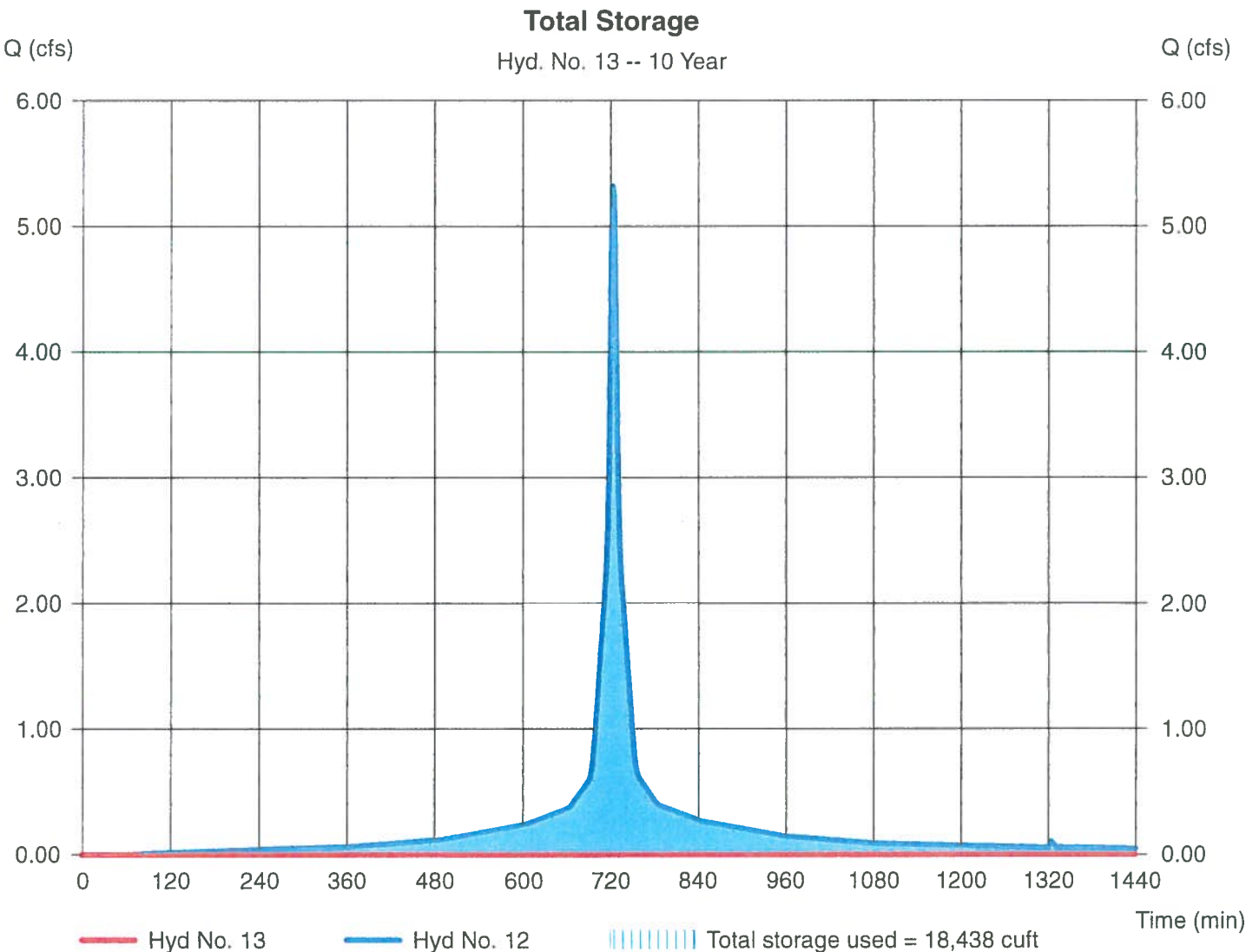
Hyd. No. 13

Total Storage

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyd. No. = 12 - Impervious Areas and Swales
Reservoir name = Total

Peak discharge = 0.000 cfs
Time to peak = n/a
Hyd. volume = 0 cuft
Max. Elevation = 18.03 ft
Max. Storage = 18,438 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.514	1	724	1,824	---	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.461	1	724	5,109	---	-----	-----	B. Paved Area 1	
3	SCS Runoff	3.764	1	724	13,366	---	-----	-----	C. Paved/Gravel Area	
4	SCS Runoff	0.300	1	725	945	---	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.680	1	725	2,144	---	-----	-----	E. Vegetated Area 2	
6	SCS Runoff	0.290	1	724	924	---	-----	-----	F. Stone Swale 1	
7	SCS Runoff	0.159	1	724	506	---	-----	-----	G. Stone Swale 2	
8	SCS Runoff	0.416	1	724	1,328	---	-----	-----	H. Swale/gravel	
9	Combine	2.264	1	724	7,857	1, 2, 6,	-----	-----	Paved Area 1 and Swale	
10	Combine	4.339	1	724	15,199	3, 7, 8,	-----	-----	Paved Area 2 and Swales	
11	Combine	0.979	1	725	3,089	4, 5,	-----	-----	Discharge to Channel	
12	Combine	6.603	1	724	23,056	9, 10,	-----	-----	Impervious Areas and Swales	
13	Reservoir	0.000	1	n/a	0	12	18.15	23,056	Total Storage	
Post.gpw					Return Period: 25 Year			Tuesday, Oct 23, 2018		

Hydrograph Report

Hydraflow Hydrographs by Intelisqlve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 1

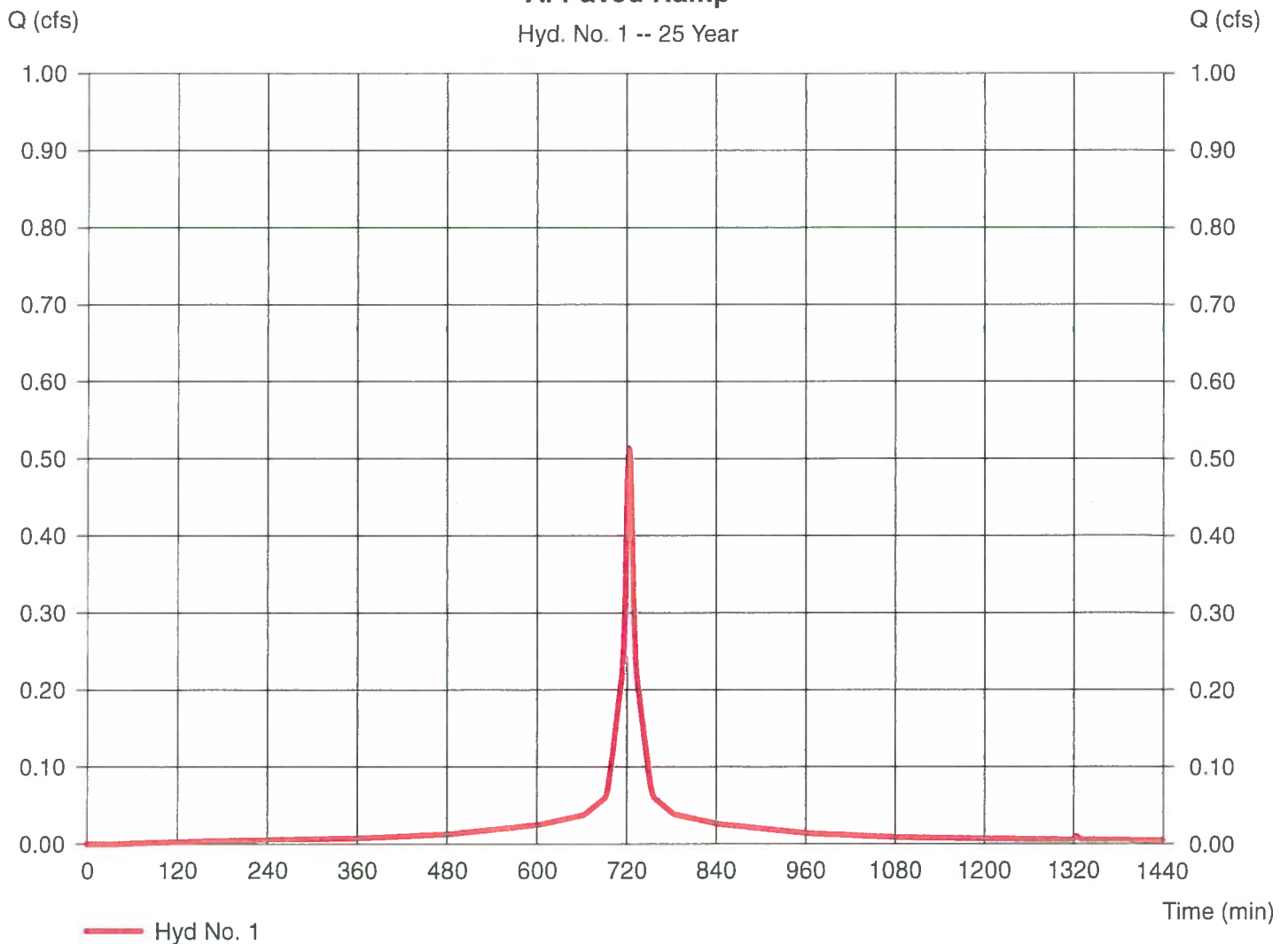
A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 0.514 cfs
 Time to peak = 724 min
 Hyd. volume = 1,824 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 2

B. Paved Area 1

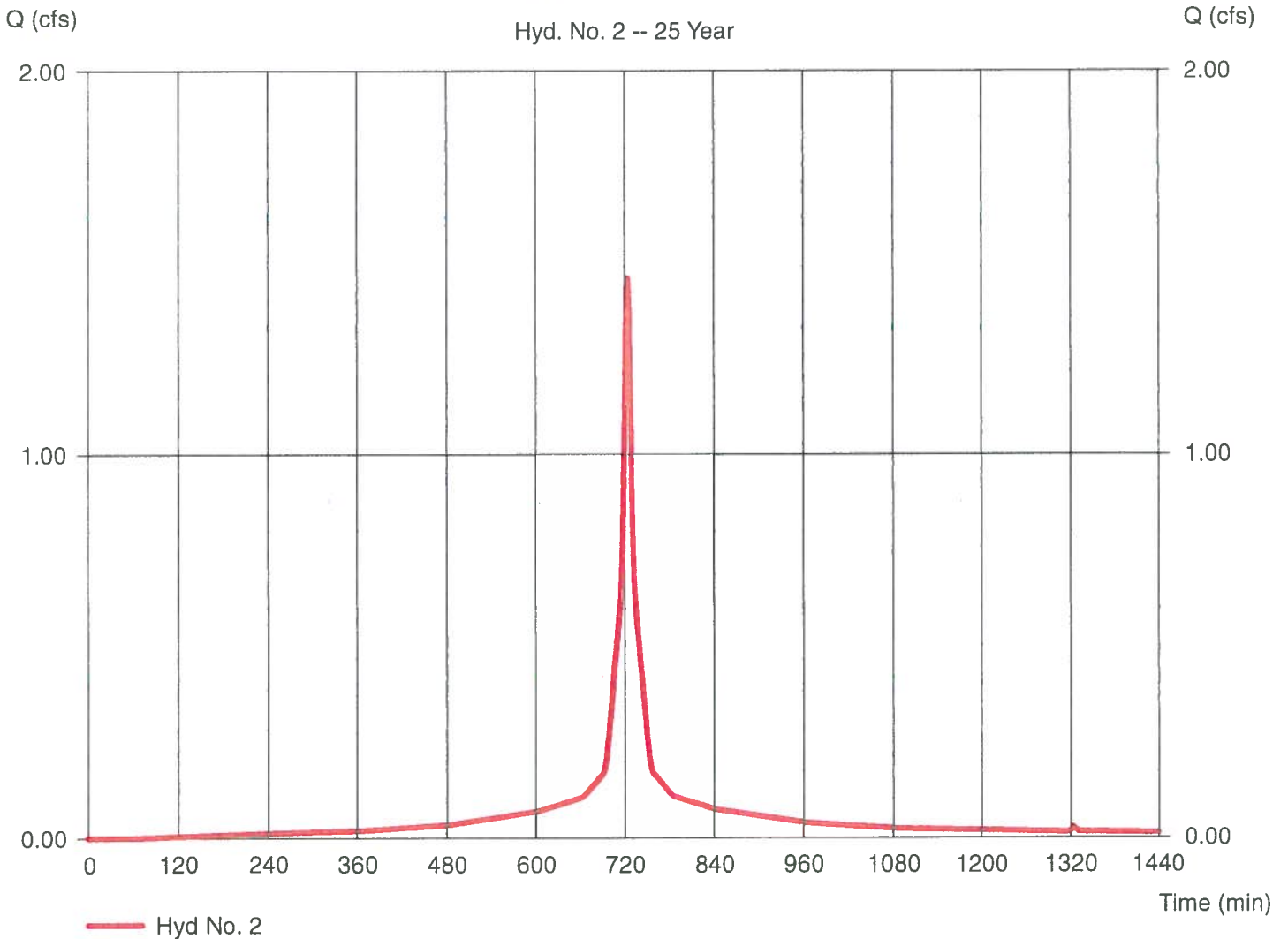
Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 1.461 cfs
 Time to peak = 724 min
 Hyd. volume = 5,109 cuft
 Curve number = 97*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.214 \times 98) + (0.012 \times 87)] / 0.230$

B. Paved Area 1

Hyd. No. 2 -- 25 Year



Hydrograph Report

Hyd. No. 3

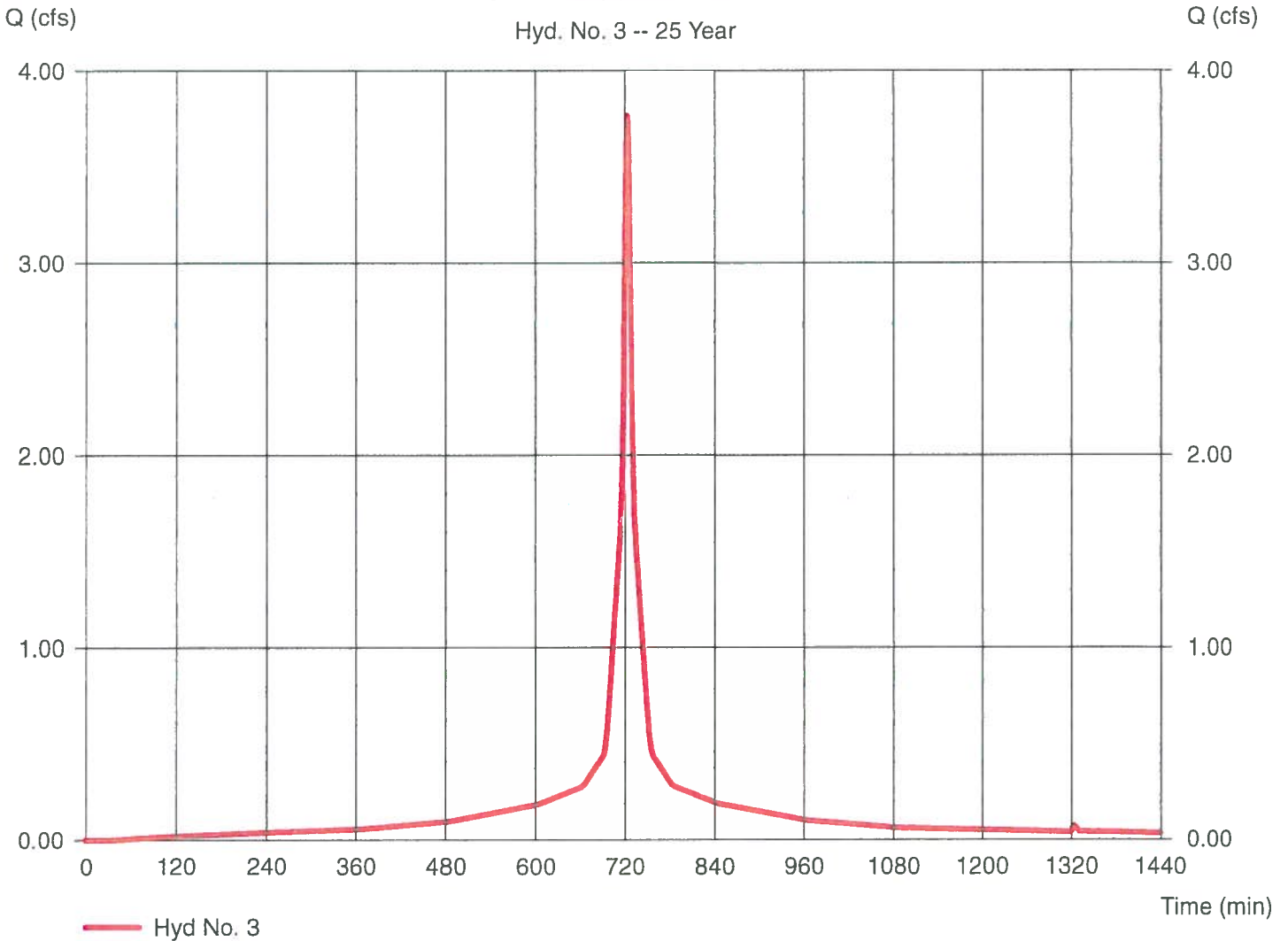
C. Paved/Gravel Area

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 0.590 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.29 in
Storm duration = 24 hrs

Peak discharge = 3.764 cfs
Time to peak = 724 min
Hyd. volume = 13,366 cuft
Curve number = 98*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.579 \times 98) + (0.014 \times 87)] / 0.590$

C. Paved/Gravel Area



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 4

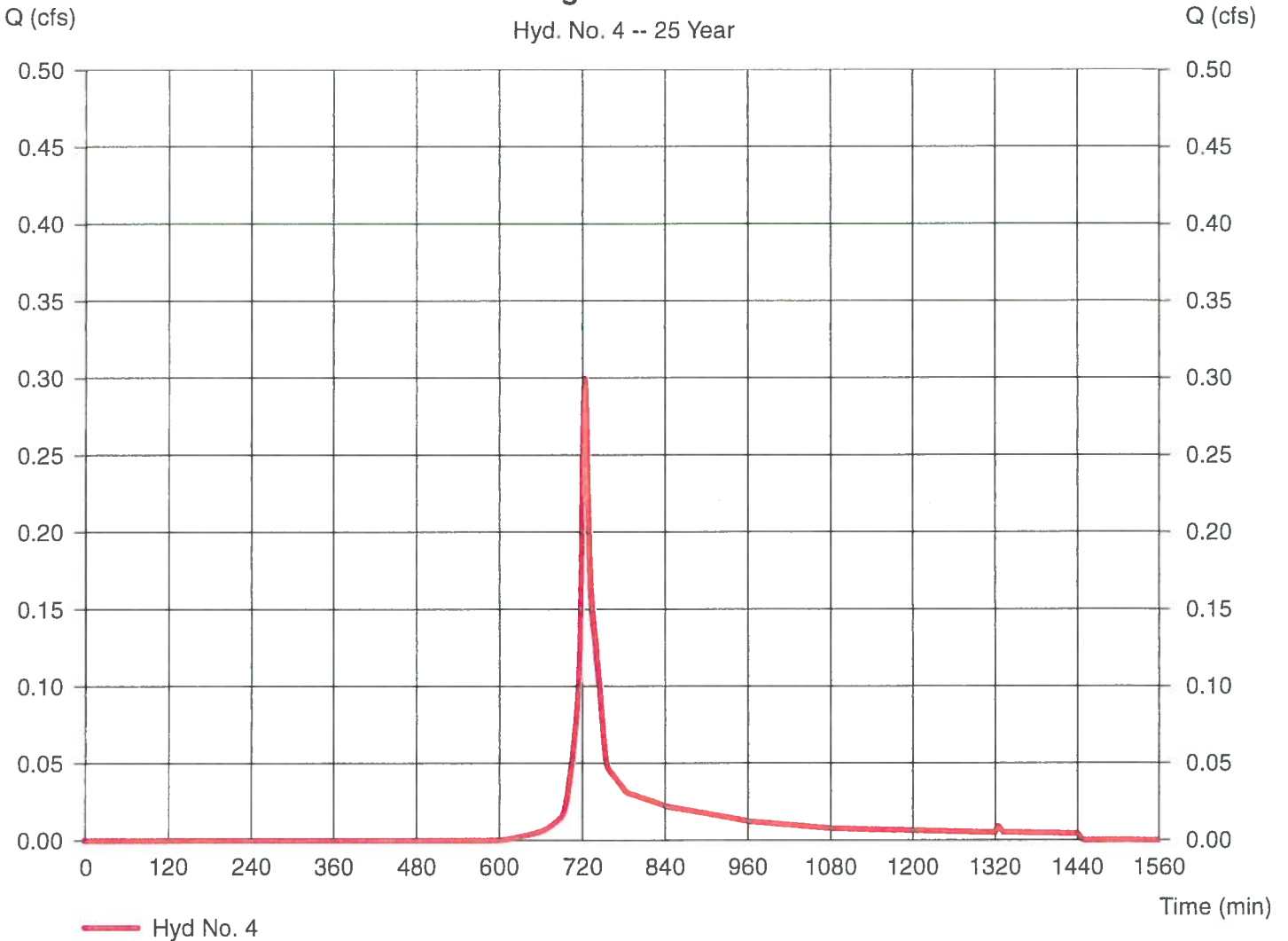
D. Vegetated Area 1

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 0.106 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.29 in
Storm duration = 24 hrs

Peak discharge = 0.300 cfs
Time to peak = 725 min
Hyd. volume = 945 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 5

