STATE OF NEW HAMPSHIRE
INTER-DEPARTMENT COMMUNICATION

DATE: January 9, 2020

FROM: Andrew O'Sullivan
Wetlands Program Manager

AT (OFFICE): Department of Transportation
Bureau of Environment

SUBJECT: Dredge & Fill Application
Wakefield, M312-13
Response to RFMI /Amendment 1
(DES#2019-03386)

TO: Stephanie Giallongo, Wetlands Inspector

THRU: Karl Benedict, Public Works Permitting Officer
New Hampshire Wetlands Bureau
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Forwarded herewith is the NHDOT"s response to the RFMI dated and received on December 10th 2019.

As a result of this RFMI the Department re-evaluated its proposed design and layout in order to address and correct some of the concerns raised in the RFMI. In addition to responding to the RFMI issues below the Department is jointly submitting the attached revised plans as an amendment to the originally submitted plans. The primary change to the plans is the proposed location of the proposed box structure. The Department was originally proposing to install the new box adjacent to the existing pipes while using the old pipes as the clean water bypass during construction. After further review of the project the Department has determined that installing the new box in the same location as the existing pipes was a preferred option, a temporary clean water bypass will be installed where the proposed box had been shown in the original application package. As a result of the proposed revisions there has been an increase of 79 square feet of temporary impacts that would have resulted in a fee increase in the amount of $31.60, however, when this additional cost is added to the original application fee the total amount is still less than the minimum $200 required for applications which was paid under the original application under Payment Voucher #585162). Therefore, there will be no additional payment for the increased impacts associated with this Amendment/RFMI response.

The following responses will be in corresponding order with the enumerated items identified in the RFMI.

1. Erosion, Sediment and Turbidity:

   Please find the attached plans that have been revised to address erosion, sediment and turbidity in accordance with Env-Wt501.02, Env-Wt 304.06 and Env-Wt-903.03. Traditionally, the Department does not dictate a contractor means or methods and therefore our Erosion Control plans do not always provide a specific details that often are later developed by the Contractor when a SWPPP is prepared. However, since this project is going to be completed by our own District forces we were able to revise the plans to include additional details as requested such as location of the sandbag coffer dam and placement of sediment bags and turbidity curtains.

2. Diversion/Dewatering:

Please find the attached plans that have been revised to depict the proposed stream water diversion. Similar to the answer provided above, we typically do not dictate means and methods however, since this project is being completed by District forces we were able to revise the plans to better show the location of the proposed clean water bypass, along with the location, and dimensions of the sand bag cofferdam as depicted in the cross section, along with the sump location, and dewatering locations. In addition to the revisions made on the plans that have been provided the Department has also updated the Construction Sequence with additional narrative support for the proposed Diversion/Dewatering associated with this project.

3. Plan Requirements:

   a. *Please find the attached plan that includes a PE Stamp.*

   b. *The plans were delineated by Sarah Large and Matt Urban. In accordance with RSA 310-A:79 III, employees of the government or the State of NH while engaged within the state in the practice of the profession of soil science or wetland science for the government is exempt from the requirement of holding a CWS. As such, the identification of Sarah and Matt as the wetland delineators meets the States obligation. A CWS stamp will not be provided on these plans.*

4. Construction Sequence:

Please find a copy of the revised construction sequence included with this Amendment/RFMI Response package.

5. Hydraulic and Geomorphic Details:

   a. The Department included all available stream crossing data that was feasibly/safely able to be obtained with the original application submission. The depth of water and accessibility to the reference reach restricted the ability of field data in the reach to be safely collected. The information that was provided in the original application included a longitudinal profile of the stream at the crossing along with invert elevation data, water depth information, and a field assessment summary that included details about vegetation, stream slope, dominant substrate and bank full width measurements. Additionally, no outlet data is applicable to the stream crossing data collection protocols since the outlet is a lake. Upstream data collection is difficult to apply the stream crossing data collection protocols because of the lacustrine backwater effect that occurs. As a result of the data collection limitations additional resources such as the NH Regional Hydraulic Geometry Curve was used to help estimate upstream reference reach bank full widths that could then be extrapolated into what a compliant design structure size would be based on the regional curves estimation of upstream bank full widths based on the know drainage area. It's our hope that this explanation along with the revised plans will address this issue.

   b. The Departments original application submission included a copy of our Env-Wt 904.09 technical report that also addresses Env-Wt 904.05. As indicated above, the Department utilized the NH Regional Hydraulic Geometry Curve to estimate what a new structure that fully meets the NH stream crossing guidelines would be. Please refer to the Env-Wt904.09 technical report included with the original application submission.

c. Please find the attached hydraulic modeling along with the summary of hydraulic modeling.

d. Please find the attached hydraulic modeling along with the summary of hydraulic modeling.

6. Administrative Provisions: *In accordance with Env-Wt 501.01 The DOT is exempt from abutter notification for public highway construction. Additionally, the work being conducted is located entirely within what is known as a prescriptive ROW that gives the NHDOT the permanent rights to maintain the roadway and our drainage infrastructure, as such since the work is within our Prescriptive ROW and we do not require any easements or abutter approvals.*

7. Natural Heritage Bureau (NHB) Datacheck: *At the time of the wetlands application submission the Department had coordinated with Amy Lamb (DNCR-NHB) in an effort to begin the process of relocating the Coastal Plain Grass Leaved Goldenrod from our proposed project area. Please find attached correspondence with Amy Lamb that summarizes the events that took place following the application submission. In brief summary, the Department met with Amy Lamb on site to review the location of the species of concern and we identified locations nearby that were suitable relocation habitat. At that field review a single test plant was moved. Coordination with Amy Lamb continued and we gathered a small group of volunteers from the NHDOT who were willing to help move the plant species during late fall, which was the recommended time of year to relocate according to Amy. The Department relocated approximately 100 plants under the supervision of Amy Lamb and then continued to monitor and water the plants weekly at her request. During construction the Department is committed to sectioning off the nearby areas that the plants were relocated to in an effort to prevent accidental impact to the species. Some of the volunteer crew who assisted in the relocation of the species will be the same crew that constructs this project, so they are intimately familiar with where the plants were moved and why they were moved. The Department will continue to monitor the success of the relocated plants for the next two growing seasons.*

8. RSA 483-B Shoreland Waterquality Protection Act: *The DOT originally obtained a Shoreland PBN (2019-01179) to Impact 175 square feet of protected Shoreland in order to temporarily removing asphalt paving above pipes in order to replace them under a corresponding wetlands permit.* Subsequent to obtaining the permit the design was changed to be able to more adequately address the NHDES wetlands permitting stream crossing design requirements.

   Typically, a change of design would require a new PBN to be filed. However, in 2018 new legislation (cited below) was passed that allows NH DOT to complete work without needing to undertake any permitting efforts for maintenance efforts such as those that are proposed by this project. As such, the Department will not be submitting a new application to the DES Shoreland program.

   RSA-483-B:5-bVII which states: "Maintenance and repair of state roadways undertaken by the department of transportation shall be exempt from the permitting requirements of this chapter, provided such roadway is not expanded."

If and when this Amendment/RFMI Response meets with the approval of the Bureau, please send the permit directly to Andrew O'Sullivan, Wetlands Program Manager, Bureau of Environment.

AMO:mru
Enclosures

cc:
BOE Original
Town of Wakefield Clerk/Conservation Commission
Darlene Forst, NHDES Shoreland Program (via electronic notification)
Lori Sommer, NHDES Wetlands Mitigation Program (via electronic notification)
Amy Lamb, NH Natural Heritage Bureau (via electronic notification)
Carol Henderson, NH Fish & Game (via electronic notification)
Michael Hicks, US Army Corp of Engineers (via electronic notification)
Kevin Nyhan, BOE (via electronic notification)

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The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

WETLANDS PERMIT APPLICATION
REQUEST FOR MORE INFORMATION

December 10, 2019

NH DEPT OF TRANSPORTATION
C/O ALAN G. HANSCOM
PO BOX 483
CONCORD NH 03302-0483

Re: Wetlands Permit Application (RSA 482-A); NHDES File Number: 2019-03386
Subject Property: NH Route 153, Wakefield

Dear Mr. Hanscom:
The New Hampshire Department of Environmental Services Land Resources Management Program (NHDES) Wetlands Bureau has reviewed your Wetlands Permit Application for the above referenced property, and has determined that additional information is needed to clarify and complete the application. This information is required in accordance with RSA 482-A, specifically RSA 482-A:3, XIV(a)(2), and Administrative Rules Env-Wt 100 through 900.

In order for NHDES to render a decision on your application, **all** of the items requested below must be addressed in full. In order to facilitate a timely decision, your response must be formatted to coincide with the information as requested below; i.e., each numbered item below must be likewise numbered in your response. NHDES will make a **final determination** based upon the information provided in your response to this request.

1. Erosion, Sediment and Turbidity: In accordance with NH Administrative Rule Env-Wt 501.02, please revise the plan to include more specific proposed methods of erosion, siltation and turbidity controls either indicated graphically and labeled or annotated as necessary. In accordance with NH Administrative Rule Env-Wt 304.06 and Env-Wt 903.03, a coffer dam or turbidity curtain shall be used to enclose dredging projects in and adjacent to marshes, lakes and rivers or along the shoreline of other surface waters. Please provide details regarding the type of erosion, sedimentation and turbidity controls that you are proposing to use.

2. Diversion / Dewatering: In accordance with New Hampshire Administrative Rule Env-Wt 903.03(5), please provide a plan which details the proposed diversion and dewatering method including estimated maximum flow to be diverted, the location/height and width of the diversion dam, sump locations and sediment treatment plan with methods and release point. If additional impact areas are required for the stream diversion/dewatering, or adjacent bank stabilization ple: se quantify and include the area on the plan.

3. Plan Requirements:
   a. In accordance with Ne w Hampshire Administrative Rule Env-Wt 904.04(g) and Env-Wt 303.04(l), plans drawn for a new or re)lacement Tier 3 stream crossing and plans for temporary cofferdams and other water control devices :onstructed in flowing water shall be stamped by a Professional Engineer (PE) who is licensed under RSA 310-A to practice in New Hampshire. Please provide an updated plan set to include a PE stamp.
   b. In accordance with Ne v Hampshire Administrative Rule Env-Wt 301.01, please revise the plan to include the stamped of the Ce tified Wetland Scientist who conducted the delineation.

4. Construction Sequence: In accordance with New Hampshire Administrative Rule Env-Wt 501.02(a)(5), please revise the plan set to include the sequence of construction including pre-construction through post-construction activities and the relative timing and progression of all work.

5. Hydraulic and Geomorphic Details:
   a. In accordance with New Hampshire Administrative Rule Env-Wt 903.03(a)(3), (4) and 903.03(b), please provide the necessary detail regarding the stream bed, channel geometry and profile. This is to include, but not be limited to, clearing limits for construction, details of all proposed channel and bank work, stream bed details, channel geometry and profile (including bankfull width, bankfull depth, entrenchment ratio, sinuosity, flood prone width, a long profile with grade controls, pools and gradients shown, an appropriate reference reach cross section), the dewatering and diversion strategy and cross sections of the proposed stream crossing with invert and flood elevations. You may consider utilizing the NHDES Wetlands Permit Application – Stream Crossing Worksheet to accompany the application package.
   b. In accordance with New Hampshire Administrative Rule Env-Wt 904.05 (a), please provide an assessment of the geomorphic compatibility of the stream crossing based on the NH Stream Crossing Guidelines, University of New Hampshire (May 2009).
   c. In accordance with New Hampshire Administrative Rule Env-Wt 904.05(e), a Tier 3 stream crossing shall be designed and constructed to accommodate the 100-year flood frequency event to ensure that there is no increase in flood stages on abutting properties and so flow and sediment transport characteristics will not be affected in a manner which could adversely affect channel stability. Please provide a hydrologic and hydraulic analysis for technical justification to quantify the existing and proposed hydraulic conditions up to the 100-year flood frequency event.
   d. In accordance with New Hampshire Administrative Rule Env-Wt 904.09(b) a request for an alternative design shall be accompanied by a technical report prepared by an environmental scientist or professional engineer that clearly explains how the proposed alternative meets the criteria for approval specified in 904.09 (c) or (d). Please provide a technical report to adequately quantify the existing and proposed conditions.

6. Administrative Provisions: In accordance with New Hampshire Administrative Rule Env-Wt 501.02, please revise the plan to depict the boundaries of the right-of-way, the location of the proposed project within the right-of-way, and the location of the properties of abutters with each lot labeled with the abutter's names and mailing addresses. In accordance with RSA 482-A:11 II. and New Hampshire Administrative Rule Env-Wt 502.02(b), if any work associated with the project will encroach outside of the NHDOT's right-of-way, onto abutting property, then please demonstrate right of access / easement from by (1) obtaining temporary construction easements or other written agreements from the owner of the abutting property owner, and (2) submitting a copy of each agreement to the NHDES Wetlands Bureau.

7. Natural Heritage Bureau (NHB) Datacheck: The NHB data check results (NHB19-3315) indicates the presence of a threatened plant species located within the project vicinity with inconclusive coordination. Please provide documentation of complete coordination with NHB (Amy.Lamb@dncr.nh.gov) including project-specific recommendations for avoiding and minimizing potential impact to the threatened plant species, plus specific recommendations for potential relocation and monitoring requirements of the protected plant species. Provide copies of correspondence to the NHDES Wetlands Bureau with the response to this more information request.

8. RSA 483-B Shoreland Water Quality Protection Act: It appears that an NHDES Shoreland PBN was accepted for this project on May 02, 2017 (NHDES File #2019-01179). Has the plan changed since that time? If so, new authorization from the Shoreland Program may be required. Please coordinate with the NHDES Shoreland Program and provide copies of correspondence to the NHDES Wetlands Bureau with the response to this more information request.

Please include file number 2019-03386 on all the required items requested above, and on all other correspondence submitted to this office relative to this application. The requested information must be submitted to NHDES within 60 days of this letter. **Please be aware that in accordance with RSA 482-A:3, XIV(a)(2), failure to provide a single and complete response to the items listed above within 60 days of the date of this request will result in a denial of your application. Therefore, if NHDES does not receive a complete response by Click here to enter a date., your application for a permit will be denied.** A copy of all the requested items must be submitted to the town of Wakefield Municipal Clerk and Conservation Commission.

If you have any questions, please contact me directly at stefanie.giallongo@des.nh.gov or (603) 559-1516.

Sincerely,

Stefanie M. Giallongo
Wetlands Inspector
NHDES Wetlands Bureau

cc: Wakefield Municipal Clerk/Conservation Commission
ec: Alan G. Hanscom, Sarah Large, Matt Urban; NHDOT
Karl Benedict, NHDES Wetlands Bureau
Darlene Forst; NHDES Shoreland Program
Lori Sommer; NHDES Wetlands Mitigation Program
Amy Lamb, NH Natural Heritage Bureau

CONSTRUCTION SEQUENCE – Updated 12-30-19

As a preventative measure, erosion control measures, such as silt fence, compost sock, and hay bales, will be placed parallel to the roadway, between the proposed work area and designated wet areas ahead of all construction activities.

The installation of the proposed box culvert will take place during low flow conditions, which is primarily in the summer months. All erosion control measures will be installed, monitored, repaired or replaced as needed to maintain water quality. These measures will not be removed until all impacted areas are stabilized. Work will be completed in 3 Steps.

Step 1 - Install the Water Diversion Structure (Clean Water Bypass, CWB)

A 36-inch diameter pipe will be used as a CWB so that the new permanent box culvert may be constructed at the same location as the existing twin culverts. The following summarizes the work to be completed during this step:

1. Install a turbidity curtain on the upstream side of the CWB pipe; the curtain should be placed to prevent any fines from entering into the existing twin culverts.
2. Install a sand bag cofferdam, to dewater the site, on the upstream side of the CWB pipe within the area contained by the turbidity curtain.
3. Place a sediment bag on the upstream side of the roadway; locate the bag a minimum of 20-feet from any delineated wetland.
4. Connect the dewatering sump pump to the sediment bag and dewater the upstream side.
5. Install silt fence and compost sock on the downstream side of the diversion between the location of the clean water bypass pipe outlet and the lake. Note that the downstream side will not be in standing water.
6. Install the water diversion structure pipe using alternating two-way traffic patterns with flaggers; construct the pipe from the downstream side to the upstream side. This is a clean water bypass and does not require treatment. The clean water bypass pipe will be set at an elevation 1-foot above the existing twin culverts.
7. A temporary channel will be constructed downstream of the CWB pipe to allow water to enter into lake. The temporary channel will be temporarily stoned lined; a geotextile will be placed under the temporary stone.
8. Remove the upstream sump pump, sand bag cofferdam, and turbidity curtain.

Flow will not be allowed through the temporary water diversion until all erosion control measures are in place for the CWB.