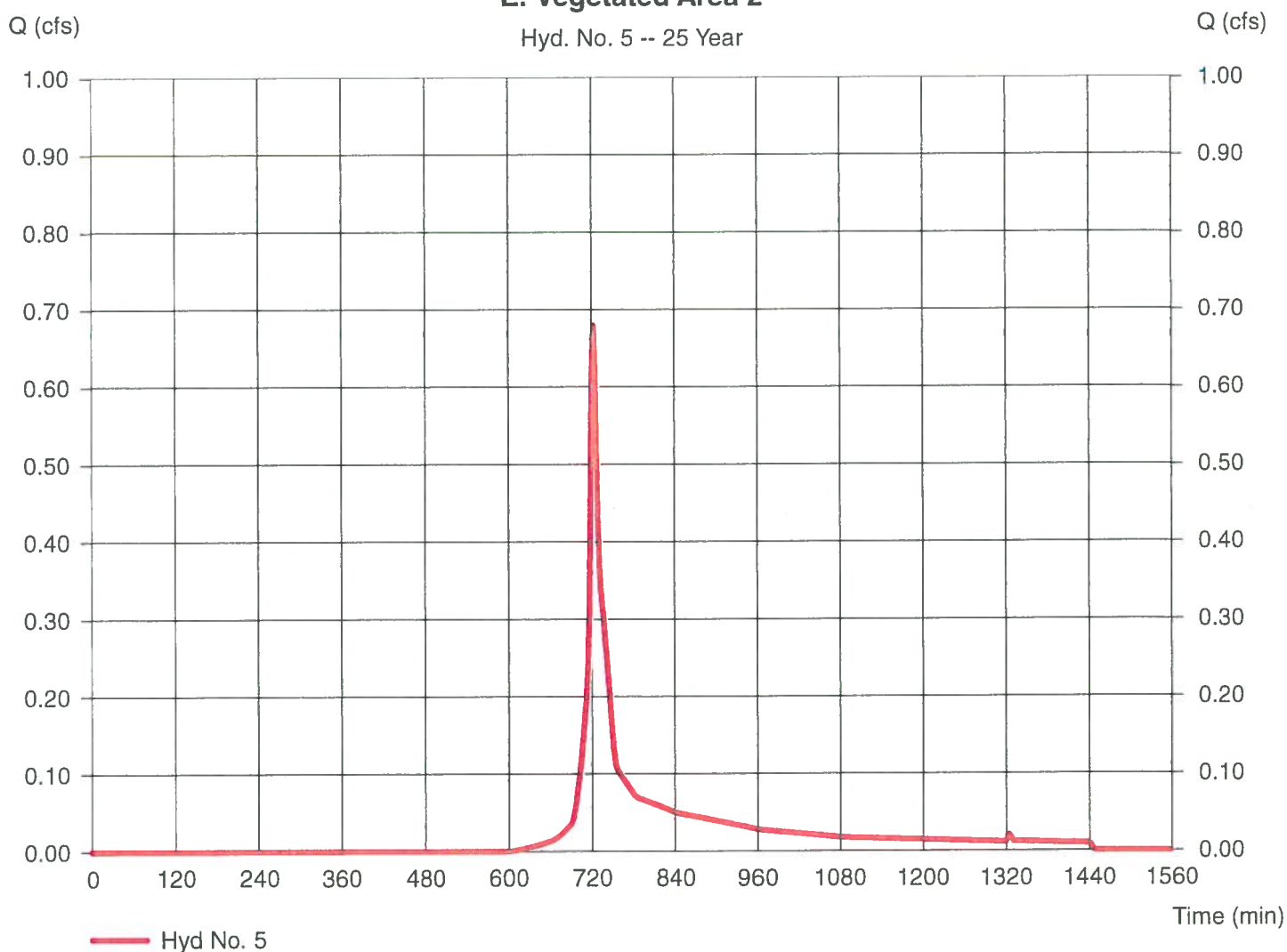
E. Vegetated Area 2

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.241 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 0.680 cfs
 Time to peak = 725 min
 Hyd. volume = 2,144 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9,2

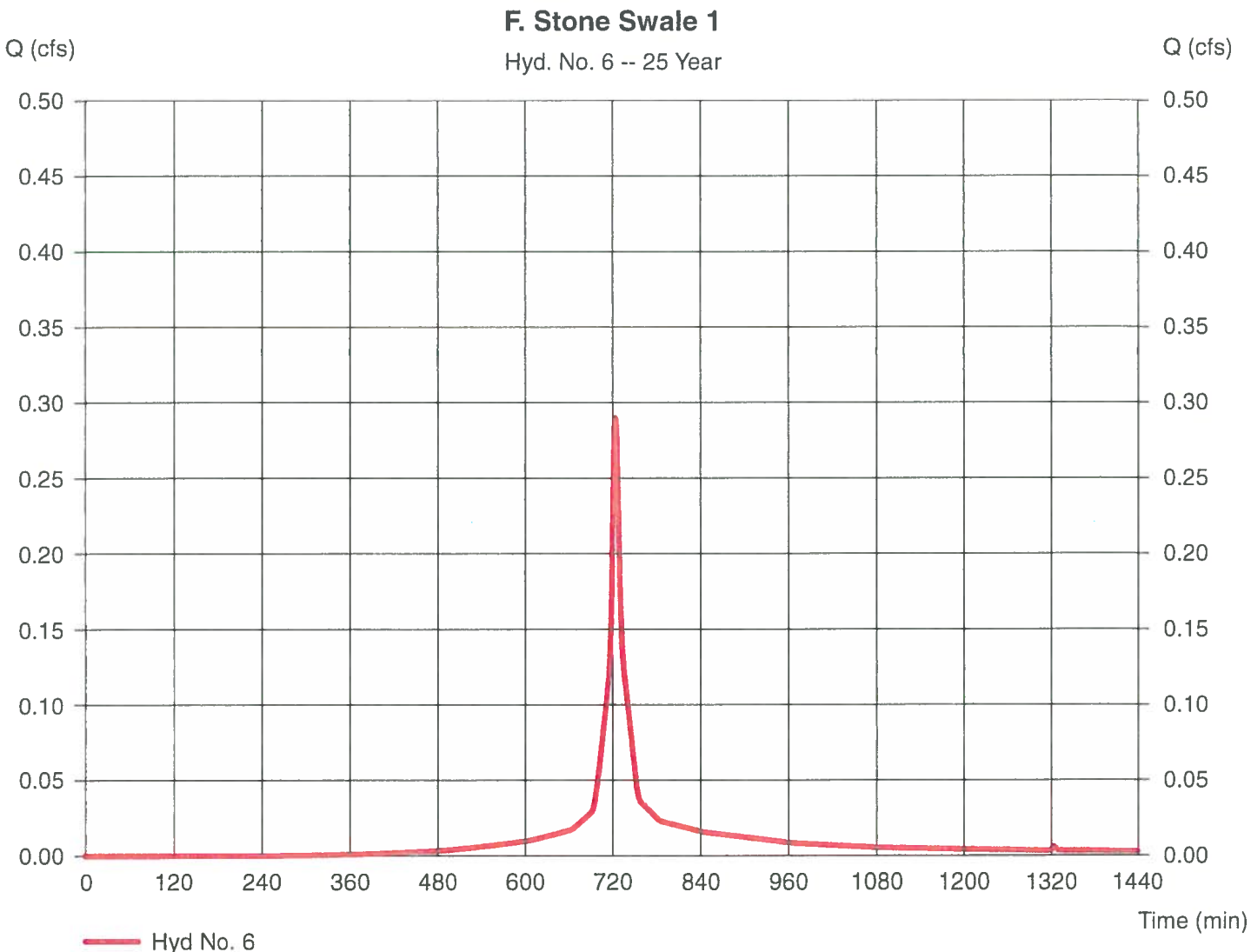
Tuesday, Oct 23, 2018

Hyd. No. 6

F. Stone Swale 1

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.052 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 0.290 cfs
 Time to peak = 724 min
 Hyd. volume = 924 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 7

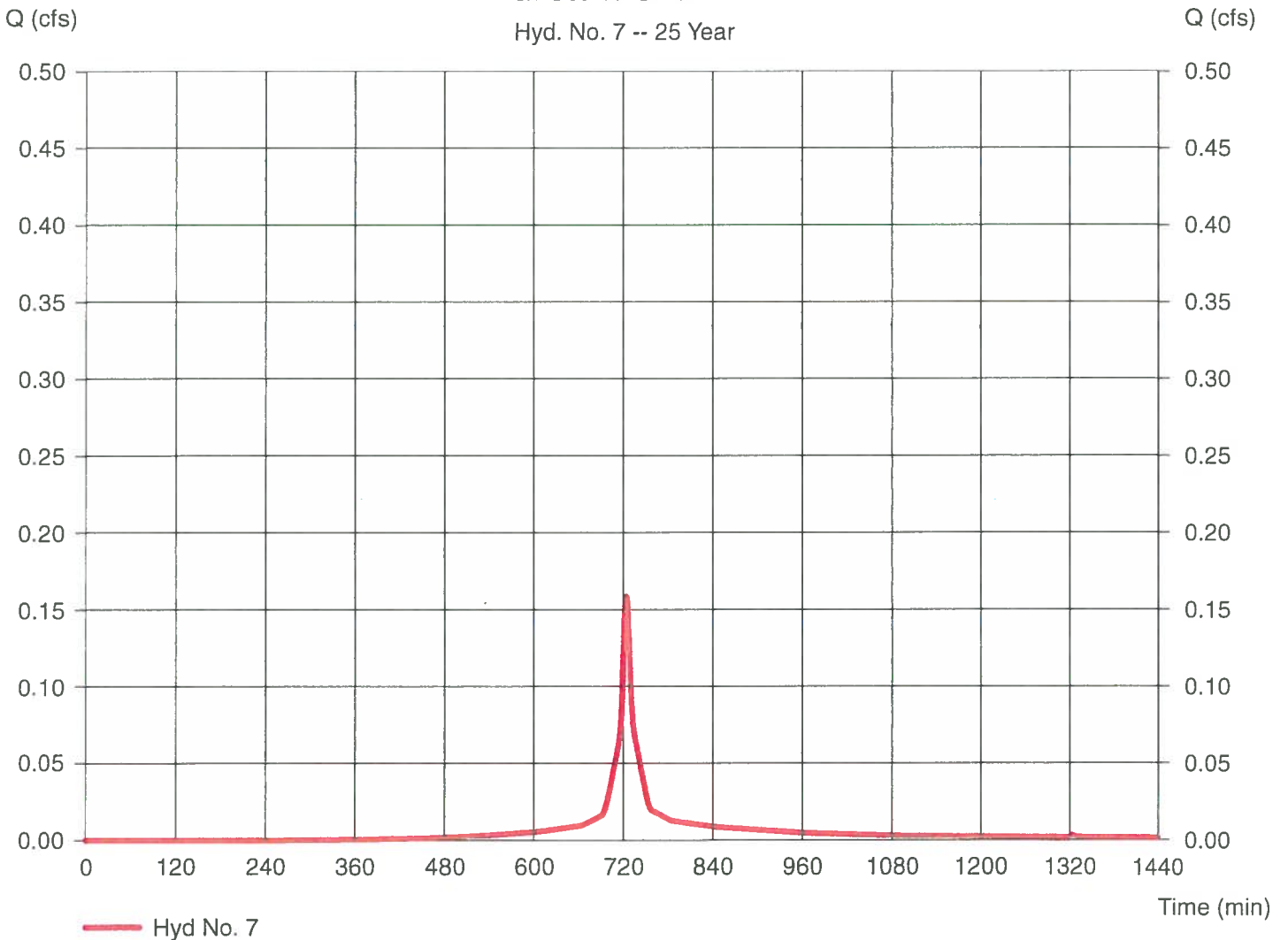
G. Stone Swale 2

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 0.028 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.29 in
 Storm duration = 24 hrs

Peak discharge = 0.159 cfs
 Time to peak = 724 min
 Hyd. volume = 506 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

G. Stone Swale 2

Hyd. No. 7 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

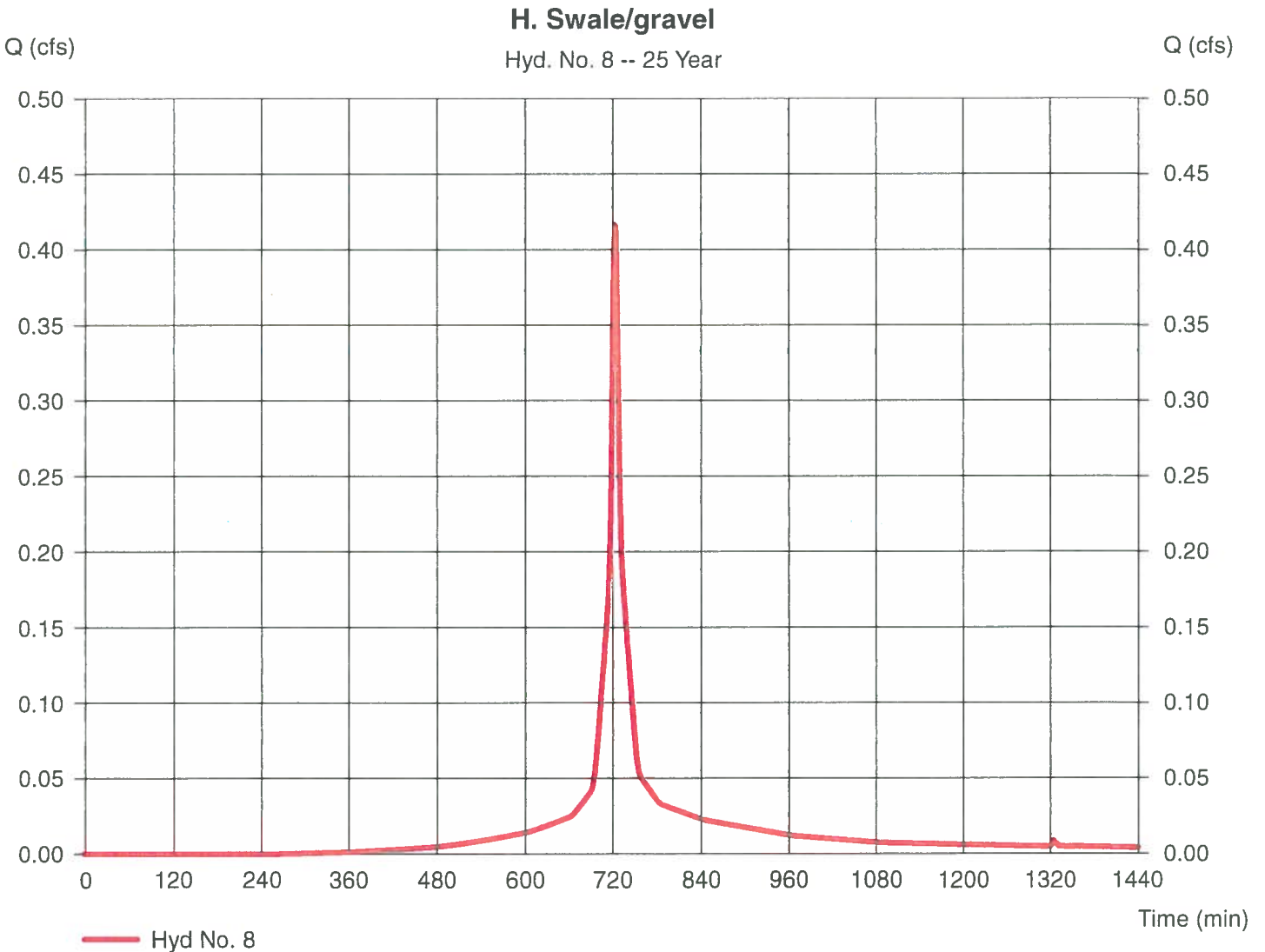
Tuesday, Oct 23, 2018

Hyd. No. 8

H. Swale/gravel

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 0.074 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 6.29 in
Storm duration = 24 hrs

Peak discharge = 0.416 cfs
Time to peak = 724 min
Hyd. volume = 1,328 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484



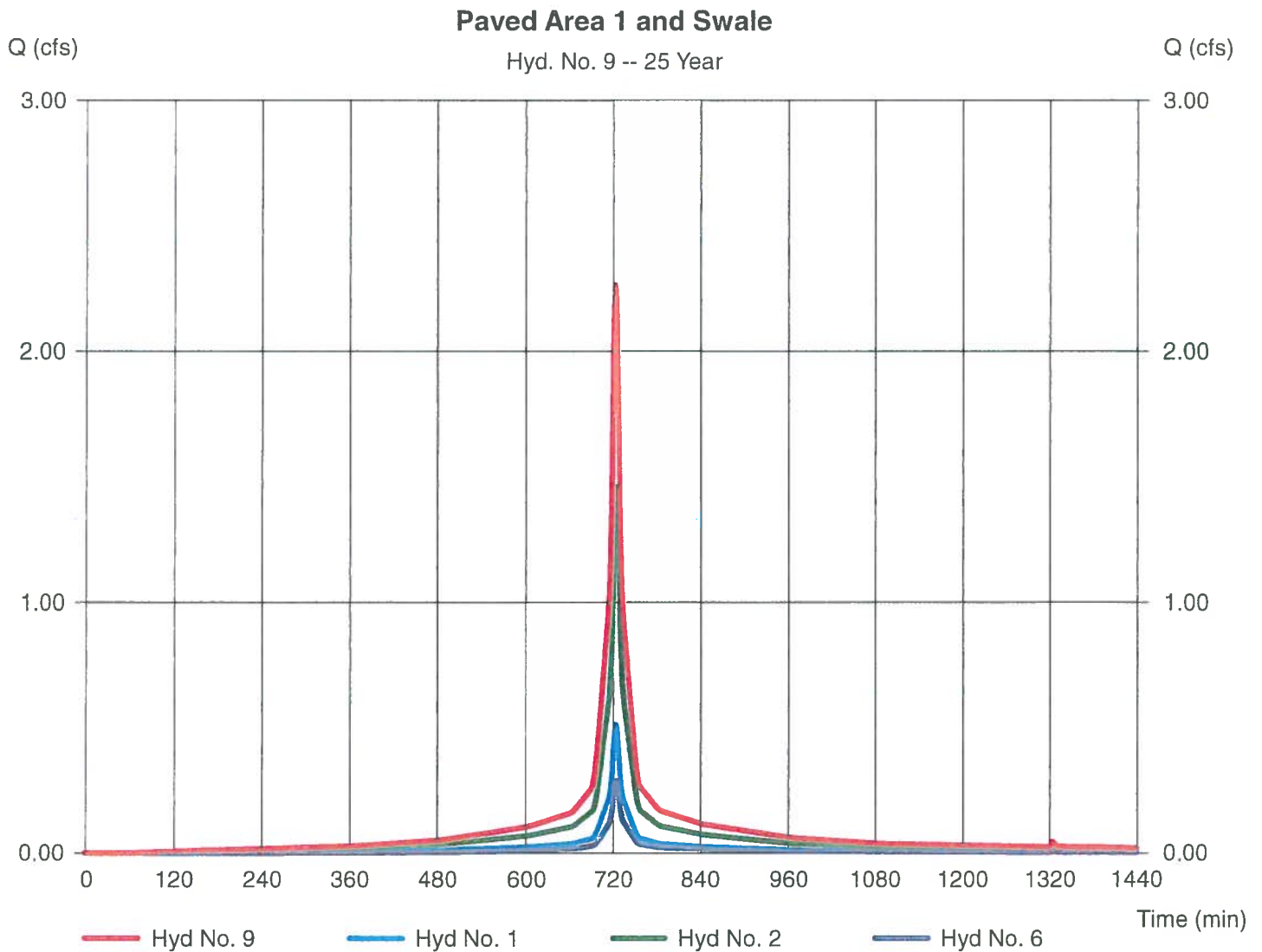
Hydrograph Report

Hyd. No. 9

Paved Area 1 and Swale

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 6

Peak discharge = 2.264 cfs
Time to peak = 724 min
Hyd. volume = 7,857 cuft
Contrib. drain. area = 0.362 ac



Hydrograph Report

Hyd. No. 10

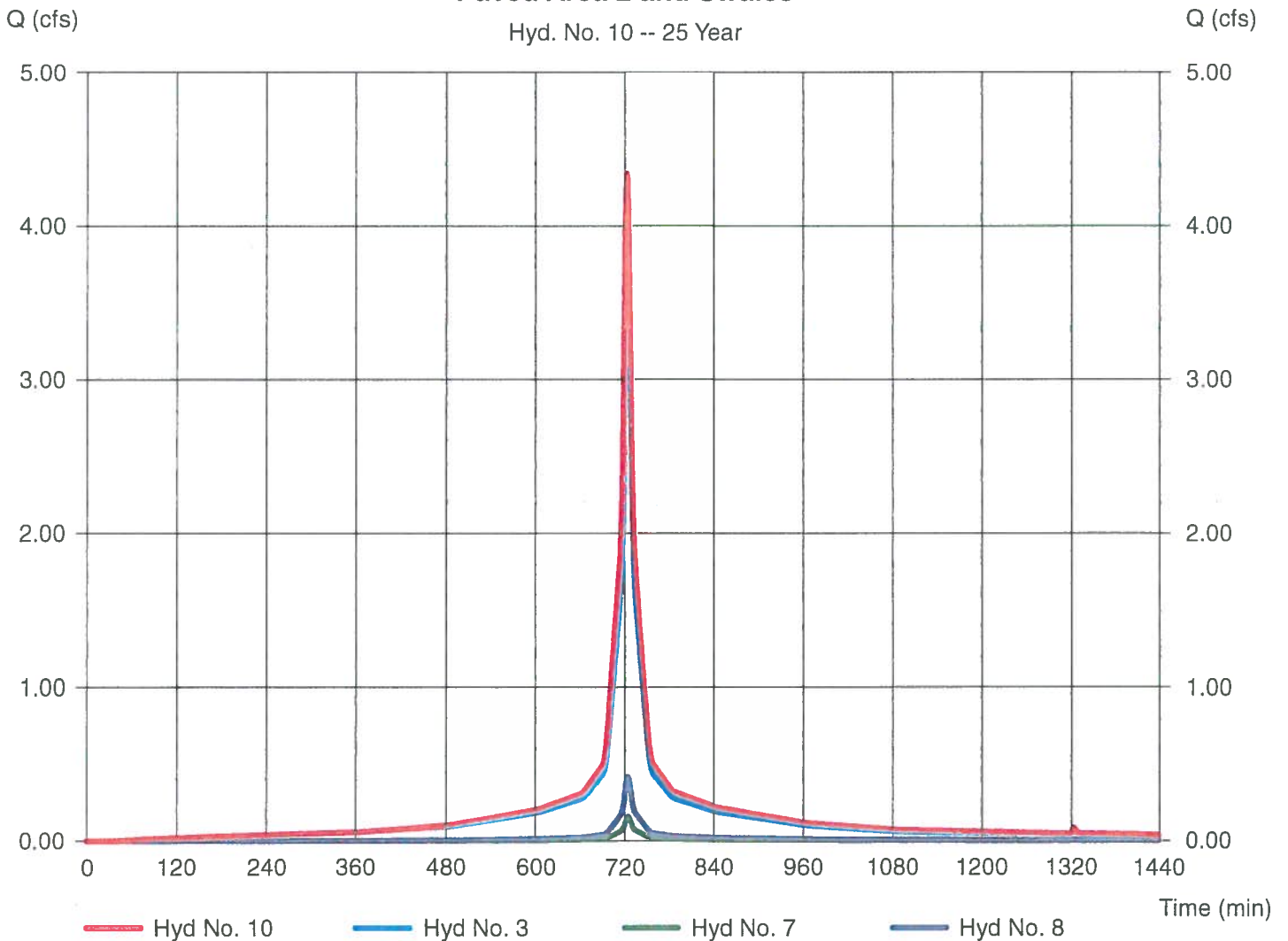
Paved Area 2 and Swales

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 3, 7, 8

Peak discharge = 4.339 cfs
Time to peak = 724 min
Hyd. volume = 15,199 cuft
Contrib. drain. area = 0.692 ac

Paved Area 2 and Swales

Hyd. No. 10 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 11

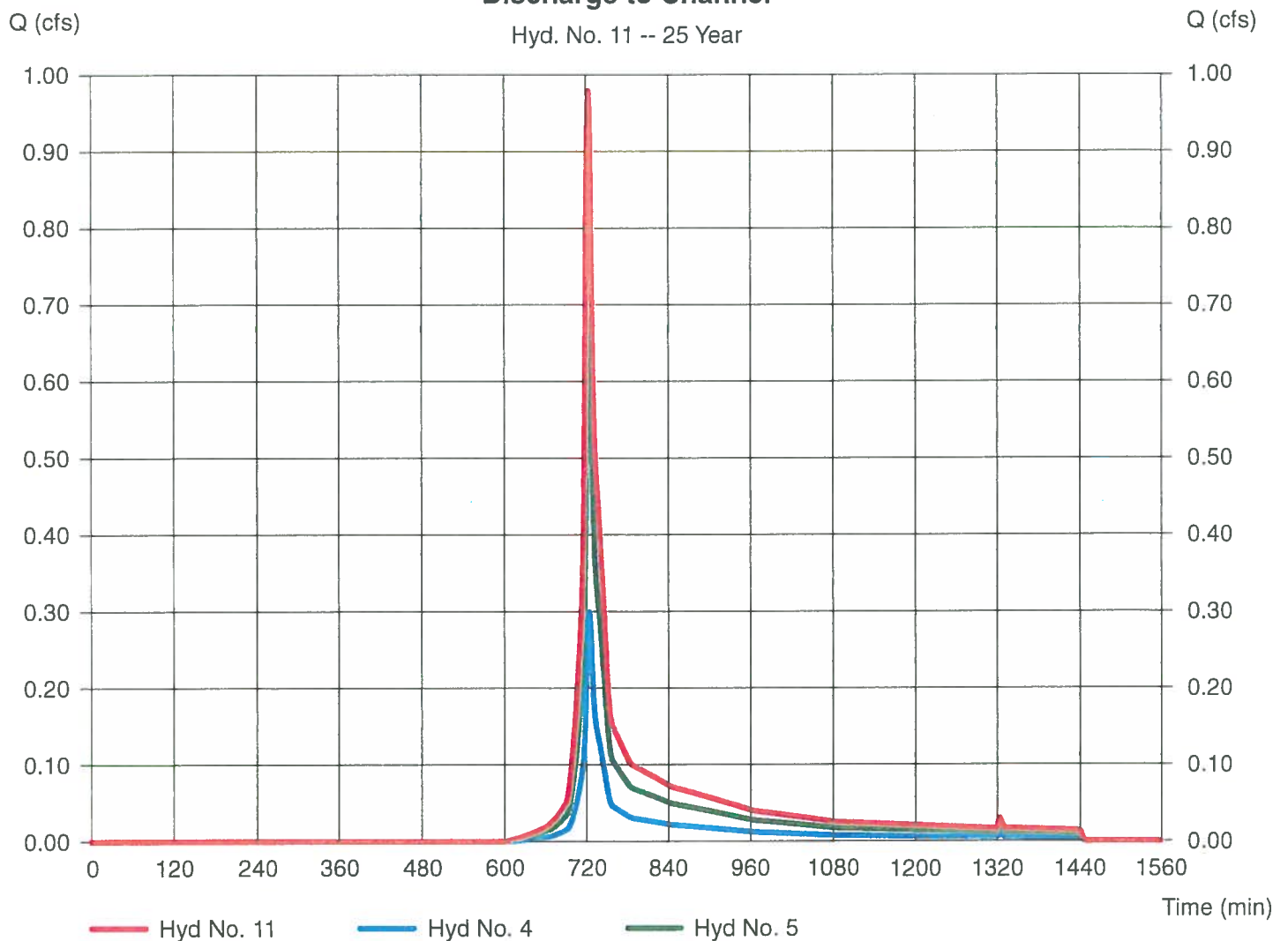
Discharge to Channel

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 1 min
 Inflow hyds. = 4, 5

Peak discharge = 0.979 cfs
 Time to peak = 725 min
 Hyd. volume = 3,089 cuft
 Contrib. drain. area = 0.347 ac

Discharge to Channel

Hyd. No. 11 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

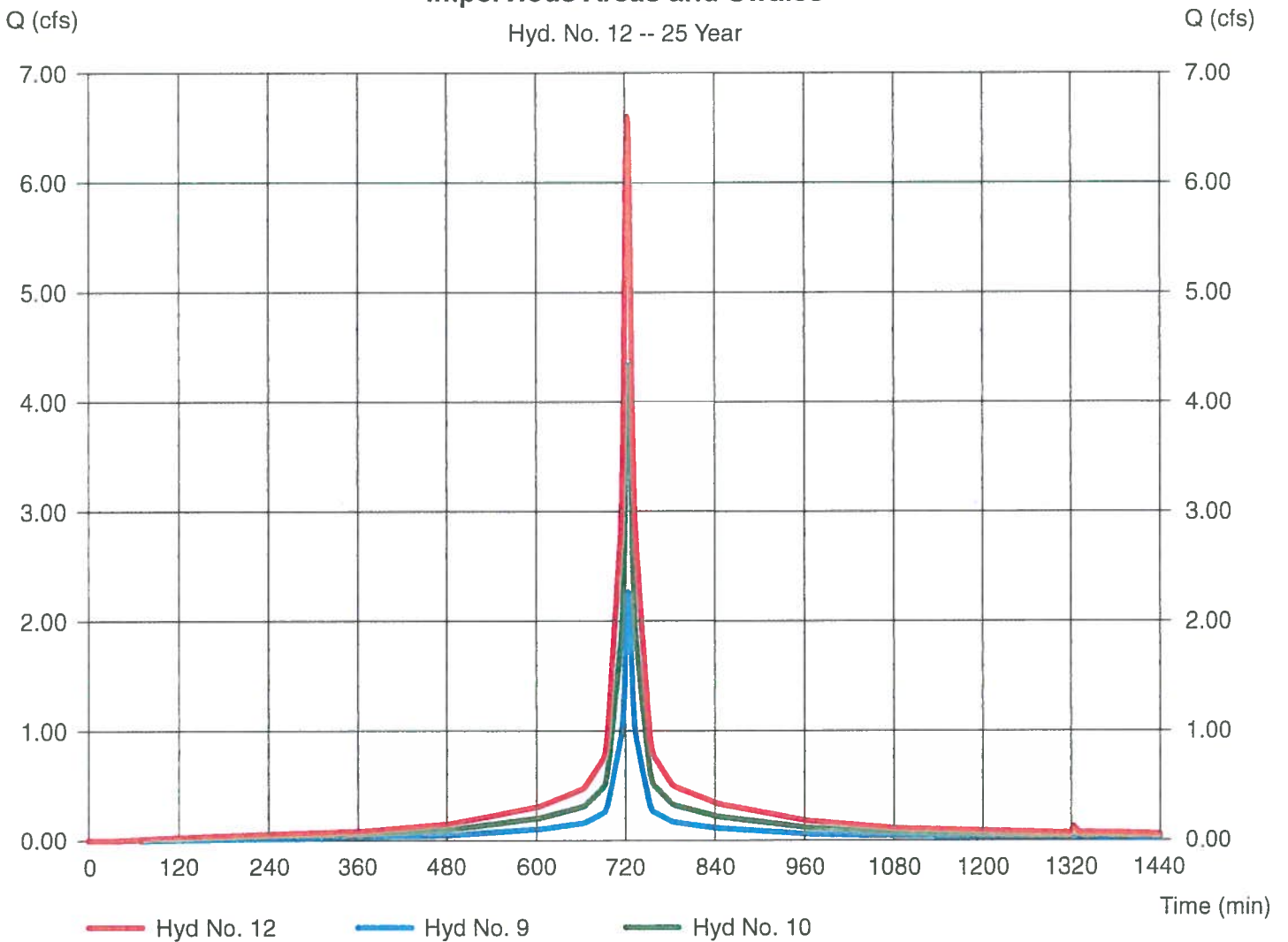
Hyd. No. 12

Impervious Areas and Swales

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 9, 10

Peak discharge = 6.603 cfs
Time to peak = 724 min
Hyd. volume = 23,056 cuft
Contrib. drain. area= 0.000 ac

Impervious Areas and Swales



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

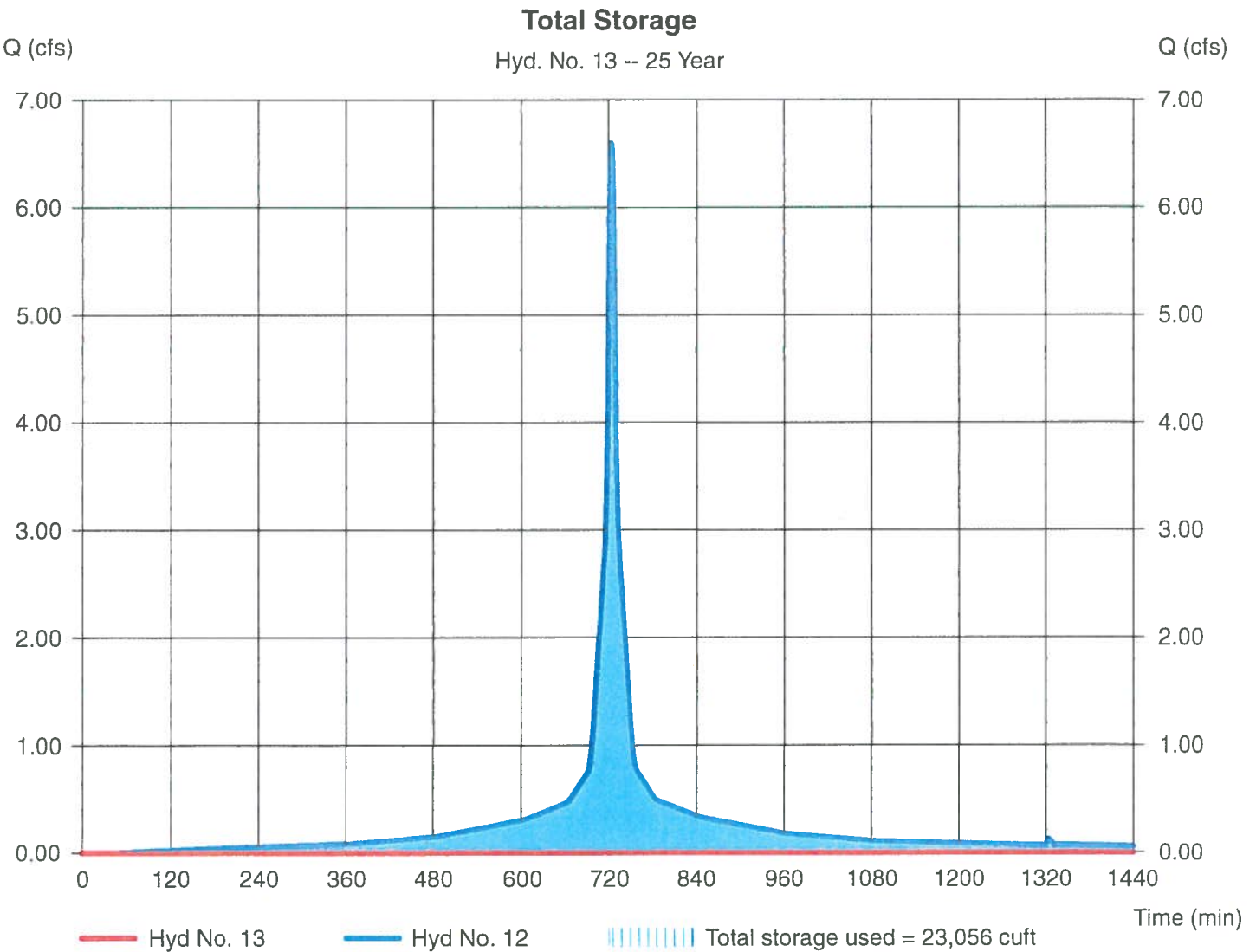
Hyd. No. 13

Total Storage

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 12 - Impervious Areas and Swales
Reservoir name = Total

Peak discharge = 0.000 cfs
Time to peak = n/a
Hyd. volume = 0 cuft
Max. Elevation = 18.15 ft
Max. Storage = 23,056 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.588	1	724	2,095	---	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.673	1	724	5,882	---	-----	-----	B. Paved Area 1	
3	SCS Runoff	4.307	1	724	15,352	---	-----	-----	C. Paved/Gravel Area	
4	SCS Runoff	0.388	1	725	1,208	---	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	0.880	1	725	2,740	---	-----	-----	E. Vegetated Area 2	
6	SCS Runoff	0.340	1	724	1,092	---	-----	-----	F. Stone Swale 1	
7	SCS Runoff	0.186	1	724	597	---	-----	-----	G. Stone Swale 2	
8	SCS Runoff	0.488	1	724	1,568	---	-----	-----	H. Swale/gravel	
9	Combine	2.600	1	724	9,068	1, 2, 6,	-----	-----	Paved Area 1 and Swale	
10	Combine	4.980	1	724	17,517	3, 7, 8,	-----	-----	Paved Area 2 and Swales	
11	Combine	1.268	1	725	3,948	4, 5,	-----	-----	Discharge to Channel	
12	Combine	7.580	1	724	26,586	9, 10,	-----	-----	Impervious Areas and Swales	
13	Reservoir	0.000	1	n/a	0	12	18.25	26,586	Total Storage	
Post.gpw					Return Period: 50 Year			Tuesday, Oct 23, 2018		

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 1

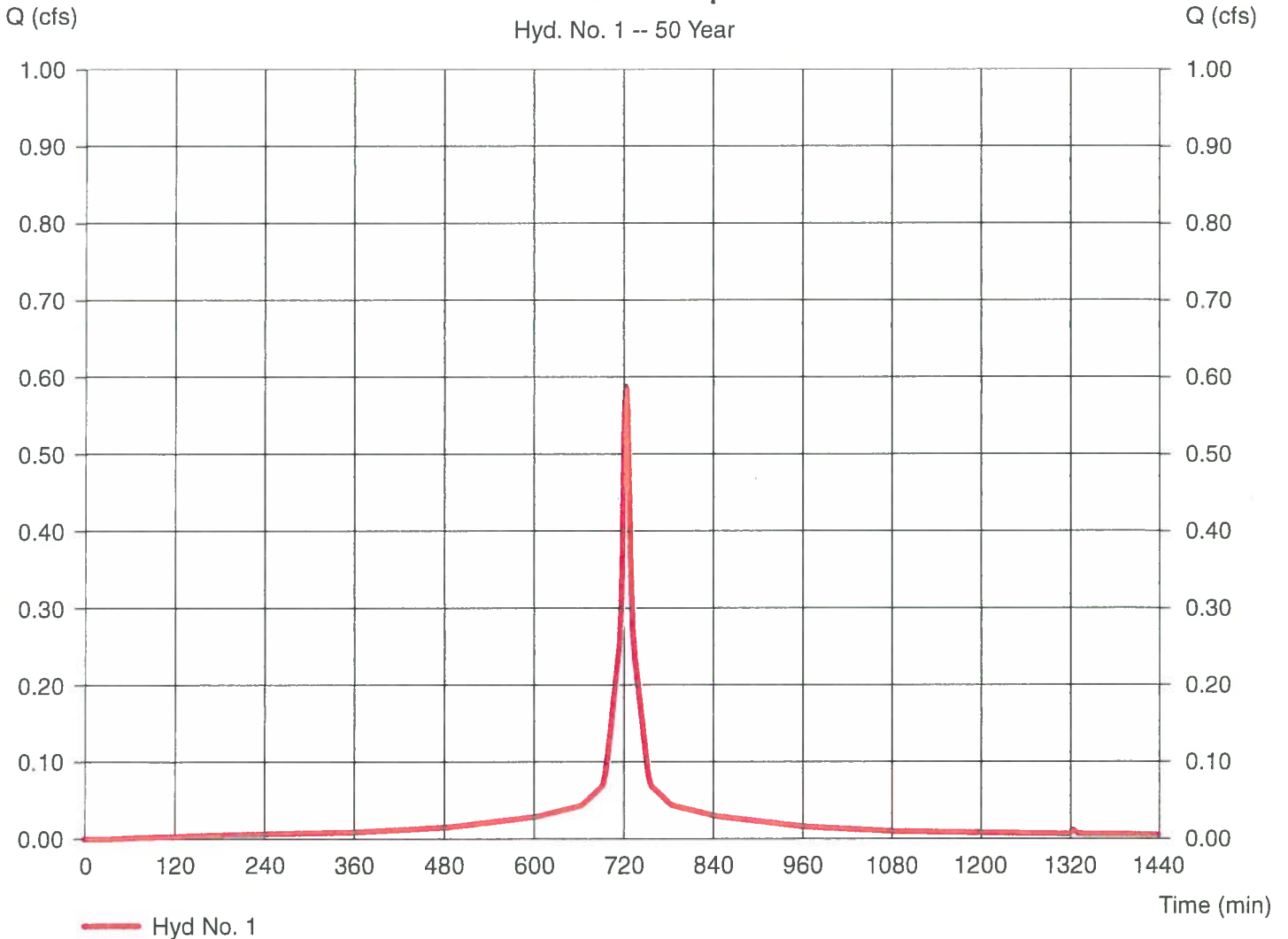
A. Paved Ramp

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.081 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.588 cfs
 Time to peak = 724 min
 Hyd. volume = 2,095 cuft
 Curve number = 98
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 2

B. Paved Area 1

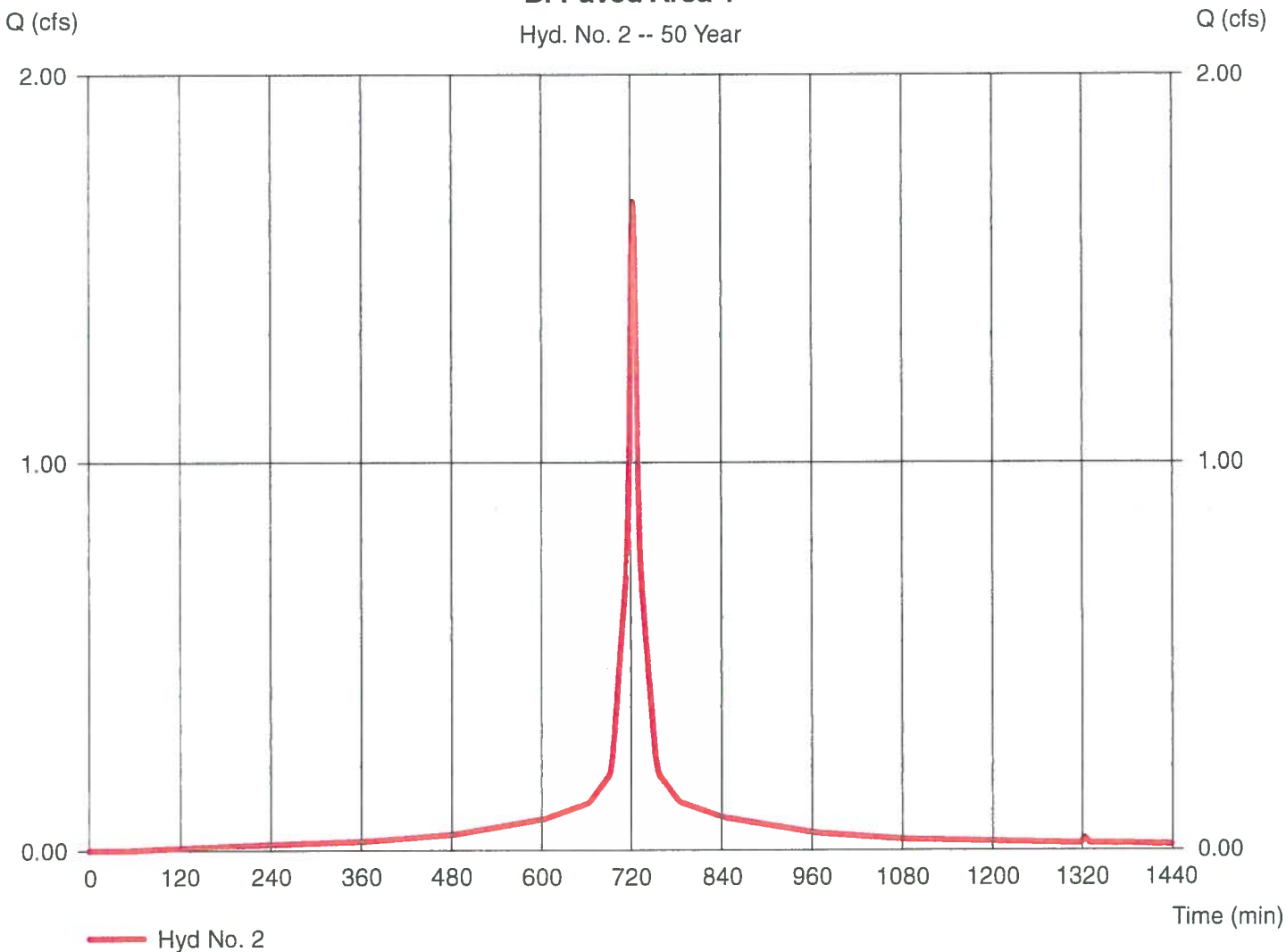
Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.230 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 1.673 cfs
 Time to peak = 724 min
 Hyd. volume = 5,882 cuft
 Curve number = 97*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.214 \times 98) + (0.012 \times 87)] / 0.230$

B. Paved Area 1

Hyd. No. 2 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 3

C. Paved/Gravel Area

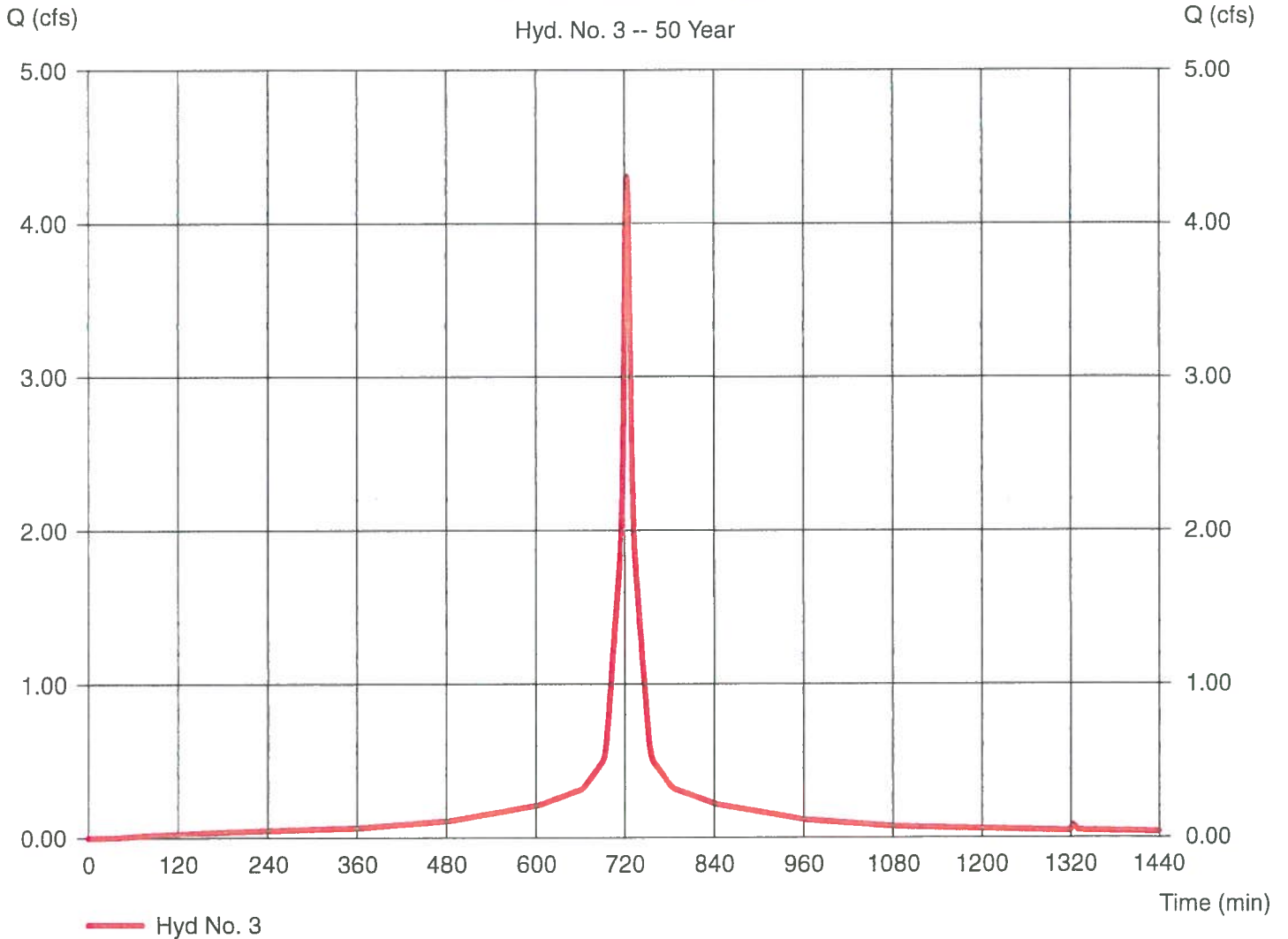
Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.590 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 4.307 cfs
 Time to peak = 724 min
 Hyd. volume = 15,352 cuft
 Curve number = 98*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