Step 2: Install Culvert

The precast box culvert will be installed in two phases. It will be installed from the downstream side to the upstream side. During Phase 1 culvert construction, only one cofferdam is required; the downstream side. During Phase 2 culvert construction, both cofferdams must be in place to dewater the site. The following summarizes the work to be completed during this step:

1. Install the downstream turbidity curtain; the curtain should prevent fines from entering the lake.
2. Install the downstream sand bag cofferdam; the cofferdam should be located within the area confined by the turbidity curtain.
3. Install the dewatering sump pump and connect it to a sediment bag located on the downstream side of the roadway. The bag should be located a minimum of 20-feet from a designated wetland.
4. Connect the dewatering sump pump to the sediment bag and dewater the downstream side.
5. Use Alternating two-way traffic patterns with temporary signals to maintain traffic over the upstream side of the roadway. Use temporary portable concrete barrier to provide separation between the alternating two-way traffic and the work area.
6. Remove the existing guardrail, located on the downstream side of the proposed culvert.
7. Construct the downstream side of the proposed box culvert. Place a 1-foot thick layer of riverbed material inside of the proposed box culvert to mimic a natural stream.
8. Construct a permanent outlet stone pad, with geotextile.
9. Construct and compact the roadway located over the downstream side of the box culvert (selects only).
10. Shift traffic to the downstream side of the roadway and continue to use alternating two-way traffic patterns with temporary signals to maintain traffic over the downstream side of the culvert. Use portable concrete barrier, on both sides of the single lane used for traffic, to maintain driver and or worker safety.
11. Install the upstream turbidity curtain; the curtain should prevent fines from entering the CWB pipe.
12. Install the upstream sand bag cofferdam; the cofferdam should be located within the area confined by the turbidity curtain.
13. Install the dewatering sump pump and connect it to a sediment bag located on the upstream side of the roadway. This second sediment bag should be located a minimum of 20-feet from a designated wetland.

14. Install the upstream side of the proposed box culvert. Place a 1-foot thick layer of riverbed material at the bottom of the proposed box culvert to mimic a natural stream.
15. Once all permanent erosion control measures are in place, remove both the upstream and downstream cofferdams and remove the upstream and downstream turbidity curtains.
16. Construct and compact the roadway located over the upstream side of the box culvert (selects only).
17. Using flaggers, remove the portable concrete barrier and temporary signals.

Flow will not be allowed through the box culvert until all permanent erosion control measures are in place for the CWB.

Step 3: Remove Water Diversion Structure and return site to original conditions

1. Install a turbidity curtain on the upstream side of the CWB pipe; the curtain should be placed to prevent any fines from entering into the newly installed box culvert.
2. Install a sand bag cofferdam, to dewater the site, on the upstream side of the CWB pipe within the area contained by the turbidity curtain.
3. Place a sediment bag on the upstream side of the roadway; locate the bag a minimum of 20-feet from any delineated wetland.
4. Connect the dewatering sump pump to the sediment bag and dewater the upstream side.
5. Once clean water is no longer flowing through the CWB pipe, install silt fence and compost sock on the downstream side of the diversion between the location of the clean water bypass pipe outlet stone and the lake.
6. Remove the water diversion structure pipe using alternating two-way traffic patterns with flaggers; remove the pipe from the downstream side to the upstream side.
7. Once the pipe is fully removed, rebuild the roadway to selects.
8. Remove the stone and geotextile used to construct the temporary CWB channel and grade the area to match existing conditions.
9. Remove the upstream sump pump, sand bag cofferdam, and turbidity curtain in that order.
10. Using flaggers, install new guardrail on the downstream side of the roadway and reconstruct the asphalt roadway that had been removed to install both the CWB pipe and the proposed box culvert.

All erosion control measure, installed at the inception of the project, will be maintained until the site has returned to its original conditions.

Urban, Matt Correspondence with Amy Lamb (NHB)

From: Lamb, Amy
Sent: Tuesday, December 3, 2019 12:33 PM
To: Stortz, Heidi
Cc: Urban, Matt; Rollins, Barbara
Subject: RE: Wakefield M312-13

Hi Heidi

Yes, the plants are dormant and no further action is needed this fall/winter.

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Stortz, Heidi <Heidi.Stortz@dot.nh.gov>
Sent: Wednesday, November 20, 2019 3:04 PM
To: Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Cc: Urban, Matt <Matt.Urban@dot.nh.gov>; Rollins, Barbara <Barbara.Rollins@dot.nh.gov>
Subject: RE: Wakefield M312-13

Hi Amy,

I went out to the Wakefield site yesterday and have attached a few photos. The plants appear to be dormant for the winter. The transplanted plants and the native plants all seem to look the same at this point. Since the cold weather is here can the monitoring be discontinued through the winter?

Thanks
Heidi

From: Lamb, Amy
Sent: Wednesday, October 30, 2019 11:39 AM
To: Stortz, Heidi
Cc: Urban, Matt; Rollins, Barbara
Subject: RE: Wakefield M312-13

Heidi,

Thanks for the update. It looks like a few of the plants in more upland areas may be a little stressed, but overall they look good. The temperatures and rain in the forecast lately should help the transplants transition to their new locations.

Thanks and keep me posted.

-Amy

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Stortz, Heidi <Heidi.Stortz@dot.nh.gov>
Sent: Wednesday, October 30, 2019 11:03 AM
To: Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Cc: Urban, Matt <Matt.Urban@dot.nh.gov>; Rollins, Barbara <Barbara.Rollins@dot.nh.gov>
Subject: RE: Wakefield M312-13

Hi Amy,

I stopped by the site in Wakefield yesterday and took some photos. The majority of the plants look ok. The sand was wet and it was drizzling/raining yesterday while I was out there. Looks like we have more rain coming in tonight thru Friday.

Thanks,
Heidi

From: Lamb, Amy
Sent: Monday, October 28, 2019 3:01 PM
To: Stortz, Heidi
Cc: Rollins, William; Urban, Matt; Rollins, Barbara; Fifield, Samantha; Nason, Todd; Mills, Arin
Subject: RE: Wakefield M312-13

Hi Heidi,

Thank you for the quick response, and for checking on the rainfall amounts in Wakefield. Thank you as well for scheduling a stop at the project site to check on the plants and take photos. I look forward to seeing the results.

Best,
Amy

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Stortz, Heidi <Heidi.Stortz@dot.nh.gov>
Sent: Monday, October 28, 2019 2:46 PM
To: Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Cc: Rollins, William <William.Rollins@dot.nh.gov>; Urban, Matt <Matt.Urban@dot.nh.gov>; Rollins, Barbara <Barbara.Rollins@dot.nh.gov>; Fifield, Samantha <Samantha.Fifield@dot.nh.gov>; Nason, Todd <Todd.Nason@dot.nh.gov>; Mills, Arin <Arin.Mills@dot.nh.gov>
Subject: RE: Wakefield M312-13

Hi Amy,

I will be in the Wakefield area tomorrow so I can stop by and take some photos. According to AccuWeather last week the Wakefield area had received decent amounts of rainfall on Tuesday, Wednesday, Friday, and Sunday with more rain to come later this week.

Thanks
Heidi

From: Lamb, Amy
Sent: Monday, October 28, 2019 2:16 PM
To: Rollins, William; Urban, Matt; Rollins, Barbara; Fifield, Samantha; Nason, Todd; Mills, Arin; Stortz, Heidi
Subject: RE: Wakefield M312-13

Good afternoon,

Thank you again to all who assisted with transplanting coastal plain grass-leaved-goldenrod on Friday, 10/18. We collectively moved about 100 plants! It was definitely a team effort and would not have been done so quickly without so many hands.

It's been a week and a half since the transplant, so I wanted to check in to see how the watering schedule has been going, and how the plants seem to be doing following the transplant.

Any photos, anecdotal information about how the plants look, or an approximate number of plants that are/aren't doing well would be great. I am curious about the timing of the transplant since the goldenrods still seemed to be actively growing, while most other plants seemed to be dormant.

Thank you again for assisting with the transplanting and care of these rare goldenrods. There are a limited number of populations of this species in NH, so NHB really does appreciate your efforts to preserve this population.

Best,
Amy

Amy Lamb
Ecological Information Specialist
(603) 271-2834
amy.lamb@dncr.nh.gov

NH Natural Heritage Bureau
DNCR - Forests & Lands
172 Pembroke Rd
Concord, NH 03301

From: Rollins, William <William.Rollins@dot.nh.gov>
Sent: Tuesday, October 15, 2019 2:05 PM
To: Urban, Matt <Matt.Urban@dot.nh.gov>; Rollins, Barbara <Barbara.Rollins@dot.nh.gov>; Fifield, Samantha <Samantha.Fifield@dot.nh.gov>; Nason, Todd <Todd.Nason@dot.nh.gov>; Mills, Arin <Arin.Mills@dot.nh.gov>; Stortz, Heidi <Heidi.Stortz@dot.nh.gov>; Lamb, Amy <Amy.Lamb@dncr.nh.gov>
Subject: RE: Wakefield M312-13

Hi Matt,

We'll provide the shovels and buckets and a couple of guys from the crew if possible.

Bill

From: Urban, Matt
Sent: Tuesday, October 15, 2019 8:51 AM
To: Rollins, William; Rollins, Barbara; Fifield, Samantha; Nason, Todd; Mills, Arin; Stortz, Heidi; Lamb, Amy
Subject: Wakefield M312-13

Hi All,

I am touching base because we are still on for meeting up at the Wakefield Province Lake Culver Replacement Project Location this Friday the 18th.

I am going to adjust our start time to 9:30 rather than 9:00 (if you get there early enjoy the view).

Barb and Bill if you can bring some shovels, buckets, maybe even some hand pruners and any other tools that you think may be helpful that would be great.

Thank you for your assistance!
Let me know if you have any questions.

Matt Urban

New Hampshire Department of Transportation
District Three - Wakefield, NH 153 Culvert Replacement

Project # M312-13
Calculated by: SDF
Date: 12-31-19

Summary of HydroCAD Analysis

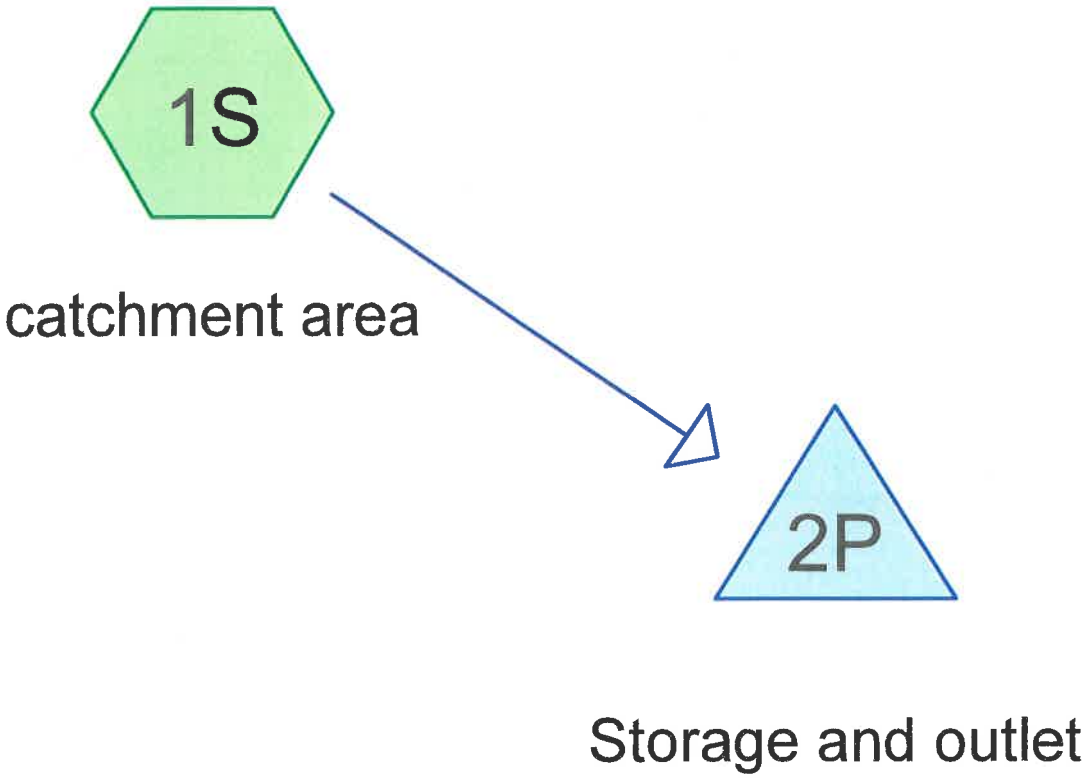
A HydroCAD model was created to evaluate the proposed 4' x 8' precast box culvert using the following data:

- StreamStats delineated catchment area: This area was downloaded into a shape file that was brought into Microstation to develop the flow path using USGS topographic maps. The shape file was also used within the USGS Soils Survey website to determine an estimate of underlying soils and their hydrologic category.
- USGS mapping: USGS maps were brought into Microstation as a raster file and to scale. Flow path lengths were determined using this map, see attached USGS map.
- USGS Soil Survey Map: A soil map was developed using the catchment area shape file downloaded from the StreamStats website, see attached soils report.
- Extreme Precipitation Data from the Northeast Regional Climate Center: 24-hour Extreme Precipitation Estimates were inputted into the HydroCAD model to evaluate this crossing for multiple storms, see attached precipitation tables.
- The storm runoff storage area was estimated based on the USGS topo maps and engineering judgement. To create a conservative model, the storm runoff storage areas located upstream of a Maine culvert that is located approximately 1.1 miles upstream of the Province Lake Rd culvert was ignored. Also, storm runoff storage areas located at an elevation below the invert of the existing culvert was also ignored.
- A topographic survey was not completed at this location, so existing culvert elevation data is based on elevations shots taken in the field. USGS data supplemented the remaining model elevation data; the elevation chosen to represent the top of roadway is 584.40.

The table below contains the results of the HydroCAD analysis performed on the crossing:

Storm Year	24-Hr Precipitation (in)	Peak Flow (cfs) through Culvert	Peak Elevation (ft)	Freeboard to Overtop Road (ft)
2	3.00	2.41	580.29	4.11
10	4.40	16.44	580.95	3.45
25	5.49	33.44	581.51	2.89
50	6.48	52.22	582.02	2.38
100	7.66	77.54	582.63	1.77

As can be seen above, the results of the analysis demonstrated that the proposed culvert has the capacity to allow for the 100-year storm flow without overtopping the roadway. This analysis can be backed with anecdotal data, as there is no history of storm water overtopping the roadway at this location.



Subcat Reach Pond Link

Routing Diagram for Model for Wakefield M312-13 Permit
Prepared by NH DOT, Printed 12/30/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
851.300	49	ME Areas (1S)
78.800	58	NH Areas (1S)
930.100	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
930.100	Other	1S
930.100		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	851.300	851.300	ME Areas	1S
0.000	0.000	0.000	0.000	78.800	78.800	NH Areas	1S
0.000	**0.000**	**0.000**	**0.000**	**930.100**	**930.100**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	579.00	578.75	40.0	0.0063	0.030	96.0	48.0	12.0

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: catchment area Runoff Area=930.100 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=13,961' Tc=326.2 min CN=50 Runoff=7.30 cfs 7.046 af

Pond 2P: Storage and outlet Peak Elev=580.29' Storage=5.236 af Inflow=7.30 cfs 7.046 af
96.0" x 48.0" Box Culvert w/ 12.0" inside fill n=0.030 L=40.0' S=0.0063 '/' Outflow=2.41 cfs 5.357 af

Total Runoff Area = 930.100 ac Runoff Volume = 7.046 af Average Runoff Depth = 0.09"
100.00% Pervious = 930.100 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: catchment area

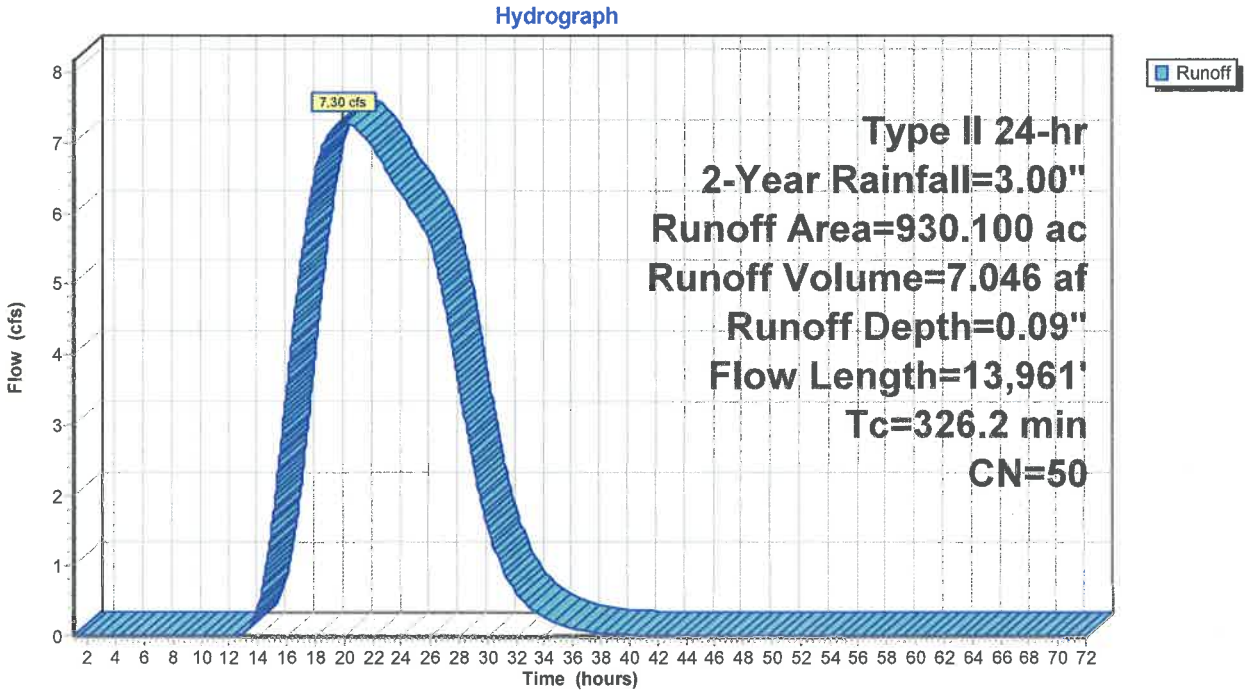
Runoff = 7.30 cfs @ 19.94 hrs, Volume= 7.046 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=3.00"

	Area (ac)	CN	Description
*	78.800	58	NH Areas
*	851.300	49	ME Areas
	930.100	50	Weighted Average
	930.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
189.6	300	0.0133	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 1.00"
10.8	696	0.1840	1.07		**Shallow Concentrated Flow, Shallow Conc Flow** Forest w/Heavy Litter Kv= 2.5 fps
4.9	442	0.0905	1.50		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.3	1,306	0.0567	1.19		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.7	4,825	0.0257	4.31	17.24	**Channel Flow, Channel Flow** Area= 4.0 sf Perim= 6.5' r= 0.62' n= 0.040 Earth, cobble bottom, clean sides
83.9	6,392	0.0019	1.27	53.31	**Channel Flow, Channel Flow** Area= 42.0 sf Perim= 21.4' r= 1.96' n= 0.080 Earth, long dense weeds
326.2	13,961	Total			

Subcatchment 1S: catchment area



Summary for Pond 2P: Storage and outlet

Inflow Area = 930.100 ac, 0.00% Impervious, Inflow Depth = 0.09" for 2-Year event
Inflow = 7.30 cfs @ 19.94 hrs, Volume= 7.046 af
Outflow = 2.41 cfs @ 29.00 hrs, Volume= 5.357 af, Atten= 67%, Lag= 543.7 min
Primary = 2.41 cfs @ 29.00 hrs, Volume= 5.357 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 580.29' @ 29.00 hrs Surf.Area= 20.239 ac Storage= 5.236 af
Flood Elev= 584.40' Surf.Area= 56.474 ac Storage= 109.544 af

Plug-Flow detention time= 1,121.8 min calculated for 5.357 af (76% of inflow)
Center-of-Mass det. time= 1,013.5 min (2,353.0 - 1,339.5)

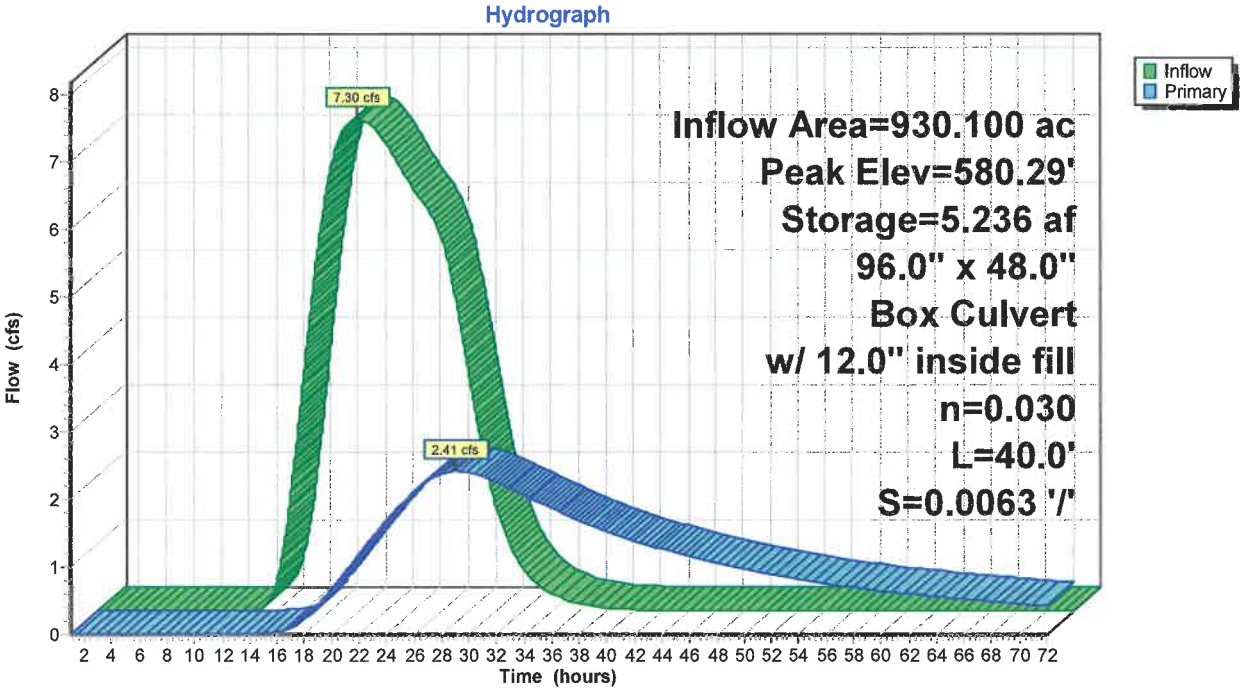
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	109.544 af	**Upstream Storage Area (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
580.00	16.417	0.000	0.000
581.00	29.796	23.107	23.107
582.00	43.302	36.549	59.655
583.00	56.474	49.888	109.544

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**96.0" W x 48.0" H Box Culvert w/ 12.0" inside fill** L= 40.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 579.00' / 578.75' S= 0.0063 '/' Cc= 0.900 n= 0.030 Stream, clean & straight, Flow Area= 24.00 sf

Primary OutFlow Max=2.41 cfs @ 29.00 hrs HW=580.29' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.41 cfs @ 1.40 fps)

Pond 2P: Storage and outlet



Stage-Discharge for Pond 2P: Storage and outlet

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
580.00	0.00	582.60	76.12
580.05	0.13	582.65	78.32
580.10	0.42	582.70	80.54
580.15	0.83	582.75	82.78
580.20	1.34	582.80	85.04
580.25	1.93	582.85	87.31
580.30	2.61	582.90	89.61
580.35	3.35	582.95	91.93
580.40	4.17	583.00	94.27
580.45	5.04	583.05	96.62
580.50	5.97	583.10	98.99
580.55	6.96	583.15	101.38
580.60	8.00	583.20	103.79
580.65	9.08	583.25	106.22
580.70	10.21	583.30	108.67
580.75	11.38	583.35	111.13
580.80	12.60	583.40	113.61
580.85	13.85	583.45	116.11
580.90	15.14	583.50	118.63
580.95	16.47	583.55	121.16
581.00	17.83	583.60	123.71
581.05	19.23	583.65	126.28
581.10	20.67	583.70	128.87
581.15	22.13	583.75	131.47
581.20	23.63	583.80	134.09
581.25	25.15	583.85	136.72
581.30	26.71	583.90	139.37
581.35	28.30	583.95	142.04
581.40	29.91	584.00	132.57
581.45	31.55	584.05	135.19
581.50	33.23	584.10	137.77
581.55	34.92	584.15	140.30
581.60	36.65	584.20	142.78
581.65	38.40	584.25	145.22
581.70	40.17	584.30	147.62
581.75	41.97	584.35	149.98
581.80	43.80	584.40	**152.31**
581.85	45.65		
581.90	47.52		
581.95	49.42		
582.00	51.34		
582.05	53.29		
582.10	55.25		
582.15	57.24		
582.20	59.26		
582.25	61.29		
582.30	63.34		
582.35	65.42		
582.40	67.52		
582.45	69.64		
582.50	71.78		
582.55	73.94		

Stage-Area-Storage for Pond 2P: Storage and outlet

Elevation (feet)	Surface (acres)	Storage (acre-feet)
580.00	16.417	0.000
580.05	17.086	0.838
580.10	17.755	1.709
580.15	18.424	2.613
580.20	19.093	3.551
580.25	19.762	4.522
580.30	20.431	5.527
580.35	21.100	6.565
580.40	21.769	7.637
580.45	22.438	8.742
580.50	23.107	9.881
580.55	23.775	11.053
580.60	24.444	12.258
580.65	25.113	13.497
580.70	25.782	14.770
580.75	26.451	16.076
580.80	27.120	17.415
580.85	27.789	18.788
580.90	28.458	20.194
580.95	29.127	21.633
581.00	29.796	23.107
581.05	30.471	24.613
581.10	31.147	26.154
581.15	31.822	27.728
581.20	32.497	29.336
581.25	33.173	30.978
581.30	33.848	32.653
581.35	34.523	34.362
581.40	35.198	36.105
581.45	35.874	37.882
581.50	36.549	39.693
581.55	37.224	41.537
581.60	37.900	43.415
581.65	38.575	45.327
581.70	39.250	47.273
581.75	39.925	49.252
581.80	40.601	51.265
581.85	41.276	53.312
581.90	41.951	55.393
581.95	42.627	57.507
582.00	43.302	59.655
582.05	43.961	61.837
582.10	44.619	64.052
582.15	45.278	66.299
582.20	45.936	68.579
582.25	46.595	70.893
582.30	47.254	73.239
582.35	47.912	75.618
582.40	48.571	78.030
582.45	49.229	80.475
582.50	49.888	82.953
582.55	50.547	85.464
582.60	51.205	88.008
582.65	51.864	90.584
582.70	52.522	93.194
582.75	53.181	95.837
582.80	53.840	98.512
582.85	54.498	101.221
582.90	55.157	103.962
582.95	55.815	106.736
583.00	**56.474**	**109.544**
583.05	56.474	109.544
583.10	56.474	109.544
583.15	56.474	109.544
583.20	56.474	109.544
583.25	56.474	109.544
583.30	56.474	109.544
583.35	56.474	109.544
583.40	56.474	109.544
583.45	56.474	109.544
583.50	56.474	109.544
583.55	56.474	109.544
583.60	56.474	109.544
583.65	56.474	109.544
583.70	56.474	109.544
583.75	56.474	109.544
583.80	56.474	109.544
583.85	56.474	109.544
583.90	56.474	109.544
583.95	56.474	109.544
584.00	56.474	109.544
584.05	56.474	109.544
584.10	56.474	109.544
584.15	56.474	109.544
584.20	56.474	109.544
584.25	56.474	109.544
584.30	56.474	109.544
584.35	56.474	109.544
584.40	56.474	109.544

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: catchment area Runoff Area=930.100 ac 0.00% Impervious Runoff Depth=0.46"
Flow Length=13,961' Tc=326.2 min CN=50 Runoff=46.16 cfs 36.004 af

Pond 2P: Storage and outlet Peak Elev=580.95' Storage=21.599 af Inflow=46.16 cfs 36.004 af
96.0" x 48.0" Box Culvert w/ 12.0" inside fill n=0.030 L=40.0' S=0.0063 '/' Outflow=16.44 cfs 32.745 af

Total Runoff Area = 930.100 ac Runoff Volume = 36.004 af Average Runoff Depth = 0.46"
100.00% Pervious = 930.100 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: catchment area

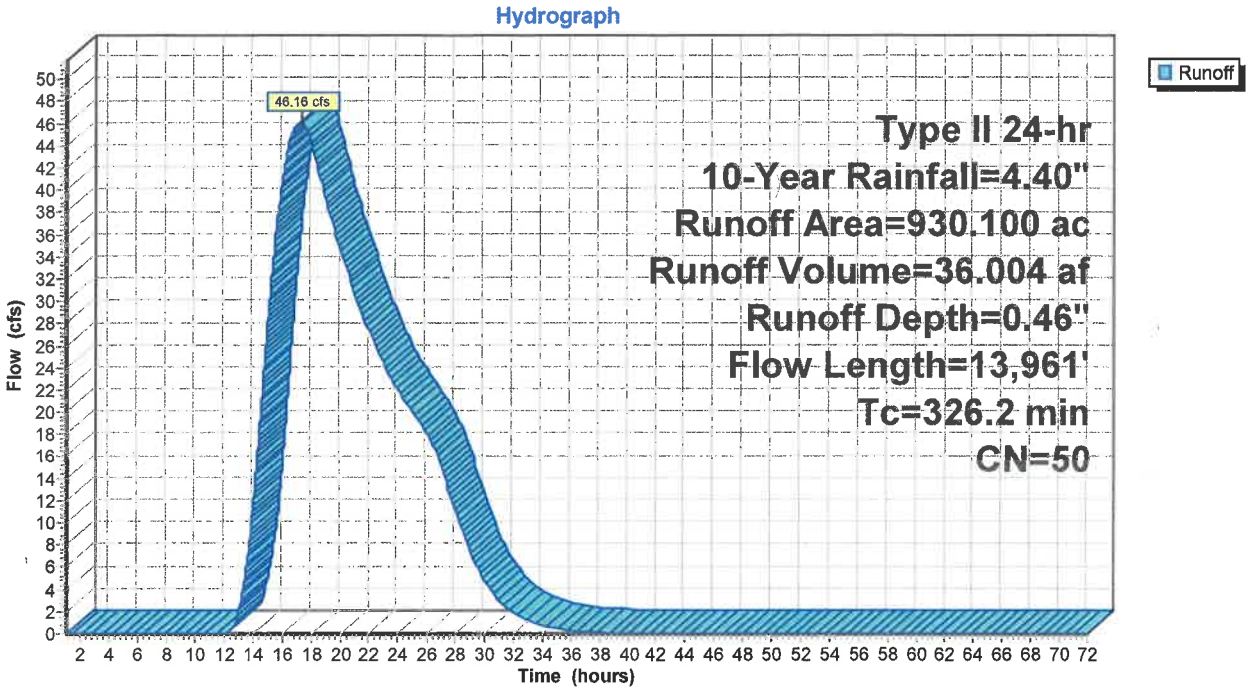
Runoff = 46.16 cfs @ 17.39 hrs, Volume= 36.004 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=4.40"

	Area (ac)	CN	Description
*	78.800	58	NH Areas
*	851.300	49	ME Areas
	930.100	50	Weighted Average
	930.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
189.6	300	0.0133	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 1.00"
10.8	696	0.1840	1.07		**Shallow Concentrated Flow, Shallow Conc Flow** Forest w/Heavy Litter Kv= 2.5 fps
4.9	442	0.0905	1.50		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.3	1,306	0.0567	1.19		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.7	4,825	0.0257	4.31	17.24	**Channel Flow, Channel Flow** Area= 4.0 sf Perim= 6.5' r= 0.62' n= 0.040 Earth, cobble bottom, clean sides
83.9	6,392	0.0019	1.27	53.31	**Channel Flow, Channel Flow** Area= 42.0 sf Perim= 21.4' r= 1.96' n= 0.080 Earth, long dense weeds
326.2	13,961	Total			

Subcatchment 1S: catchment area



Summary for Pond 2P: Storage and outlet

Inflow Area = 930.100 ac, 0.00% Impervious, Inflow Depth = 0.46" for 10-Year event
Inflow = 46.16 cfs @ 17.39 hrs, Volume= 36.004 af
Outflow = 16.44 cfs @ 26.59 hrs, Volume= 32.745 af, Atten= 64%, Lag= 551.9 min
Primary = 16.44 cfs @ 26.59 hrs, Volume= 32.745 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 580.95' @ 26.59 hrs Surf.Area= 29.111 ac Storage= 21.599 af
Flood Elev= 584.40' Surf.Area= 56.474 ac Storage= 109.544 af

Plug-Flow detention time= 860.2 min calculated for 32.745 af (91% of inflow)
Center-of-Mass det. time= 808.3 min (2,038.3 - 1,230.0)