* Composite (Area/CN) = $[(0.579 \times 98) + (0.014 \times 87)] / 0.590$

C. Paved/Gravel Area

Hyd. No. 3 -- 50 Year



Hydrograph Report

Hyd. No. 4

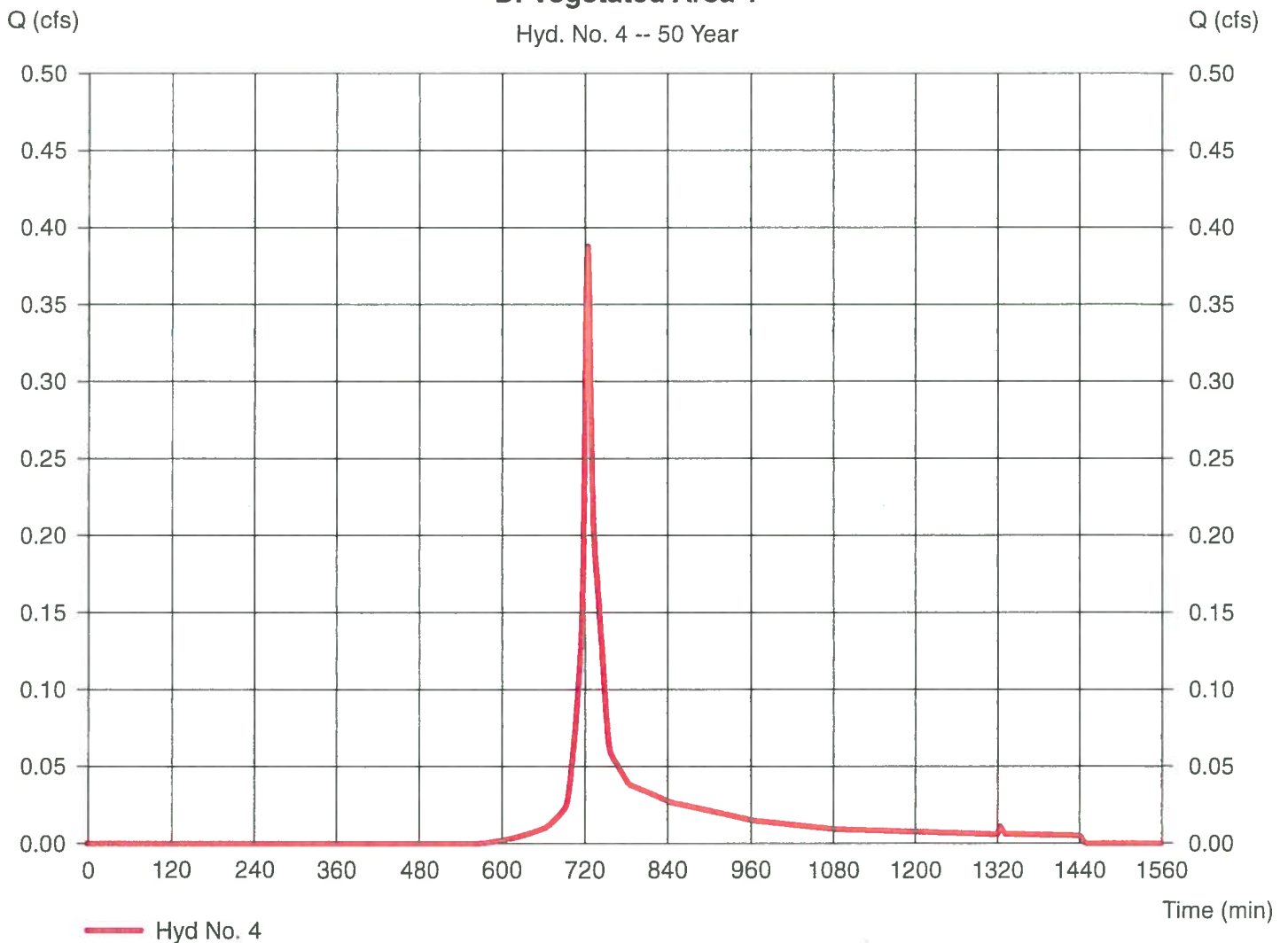
D. Vegetated Area 1

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 0.106 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.19 in
Storm duration = 24 hrs

Peak discharge = 0.388 cfs
Time to peak = 725 min
Hyd. volume = 1,208 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

D. Vegetated Area 1

Hyd. No. 4 -- 50 Year



Hyd. No. 5

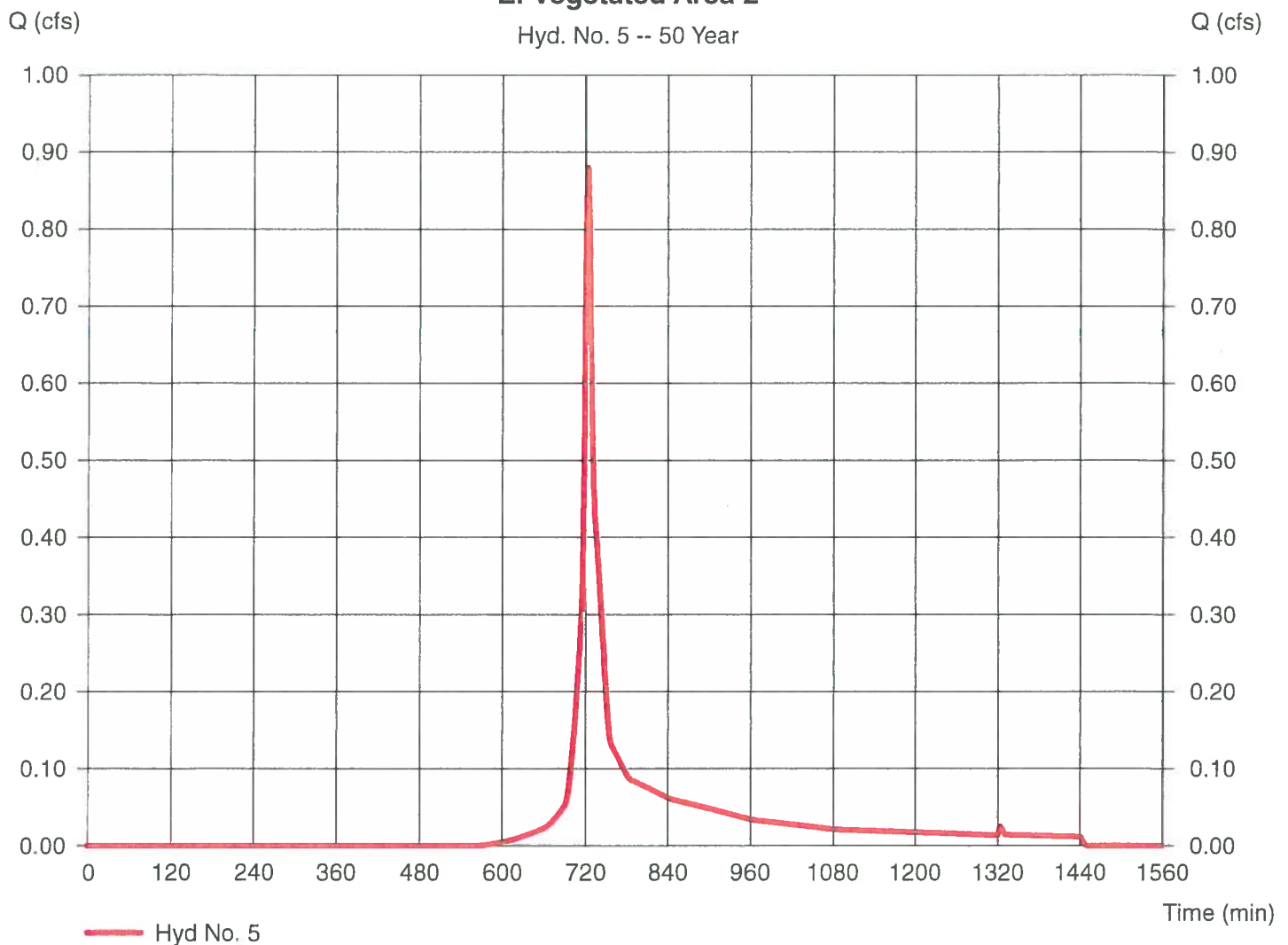
E. Vegetated Area 2

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 0.241 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.19 in
Storm duration = 24 hrs

Peak discharge = 0.880 cfs
Time to peak = 725 min
Hyd. volume = 2,740 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

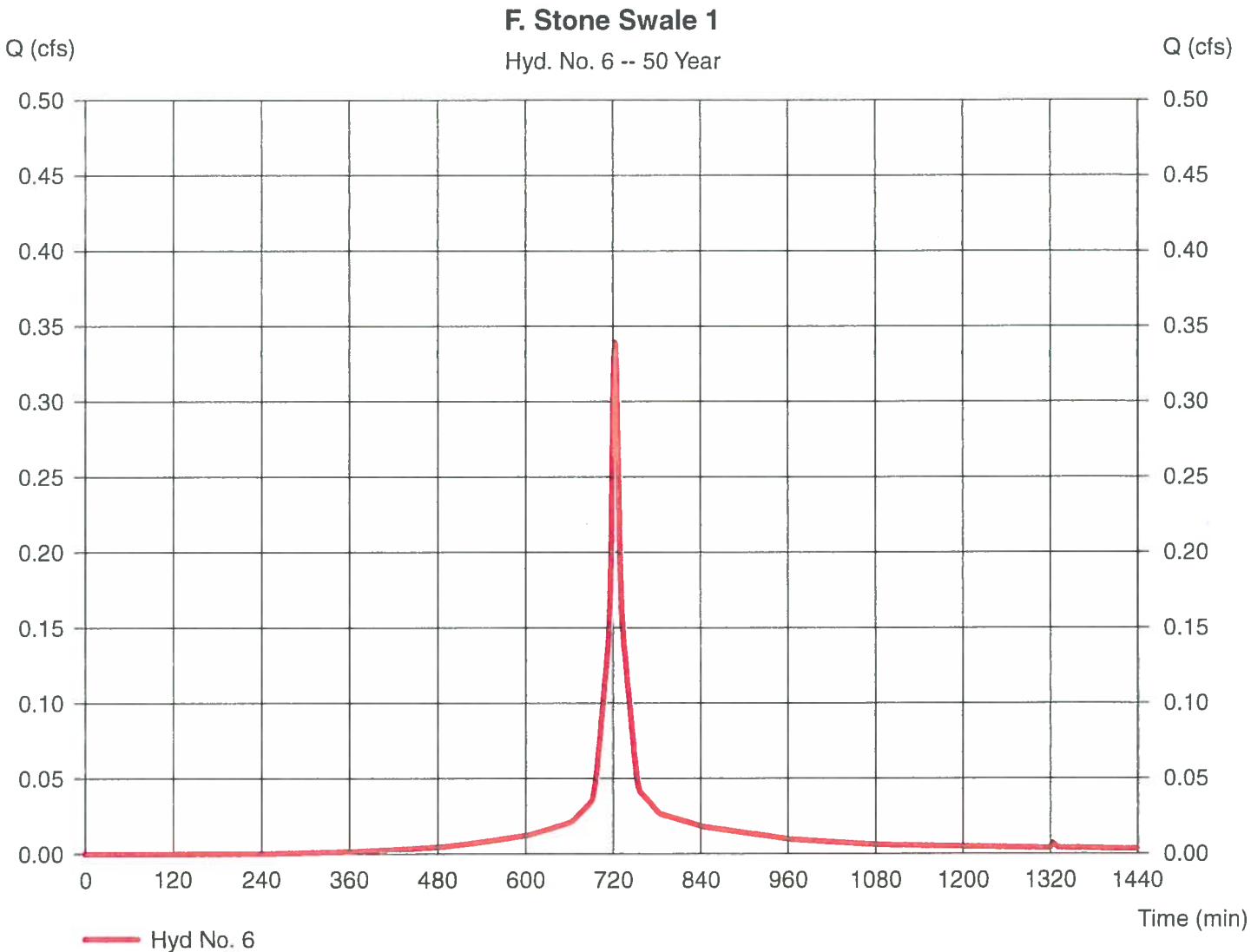
Tuesday, Oct 23, 2018

Hyd. No. 6

F. Stone Swale 1

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.052 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.340 cfs
 Time to peak = 724 min
 Hyd. volume = 1,092 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 7

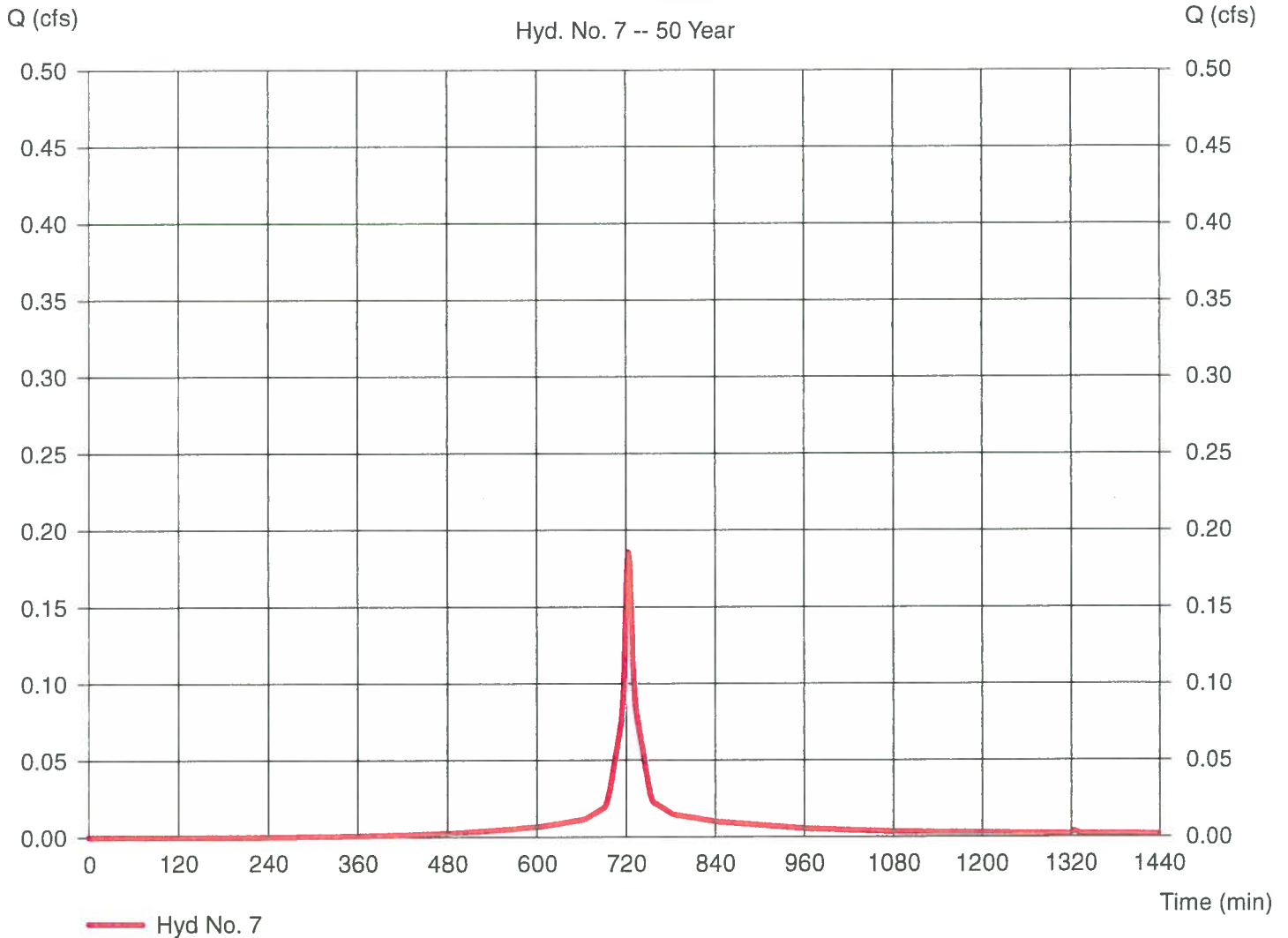
G. Stone Swale 2

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 0.028 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 7.19 in
 Storm duration = 24 hrs

Peak discharge = 0.186 cfs
 Time to peak = 724 min
 Hyd. volume = 597 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

G. Stone Swale 2

Hyd. No. 7 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

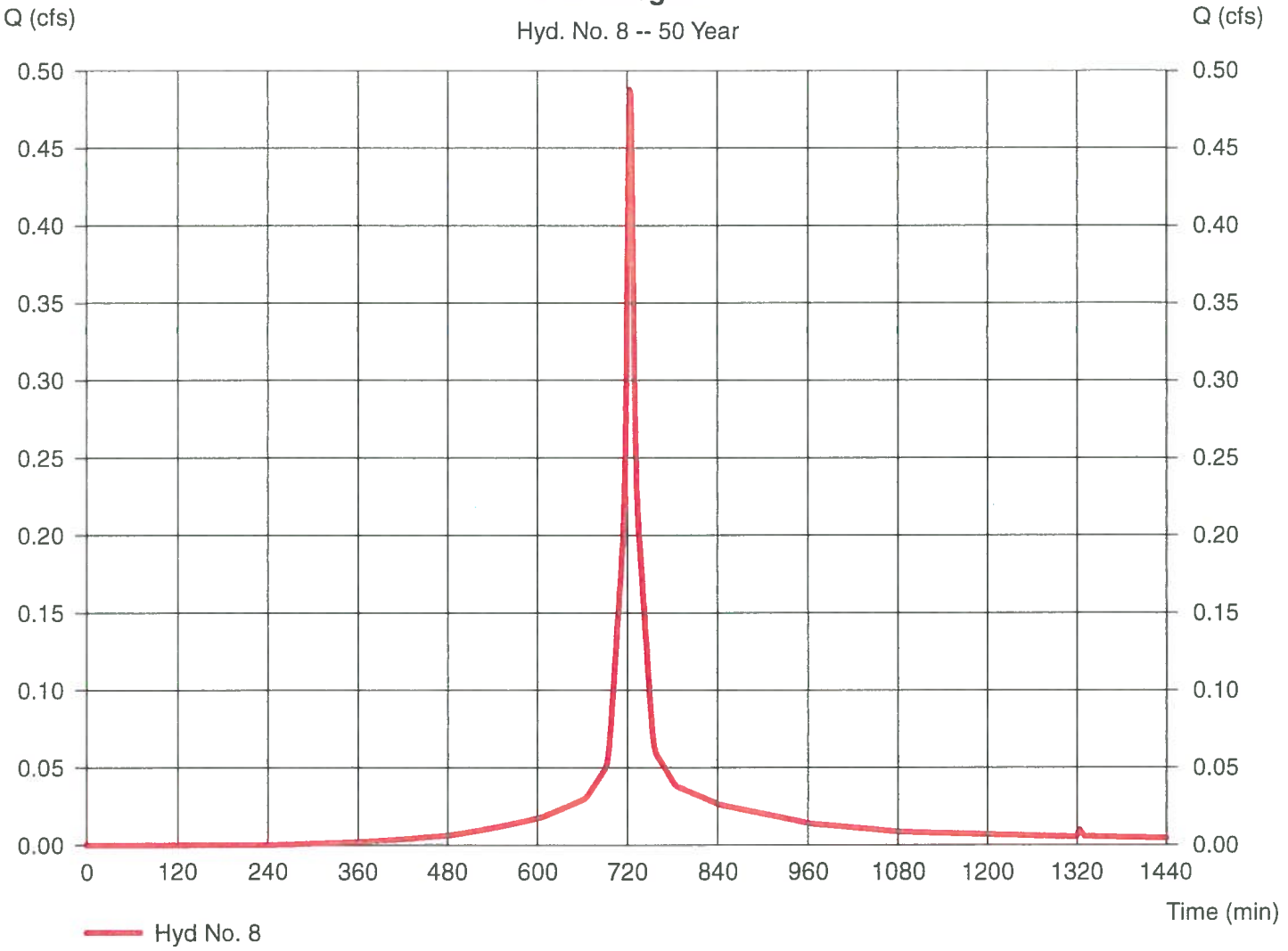
Hyd. No. 8

H. Swale/gravel

Hydrograph type = SCS Runoff
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 0.074 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 7.19 in
Storm duration = 24 hrs

Peak discharge = 0.488 cfs
Time to peak = 724 min
Hyd. volume = 1,568 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