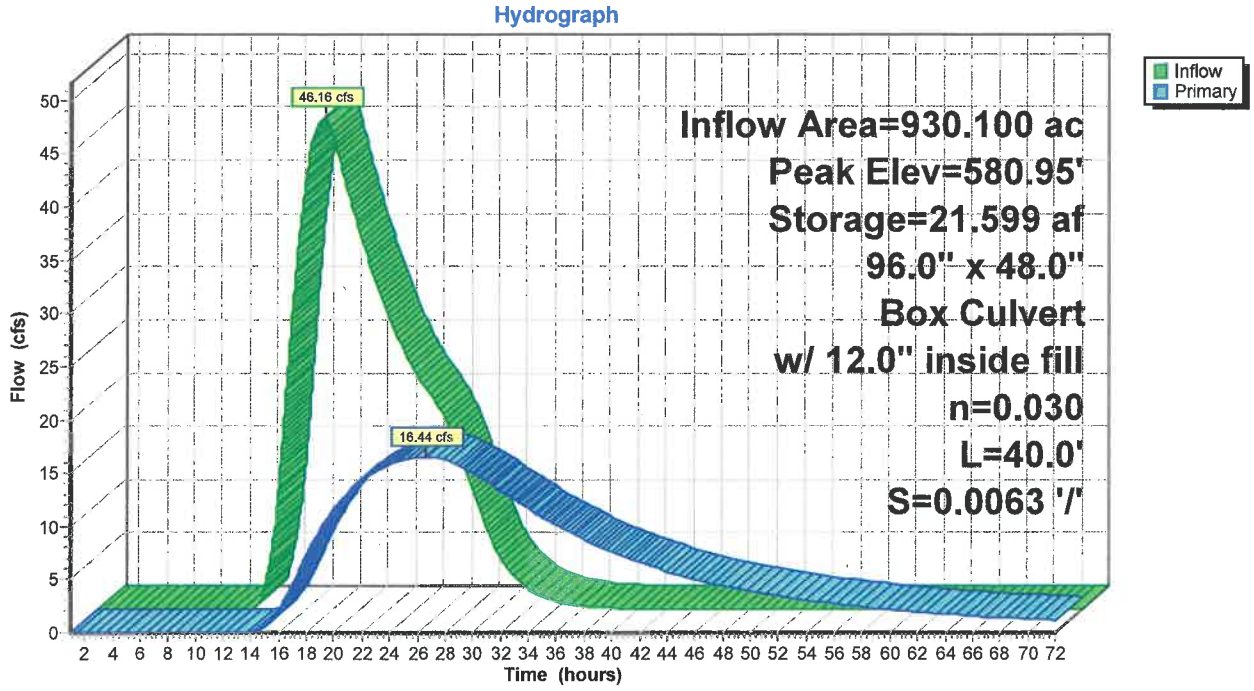
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	109.544 af	**Upstream Storage Area (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
580.00	16.417	0.000	0.000
581.00	29.796	23.107	23.107
582.00	43.302	36.549	59.655
583.00	56.474	49.888	109.544

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**96.0" W x 48.0" H Box Culvert w/ 12.0" inside fill** L= 40.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 579.00' / 578.75' S= 0.0063 '/' Cc= 0.900 n= 0.030 Stream, clean & straight, Flow Area= 24.00 sf

Primary OutFlow Max=16.44 cfs @ 26.59 hrs HW=580.95' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 16.44 cfs @ 2.89 fps)

Pond 2P: Storage and outlet



Stage-Discharge for Pond 2P: Storage and outlet

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
580.00	0.00	582.60	76.12
580.05	0.13	582.65	78.32
580.10	0.42	582.70	80.54
580.15	0.83	582.75	82.78
580.20	1.34	582.80	85.04
580.25	1.93	582.85	87.31
580.30	2.61	582.90	89.61
580.35	3.35	582.95	91.93
580.40	4.17	583.00	94.27
580.45	5.04	583.05	96.62
580.50	5.97	583.10	98.99
580.55	6.96	583.15	101.38
580.60	8.00	583.20	103.79
580.65	9.08	583.25	106.22
580.70	10.21	583.30	108.67
580.75	11.38	583.35	111.13
580.80	12.60	583.40	113.61
580.85	13.85	583.45	116.11
580.90	15.14	583.50	118.63
580.95	16.47	583.55	121.16
581.00	17.83	583.60	123.71
581.05	19.23	583.65	126.28
581.10	20.67	583.70	128.87
581.15	22.13	583.75	131.47
581.20	23.63	583.80	134.09
581.25	25.15	583.85	136.72
581.30	26.71	583.90	139.37
581.35	28.30	583.95	142.04
581.40	29.91	584.00	132.57
581.45	31.55	584.05	135.19
581.50	33.23	584.10	137.77
581.55	34.92	584.15	140.30
581.60	36.65	584.20	142.78
581.65	38.40	584.25	145.22
581.70	40.17	584.30	147.62
581.75	41.97	584.35	149.98
581.80	43.80	584.40	**152.31**
581.85	45.65		
581.90	47.52		
581.95	49.42		
582.00	51.34		
582.05	53.29		
582.10	55.25		
582.15	57.24		
582.20	59.26		
582.25	61.29		
582.30	63.34		
582.35	65.42		
582.40	67.52		
582.45	69.64		
582.50	71.78		
582.55	73.94		

Stage-Area-Storage for Pond 2P: Storage and outlet

Elevation (feet)	Surface (acres)	Storage (acre-feet)
580.00	16.417	0.000
580.05	17.086	0.838
580.10	17.755	1.709
580.15	18.424	2.613
580.20	19.093	3.551
580.25	19.762	4.522
580.30	20.431	5.527
580.35	21.100	6.565
580.40	21.769	7.637
580.45	22.438	8.742
580.50	23.107	9.881
580.55	23.775	11.053
580.60	24.444	12.258
580.65	25.113	13.497
580.70	25.782	14.770
580.75	26.451	16.076
580.80	27.120	17.415
580.85	27.789	18.788
580.90	28.458	20.194
580.95	29.127	21.633
581.00	29.796	23.107
581.05	30.471	24.613
581.10	31.147	26.154
581.15	31.822	27.728
581.20	32.497	29.336
581.25	33.173	30.978
581.30	33.848	32.653
581.35	34.523	34.362
581.40	35.198	36.105
581.45	35.874	37.882
581.50	36.549	39.693
581.55	37.224	41.537
581.60	37.900	43.415
581.65	38.575	45.327
581.70	39.250	47.273
581.75	39.925	49.252
581.80	40.601	51.265
581.85	41.276	53.312
581.90	41.951	55.393
581.95	42.627	57.507
582.00	43.302	59.655
582.05	43.961	61.837
582.10	44.619	64.052
582.15	45.278	66.299
582.20	45.936	68.579
582.25	46.595	70.893
582.30	47.254	73.239
582.35	47.912	75.618
582.40	48.571	78.030
582.45	49.229	80.475
582.50	49.888	82.953
582.55	50.547	85.464
582.60	51.205	88.008
582.65	51.864	90.584
582.70	52.522	93.194
582.75	53.181	95.837
582.80	53.840	98.512
582.85	54.498	101.221
582.90	55.157	103.962
582.95	55.815	106.736
583.00	**56.474**	**109.544**
583.05	56.474	109.544
583.10	56.474	109.544
583.15	56.474	109.544
583.20	56.474	109.544
583.25	56.474	109.544
583.30	56.474	109.544
583.35	56.474	109.544
583.40	56.474	109.544
583.45	56.474	109.544
583.50	56.474	109.544
583.55	56.474	109.544
583.60	56.474	109.544
583.65	56.474	109.544
583.70	56.474	109.544
583.75	56.474	109.544
583.80	56.474	109.544
583.85	56.474	109.544
583.90	56.474	109.544
583.95	56.474	109.544
584.00	56.474	109.544
584.05	56.474	109.544
584.10	56.474	109.544
584.15	56.474	109.544
584.20	56.474	109.544
584.25	56.474	109.544
584.30	56.474	109.544
584.35	56.474	109.544
584.40	56.474	109.544

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: catchment area Runoff Area=930.100 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=13,961' Tc=326.2 min CN=50 Runoff=99.11 cfs 69.982 af

Pond 2P: Storage and outlet Peak Elev=581.51' Storage=39.921 af Inflow=99.11 cfs 69.982 af
96.0" x 48.0" Box Culvert w/ 12.0" inside fill n=0.030 L=40.0' S=0.0063 '/' Outflow=33.44 cfs 65.686 af

Total Runoff Area = 930.100 ac Runoff Volume = 69.982 af Average Runoff Depth = 0.90"
100.00% Pervious = 930.100 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: catchment area

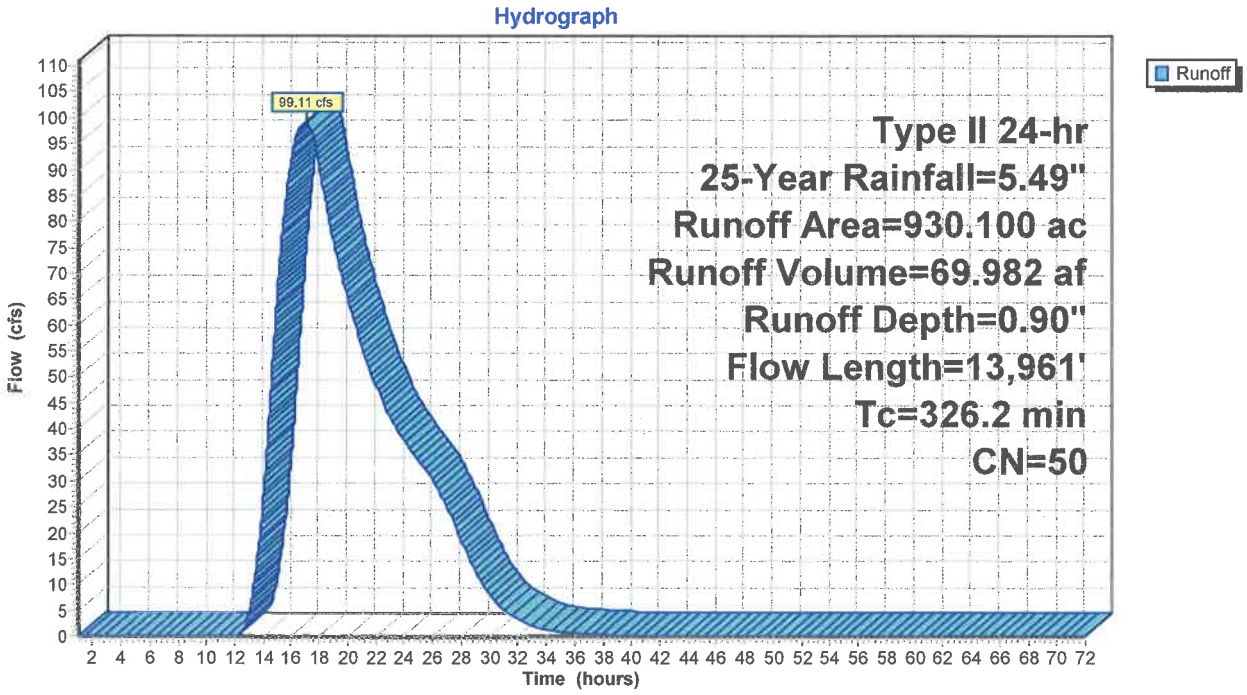
Runoff = 99.11 cfs @ 17.03 hrs, Volume= 69.982 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=5.49"

	Area (ac)	CN	Description
*	78.800	58	NH Areas
*	851.300	49	ME Areas
	930.100	50	Weighted Average
	930.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
189.6	300	0.0133	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 1.00"
10.8	696	0.1840	1.07		**Shallow Concentrated Flow, Shallow Conc Flow** Forest w/Heavy Litter Kv= 2.5 fps
4.9	442	0.0905	1.50		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.3	1,306	0.0567	1.19		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.7	4,825	0.0257	4.31	17.24	**Channel Flow, Channel Flow** Area= 4.0 sf Perim= 6.5' r= 0.62' n= 0.040 Earth, cobble bottom, clean sides
83.9	6,392	0.0019	1.27	53.31	**Channel Flow, Channel Flow** Area= 42.0 sf Perim= 21.4' r= 1.96' n= 0.080 Earth, long dense weeds
326.2	13,961	Total			

Subcatchment 1S: catchment area



Summary for Pond 2P: Storage and outlet

Inflow Area = 930.100 ac, 0.00% Impervious, Inflow Depth = 0.90" for 25-Year event
Inflow = 99.11 cfs @ 17.03 hrs, Volume= 69.982 af
Outflow = 33.44 cfs @ 25.09 hrs, Volume= 65.686 af, Atten= 66%, Lag= 483.9 min
Primary = 33.44 cfs @ 25.09 hrs, Volume= 65.686 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 581.51' @ 25.09 hrs Surf.Area= 36.633 ac Storage= 39.921 af
Flood Elev= 584.40' Surf.Area= 56.474 ac Storage= 109.544 af

Plug-Flow detention time= 799.2 min calculated for 65.676 af (94% of inflow)
Center-of-Mass det. time= 761.6 min (1,960.6 - 1,199.1)

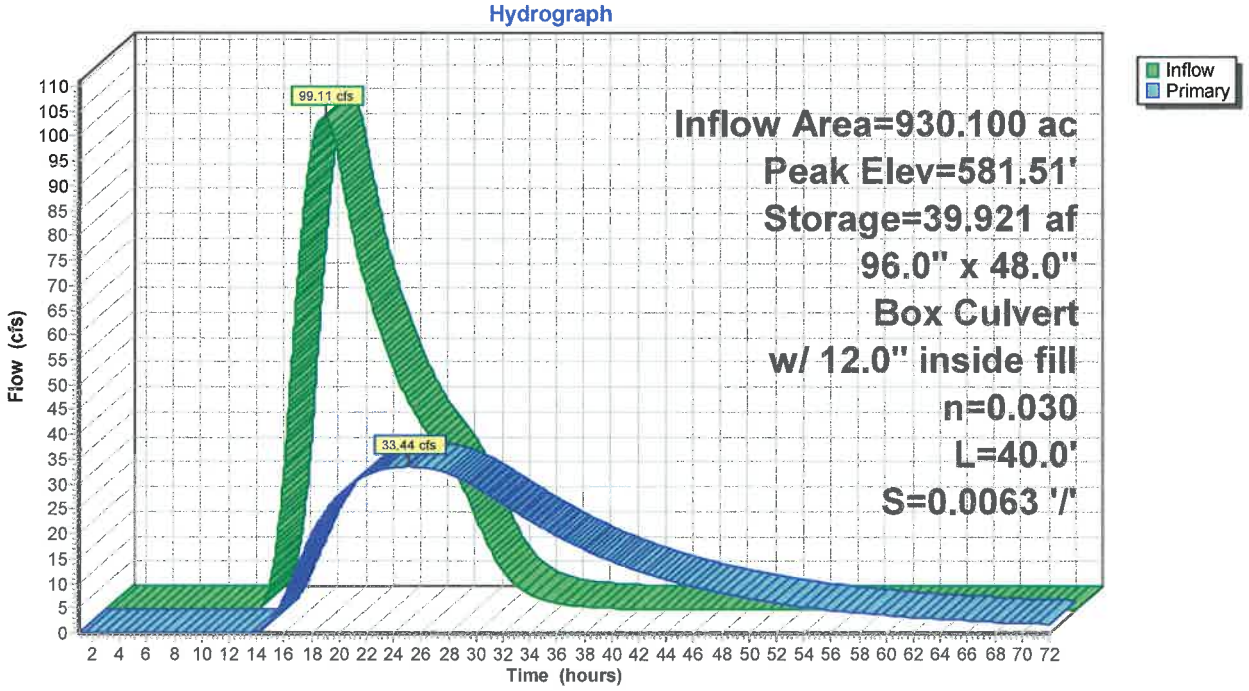
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	109.544 af	**Upstream Storage Area (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
580.00	16.417	0.000	0.000
581.00	29.796	23.107	23.107
582.00	43.302	36.549	59.655
583.00	56.474	49.888	109.544

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**96.0" W x 48.0" H Box Culvert w/ 12.0" inside fill** L= 40.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 579.00' / 578.75' S= 0.0063 '/' Cc= 0.900 n= 0.030 Stream, clean & straight, Flow Area= 24.00 sf

Primary OutFlow Max=33.44 cfs @ 25.09 hrs HW=581.51' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 33.44 cfs @ 3.70 fps)

Pond 2P: Storage and outlet



Stage-Discharge for Pond 2P: Storage and outlet

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
580.00	0.00	582.60	76.12
580.05	0.13	582.65	78.32
580.10	0.42	582.70	80.54
580.15	0.83	582.75	82.78
580.20	1.34	582.80	85.04
580.25	1.93	582.85	87.31
580.30	2.61	582.90	89.61
580.35	3.35	582.95	91.93
580.40	4.17	583.00	94.27
580.45	5.04	583.05	96.62
580.50	5.97	583.10	98.99
580.55	6.96	583.15	101.38
580.60	8.00	583.20	103.79
580.65	9.08	583.25	106.22
580.70	10.21	583.30	108.67
580.75	11.38	583.35	111.13
580.80	12.60	583.40	113.61
580.85	13.85	583.45	116.11
580.90	15.14	583.50	118.63
580.95	16.47	583.55	121.16
581.00	17.83	583.60	123.71
581.05	19.23	583.65	126.28
581.10	20.67	583.70	128.87
581.15	22.13	583.75	131.47
581.20	23.63	583.80	134.09
581.25	25.15	583.85	136.72
581.30	26.71	583.90	139.37
581.35	28.30	583.95	142.04
581.40	29.91	584.00	132.57
581.45	31.55	584.05	135.19
581.50	33.23	584.10	137.77
581.55	34.92	584.15	140.30
581.60	36.65	584.20	142.78
581.65	38.40	584.25	145.22
581.70	40.17	584.30	147.62
581.75	41.97	584.35	149.98
581.80	43.80	584.40	**152.31**
581.85	45.65		
581.90	47.52		
581.95	49.42		
582.00	51.34		
582.05	53.29		
582.10	55.25		
582.15	57.24		
582.20	59.26		
582.25	61.29		
582.30	63.34		
582.35	65.42		
582.40	67.52		
582.45	69.64		
582.50	71.78		
582.55	73.94		

Stage-Area-Storage for Pond 2P: Storage and outlet

Elevation (feet)	Surface (acres)	Storage (acre-feet)
580.00	16.417	0.000
580.05	17.086	0.838
580.10	17.755	1.709
580.15	18.424	2.613
580.20	19.093	3.551
580.25	19.762	4.522
580.30	20.431	5.527
580.35	21.100	6.565
580.40	21.769	7.637
580.45	22.438	8.742
580.50	23.107	9.881
580.55	23.775	11.053
580.60	24.444	12.258
580.65	25.113	13.497
580.70	25.782	14.770
580.75	26.451	16.076
580.80	27.120	17.415
580.85	27.789	18.788
580.90	28.458	20.194
580.95	29.127	21.633
581.00	29.796	23.107
581.05	30.471	24.613
581.10	31.147	26.154
581.15	31.822	27.728
581.20	32.497	29.336
581.25	33.173	30.978
581.30	33.848	32.653
581.35	34.523	34.362
581.40	35.198	36.105
581.45	35.874	37.882
581.50	36.549	39.693
581.55	37.224	41.537
581.60	37.900	43.415
581.65	38.575	45.327
581.70	39.250	47.273
581.75	39.925	49.252
581.80	40.601	51.265
581.85	41.276	53.312
581.90	41.951	55.393
581.95	42.627	57.507
582.00	43.302	59.655
582.05	43.961	61.837
582.10	44.619	64.052
582.15	45.278	66.299
582.20	45.936	68.579
582.25	46.595	70.893
582.30	47.254	73.239
582.35	47.912	75.618
582.40	48.571	78.030
582.45	49.229	80.475
582.50	49.888	82.953
582.55	50.547	85.464
582.60	51.205	88.008
582.65	51.864	90.584
582.70	52.522	93.194
582.75	53.181	95.837
582.80	53.840	98.512
582.85	54.498	101.221
582.90	55.157	103.962
582.95	55.815	106.736
583.00	**56.474**	**109.544**
583.05	56.474	109.544
583.10	56.474	109.544
583.15	56.474	109.544
583.20	56.474	109.544
583.25	56.474	109.544
583.30	56.474	109.544
583.35	56.474	109.544
583.40	56.474	109.544
583.45	56.474	109.544
583.50	56.474	109.544
583.55	56.474	109.544
583.60	56.474	109.544
583.65	56.474	109.544
583.70	56.474	109.544
583.75	56.474	109.544
583.80	56.474	109.544
583.85	56.474	109.544
583.90	56.474	109.544
583.95	56.474	109.544
584.00	56.474	109.544
584.05	56.474	109.544
584.10	56.474	109.544
584.15	56.474	109.544
584.20	56.474	109.544
584.25	56.474	109.544
584.30	56.474	109.544
584.35	56.474	109.544
584.40	56.474	109.544

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: catchment area Runoff Area=930.100 ac 0.00% Impervious Runoff Depth=1.39"
Flow Length=13,961' Tc=326.2 min CN=50 Runoff=160.83 cfs 107.433 af

Pond 2P: Storage and outlet Peak Elev=582.02' Storage=60.637 af Inflow=160.83 cfs 107.433 af
96.0" x 48.0" Box Culvert w/ 12.0" inside fill n=0.030 L=40.0' S=0.0063 '/' Outflow=52.22 cfs 102.183 af

Total Runoff Area = 930.100 ac Runoff Volume = 107.433 af Average Runoff Depth = 1.39"
100.00% Pervious = 930.100 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: catchment area

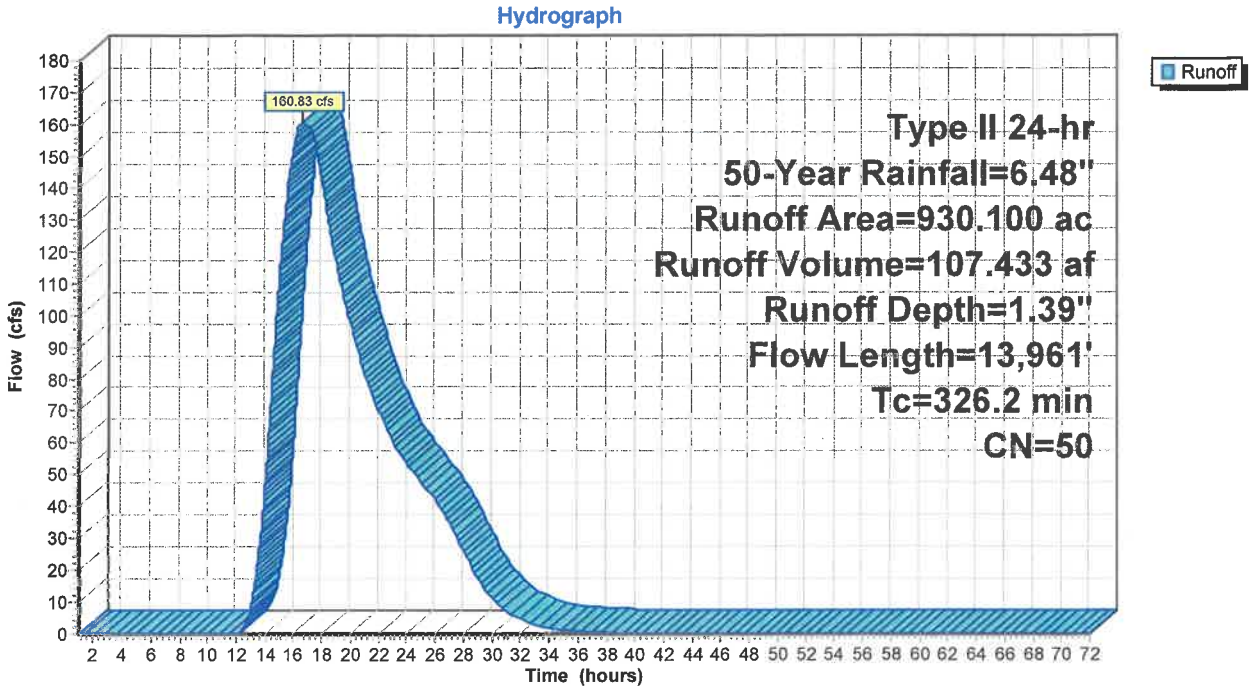
Runoff = 160.83 cfs @ 16.67 hrs, Volume= 107.433 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-Year Rainfall=6.48"

	Area (ac)	CN	Description
*	78.800	58	NH Areas
*	851.300	49	ME Areas
	930.100	50	Weighted Average
	930.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
189.6	300	0.0133	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 1.00"
10.8	696	0.1840	1.07		**Shallow Concentrated Flow, Shallow Conc Flow** Forest w/Heavy Litter Kv= 2.5 fps
4.9	442	0.0905	1.50		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.3	1,306	0.0567	1.19		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.7	4,825	0.0257	4.31	17.24	**Channel Flow, Channel Flow** Area= 4.0 sf Perim= 6.5' r= 0.62' n= 0.040 Earth, cobble bottom, clean sides
83.9	6,392	0.0019	1.27	53.31	**Channel Flow, Channel Flow** Area= 42.0 sf Perim= 21.4' r= 1.96' n= 0.080 Earth, long dense weeds
326.2	13,961	Total			

Subcatchment 1S: catchment area



Summary for Pond 2P: Storage and outlet

Inflow Area = 930.100 ac, 0.00% Impervious, Inflow Depth = 1.39" for 50-Year event
Inflow = 160.83 cfs @ 16.67 hrs, Volume= 107.433 af
Outflow = 52.22 cfs @ 24.13 hrs, Volume= 102.183 af, Atten= 68%, Lag= 447.6 min
Primary = 52.22 cfs @ 24.13 hrs, Volume= 102.183 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 582.02' @ 24.13 hrs Surf.Area= 43.599 ac Storage= 60.637 af
Flood Elev= 584.40' Surf.Area= 56.474 ac Storage= 109.544 af

Plug-Flow detention time= 778.4 min calculated for 102.169 af (95% of inflow)
Center-of-Mass det. time= 747.2 min (1,929.6 - 1,182.5)

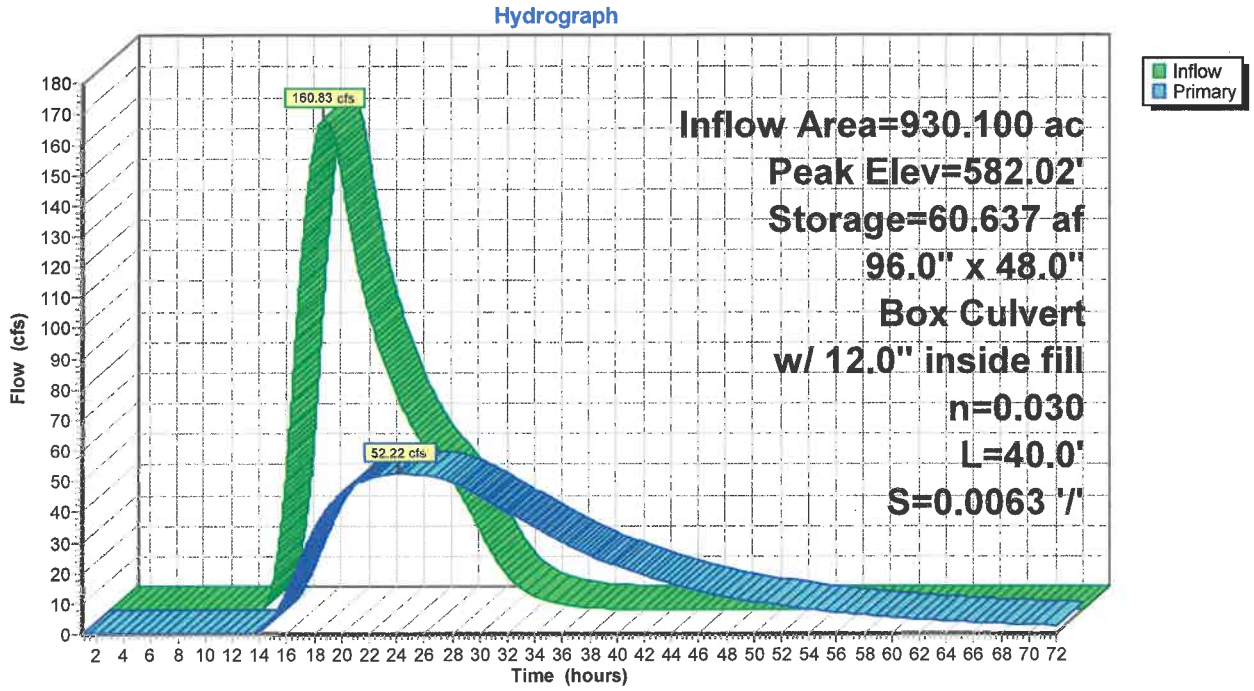
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	109.544 af	**Upstream Storage Area (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
580.00	16.417	0.000	0.000
581.00	29.796	23.107	23.107
582.00	43.302	36.549	59.655
583.00	56.474	49.888	109.544

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**96.0" W x 48.0" H Box Culvert w/ 12.0" inside fill** L= 40.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 579.00' / 578.75' S= 0.0063 '/' Cc= 0.900 n= 0.030 Stream, clean & straight, Flow Area= 24.00 sf

Primary OutFlow Max=52.22 cfs @ 24.13 hrs HW=582.02' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 52.22 cfs @ 4.30 fps)

Pond 2P: Storage and outlet



Stage-Discharge for Pond 2P: Storage and outlet

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
580.00	0.00	582.60	76.12
580.05	0.13	582.65	78.32
580.10	0.42	582.70	80.54
580.15	0.83	582.75	82.78
580.20	1.34	582.80	85.04
580.25	1.93	582.85	87.31
580.30	2.61	582.90	89.61
580.35	3.35	582.95	91.93
580.40	4.17	583.00	94.27
580.45	5.04	583.05	96.62
580.50	5.97	583.10	98.99
580.55	6.96	583.15	101.38
580.60	8.00	583.20	103.79
580.65	9.08	583.25	106.22
580.70	10.21	583.30	108.67
580.75	11.38	583.35	111.13
580.80	12.60	583.40	113.61
580.85	13.85	583.45	116.11
580.90	15.14	583.50	118.63
580.95	16.47	583.55	121.16
581.00	17.83	583.60	123.71
581.05	19.23	583.65	126.28
581.10	20.67	583.70	128.87
581.15	22.13	583.75	131.47
581.20	23.63	583.80	134.09
581.25	25.15	583.85	136.72
581.30	26.71	583.90	139.37
581.35	28.30	583.95	142.04
581.40	29.91	584.00	132.57
581.45	31.55	584.05	135.19
581.50	33.23	584.10	137.77
581.55	34.92	584.15	140.30
581.60	36.65	584.20	142.78
581.65	38.40	584.25	145.22
581.70	40.17	584.30	147.62
581.75	41.97	584.35	149.98
581.80	43.80	584.40	**152.31**
581.85	45.65		
581.90	47.52		
581.95	49.42		
582.00	51.34		
582.05	53.29		
582.10	55.25		
582.15	57.24		
582.20	59.26		
582.25	61.29		
582.30	63.34		
582.35	65.42		
582.40	67.52		
582.45	69.64		
582.50	71.78		
582.55	73.94		

Stage-Area-Storage for Pond 2P: Storage and outlet

Elevation (feet)	Surface (acres)	Storage (acre-feet)
580.00	16.417	0.000
580.05	17.086	0.838
580.10	17.755	1.709
580.15	18.424	2.613
580.20	19.093	3.551
580.25	19.762	4.522
580.30	20.431	5.527
580.35	21.100	6.565
580.40	21.769	7.637
580.45	22.438	8.742
580.50	23.107	9.881
580.55	23.775	11.053
580.60	24.444	12.258
580.65	25.113	13.497
580.70	25.782	14.770
580.75	26.451	16.076
580.80	27.120	17.415
580.85	27.789	18.788
580.90	28.458	20.194
580.95	29.127	21.633
581.00	29.796	23.107
581.05	30.471	24.613
581.10	31.147	26.154
581.15	31.822	27.728
581.20	32.497	29.336
581.25	33.173	30.978
581.30	33.848	32.653
581.35	34.523	34.362
581.40	35.198	36.105
581.45	35.874	37.882
581.50	36.549	39.693
581.55	37.224	41.537
581.60	37.900	43.415
581.65	38.575	45.327
581.70	39.250	47.273
581.75	39.925	49.252
581.80	40.601	51.265
581.85	41.276	53.312
581.90	41.951	55.393
581.95	42.627	57.507
582.00	43.302	59.655
582.05	43.961	61.837
582.10	44.619	64.052
582.15	45.278	66.299
582.20	45.936	68.579
582.25	46.595	70.893
582.30	47.254	73.239
582.35	47.912	75.618
582.40	48.571	78.030
582.45	49.229	80.475
582.50	49.888	82.953
582.55	50.547	85.464
582.60	51.205	88.008
582.65	51.864	90.584
582.70	52.522	93.194
582.75	53.181	95.837
582.80	53.840	98.512
582.85	54.498	101.221
582.90	55.157	103.962
582.95	55.815	106.736
583.00	56.474	109.544
583.05	56.474	109.544
583.10	56.474	109.544
583.15	56.474	109.544
583.20	56.474	109.544
583.25	56.474	109.544
583.30	56.474	109.544
583.35	56.474	109.544
583.40	56.474	109.544
583.45	56.474	109.544
583.50	56.474	109.544
583.55	56.474	109.544
583.60	56.474	109.544
583.65	56.474	109.544
583.70	56.474	109.544
583.75	56.474	109.544
583.80	56.474	109.544
583.85	56.474	109.544
583.90	56.474	109.544
583.95	56.474	109.544
584.00	56.474	109.544
584.05	56.474	109.544
584.10	56.474	109.544
584.15	56.474	109.544
584.20	56.474	109.544
584.25	56.474	109.544
584.30	56.474	109.544
584.35	56.474	109.544
584.40	56.474	109.544

Time span=1.00-72.00 hrs, dt=0.01 hrs, 7101 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: catchment area Runoff Area=930.100 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=13,961' Tc=326.2 min CN=50 Runoff=248.04 cfs 158.558 af

Pond 2P: Storage and outlet Peak Elev=582.63' Storage=89.676 af Inflow=248.04 cfs 158.558 af
96.0" x 48.0" Box Culvert w/ 12.0" inside fill n=0.030 L=40.0' S=0.0063 '/' Outflow=77.54 cfs 152.116 af

Total Runoff Area = 930.100 ac Runoff Volume = 158.558 af Average Runoff Depth = 2.05"
100.00% Pervious = 930.100 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: catchment area