H. Swale/gravel
Hyd. No. 8 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

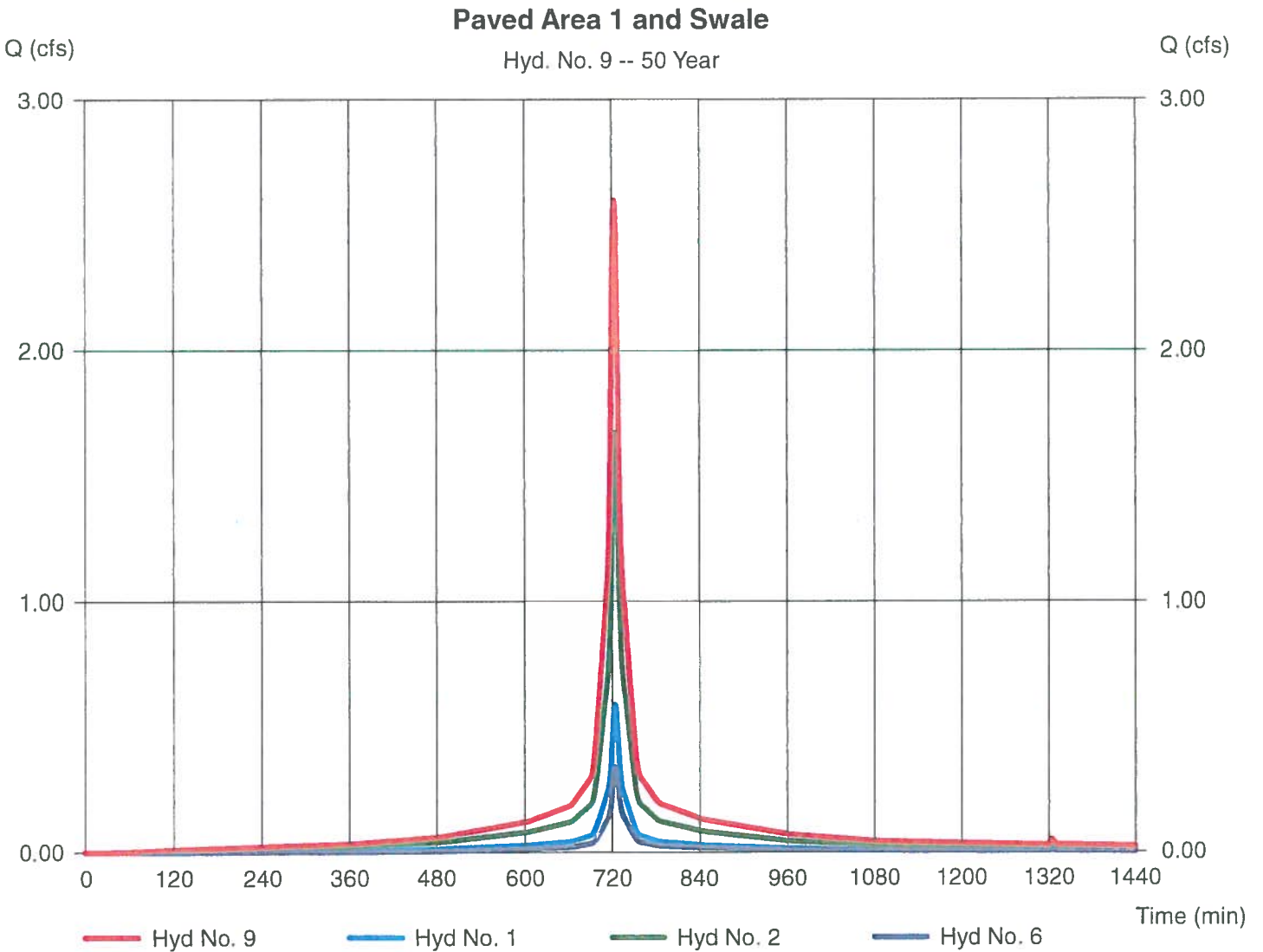
Tuesday, Oct 23, 2018

Hyd. No. 9

Paved Area 1 and Swale

Hydrograph type = Combine
 Storm frequency = 50 yrs
 Time interval = 1 min
 Inflow hyds. = 1, 2, 6

Peak discharge = 2.600 cfs
 Time to peak = 724 min
 Hyd. volume = 9,068 cuft
 Contrib. drain. area = 0.362 ac



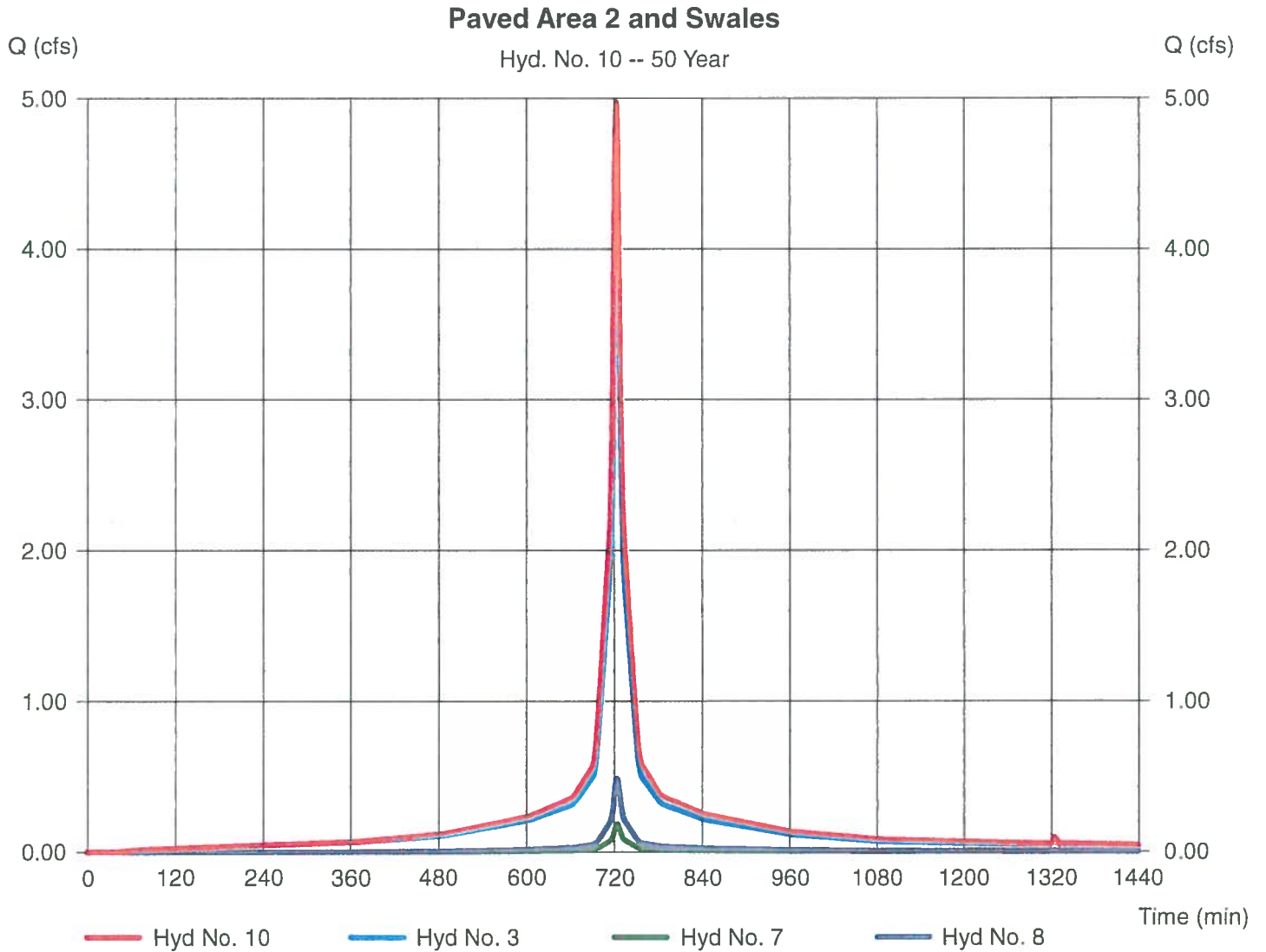
Hydrograph Report

Hyd. No. 10

Paved Area 2 and Swales

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyds. = 3, 7, 8

Peak discharge = 4.980 cfs
Time to peak = 724 min
Hyd. volume = 17,517 cuft
Contrib. drain. area = 0.692 ac



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 11

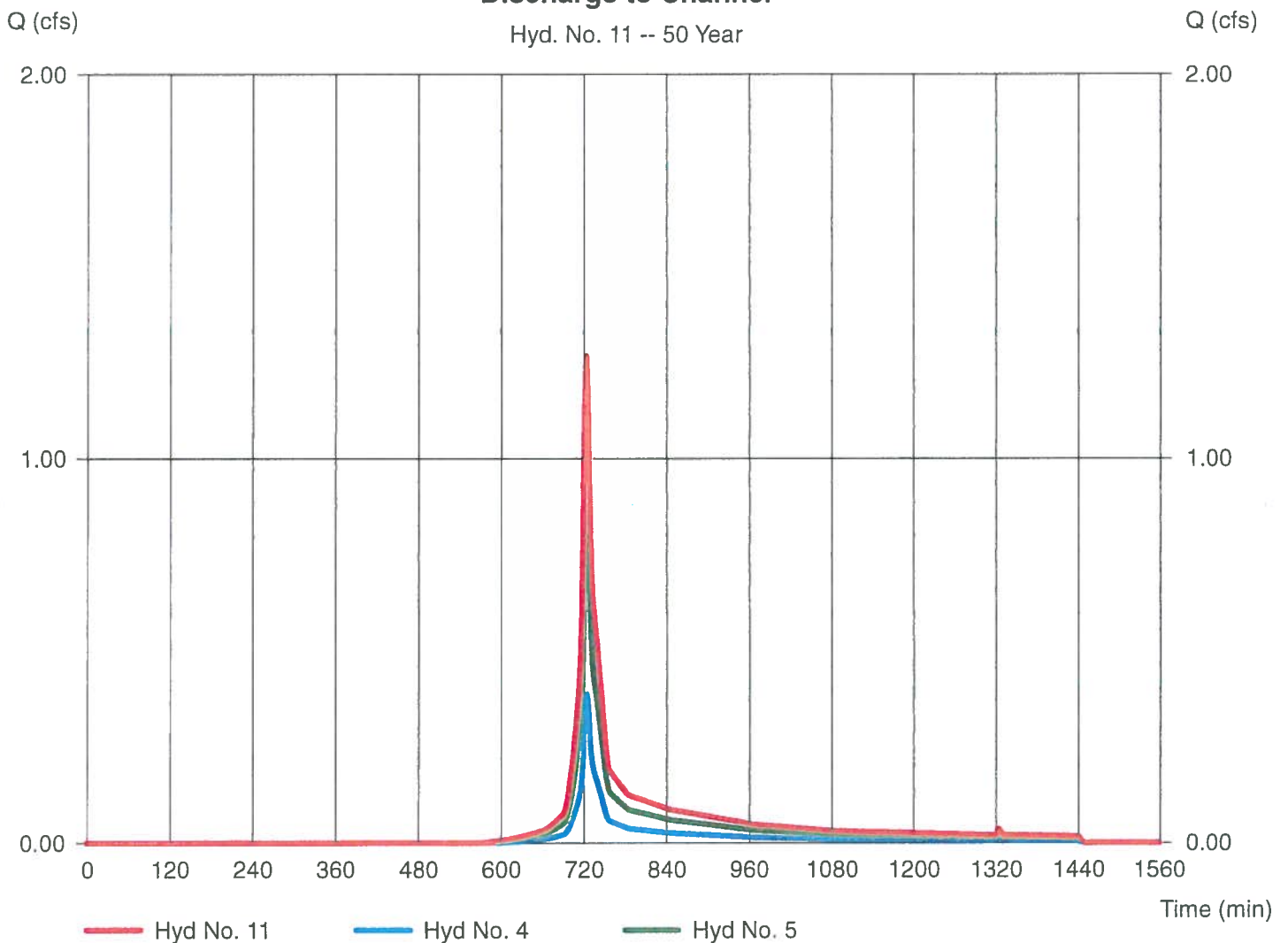
Discharge to Channel

Hydrograph type = Combine
 Storm frequency = 50 yrs
 Time interval = 1 min
 Inflow hyds. = 4, 5

Peak discharge = 1.268 cfs
 Time to peak = 725 min
 Hyd. volume = 3,948 cuft
 Contrib. drain. area = 0.347 ac

Discharge to Channel

Hyd. No. 11 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

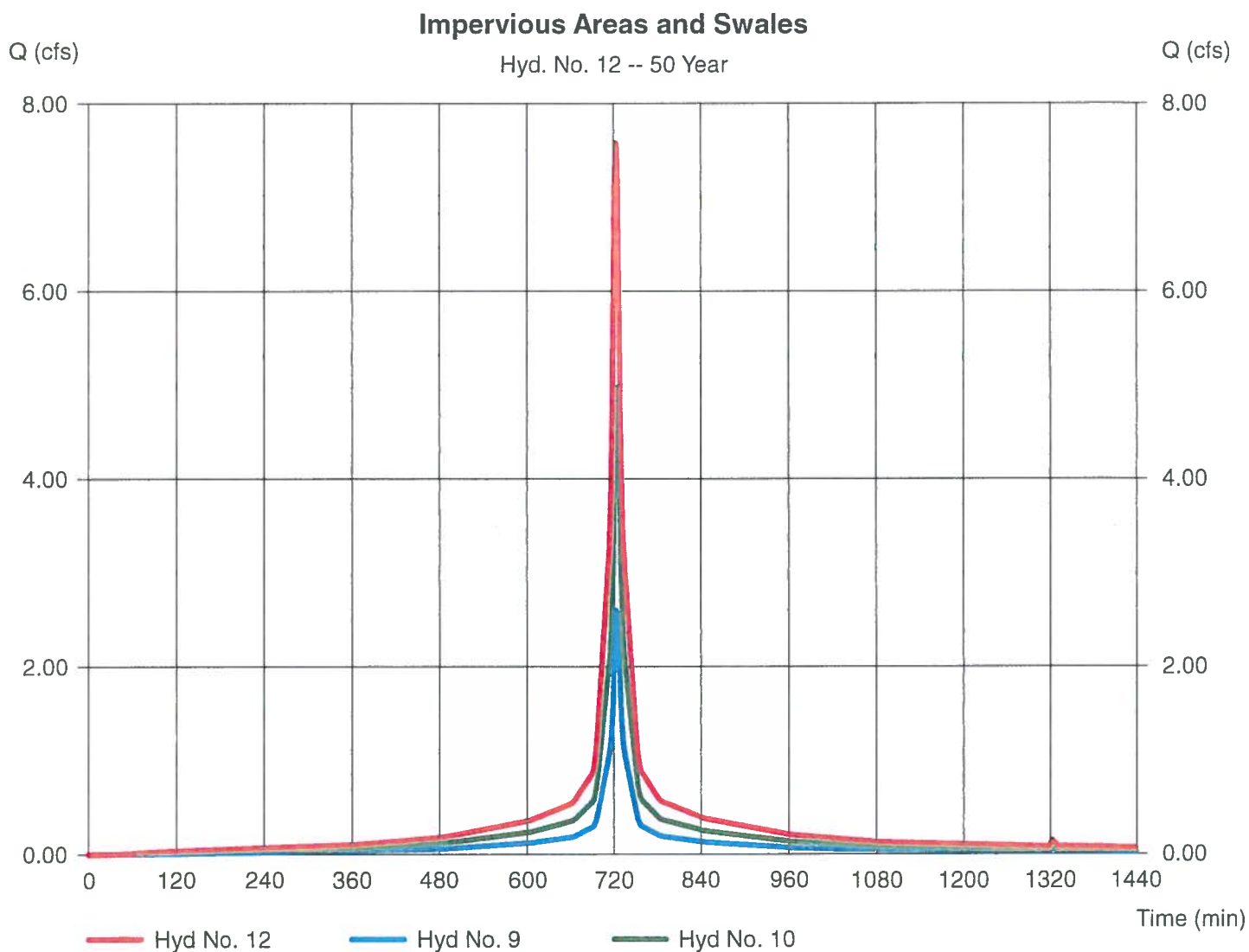
Tuesday, Oct 23, 2018

Hyd. No. 12

Impervious Areas and Swales

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyds. = 9, 10

Peak discharge = 7.580 cfs
Time to peak = 724 min
Hyd. volume = 26,586 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydrallow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

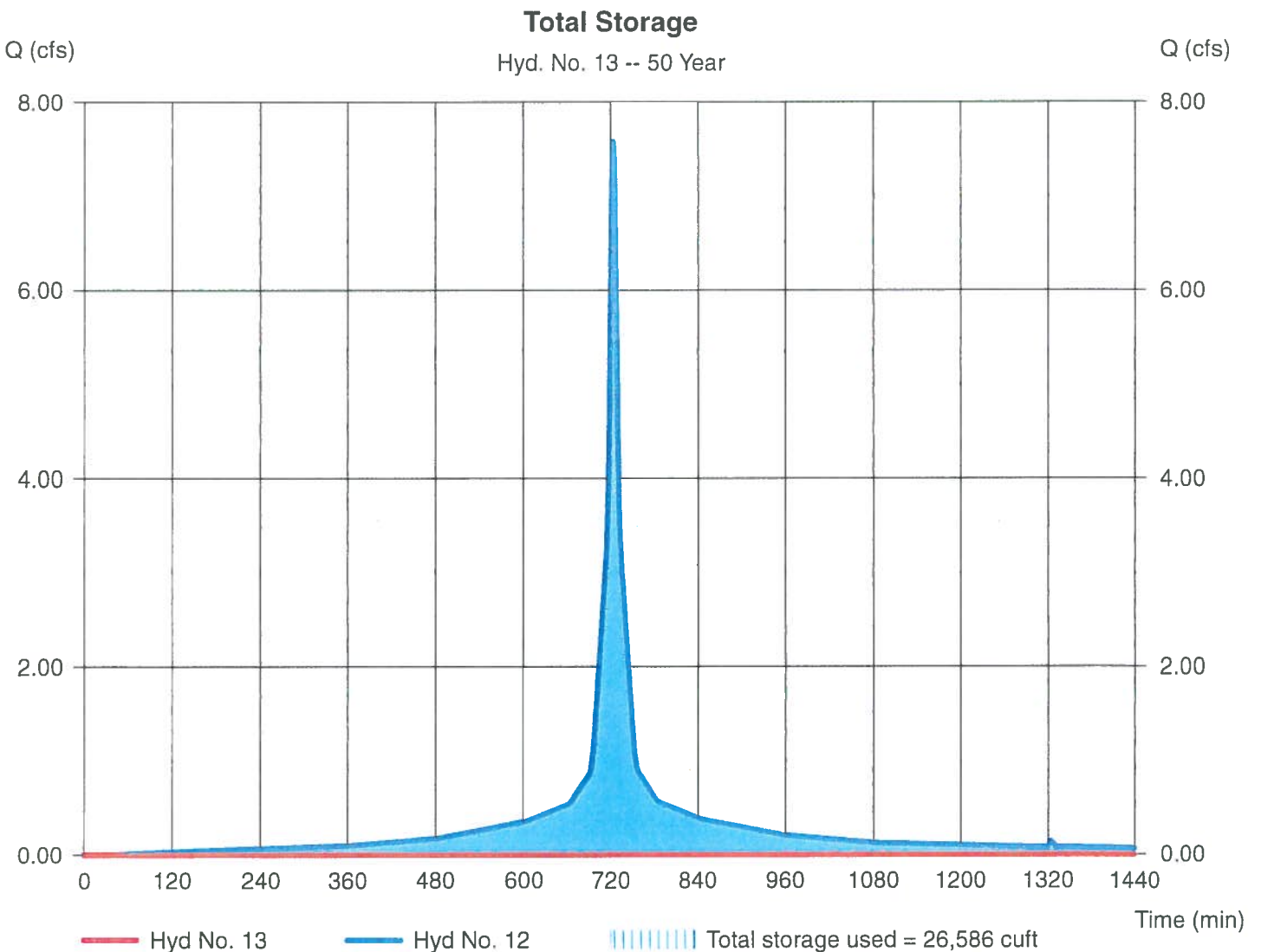
Hyd. No. 13

Total Storage

Hydrograph type = Reservoir
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyd. No. = 12 - Impervious Areas and Swales
Reservoir name = Total

Peak discharge = 0.000 cfs
Time to peak = n/a
Hyd. volume = 0 cuft
Max. Elevation = 18.25 ft
Max. Storage = 26,586 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description	
1	SCS Runoff	0.662	1	724	2,366	----	-----	-----	A. Paved Ramp	
2	SCS Runoff	1.885	1	724	6,656	----	-----	-----	B. Paved Area 1	
3	SCS Runoff	4.849	1	724	17,338	----	-----	-----	C. Paved/Gravel Area	
4	SCS Runoff	0.480	1	725	1,484	----	-----	-----	D. Vegetated Area 1	
5	SCS Runoff	1.088	1	725	3,367	----	-----	-----	E. Vegetated Area 2	
6	SCS Runoff	0.389	1	724	1,260	----	-----	-----	F. Stone Swale 1	
7	SCS Runoff	0.213	1	724	690	----	-----	-----	G. Stone Swale 2	
8	SCS Runoff	0.559	1	724	1,810	----	-----	-----	H. Swale/gravel	
9	Combine	2.935	1	724	10,282	1, 2, 6,	-----	-----	Paved Area 1 and Swale	
10	Combine	5.620	1	724	19,838	3, 7, 8,	-----	-----	Paved Area 2 and Swales	
11	Combine	1.568	1	725	4,851	4, 5,	-----	-----	Discharge to Channel	
12	Combine	8.555	1	724	30,120	9, 10,	-----	-----	Impervious Areas and Swales	
13	Reservoir	0.000	1	n/a	0	12	18.34	30,120	Total Storage	
Post.gpw					Return Period: 100 Year			Tuesday, Oct 23, 2018		

Hydrograph Report

Hyd. No. 1

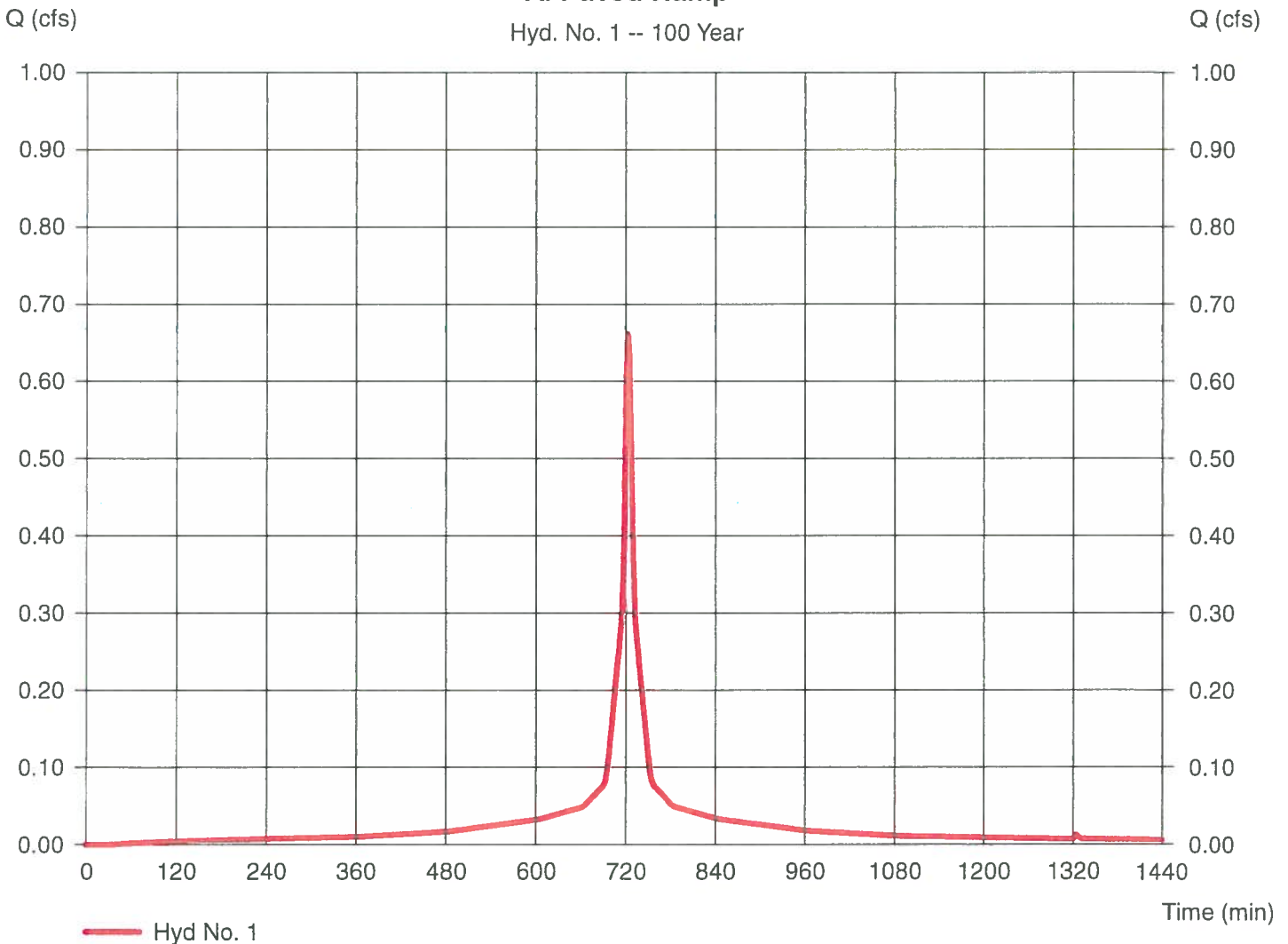
A. Paved Ramp

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.081 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 0.662 cfs
Time to peak = 724 min
Hyd. volume = 2,366 cuft
Curve number = 98
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

A. Paved Ramp

Hyd. No. 1 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 2

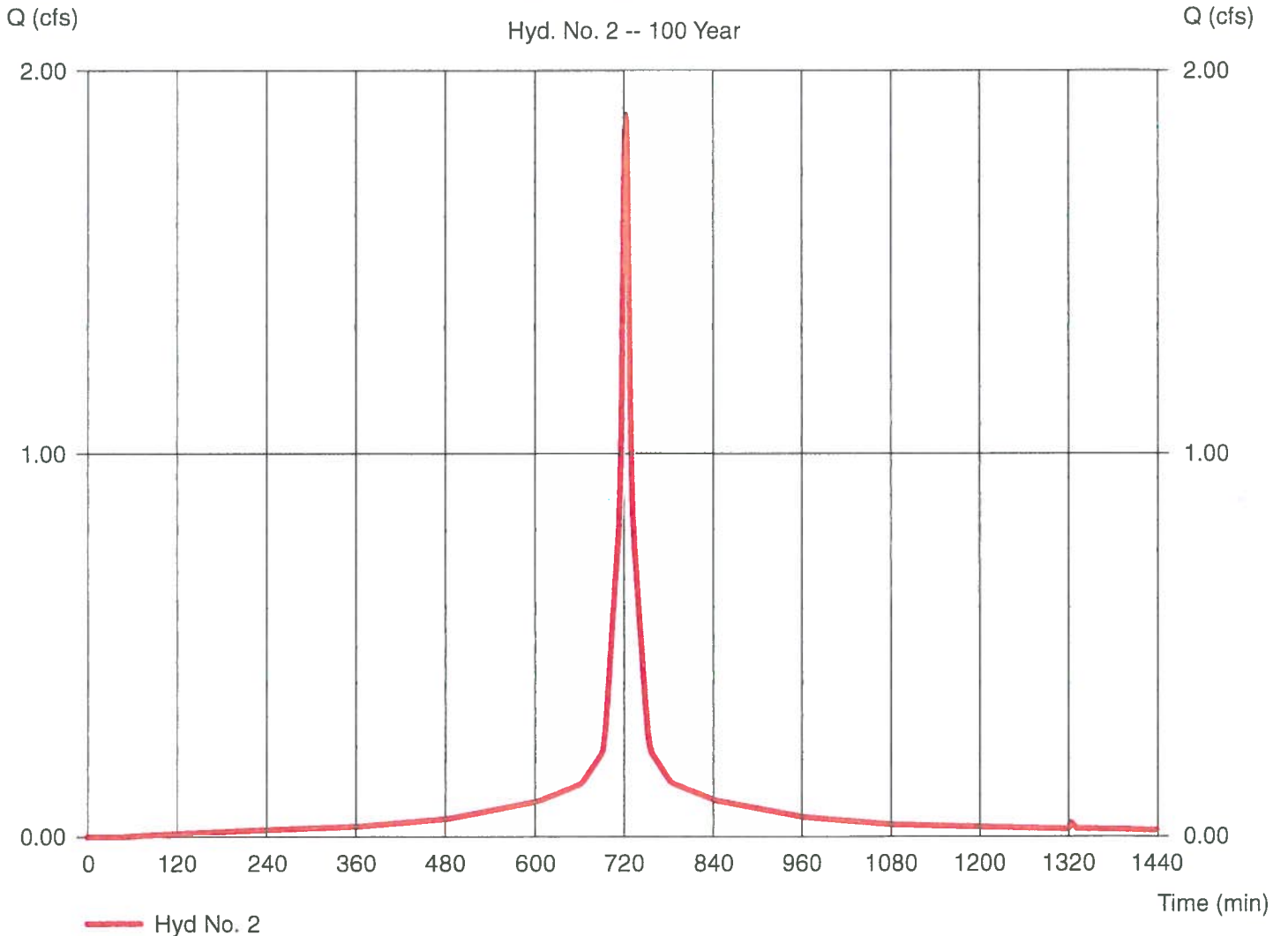
B. Paved Area 1

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.230 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 1.885 cfs
Time to peak = 724 min
Hyd. volume = 6,656 cuft
Curve number = 97*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.214 \times 98) + (0.012 \times 87)] / 0.230$

B. Paved Area 1



Hydrograph Report

Hyd. No. 3

C. Paved/Gravel Area

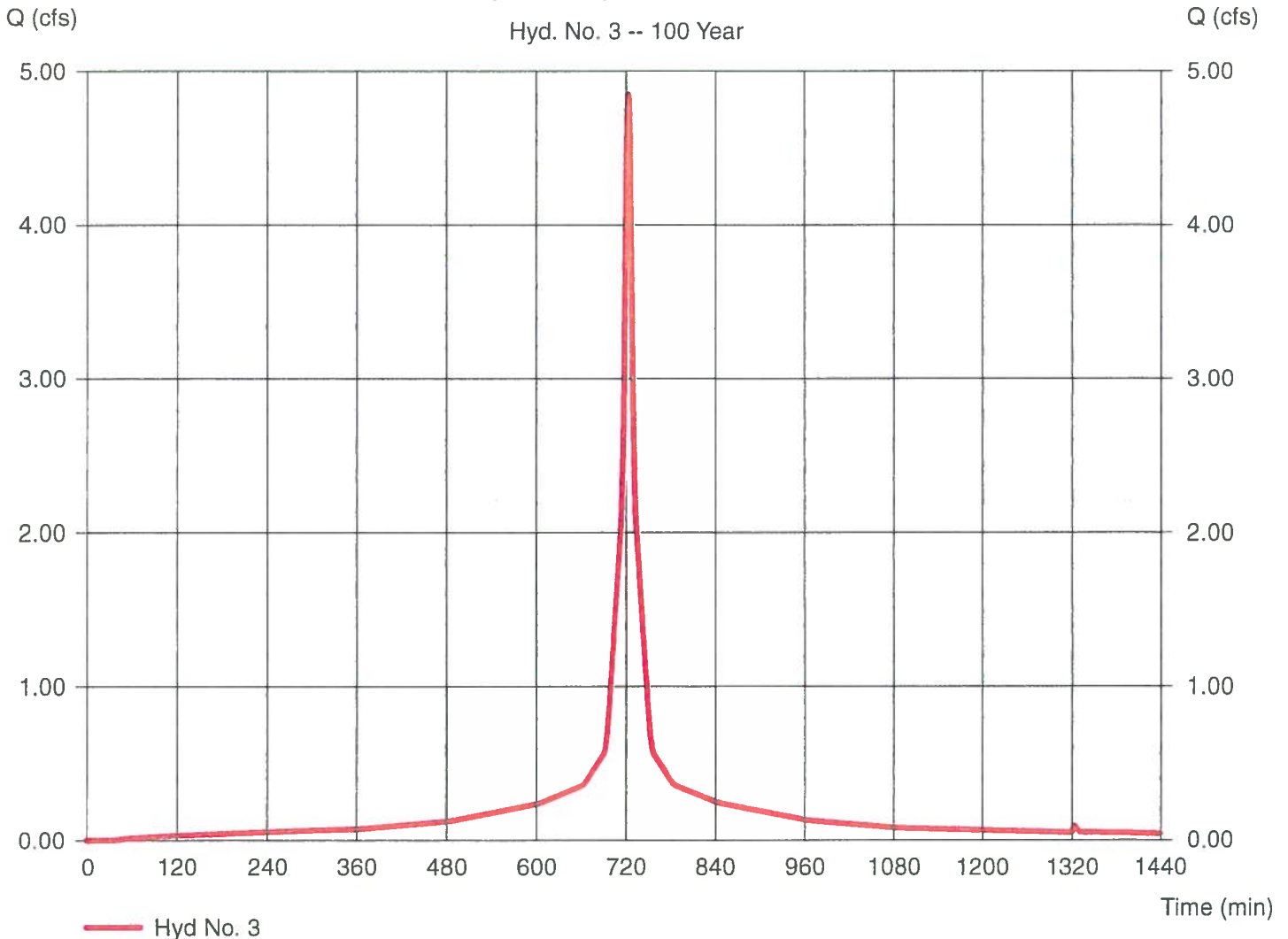
Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.590 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 4.849 cfs
Time to peak = 724 min
Hyd. volume = 17,338 cuft
Curve number = 98*
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

* Composite (Area/CN) = $[(0.579 \times 98) + (0.014 \times 87)] / 0.590$

C. Paved/Gravel Area

Hyd. No. 3 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

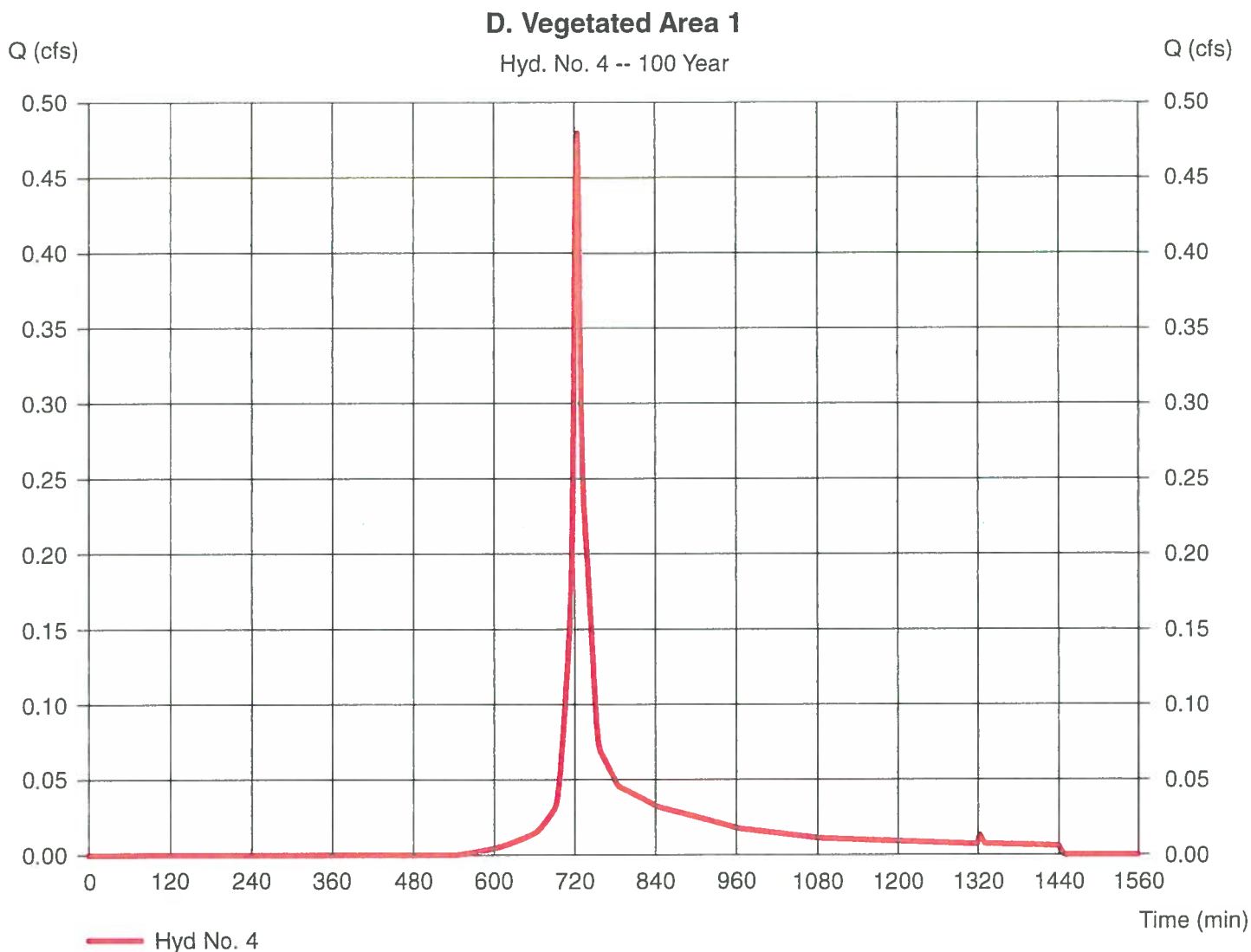
Tuesday, Oct 23, 2018

Hyd. No. 4

D. Vegetated Area 1

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.106 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 0.480 cfs
 Time to peak = 725 min
 Hyd. volume = 1,484 cuft
 Curve number = 63
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hyd. No. 5

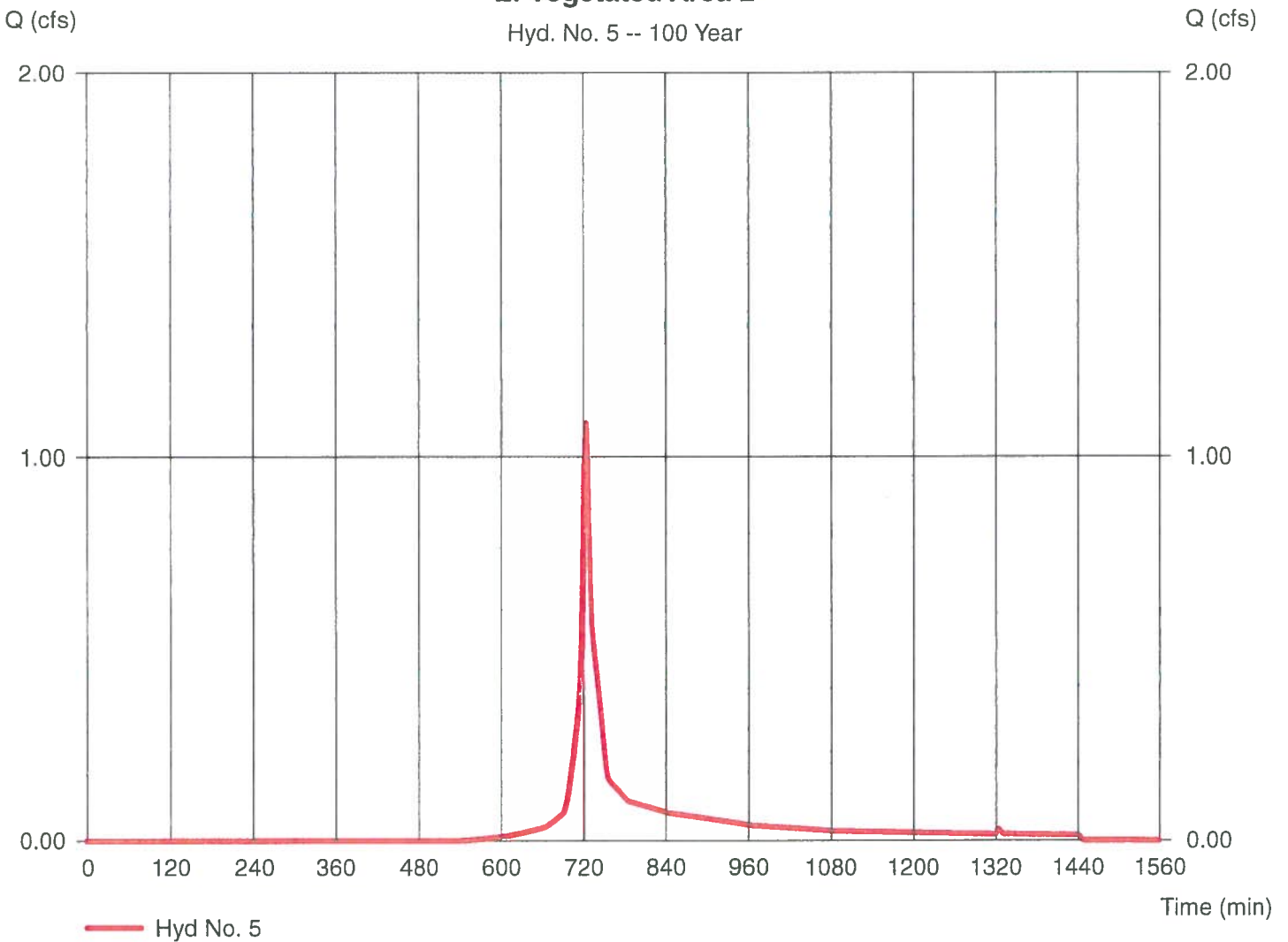
E. Vegetated Area 2

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.241 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 1.088 cfs
Time to peak = 725 min
Hyd. volume = 3,367 cuft
Curve number = 63
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

E. Vegetated Area 2

Hyd. No. 5 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Oct 23, 2018

Hyd. No. 6

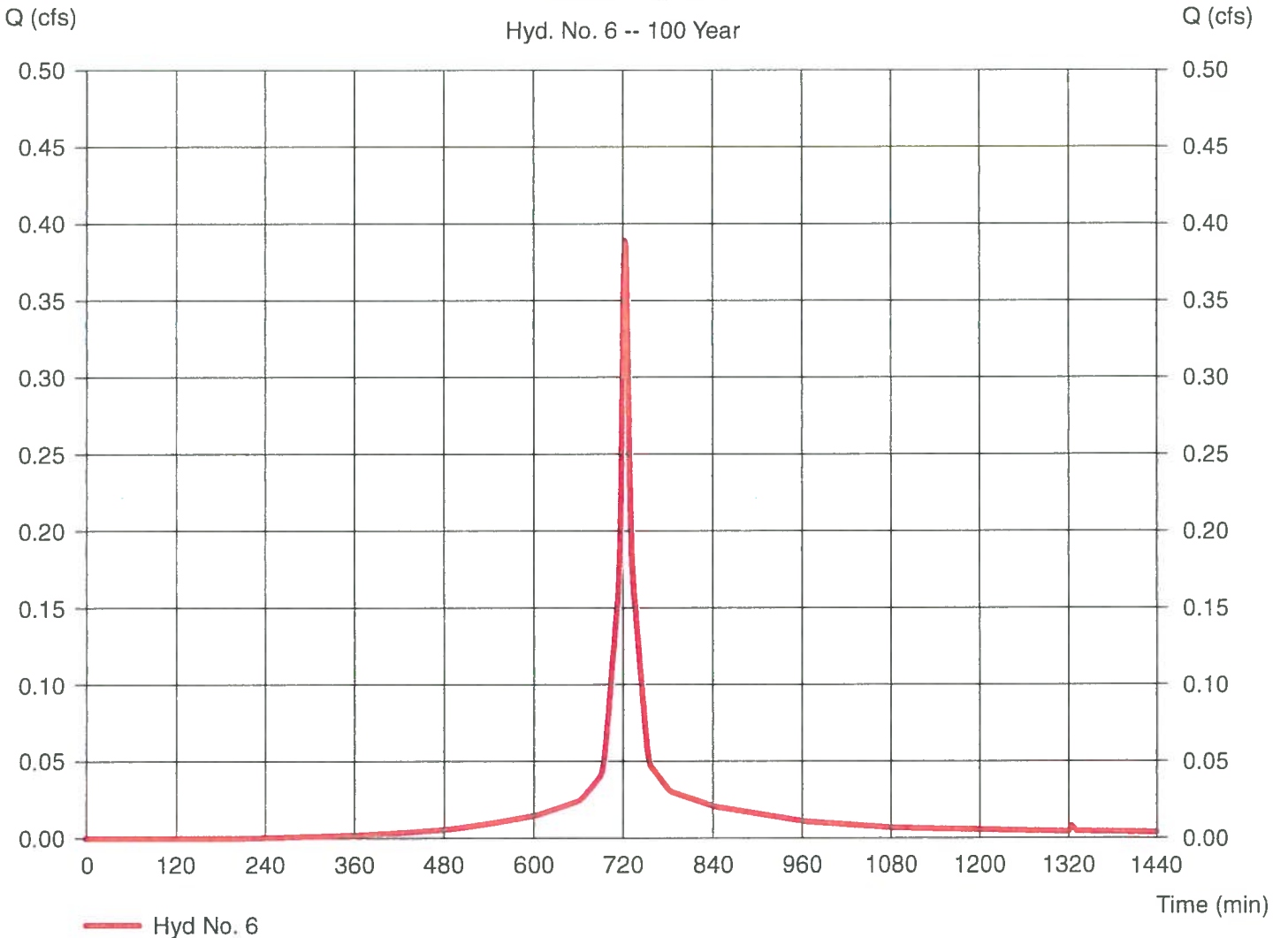
F. Stone Swale 1

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.052 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 0.389 cfs
 Time to peak = 724 min
 Hyd. volume = 1,260 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484