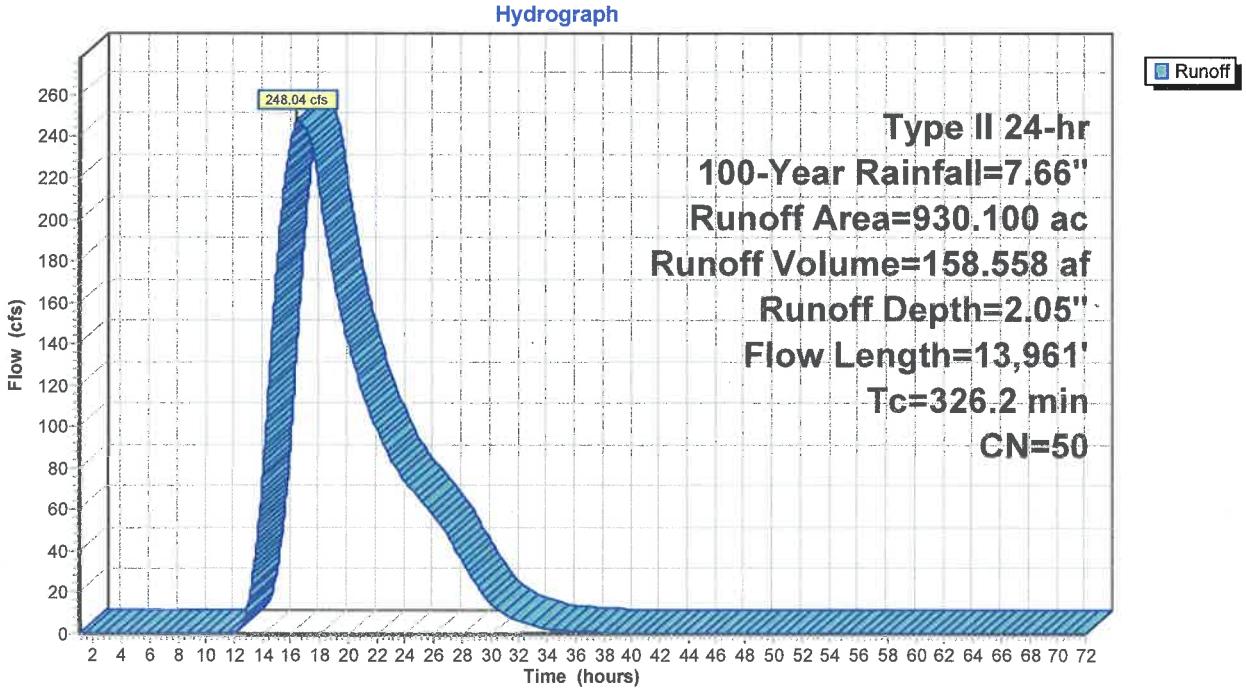
Runoff = 248.04 cfs @ 16.32 hrs, Volume= 158.558 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=7.66"

	Area (ac)	CN	Description
*	78.800	58	NH Areas
*	851.300	49	ME Areas
	930.100	50	Weighted Average
	930.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
189.6	300	0.0133	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 1.00"
10.8	696	0.1840	1.07		**Shallow Concentrated Flow, Shallow Conc Flow** Forest w/Heavy Litter Kv= 2.5 fps
4.9	442	0.0905	1.50		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.3	1,306	0.0567	1.19		**Shallow Concentrated Flow, Shallow Conc Flow** Woodland Kv= 5.0 fps
18.7	4,825	0.0257	4.31	17.24	**Channel Flow, Channel Flow** Area= 4.0 sf Perim= 6.5' r= 0.62' n= 0.040 Earth, cobble bottom, clean sides
83.9	6,392	0.0019	1.27	53.31	**Channel Flow, Channel Flow** Area= 42.0 sf Perim= 21.4' r= 1.96' n= 0.080 Earth, long dense weeds
326.2	13,961	Total			

Subcatchment 1S: catchment area



Summary for Pond 2P: Storage and outlet

Inflow Area = 930.100 ac, 0.00% Impervious, Inflow Depth = 2.05" for 100-Year event
Inflow = 248.04 cfs @ 16.32 hrs, Volume= 158.558 af
Outflow = 77.54 cfs @ 23.55 hrs, Volume= 152.116 af, Atten= 69%, Lag= 434.0 min
Primary = 77.54 cfs @ 23.55 hrs, Volume= 152.116 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 582.63' @ 23.55 hrs Surf.Area= 51.633 ac Storage= 89.676 af
Flood Elev= 584.40' Surf.Area= 56.474 ac Storage= 109.544 af

Plug-Flow detention time= 771.7 min calculated for 152.116 af (96% of inflow)
Center-of-Mass det. time= 744.7 min (1,913.7 - 1,169.0)

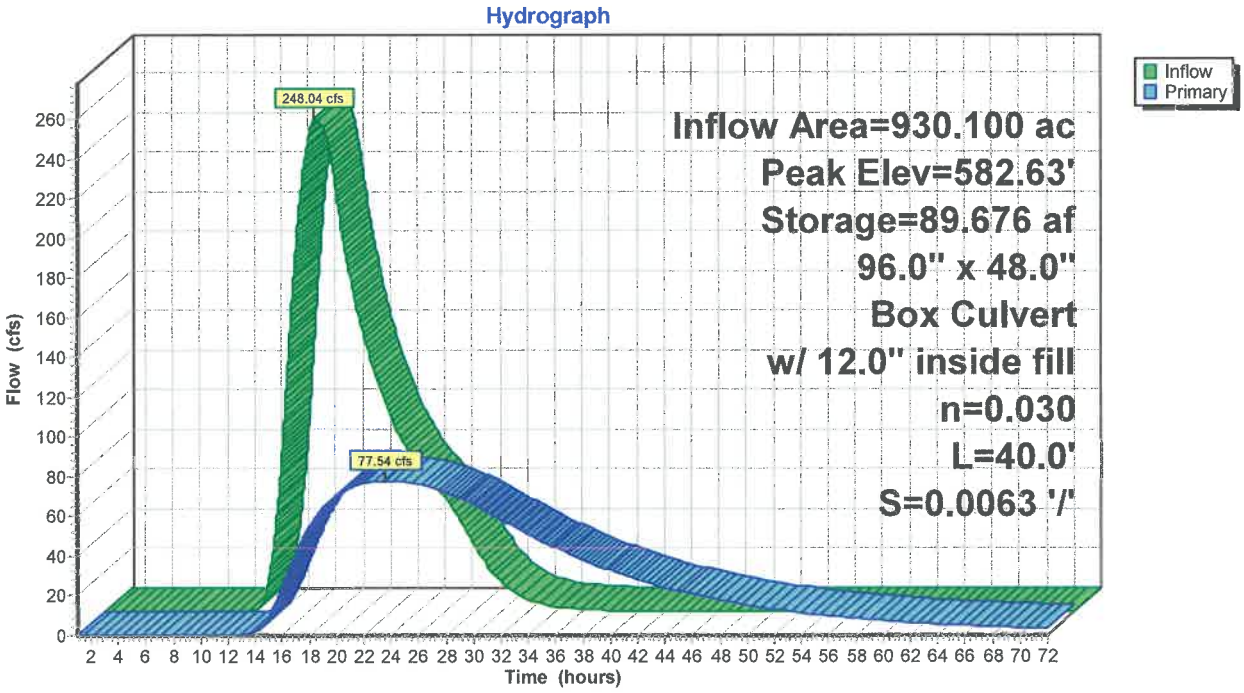
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	109.544 af	**Upstream Storage Area (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
580.00	16.417	0.000	0.000
581.00	29.796	23.107	23.107
582.00	43.302	36.549	59.655
583.00	56.474	49.888	109.544

Device	Routing	Invert	Outlet Devices
#1	Primary	580.00'	**96.0" W x 48.0" H Box Culvert w/ 12.0" inside fill** L= 40.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 579.00' / 578.75' S= 0.0063 '/' Cc= 0.900 n= 0.030 Stream, clean & straight, Flow Area= 24.00 sf

Primary OutFlow Max=77.54 cfs @ 23.55 hrs HW=582.63' (Free Discharge)
1=Culvert (Barrel Controls 77.54 cfs @ 4.91 fps)

Pond 2P: Storage and outlet



Stage-Discharge for Pond 2P: Storage and outlet

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
580.00	0.00	582.60	76.12
580.05	0.13	582.65	78.32
580.10	0.42	582.70	80.54
580.15	0.83	582.75	82.78
580.20	1.34	582.80	85.04
580.25	1.93	582.85	87.31
580.30	2.61	582.90	89.61
580.35	3.35	582.95	91.93
580.40	4.17	583.00	94.27
580.45	5.04	583.05	96.62
580.50	5.97	583.10	98.99
580.55	6.96	583.15	101.38
580.60	8.00	583.20	103.79
580.65	9.08	583.25	106.22
580.70	10.21	583.30	108.67
580.75	11.38	583.35	111.13
580.80	12.60	583.40	113.61
580.85	13.85	583.45	116.11
580.90	15.14	583.50	118.63
580.95	16.47	583.55	121.16
581.00	17.83	583.60	123.71
581.05	19.23	583.65	126.28
581.10	20.67	583.70	128.87
581.15	22.13	583.75	131.47
581.20	23.63	583.80	134.09
581.25	25.15	583.85	136.72
581.30	26.71	583.90	139.37
581.35	28.30	583.95	142.04
581.40	29.91	584.00	132.57
581.45	31.55	584.05	135.19
581.50	33.23	584.10	137.77
581.55	34.92	584.15	140.30
581.60	36.65	584.20	142.78
581.65	38.40	584.25	145.22
581.70	40.17	584.30	147.62
581.75	41.97	584.35	149.98
581.80	43.80	584.40	**152.31**
581.85	45.65		
581.90	47.52		
581.95	49.42		
582.00	51.34		
582.05	53.29		
582.10	55.25		
582.15	57.24		
582.20	59.26		
582.25	61.29		
582.30	63.34		
582.35	65.42		
582.40	67.52		
582.45	69.64		
582.50	71.78		
582.55	73.94		

Stage-Area-Storage for Pond 2P: Storage and outlet

Elevation (feet)	Surface (acres)	Storage (acre-feet)
580.00	16.417	0.000
580.05	17.086	0.838
580.10	17.755	1.709
580.15	18.424	2.613
580.20	19.093	3.551
580.25	19.762	4.522
580.30	20.431	5.527
580.35	21.100	6.565
580.40	21.769	7.637
580.45	22.438	8.742
580.50	23.107	9.881
580.55	23.775	11.053
580.60	24.444	12.258
580.65	25.113	13.497
580.70	25.782	14.770
580.75	26.451	16.076
580.80	27.120	17.415
580.85	27.789	18.788
580.90	28.458	20.194
580.95	29.127	21.633
581.00	29.796	23.107
581.05	30.471	24.613
581.10	31.147	26.154
581.15	31.822	27.728
581.20	32.497	29.336
581.25	33.173	30.978
581.30	33.848	32.653
581.35	34.523	34.362
581.40	35.198	36.105
581.45	35.874	37.882
581.50	36.549	39.693
581.55	37.224	41.537
581.60	37.900	43.415
581.65	38.575	45.327
581.70	39.250	47.273
581.75	39.925	49.252
581.80	40.601	51.265
581.85	41.276	53.312
581.90	41.951	55.393
581.95	42.627	57.507
582.00	43.302	59.655
582.05	43.961	61.837
582.10	44.619	64.052
582.15	45.278	66.299
582.20	45.936	68.579
582.25	46.595	70.893
582.30	47.254	73.239
582.35	47.912	75.618
582.40	48.571	78.030
582.45	49.229	80.475
582.50	49.888	82.953
582.55	50.547	85.464
582.60	51.205	88.008
582.65	51.864	90.584
582.70	52.522	93.194
582.75	53.181	95.837
582.80	53.840	98.512
582.85	54.498	101.221
582.90	55.157	103.962
582.95	55.815	106.736
583.00	**56.474**	**109.544**
583.05	56.474	109.544
583.10	56.474	109.544
583.15	56.474	109.544
583.20	56.474	109.544
583.25	56.474	109.544
583.30	56.474	109.544
583.35	56.474	109.544
583.40	56.474	109.544
583.45	56.474	109.544
583.50	56.474	109.544
583.55	56.474	109.544
583.60	56.474	109.544
583.65	56.474	109.544
583.70	56.474	109.544
583.75	56.474	109.544
583.80	56.474	109.544
583.85	56.474	109.544
583.90	56.474	109.544
583.95	56.474	109.544
584.00	56.474	109.544
584.05	56.474	109.544
584.10	56.474	109.544
584.15	56.474	109.544
584.20	56.474	109.544
584.25	56.474	109.544
584.30	56.474	109.544
584.35	56.474	109.544
584.40	56.474	109.544

StreamStats Report for Province Lak Culvert located on NH 153 in Wakefield

Region ID:	NH
Workspace ID:	NH20191216172729401000
Clicked Point (Latitude, Longitude):	43.68303, -70.98140
Time:	2019-12-16 12:27:45 -0500

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.45	square miles
CONIF	Percentage of land surface covered by coniferous forest	13.9763	percent
PREBC0103	Mean annual precipitation of basin centroid for January 1 to March 15 winter period	8.66	inches
BSLDEM30M	Mean basin slope computed from 30 m DEM	10.718	percent
MIXFOR	Percentage of land area covered by mixed deciduous and coniferous forest	41.2004	percent
PREG_03_05	Mean precipitation at gaging station location for March 16 to May 31 spring period	9.8	inches
TEMP	Mean Annual Temperature	43.998	degrees F
TEMP_06_10	Basinwide average temperature for June to October summer period	60.396	degrees F
PREG_06_10	Mean precipitation at gaging station location for June to October summer period	18.5	inches
ELEVMAX	Maximum basin elevation	1165.542	feet
APRAVPRE	Mean April Precipitation	4.391	inches
WETLAND	Percentage of Wetlands	10.0113	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	72.1	feet per mi
PRECIPOUT	Mean annual precip at the stream outlet (based on annual PRISM precip data in inches from 1971-2000)	46	inches
MINTEMP_W	Mean winter minimum air temperature over basin surface area	12.159	degrees F
SNOFALL	Mean Annual Snowfall	80.675	inches
PREBC_1112	Mean annual precipitation of basin centroid for November 1 to December 31 period	9.29	inches
PRECIPCENT	Mean Annual Precip at Basin Centroid	46.6	inches

Seasonal Flow Statistics Parameters[Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.45	square miles	3.26	689
CONIF	Percent Coniferous Forest	13.9763	percent	3.07	56.2

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PREBC0103	Jan to Mar Basin Centroid Precip	8.66	inches	5.79	15.1
BSLDEM30M	Mean Basin Slope from 30m DEM	10.718	percent	3.19	38.1
MIXFOR	Percent Mixed Forest	41.2004	percent	6.21	46.1
PREG_03_05	Mar to May Gage Precipitation	9.8	inches	6.83	11.5
TEMP	Mean Annual Temperature	43.998	degrees F	36	48.7
TEMP_06_10	Jun to Oct Mean Basinwide Temp	60.396	degrees F	52.9	64.4
PREG_06_10	Jun to Oct Gage Precipitation	18.5	inches	16.5	23.1
ELEVMAX	Maximum Basin Elevation	1165.542	feet	260	6290

Seasonal Flow Statistics Disclaimers[Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Seasonal Flow Statistics Flow Report[Low Flow Statewide]

Statistic	Value	Unit
Jan to Mar15 60 Percent Flow	1.12	ft^3/s
Jan to Mar15 70 Percent Flow	0.943	ft^3/s
Jan to Mar15 80 Percent Flow	0.8	ft^3/s
Jan to Mar15 90 Percent Flow	0.582	ft^3/s
Jan to Mar15 95 Percent Flow	0.456	ft^3/s
Jan to Mar15 98 Percent Flow	0.363	ft^3/s
Jan to Mar15 7 Day 2 Year Low Flow	0.768	ft^3/s
Jan to Mar15 7 Day 10 Year Low Flow	0.413	ft^3/s
Mar16 to May 60 Percent Flow	3.07	ft^3/s
Mar16 to May 70 Percent Flow	2.41	ft^3/s
Mar16 to May 80 Percent Flow	1.77	ft^3/s
Mar16 to May 90 Percent Flow	1.24	ft^3/s
Mar16 to May 95 Percent Flow	0.906	ft^3/s
Mar16 to May 98 Percent Flow	0.623	ft^3/s
Mar16 to May 7 Day 2 Year Low Flow	1.05	ft^3/s
Mar16 to May 7 Day 10 Year Low Flow	0.567	ft^3/s
Jun to Oct 60 Percent Flow	0.208	ft^3/s
Jun to Oct 70 Percent Flow	0.148	ft^3/s
Jun to Oct 80 Percent Flow	0.102	ft^3/s
Jun to Oct 90 Percent Flow	0.0613	ft^3/s
Jun to Oct 95 Percent Flow	0.0402	ft^3/s
Jun to Oct 98 Percent Flow	0.0329	ft^3/s
Jun to Oct 7 Day 2 Year Low Flow	0.071	ft^3/s
Jun to Oct 7 Day 10 Year Low Flow	0.022	ft^3/s
Nov to Dec 60 Percent Flow	1.36	ft^3/s
Nov to Dec 70 Percent Flow	1.03	ft^3/s
Nov to Dec 80 Percent Flow	0.77	ft^3/s
Nov to Dec 90 Percent Flow	0.49	ft^3/s
Nov to Dec 95 Percent Flow	0.311	ft^3/s
Nov to Dec 98 Percent Flow	0.185	ft^3/s
Oct to Nov 7 Day 2 Year Low Flow	0.739	ft^3/s
Oct to Nov 7 Day 10 Year Low Flow	0.29	ft^3/s