F. Stone Swale 1

Hyd. No. 6 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

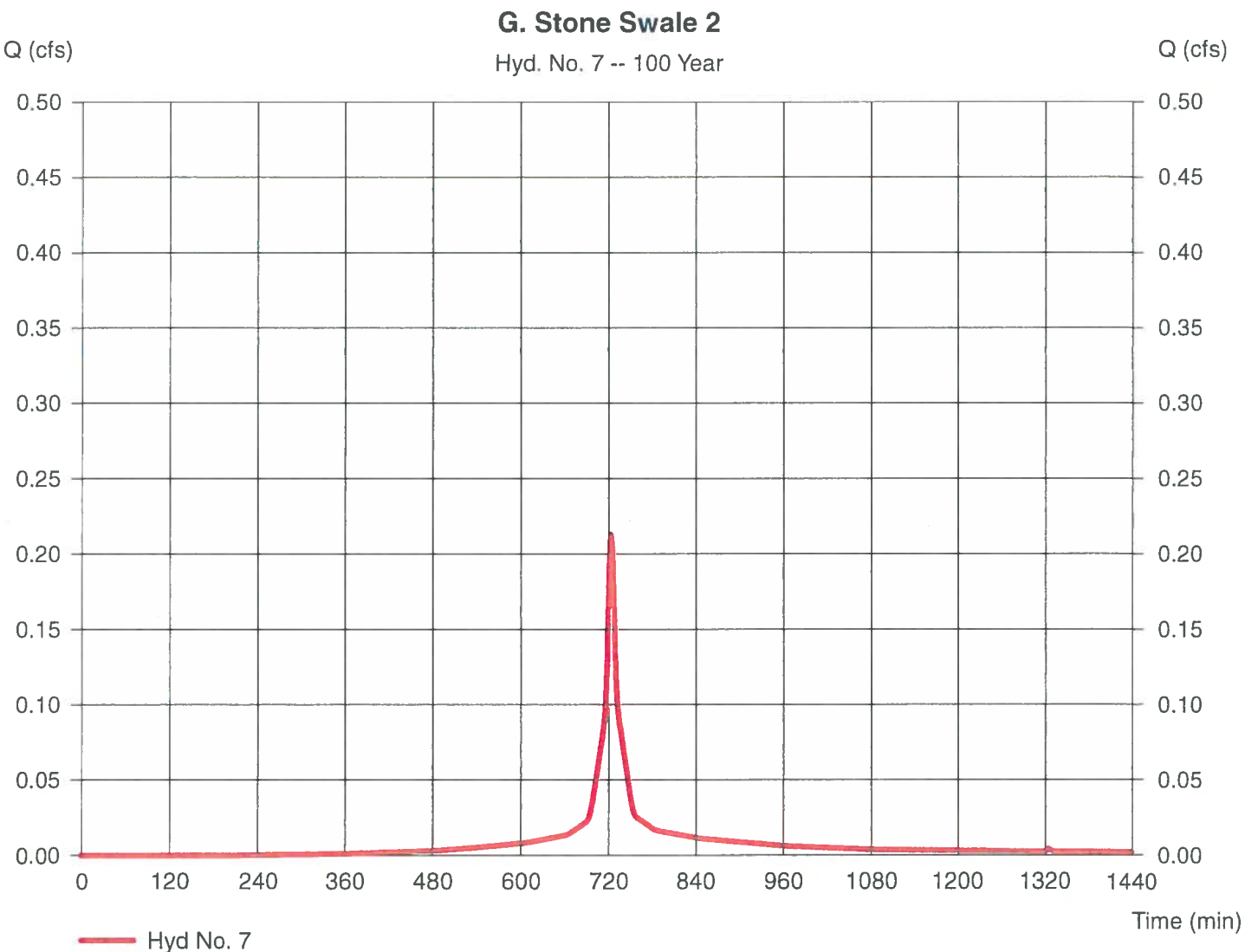
Tuesday, Oct 23, 2018

Hyd. No. 7

G. Stone Swale 2

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 0.028 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 8.09 in
 Storm duration = 24 hrs

Peak discharge = 0.213 cfs
 Time to peak = 724 min
 Hyd. volume = 690 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.00 min
 Distribution = Type III
 Shape factor = 484



Hydrograph Report

Hyd. No. 8

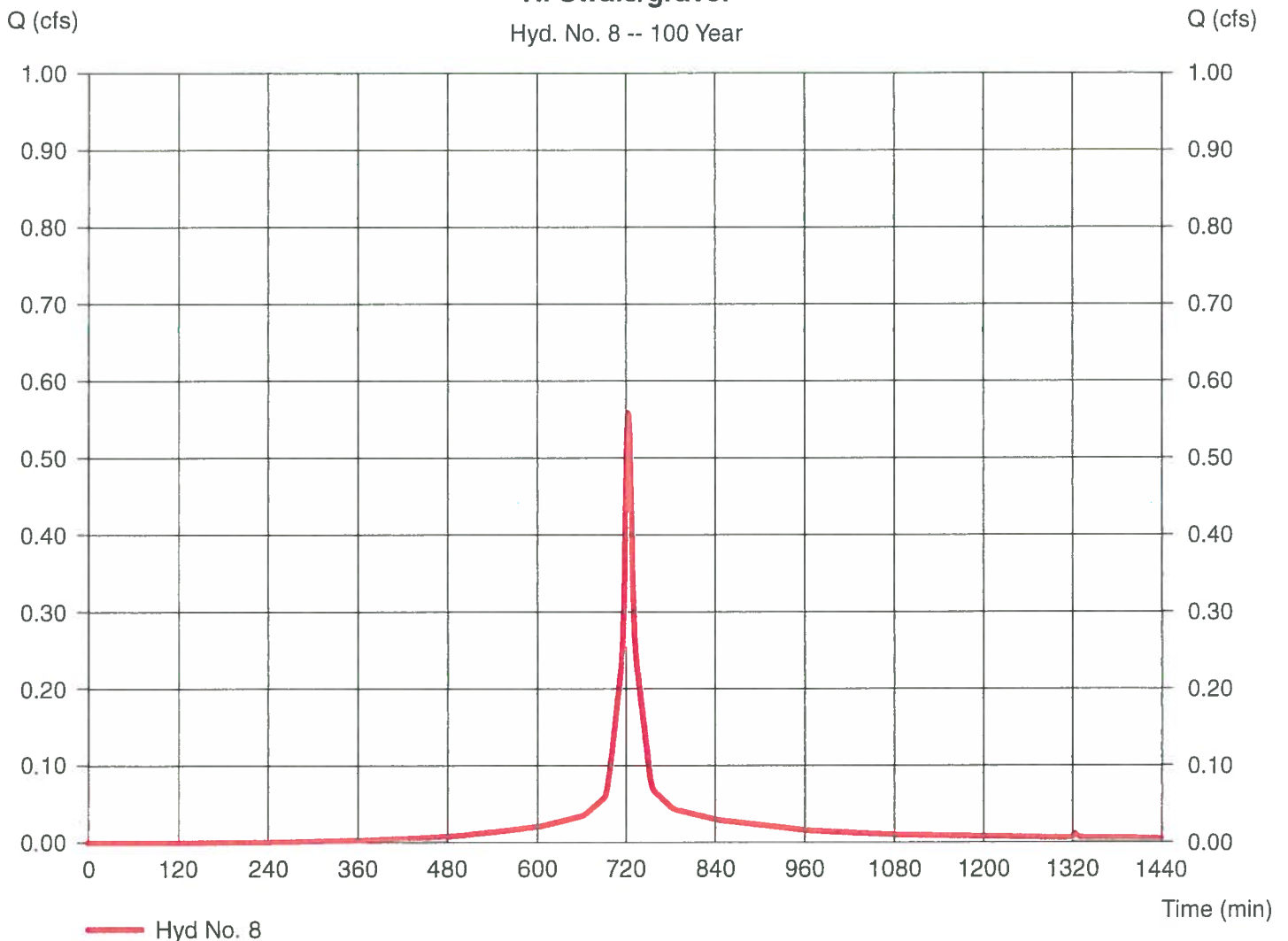
H. Swale/gravel

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 0.074 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.09 in
Storm duration = 24 hrs

Peak discharge = 0.559 cfs
Time to peak = 724 min
Hyd. volume = 1,810 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.00 min
Distribution = Type III
Shape factor = 484

H. Swale/gravel

Hyd. No. 8 -- 100 Year



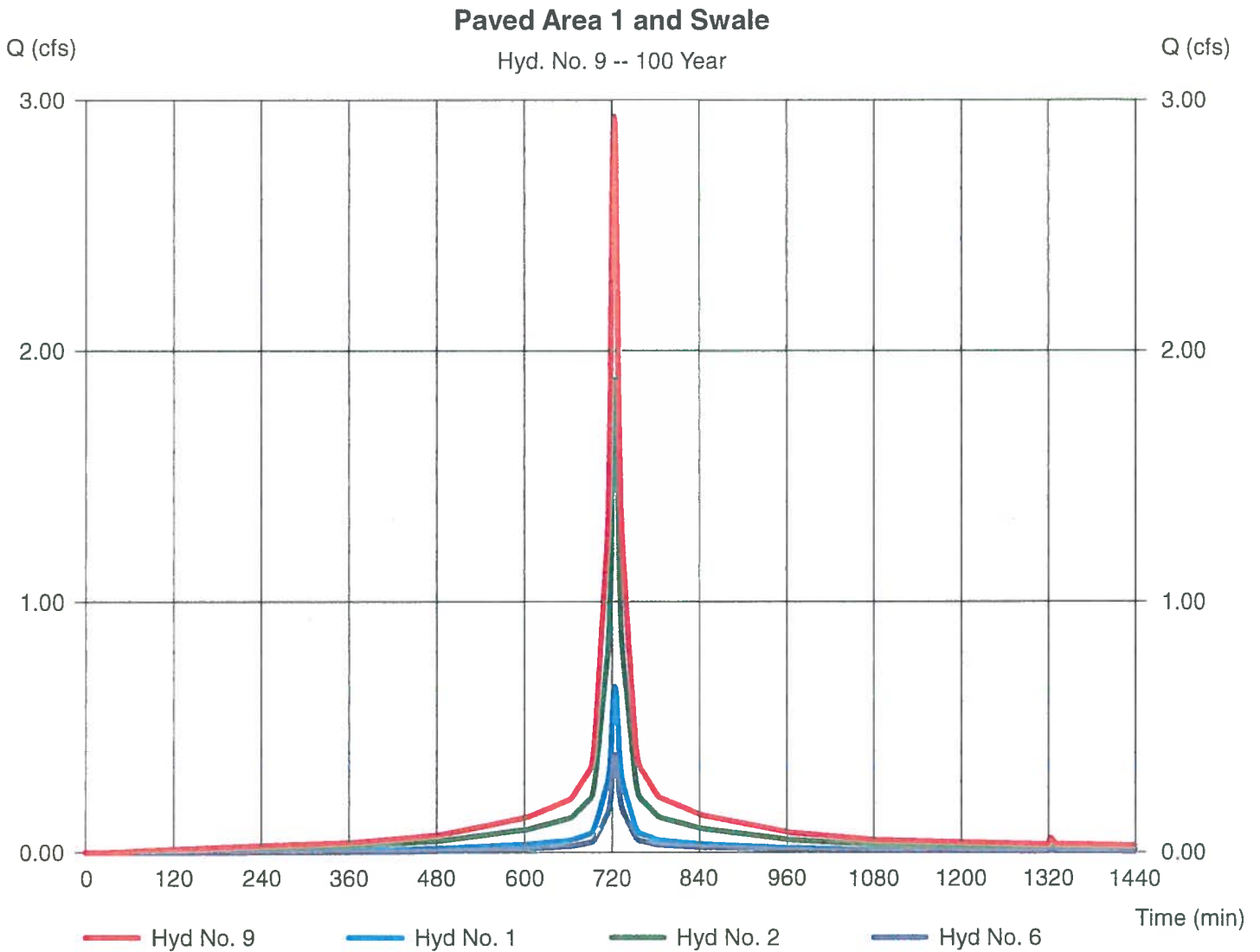
Hydrograph Report

Hyd. No. 9

Paved Area 1 and Swale

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 1, 2, 6

Peak discharge = 2.935 cfs
Time to peak = 724 min
Hyd. volume = 10,282 cuft
Contrib. drain. area = 0.362 ac



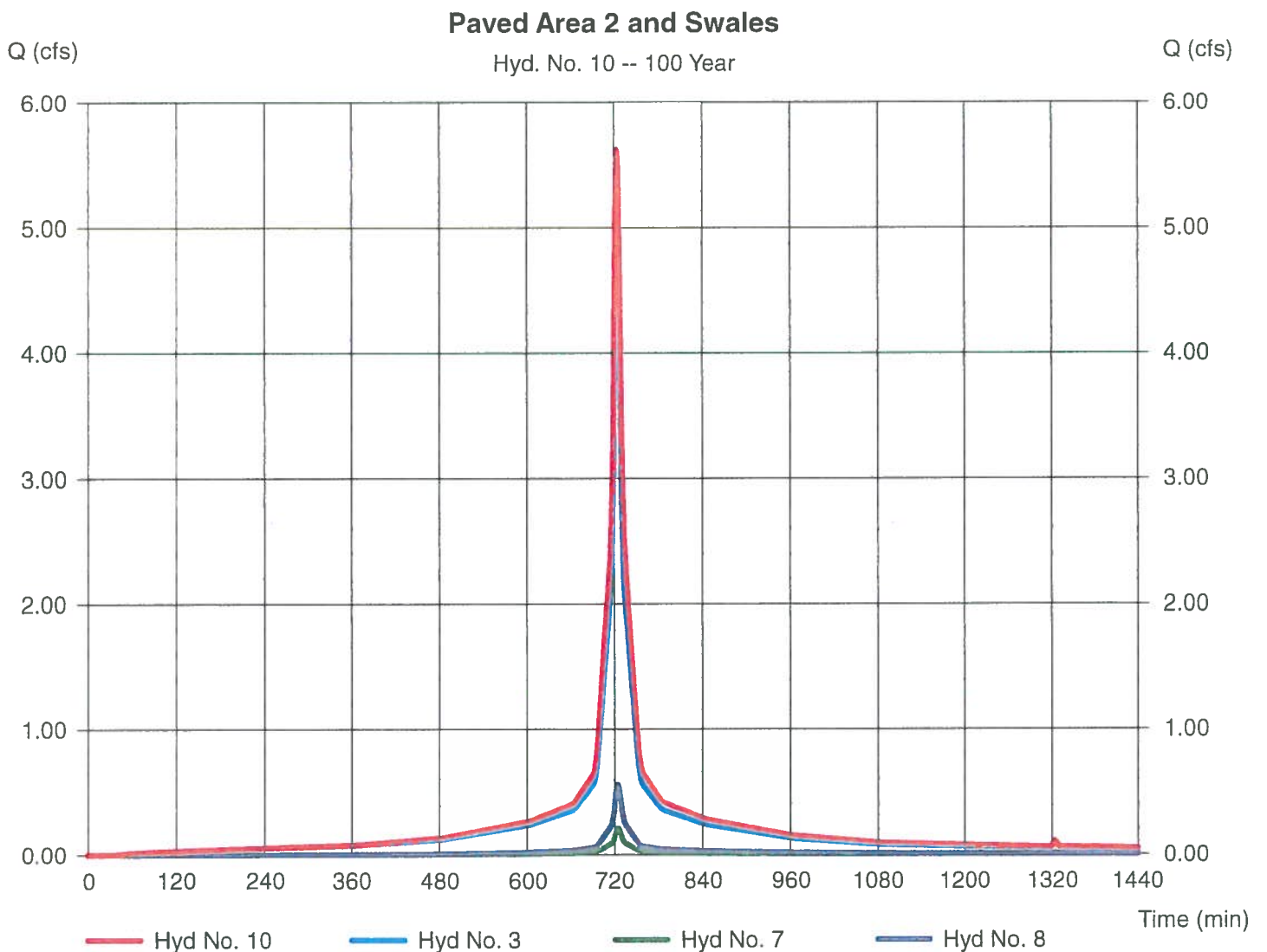
Hydrograph Report

Hyd. No. 10

Paved Area 2 and Swales

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 3, 7, 8

Peak discharge = 5.620 cfs
Time to peak = 724 min
Hyd. volume = 19,838 cuft
Contrib. drain. area = 0.692 ac



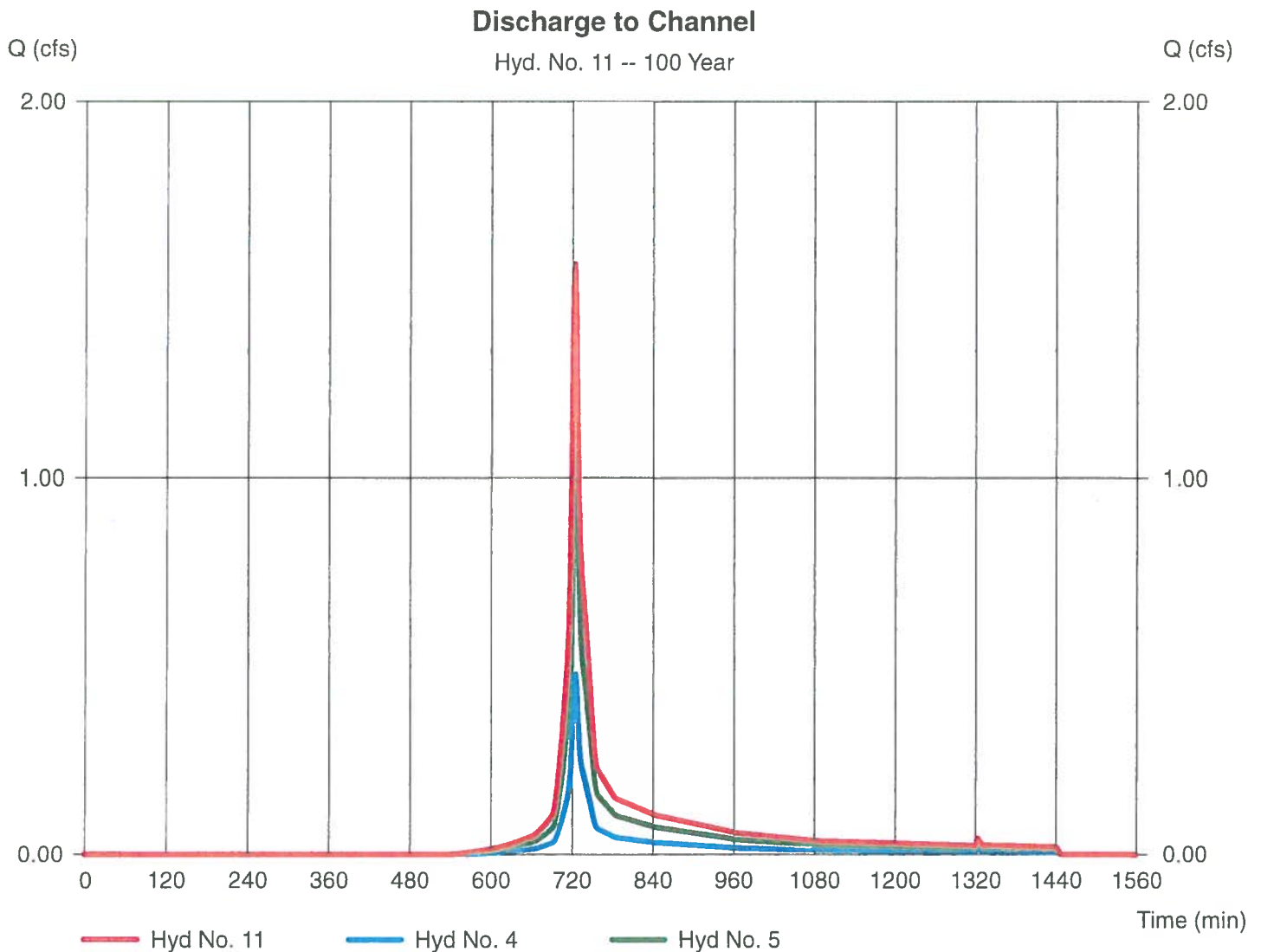
Hydrograph Report

Hyd. No. 11

Discharge to Channel

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 4, 5

Peak discharge = 1.568 cfs
Time to peak = 725 min
Hyd. volume = 4,851 cuft
Contrib. drain. area= 0.347 ac



Hydrograph Report

Hyd. No. 12

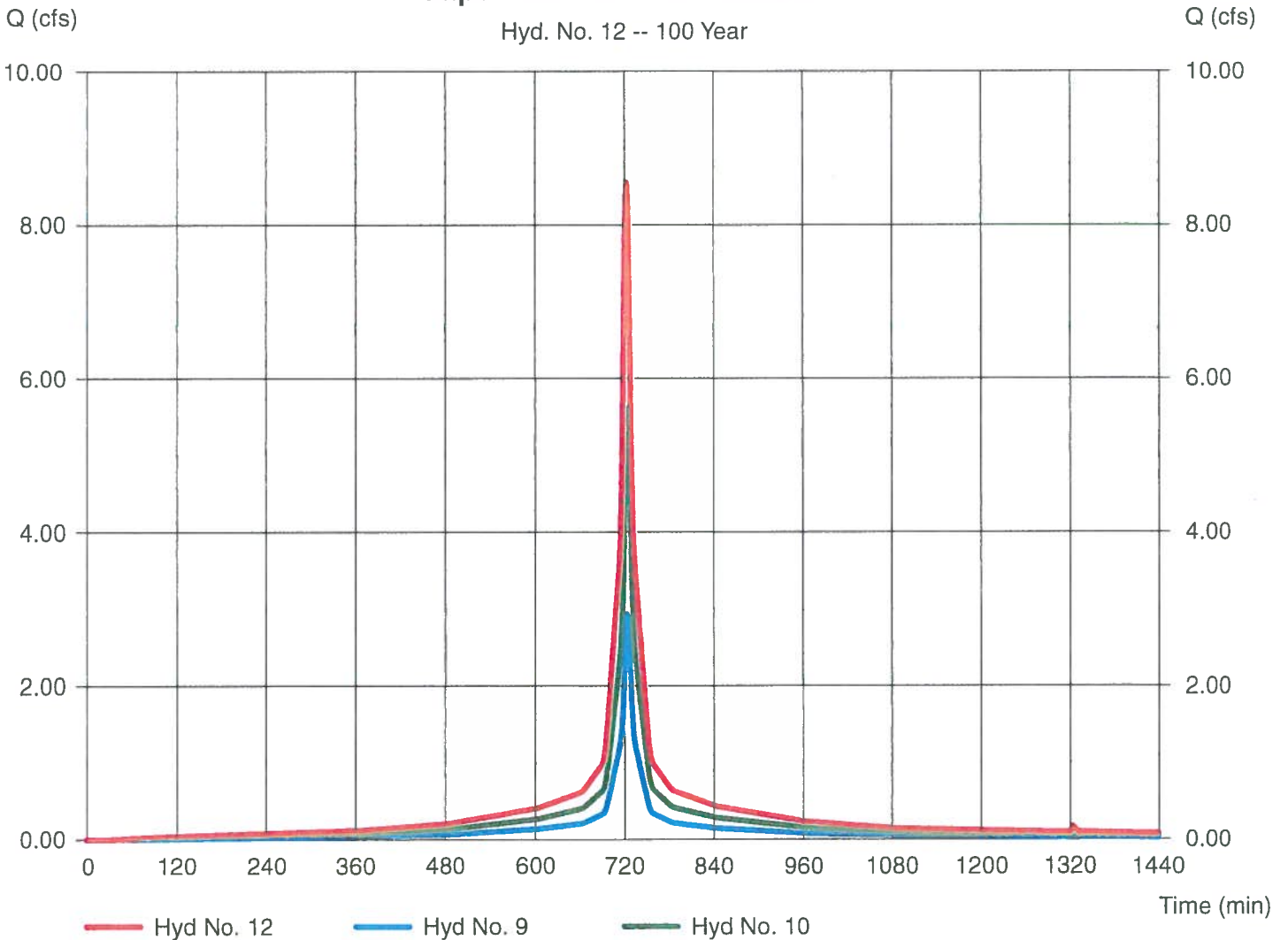
Impervious Areas and Swales

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 9, 10

Peak discharge = 8.555 cfs
Time to peak = 724 min
Hyd. volume = 30,120 cuft
Contrib. drain. area = 0.000 ac