Seasonal Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Flow-Duration Statistics Parameters[Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.45	square miles	3.26	689
PREG_06_10	Jun to Oct Gage Precipitation	18.5	inches	16.5	23.1
TEMP	Mean Annual Temperature	43.998	degrees F	36	48.7

Flow-Duration Statistics Disclaimers[Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Flow-Duration Statistics Flow Report[Low Flow Statewide]

Statistic	Value	Unit
60 Percent Duration	0.745	ft^3/s
70 Percent Duration	0.49	ft^3/s
80 Percent Duration	0.27	ft^3/s
90 Percent Duration	0.128	ft^3/s
95 Percent Duration	0.0748	ft^3/s
98 Percent Duration	0.044	ft^3/s

Flow-Duration Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Low-Flow Statistics Parameters[Low Flow Statewide]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.45	square miles	3.26	689
TEMP	Mean Annual Temperature	43.998	degrees F	36	48.7
PREG_06_10	Jun to Oct Gage Precipitation	18.5	inches	16.5	23.1

Low-Flow Statistics Disclaimers[Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Low Flow Statewide]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0706	ft^3/s
7 Day 10 Year Low Flow	0.0217	ft^3/s

Low-Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (http://pubs.water.usgs.gov/wrir02-4298)

Peak-Flow Statistics Parameters[Peak Flow Statewide SIR2008 5206]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.45	square miles	0.7	1290
APRAVPRE	Mean April Precipitation	4.391	inches	2.79	6.23
WETLAND	Percent Wetlands	10.0113	percent	0	21.8
CSL10_85	Stream Slope 10 and 85 Method	72.1	feet per mi	5.43	543

Peak-Flow Statistics Flow Report[Peak Flow Statewide SIR2008 5206]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp	Equiv. Yrs.
2 Year Peak Flood	46.7	ft^3/s	28.5	76.3	30.1	3.2
5 Year Peak Flood	82.7	ft^3/s	49.9	137	31.1	4.7
10 Year Peak Flood	114	ft^3/s	67.4	193	32.3	6.2
25 Year Peak Flood	157	ft^3/s	90	276	34.3	8
50 Year Peak Flood	194	ft^3/s	108	351	36.4	9
100 Year Peak Flood	239	ft^3/s	128	447	38.6	9.8
500 Year Peak Flood	352	ft^3/s	174	713	44.1	11

Peak-Flow Statistics Citations

Olson, S.A.,2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S.Geological Survey Scientific Investigations Report 2008-5206, 57 p. (http://pubs.usgs.gov/sir/2008/5206/)

Recharge Statistics Parameters[Groundwater Recharge Statewide 2004 5019]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PRECIPOUT	Mean Annual Precip at Gage	46	inches	35.83	53.11
TEMP	Mean Annual Temperature	43.998	degrees F	36.05	48.69
MINTEMP_W	Mean Winter Min Temperature	12.159	degrees F	0.8	19.88
CONIF	Percent Coniferous Forest	13.9763	percent	3.07	56.18
PREG_03_05	Mar to May Gage Precipitation	9.8	inches	6.83	11.54
SNOFALL	Mean Annual Snowfall	80.675	inches	54.46	219.07
PREG_06_10	Jun to Oct Gage Precipitation	18.5	inches	16.46	23.11
MIXFOR	Percent Mixed Forest	41.2004	percent	6.21	46.13
PREBC_1112	Nov to Dec Basin Centroid Precip	9.29	inches	6.57	15.2
PRECIPCENT	Mean Annual Precip at Basin Centroid	46.6	inches	37.44	75.91

Recharge Statistics Flow Report[Groundwater Recharge Statewide 2004 5019]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SEp
GW_Recharge_Jan_to_Mar15	5.34	in	15.5
GW_Recharge_Mar16_to_May	8.7	in	12.4
GW_Recharge_Jun_to_Oct	2.91	in	26.5
GW_Recharge_Nov_to_Dec	4.34	in	15.8
GW_Recharge_Ann	23.1	in	12.4

Recharge Statistics Citations

Flynn, R.H. and Tasker, G.D.,2004, Generalized Estimates from Streamflow Data of Annual and Seasonal Ground-Water-Recharge Rates for Drainage Basins in New Hampshire, U.S. Geological Survey Scientific Investigations Report 2004-5019, 67 p. (http://pubs.usgs.gov/sir/2004/5019/http://pubs.usgs.gov/sir/2004/5019/)

Application Version: 4.3.11

USGS Soils Information

New Hampshire					
Soil Type	Area (SF)	Area (AC)	CN	Comment	Area (AC)*CN
Type A	84263.53	1.9	36	Woods and Brush	69.64
	238977.36	5.5	30	Woods and Brush	164.58
	498310.13	11.4	36	Brush and Woods	411.83
Type AD	316368.5	7.3	73	Brush	530.19
	30799.74	0.7	73	Brush	51.62
Type B	309335.06	7.1	48	Brush	340.87
	378238.86	8.7	55	Woods and Brush	477.57
	150881.09	3.5	55	Brush	190.51
	149478.69	3.4	55	Brush and Woods	188.74
	30127.72	0.7	55	Brush	38.04
Type C	753065.95	17.3	73	Brush and Woods	1262.03
	232384.17	5.3	70	Woods and Brush	373.44
	40209.51	0.9	80	Brush and Impervious	73.85
Type D	218532.14	5.0	73	Brush	366.23
NH Total Area (SF)=	3430972.45		Sum of Area * CN =		4539.11
NH Total Area (AC)=	78.764				
NH Composite CN =	57.63	Area * CN)/Total Area			

Maine					
Soil Type	Area (SF)	Area (AC)	CN	Comment	Area (AC)*CN
Type A	139725	3.21	30	Woods	96.23
	3937.81	0.09	35	Woods and Brush	3.16
	230146.09	5.28	35	Woods and Brush	184.92
	3578471.37	82.15	35	Woods and Brush	2875.26
	2064563.8	47.40	35	Woods and Brush	1658.86
	408450.26	9.38	35	Woods and Brush	328.19
	1232931.51	28.30	35	Woods and Brush	990.65
	51557.11	1.18	35	Woods and Brush	41.43
	183697.74	4.22	35	Woods and Brush	147.60
	237667.83	5.46	35	Woods and Brush	190.96
	438647.57	10.07	35	Woods and Brush	352.45
	502945.92	11.55	35	Woods and Brush	404.11
	349409.25	8.02	35	Woods and Brush	280.75
	2053795.45	47.15	35	Woods and Brush	1650.20
	115006.59	2.64	35	Woods and Brush	92.41
Type A	442657.53	10.16	35	Woods and Fields	355.67

Soil Type	Area (SF)	Area (AC)	CN	Comment	Area (AC)*CN
	671247.35	15.41	35	Woods and Brush	539.34
	955593.17	21.94	30	Woods	658.12
	118062.76	2.71	30	Woods	81.31
	413286.79	9.49	30	Woods	284.63
	98263.58	2.26	30	Woods	67.67
	213175.6	4.89	35	Woods and Brush	171.28
	295016.27	6.77	35	Woods and Brush	237.04
	1370427.91	31.46	35	Woods and Brush	1101.12
	186629.2	4.28	35	Woods and Brush	149.95
	359621.46	8.26	35	Woods and Brush	288.95
	70461.2	1.62	35	Woods and Brush	56.61
	264917.66	6.08	30	Brush	182.45
	248738.88	5.71	35	Brush and Woods	199.86
	279165.04	6.41	30	Woods	192.26
	317499.89	7.29	35	Brush and Woods	255.11
	293868.38	6.75	35	Brush and Woods	236.12
	3057569.37	70.19	35	Brush and Woods	2456.72
	41480.44	0.95	35	Brush and Woods	33.33
	98804.5	2.27	30	Brush	68.05
	1611301.62	36.99	30	Woods	1109.71
	340031.6	7.81	35	Woods and Brush	273.21
	46029.19	1.06	35	Woods and Brush	36.98
	229551	5.27	35	Brush and Woods	184.44
	35193.04	0.81	35	Brush and Woods	28.28
	6731.98	0.15	30	Brush	4.64
Surface Rock	187238.2	4.30	98	Rock	421.24
Type B/D	162023.73	3.72	77	Brush	286.41
Type C	620617.62	14.25	73	Woods and Brush	1040.06
	213792.61	4.91	70	Woods	343.56
Type CD	150371	3.45	79	Woods and Field	272.71
	194870.11	4.47	77	Woods	344.47
	284905.9	6.54	77	Woods	503.62
	159141.11	3.65	73	Brush	266.70
	350057.92	8.04	73	Brush	586.64
	318165.22	7.30	77	Brush and Woods	562.41
	101847.51	2.34	73	Brush	170.68
	122602.76	2.81	73	Brush	205.46
	1512855.32	34.73	77	Woods and Brush	2674.24
	238459.06	5.47	77	Woods	421.52
Type D	44249.78	1.02	77	Woods and Brush	78.22
	22553.52	0.52	77	Woods and Brush	39.87
Type D	171581.55	3.94	73	Brush	287.54
	85336.99	1.96	73	Brush	143.01

Soil Type	Area (SF)	Area (AC)	CN	Comment	Area (AC)*CN
	259394.54	5.95	77	Woods	458.53
	842377.12	19.34	77	Woods	1489.05
	283437.46	6.51	77	Woods	501.03
	247478.1	5.68	73	Brush and Woods	414.74
	88104.68	2.02	77	Woods and Brush	155.74
	128505.81	2.95	77	Woods and Brush	227.16
	268854.1	6.17	77	Woods	475.25
	168129.45	3.86	77	Woods	297.20
	314845.72	7.23	77	Woods and Brush	556.55
	441433.02	10.13	77	Woods and Brush	780.31
	400933.29	9.20	73	Brush and Woods	671.90
	2563.7	0.06	73	Brush and Woods	4.30
Type AD	4506613.81	103.46	73	Brush	7552.41
	534042.07	12.26	73	Brush	894.97
ME Total Area (SF) =	37083661.49		Sum of Area * CN =		41677.55
ME Total Area (AC) =	851.3				
ME Composite CN =	48.96				
Total Area (AC) =	930.1				
Total AREA (SQ MI) =	1.45				
Total Composite CN =	49.7				

Flow Path for Time of Concentration

Sheet Flow (first 300 LF)			
Elevation Top (fT)	Elevation Bottom (FT)	Length (FT)	Slope
862	858	300	1.33%

Shallow Concentrated Flow			
Elevation Top (fT)	Elevation Bottom (FT)	Length (FT)	Slope
858	730	695.808418	18.40%
730	690	441.792393	9.05%
690	616	1305.989326	5.67%

Channel Flow			
Elevation Top (fT)	Elevation Bottom (FT)	Length (FT)	Slope
616	492	4824.551826	2.57%
492	480	6391.176935	0.19%

Elevation	Area (SF)	Area (AC)
580	715119.112	16.417
581	1297935.39	29.796
582	1886213.418	43.302
583	2460025.771	56.474

Type II

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.983 degrees West
Latitude	43.682 degrees North
Elevation	0 feet
Date/Time	Fri, 20 Dec 2019 14:35:32 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.48	0.63	0.78	1.00	1yr	0.68	0.95	1.16	1.49	1.92	2.49	2.80	1yr	2.21	2.69	3.15	3.84	4.40	1yr
2yr	0.31	0.48	0.60	0.79	0.99	1.25	2yr	0.85	1.15	1.46	1.85	2.35	3.00	3.36	2yr	2.65	3.23	3.73	4.47	5.11	2yr
5yr	0.37	0.57	0.72	0.96	1.23	1.57	5yr	1.06	1.43	1.83	2.32	2.94	3.73	4.24	5yr	3.30	4.08	4.69	5.53	6.26	5yr
10yr	0.41	0.64	0.81	1.11	1.44	1.86	10yr	1.24	1.68	2.18	2.76	3.49	4.40	5.07	10yr	3.90	4.88	5.58	6.49	7.31	10yr
25yr	0.48	0.77	0.98	1.35	1.79	2.32	25yr	1.54	2.09	2.73	3.47	4.38	5.49	6.42	25yr	4.86	6.18	7.03	8.04	8.96	25yr
50yr	0.55	0.87	1.12	1.57	2.11	2.76	50yr	1.82	2.46	3.25	4.13	5.20	6.48	7.68	50yr	5.74	7.39	8.37	9.45	10.47	50yr
100yr	0.61	0.99	1.28	1.82	2.49	3.28	100yr	2.15	2.91	3.87	4.92	6.17	7.66	9.19	100yr	6.78	8.84	9.97	11.12	12.23	100yr
200yr	0.70	1.15	1.48	2.13	2.93	3.89	200yr	2.53	3.44	4.60	5.84	7.32	9.06	11.01	200yr	8.02	10.58	11.89	13.08	14.30	200yr
500yr	0.84	1.38	1.79	2.61	3.66	4.89	500yr	3.16	4.30	5.78	7.35	9.18	11.32	13.97	500yr	10.02	13.43	15.00	16.23	17.59	500yr

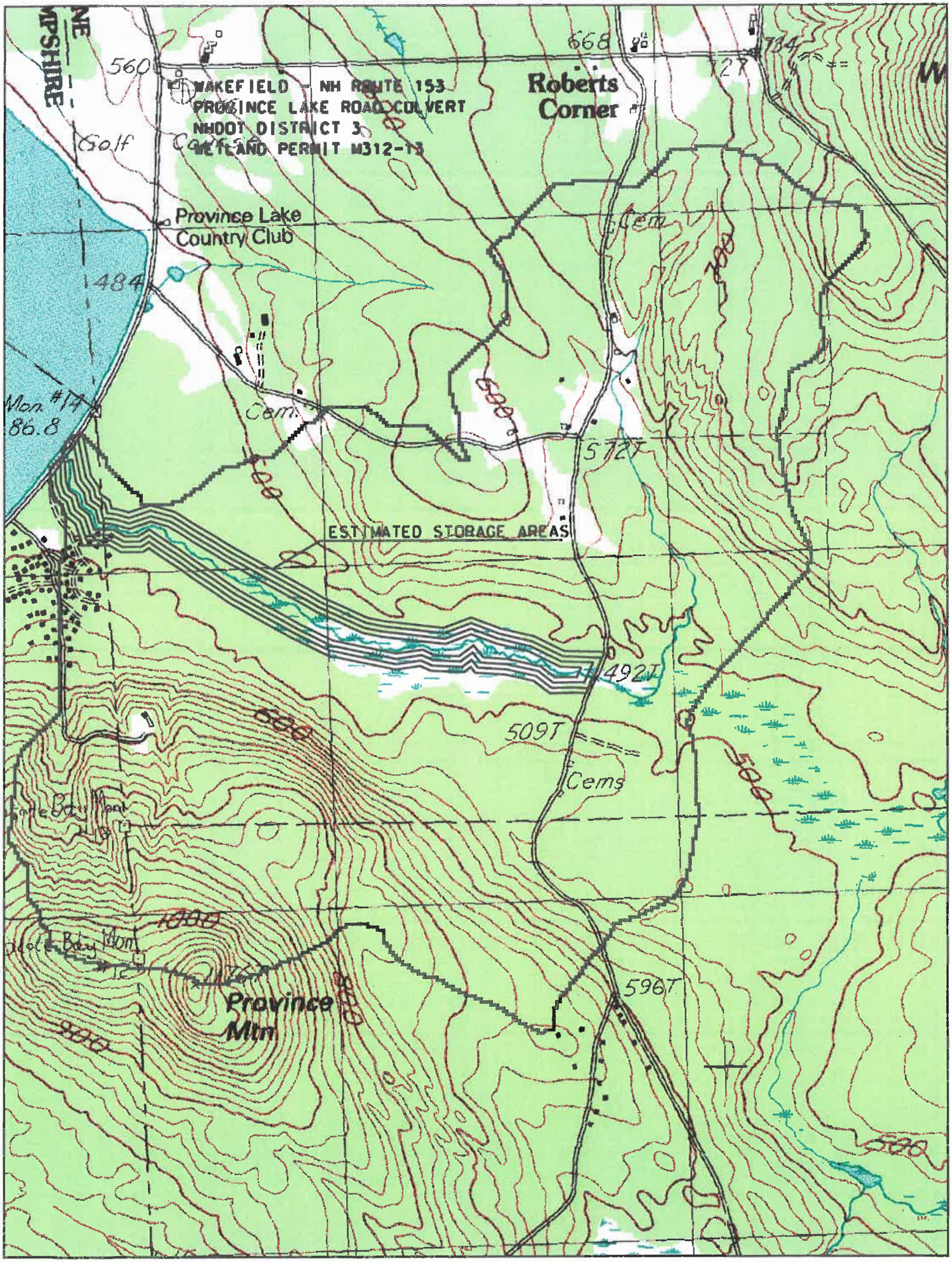
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.22	0.35	0.42	0.57	0.70	0.85	1yr	0.60	0.84	0.96	1.26	1.33	2.10	2.44	1yr	1.86	2.35	2.72	3.26	3.62	1yr
2yr	0.30	0.46	0.57	0.77	0.95	1.15	2yr	0.82	1.12	1.31	1.75	2.24	2.87	3.23	2yr	2.54	3.11	3.60	4.28	4.90	2yr
5yr	0.34	0.52	0.65	0.89	1.14	1.36	5yr	0.98	1.33	1.55	2.04	2.66	3.34	3.81	5yr	2.95	3.67	4.27	5.11	5.82	5yr
10yr	0.37	0.58	0.71	1.00	1.29	1.55	10yr	1.11	1.51	1.76	2.29	2.99	3.74	4.29	10yr	3.31	4.13	4.83	5.78	6.50	10yr
25yr	0.43	0.65	0.81	1.16	1.53	1.84	25yr	1.32	1.80	2.07	2.67	3.41	4.33	4.98	25yr	3.83	4.79	5.69	6.33	7.33	25yr
50yr	0.48	0.72	0.90	1.29	1.74	2.10	50yr	1.50	2.06	2.35	2.99	3.75	4.82	5.57	50yr	4.27	5.35	6.45	7.00	8.15	50yr
100yr	0.53	0.80	1.00	1.45	1.98	2.40	100yr	1.71	2.35	2.67	3.35	4.13	5.36	6.20	100yr	4.75	5.97	7.30	7.75	9.08	100yr
200yr	0.59	0.88	1.12	1.62	2.26	2.75	200yr	1.95	2.69	3.05	3.75	4.53	5.95	6.89	200yr	5.27	6.62	8.28	8.56	10.13	200yr
500yr	0.68	1.01	1.30	1.89	2.69	3.32	500yr	2.32	3.25	3.62	4.37	5.10	6.80	7.92	500yr	6.02	7.61	9.75	9.75	11.71	500yr