Impervious Areas and Swales

Hyd. No. 12 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

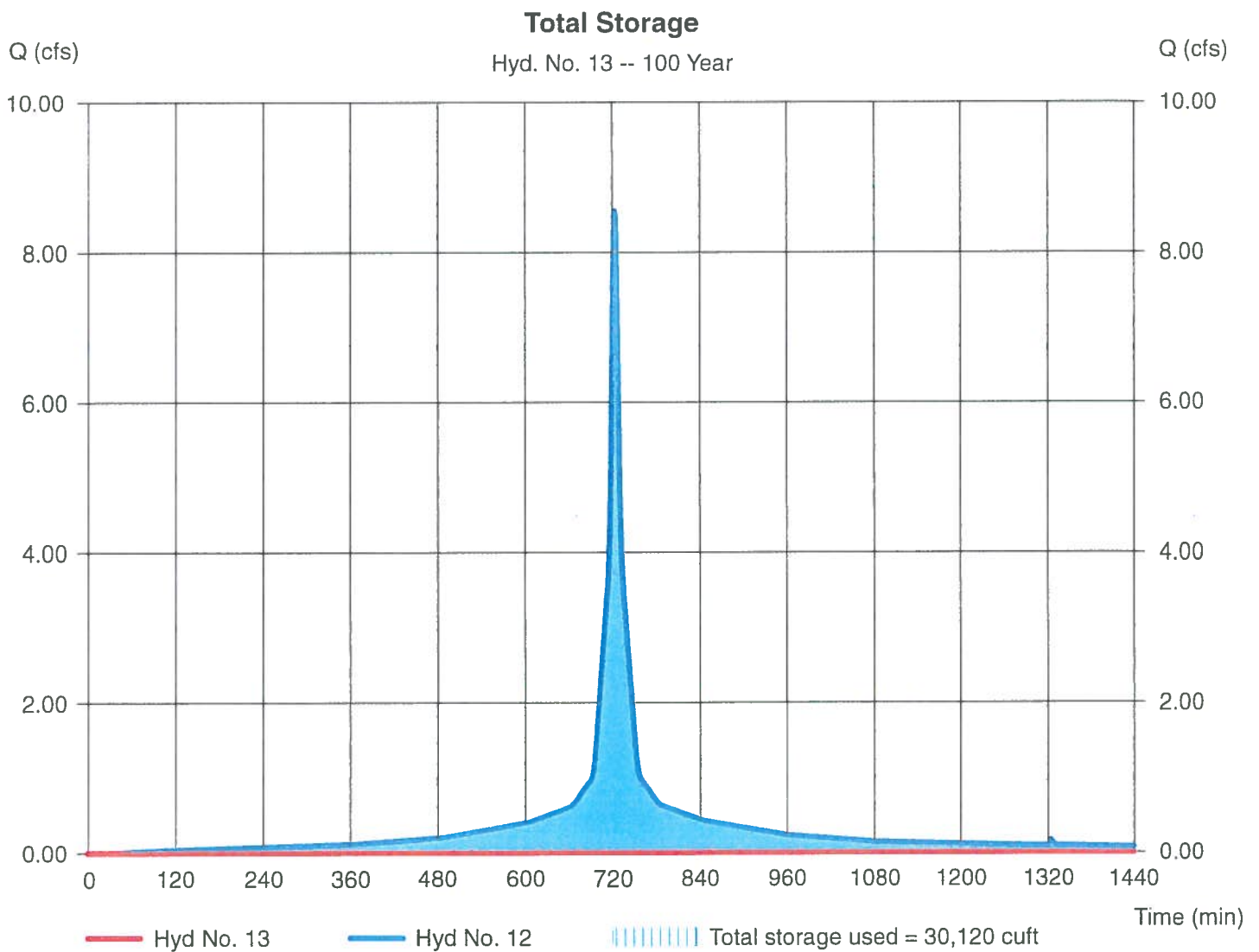
Tuesday, Oct 23, 2018

Hyd. No. 13

Total Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - Impervious Areas and Swales	Max. Elevation	= 18.34 ft
Reservoir name	= Total	Max. Storage	= 30,120 cuft

Storage Indication method used.



**CONSTRUCTION PERIOD POLLUTION
PREVENTION PLAN**

CABOT YARD CARHOUSE SITE IMPROVEMENTS
BOSTON, MASSACHUSETTS

Standard 8:

Construction Period Pollution Prevention and Erosion and Sediment Control Plan

Site Description

The site of the proposed renovation project is located on the banks at the southern most point of the Fort Point Channel in South Boston. Fort Point Channel separates South Boston from downtown Boston and feeds into Boston Harbor. The project site address is at 59 West Fourth Street in South Boston. The project involves renovations and upgrades to the MBTA Cabot Rapid Transit Maintenance facility which was constructed in 1973. The site runs along approximately 900 feet of the southeastern side of the Fort Point Channel. The coastal barrier consists of concrete and stone seawalls and stone swales. Along most of the site there is a 20 to 30 foot wide strip of vegetation between the coastal barriers and the gravel lot. Vegetation consists of grasses, medium sized brush, and small to medium sized woody vegetation and trees. A chain link fence separates the vegetation from the gravel lot. On its eastern side the site is lined by railroad tracks. There is a paved access ramp leading down to the site from West Fourth Street. The pavement ends at the bottom of the ramp and transitions into a gravel and dirt surface. The New Broadway Bridge crosses over the project site.

The site is currently mainly used as a parking facility for MBTA employees. Employees park on the existing level gravel surfaces. The site is also being used as a storage location for miscellaneous materials left over from other MBTA projects. There are piles of gravel, concrete jersey barriers, lumber for rail construction, and other debris.



Surficial Geology

The soils located at 59 West Fourth Street are identified as Udorthents, wet substratum (655) by the Natural Resource Conservation Services (NRCS). Udorthents consist primarily of moderately coarse textured soil material and a few small areas of medium textured material. This map unit consists of filled areas that were previously tidal marshes, river flood plains, bays, harbors, or swamps. The fill consists of rubble, refuse, and mixed soil material (typically sand, gravel, and channel dredgings. This soil has slow to moderate permeability (estimated at 5 to 15 minutes per inch percolation rates) and low to moderate available water capacity. Due to the well compacted surface, water will tend to pond on the surface following an intense rainfall.

Current Condition

The site mainly consists of a fenced in gravel lot. There are no formal parking spaces but MBTA employees use the site as a parking lot. The employees park on any open, level gravel throughout the site. The materials and miscellaneous debris are mainly located along the sides of the northern end of the gravel lot. Due to the unorganized parking and placement of stored materials a lot of the space is unutilized and left open. Consolidating the construction materials and designating certain areas for parking would increase the amount of available space.

Proposed Renovations and Anticipated Maintenance

The Cabot Carhouse Renovation project involves site improvements such as surface paving and the installation of temporary staging facilities. The staging facilities are anticipated to be in use for three to five years depending on the rate at which the MBTA projects are completed.

The site improvements include adding new pavement where gravel/stone currently exists. The extent of the new pavement can be seen on the plans. The proposed extent of the pavement will add 34,562 square feet of new impervious surface to the site. Parking and area pavement markings will be added to the pavement to direct traffic and designate specific areas for parking. The amount of parking will be sufficient to accommodate all of the MBTA employees who currently use the gravel lot and the MBTA and LMH-Lane Cabot Yard Joint Venture (LMH-Lane JV) employees who will use the trailers. The existing compacted gravel and stone driving surface would be regraded and leveled to allow proposed paving to meeting existing grades and to pitch it slightly toward the stormwater infiltration trench. Currently most runoff flow at the site is in this general direction, away from Fort Point Channel.

The temporary staging area site renovations include the installation of eight (8) trailers, each one 60' long by 12' wide, to act as field offices for MBTA and LMH-Lane JV employees. There will be three (3) trailers for MBTA employees and five (5) trailers for the LMH-Lane JV. A deck will be located between the two sets of trailers. The proposed locations of the trailers and deck can be seen on the plans. The MBTA trailers and portions of the deck are located beneath the New Broadway Bridge. The miscellaneous construction materials currently on site will be consolidated and moved towards the

northern side of the site for MBTA future use. Consolidating the lumber, jersey barriers, stockpiled stone, and other materials will open up space for the trailers and additional parking.

The trailers will require a water service to be installed. The proposed service is a 3" HDPE pipe that ties into an existing water service on West Fourth Street close to where it passes under Interstate-93. The water line then runs along the northern side of West Fourth Street and down the paved access ramp to the site. Wastewater will be stored in the trailer tight tank on-site and be pumped out regularly.

Other site utilities such as electric, telecommunication and/or cable will be brought to the site trailers aurally to reduce site excavation and disturbance. It is anticipated that up to three service poles may be needed to accommodate the utilities from West Fourth Street.

To handle the runoff generated by the increased impervious surface, a stone swale will be added along the southeastern side of the site. The site will be graded and paved to direct flow to the swale. The swale will provide storage and infiltration for stormwater runoff. The treatment swale has been sized to accept the first 2" rainfall and store the flow allowing it to filter and infiltrate. The estimated volume of the swale is about 6,800 CF, ample to allow detention of a 25 year storm event. Above that storm intensity level the parking lot would begin to flood and additional storage within the parking area would allow for containment of the 100 Year flood event with an average flood depth of 6 inches over the parking area. Combining the storage and infiltration, the proposed facilities will fully contain the 100 year event.

Construction Period Operation and Maintenance Plan

Before construction begins, a silt fence and staked straw wattles are to be installed as detailed on the inside of the existing chain link fence along the entire length of the project area. The silt fence and straw wattles will remain in place post-construction as a permanent sediment and erosion control barrier. Limited excavation is anticipated so the extent of erodible surface will be limited.

The silt fence and straw wattles shall be inspected weekly during construction. The silt fence shall be inspected for any deficiencies. The straw wattles shall be inspected to ensure they are securely staked and to inspect sediment accumulation levels.

Deposited sediment shall be cleaned from the staked straw wattles when sediment levels reach 50% of the wattle height. Sediment shall be disposed of and the area stabilized.

Entity Responsible for Plan Compliance

The LMH-Lane JV is responsible for Plan Compliance. Operation and Maintenance will be handled by the LMH-Lane JV construction contractor which is to be determined.

Construction Period Pollution Prevention Measures

The construction period pollution prevention measures include the installation of a silt fence and straw wattles along the fence on the westerly limits of the project area (as detailed on the plans).

Erosion and Sedimentation Control Plan Drawings

Refer to the Environmental Protection specification (Section 31 25 00) (copy attached) and design plans.

Detail Drawings and Specifications for Erosion Control BMPs, Including Sizing Calculations

Refer to the Environmental Protection specification (Section 31 25 00) (copy attached) and design plans.

Vegetation Planning

The only vegetation on site is located between the coastal barrier and the fence that runs along the westerly edge of the site. The vegetation shall not be disturbed during construction.

Site Plan –Temporary Staging Area

The proposed plan involves consolidating the miscellaneous construction materials on site, paving the gravel surface to the extent shown on the plans, and installing eight (8) trailers to be used as field offices. The installation of the site trailers includes the installation of a water service and utilizing the trailer storage tanks for wastewater holding.

Construction Sequencing Plan

The sequence of construction is anticipated to be as follows:

1. Installation of all erosion control systems and approval of Con Comm Agent
2. Consolidation of the existing construction material on-site to the northern side of the site.
3. Grading of the gravel surface.
4. Construction of 8' wide stone infiltration swale along the easterly edge of the site.
5. Installation of water service and ancillary aerial utilities.
6. Parking paving
7. Placement of trailers on site and installation of deck.
8. Site cleanup.

This sequence of construction is offered as one option. The construction contractor will ultimately be responsible for determining the construction sequence. However, erosion control measures will be required to be implemented prior to the start of construction activities and remain until the conclusion of construction activities.

Sequencing of Erosion and Sedimentation Controls

Before any construction begins, a silt fence and staked straw wattles are to be installed along the westerly edge the project area along the inside of the chain link fence. The silt fence and straw wattles will remain as a permanent sediment and erosion control measure.

Operation and Maintenance of Erosion and Sedimentation Controls

The silt fence shall be inspected weekly for any deficiencies and to inspect sediment accumulation levels. Straw Wattles shall be inspected weekly to ensure wattles are securely staked and to inspect sediment accumulation levels.

Deposited sediment shall be cleaned from the staked straw wattles and silt fence when sediment levels reach 50% of the wattle height. Sediment shall be disposed of and stabilized with vegetation.

Inspection Schedule

Erosion and Sediment Controls are to be inspected weekly.

Maintenance Schedule

The silt fence is to be cleaned of accumulated sediment when sediment levels rise to 50% of its full height or when sediment is causing deficiencies in the fence. The fence is to be repaired or replaced as needed.

Straw Wattles are to be cleaned of accumulated sediments when sediment levels rise to 50% of their full height. Wattles are to be re-staked and/or replaced as needed.

Inspection and Maintenance Log Form
Inspections To Be Conducted Weekly
Weekly Inspection Log Form

Make copies of this form as needed.

Date of Weekly Inspection:

Inspected By:

Inspection Notes:

Inspect Straw Wattles to confirm wattles are securely staked and that there are no gaps or deficiencies in the straw wattles. Inspect silt fencing for deficiencies.

Inspect accumulated sediment levels. Sediment shall be removed when accumulation levels reach 50% of the straw wattle height. Sediment shall be disposed of and stabilized with vegetation.

Maintenance Required:

Maintenance Completed Date:

**POST CONSTRUCTION
OPERATION AND MAINTENANCE PLAN**

Cabot Yard Carhouse
Boston, MA

POST CONSTRUCTION
Operation and Maintenance Plan

Stormwater Management System Owner: LMH-Lane Cabot Yard Joint Venture

Party Responsible for Operation and Maintenance: LMH-Lane Cabot Yard Joint Venture

Schedule for implementation of routine and non-routine maintenance task:

Monthly inspect straw wattles and silt fence for sediment accumulation. Remove sediment when levels reach half of the straw wattle height. Inspect wattles to ensure they are properly staked and secure. Restake and replace wattles as needed. Inspect silt fence for any deficiencies, repair and/or replace fence as needed.

Semi-annually inspect stone infiltration swale. Inspect swale for sediment accumulation and remove as necessary. Inspect swale for rock displacement, replace stones as needed.

Plan showing the location of all stormwater BMPs maintenance access areas:

Not applicable.

Description and delineation of public safety features:

There is a 6-foot high chain link fence that run along the Western edge of the site. The fence separates the gravel lot from the vegetation strip and the channel. There is also a chain link fence that borders the Eastern edge of the site that separates the site from the railroad tracks.

Estimated operation and maintenance budget:

Minimal operation and maintenance costs are anticipated for this site. A nominal amount of \$2,000.00 per year is anticipated for inspections and minor maintenance for upkeep of the stormwater management system.

Operation and Maintenance Log Form:

See attached.

Cabot Yard Carhouse
Boston, MA
Operation and Maintenance Log Form

Make copies of this form as needed.

Inspect straw wattles and silt fence monthly. Inspect straw wattles and silt fence for sediment accumulation. Remove sediment when sediment level is half the height of the straw wattles. Inspect straw wattles and silt fence for damage. Repair or replace wattles and silt fence as necessary.

Inspect stone infiltration swale semi-annually. Inspect swale for sediment accumulation. Inspect swale for traprock displacement, replace as needed.

Date of Inspection:

Inspected by:

Description/Location of any damage to straw wattles or silt fence:

Description/Location of sediment accumulation:

Description/Location of any damage t/erosion to stoned swale or containment berm:

Maintenance measures required:

Date Maintenance Completed:

Date of Next Inspection:

**ENVIRONMENTAL PROTECTION
SPECIFICATION**

SECTION 31 25 00

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.
- B. The requirements set forth in this section of the specifications apply to cross-country areas, river and stream crossings, and construction in and adjacent to wetlands, unless otherwise specifically stated.
- C. All work under this Contract shall be in accordance with any Conservation Commissions' Order of Conditions as well as any requirements applied from any local, State or Federal agency having jurisdiction over all or portions of the work.

1.02 MEASUREMENT AND PAYMENT

- A. The quantity of Siltation Barrier under the applicable Bid Item will be measured per linear foot along the centerline of the barrier, complete in place, including all incidentals necessary.
- B. The unit price under this Siltation Barrier item shall constitute full compensation for installation, maintenance and removal of the barrier as shown on the Drawings, complete in place, including all incidentals necessary.

PART 2 MATERIALS

2.01 STRAW WATTLES

- A. Straw Wattles shall have a minimum of eight (8) inches in diameter. They shall be fastened with a two (2) inch by two (2) inch stake two (2) feet long. Stakes shall be driven to fasten the wattles at no more than every ten (10) feet.

2.02 SILT FENCE

- A. The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 2-1/2 foot wide, continuous length support netting, and stapled to preweathered oak posts installed as shown on the drawings. The oak posts shall be 2 inches by 2 inches by 4 feet-8 inches and shall be tapered. The support netting shall be industrial strength polypropylene. The bottom edge of the sediment control fabric shall be buried as shown on the drawings. The sediment control fabric shall conform to the following properties:

2.02 SILT FENCE (continued)

1. Minimum weight of 2.5 oz/sy (ASTM D-3776-79)
2. Minimum thickness of 17 mils (ASTM D1777-79)
3. Minimum tear strength of 65 lbs. (ASTM D1117-80)
4. Minimum burst strength of 210 psi (ASTM D3786-80)
5. Minimum coefficient of permeability of 0.0009 cm/sec
6. Equivalent opening size (EOS) 20 (U.S. Standard Sieve)
7. Water flow rate of 10 gal/min/sf

PART 3 EXECUTION

3.01 IMPLEMENTATION

- A. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.
- B. The Contractor shall submit for approval six (6) sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within one-hundred (100) feet of wetlands or across areas designated as wetlands.
- C. The Conservation Commission agents, will be notified of the date and location of the Pre-Construction Meeting. The Conservation Commission agent shall be in attendance to review the Contractor's proposed environmental protection and sediment control measures and the sequence and schedule of work.
- D. The Contractor shall submit, for review and approval by the Engineer, the sequence and schedule of activities for environmental protection and sediment control measures.
- E. After installation of siltation barrier the Contractor shall schedule a Conservation Commission agent to inspect and approve the barrier before excavation activities may begin.
- F. If a non-compliance item is detected by the Engineer, the Engineer will notify the Contractor in writing of any non-compliance. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Engineer may order stoppage of all or part of the work until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the contractor as a result of time lost due to any stop work orders shall be made.

3.02 AREA OF CONSTRUCTION ACTIVITY

- A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES

- A. The Contractor shall not pollute water resource areas with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of water resources.
- B. Special measures should be taken to insure against spillage of any pollutants into public waters or wetland resource areas.

3.04 CONSTRUCTION IN AREAS SUBJECT TO WETLAND PROTECTION REGULATIONS

- A. Insofar as possible, the Contractor shall make every effort to minimize disturbance within areas designated as wetlands, or water resource areas including coastal resources, banks and beaches.
- B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.
- C. The elevations of resource areas shall not be unduly disturbed by the Contractor's operations outside of the trench limits. If such disturbance does occur, the Contractor shall take all measures necessary to return these areas to the elevations which existed prior to construction.
- D. The Contractor shall limit the extent of open excavation and ensure the areas are stabilized at the end of each work day to prevent further damage as a result of wind or wave action.
- E. The Contractor shall prevent erosion, loss of material and excavation materials from entering beach areas and shall progress work to ensure this.
- F. Excavated materials shall not be permanently placed or temporarily stored in areas designated as coastal beaches. Temporary storage areas for excavated material shall be as approved by the Engineer.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS

- A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be extend longer than one (1) day, temporary mulching or other protective measures shall be provided as required.
- B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 PREPAREDNESS FOR STORM EVENTS

- A. The Contractor shall make efforts to adequately prepare the work site for storm events.
- B. Insofar as possible the Contractor shall limit the amount of open excavations and the duration for which there are open excavations on-site.
- C. The Contractor shall stabilize open excavations and the surrounding areas to withstand conditions present during storm events.

3.07 LOCATION OF STORAGE AREAS

- A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.
- B. Adequate measures for erosion and sediment control such as the placement of baled hay or straw around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.
- C. There shall be no storage of equipment or materials in water resource areas.
- D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.08 PROTECTION OF LANDSCAPE

- A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. The Contractor shall, in any event, be responsible for any damage resulting from such use.

3.07 PROTECTION OF LANDSCAPE (continued)

- B. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may direct the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed.

3.08 DUST CONTROL

- A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of areas as necessary, to minimize creation and dispersion of dust.

3.09 STRAW WATTLES

- A. To trap sediment and to prevent sediment from entering resource areas, straw wattles shall be used as directed by the Engineer or as directed by Conservation Commission representatives. Care shall be taken to keep the wattles from breaking apart. The wattles should be securely staked to prevent overturning, flotation or displacement. All deposited sediment shall be removed periodically.

3.10 SILTATION BARRIER

- A. Where directed by the Engineer, the Contractor shall erect and maintain a temporary siltation barrier. The siltation barrier shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction.

3.11 DEVICE MAINTENANCE

- A. During the progress of work, the Contractor shall:
 - 1. Remove accumulated sediment once it builds up to one-half of the height of the siltation barrier.
 - 2. Replace damaged fencing or hay bales, where required.
 - 3. Make other repairs as necessary to ensure that all silt fencing and hay bales are filtering all runoff directed to them.

3.12 SURFACE RESTORATION

- A. Loaming and Seeding shall be conducted as soon as is practical once construction has been completed within the areas designated.

3.13 REMOVAL AND FINAL CLEANUP

- A. At the completion of construction, remove sediment control devices and all accumulated silt. Dispose of silt and work materials in proper manner. Regrade all areas disturbed during this process and stabilize area against erosion.

END OF SECTION

**ILLICIT DISCHARGE COMPLIANCE
STATEMENT**

ILLCIT DISCHARGE COMPLIANCE STATEMENT

Cabot Yard Carhouse Site Improvements, Boston, MA

DEP does not permit illicit discharges, defined by 310 CMR 10.04 as follows, to the stormwater management system:

“Illicit discharge means a discharge that is not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.”

I certify that there will be no illicit discharges to the City of Boston’s Stormwater System.



Signature

Massimo Marino
Printed Name

Managing Director and Chairman of the Committee
of the Joint Venture
Title

October 23, 2018
Date

*City of Boston
1 City Hall Square
Boston, MA 02201*