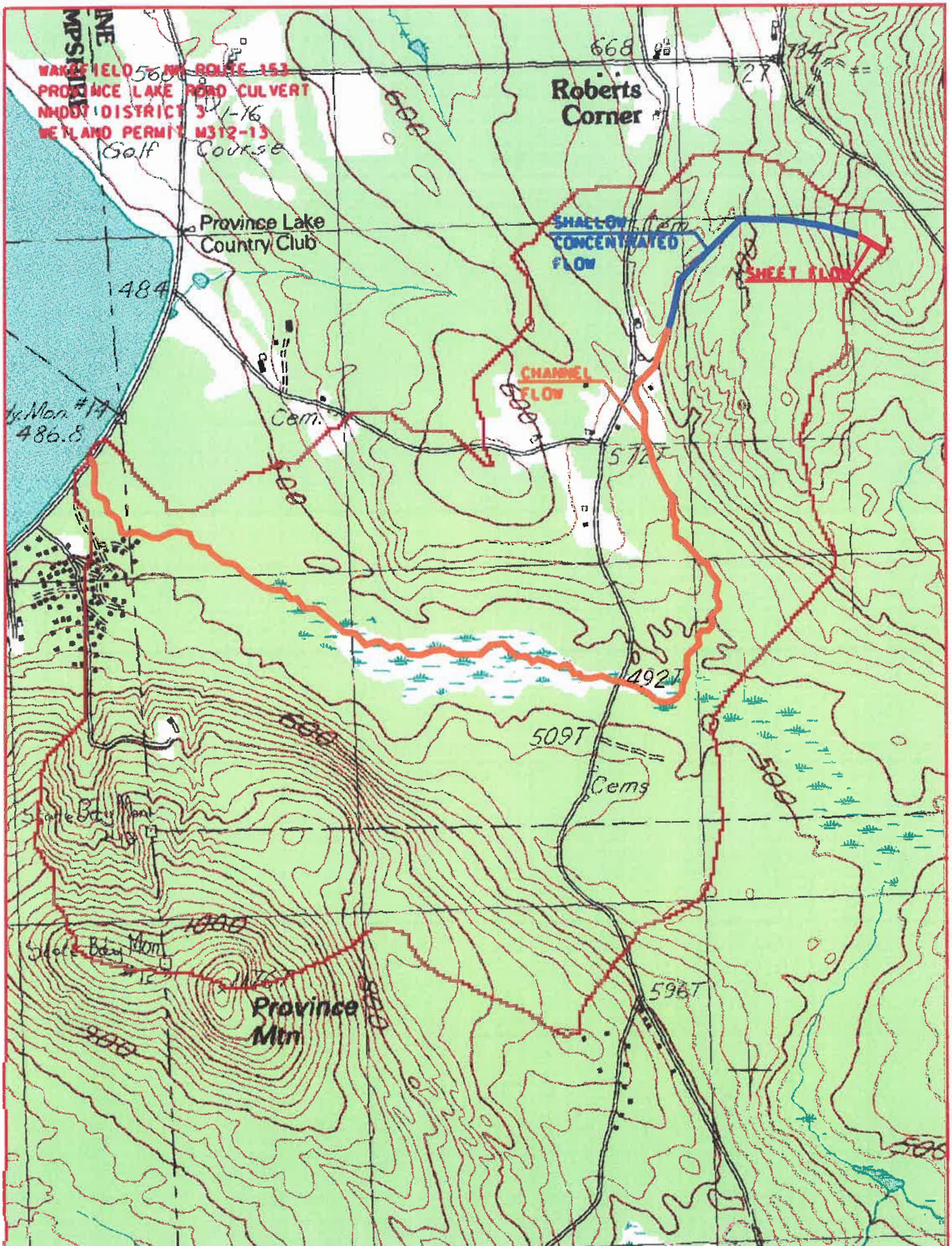
Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.42	0.52	0.69	0.85	1.06	1yr	0.74	1.03	1.21	1.64	2.06	2.75	3.13	1yr	2.43	3.01	3.47	4.18	4.77	1yr
2yr	0.32	0.50	0.61	0.83	1.02	1.23	2yr	0.88	1.20	1.41	1.89	2.48	3.15	3.56	2yr	2.79	3.42	3.94	4.71	5.36	2yr
5yr	0.39	0.60	0.75	1.03	1.31	1.56	5yr	1.13	1.52	1.81	2.43	3.13	4.15	4.65	5yr	3.67	4.47	5.12	5.93	6.67	5yr
10yr	0.46	0.71	0.88	1.23	1.59	1.88	10yr	1.38	1.84	2.19	2.96	3.81	5.11	5.75	10yr	4.52	5.53	6.33	7.13	7.97	10yr
25yr	0.58	0.89	1.10	1.58	2.07	2.43	25yr	1.79	2.37	2.82	3.86	4.97	6.77	7.63	25yr	5.99	7.34	8.34	9.98	10.12	25yr
50yr	0.69	1.05	1.31	1.88	2.53	2.93	50yr	2.19	2.87	3.42	4.71	6.10	8.39	9.49	50yr	7.42	9.13	10.30	12.26	13.12	50yr
100yr	0.83	1.25	1.56	2.26	3.10	3.55	100yr	2.67	3.47	4.15	5.76	7.49	10.41	11.81	100yr	9.22	11.36	12.72	15.10	15.94	100yr
200yr	0.98	1.48	1.88	2.72	3.79	4.30	200yr	3.27	4.20	5.04	7.04	9.22	12.94	14.72	200yr	11.45	14.15	15.73	18.62	19.35	200yr
500yr	1.24	1.85	2.38	3.46	4.92	5.54	500yr	4.25	5.41	6.49	9.20	12.13	17.26	19.65	500yr	15.27	18.90	20.82	24.57	25.04	500yr

Powered by ACIS Northeast Regional Climate Center



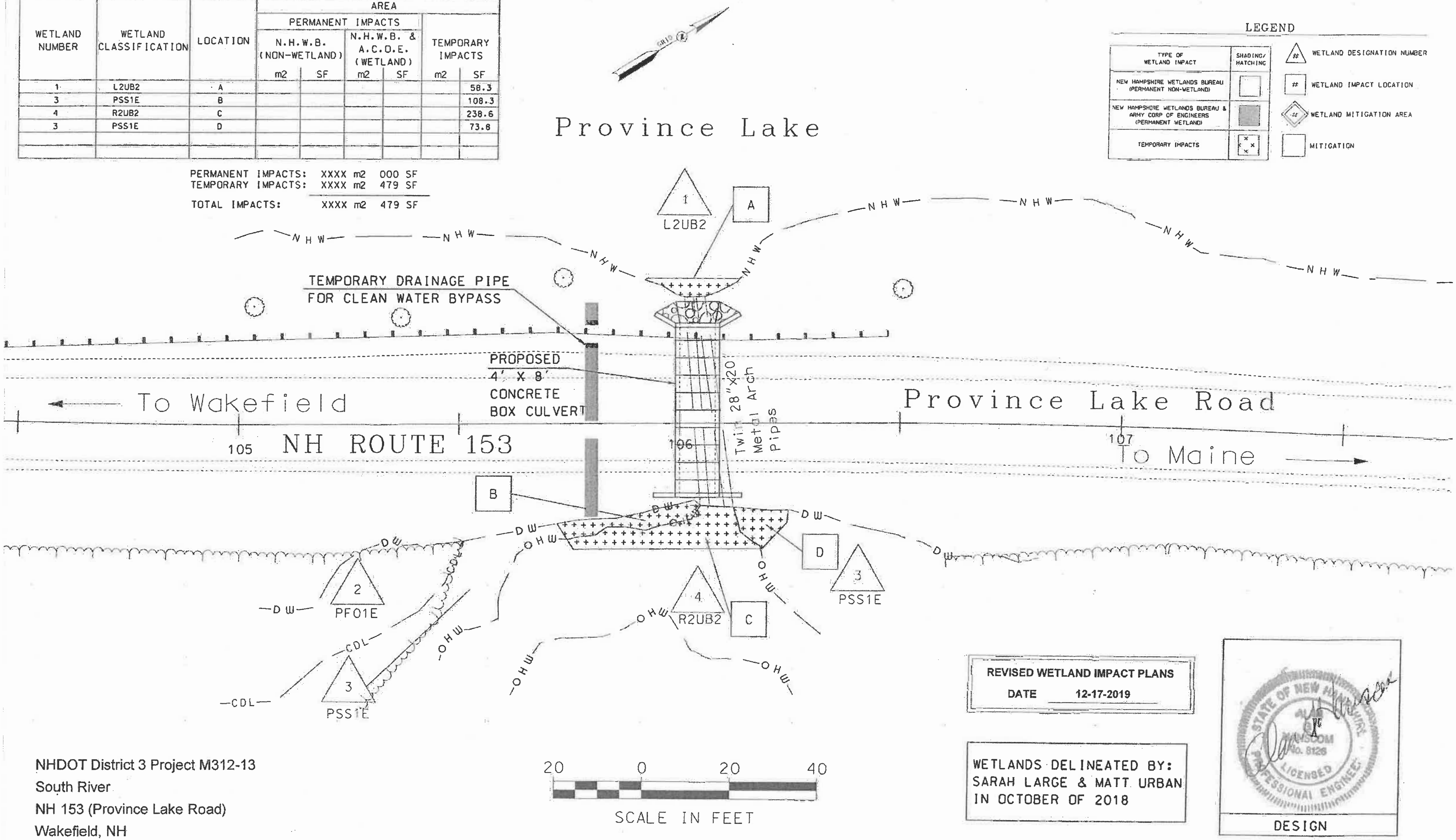
WAKEFIELD - NH ROUTE 153
PROVINCE LAKE ROAD CULVERT
NHDOT DISTRICT 3
WETLAND PERMIT M312-13
Roberts Corner
Province Lake
Country Club
Golf Course
ESTIMATED STORAGE AREAS
Province Mtn
Cem
Cems
Mon #14
86.8
560
668
727
484
572T
492T
509T
596T


WAKEFIELD NH ROUTE 153
PROVINCE LAKE ROAD CULVERT
NHDOT DISTRICT 3
WETLAND PERMIT M312-13
Roberts
Corner
Golf Course
Province Lake
Country Club
SHALLOW CONCENTRATED FLOW
SHEET FLOW
CHANNEL FLOW
Cem.
Province
Mtn
484
572T
492T
509T
596T
Cems
668
727
734

WETLAND IMPACT SUMMARY

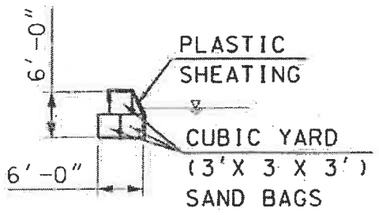
WETLAND NUMBER	WETLAND CLASSIFICATION	LOCATION	AREA: PERMANENT IMPACTS: N.H.W.B. (NON-WETLAND) m2	SF	N.H.W.B. & A.C.O.E. (WETLAND) m2	SF	TEMPORARY IMPACTS m2	SF
1	L2UB2	A						58.3
3	PSS1E	B						108.3
4	R2UB2	C						238.6
3	PSS1E	D						73.8

PERMANENT IMPACTS: XXXX m2 000 SF
TEMPORARY IMPACTS: XXXX m2 479 SF
TOTAL IMPACTS: XXXX m2 479 SF

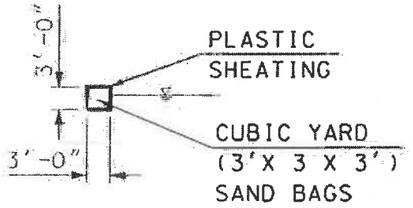


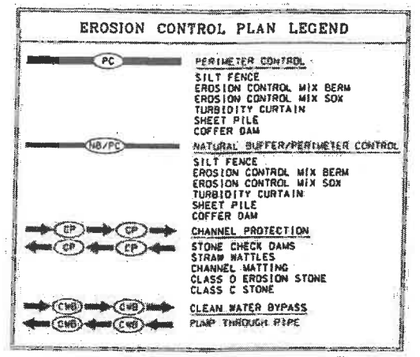
NHDOT District 3 Project M312-13
South River
NH 153 (Province Lake Road)
Wakefield, NH

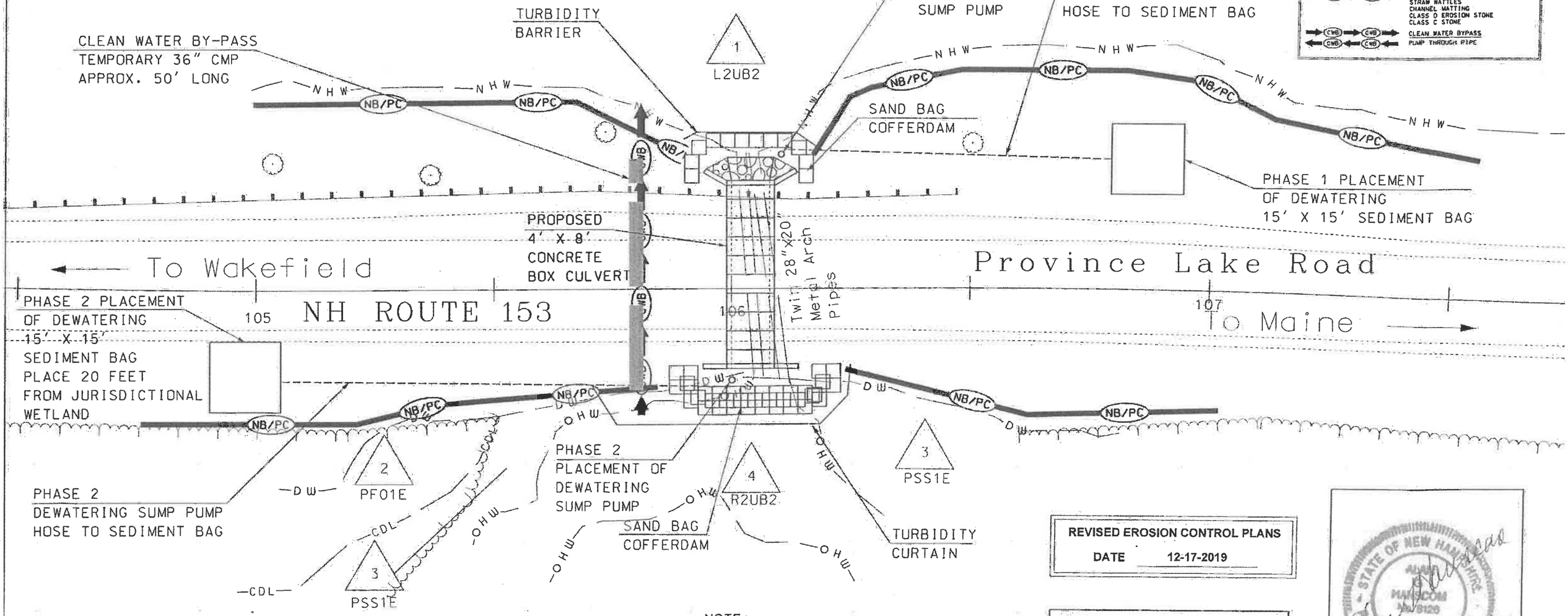
UPSTREAM COFFERDAM



DOWNSTREAM COFFERDAM







NHDOT District 3 Project M312-13
South River
NH 153 (Province Lake Road)
Wakefield, NH

20 0 20 40
SCALE IN FEET

NOTE:
COFFERDAMS AND TURBIDITY BARRIER WILL ALSO BE USED TO INSTALL THE TEMPORARY DRAINAGE PIPE.

REVISED EROSION CONTROL PLANS
DATE 12-17-2019

WETLANDS DELINEATED BY:
SARAH LARGE & MATT URBAN
IN OCTOBER OF 2018

DESIGN