U.S. General Services Administration

DRAFT ENVIRONMENTAL ASSESSMENT

Norton Land Port of Entry

Norton, Vermont

September 2025

GSA

APPENDIX A—WETLANDS AND WATERBODIES DELINEATION REPORT

Wetlands and Waterbodies Delineation Report

Norton Land Port of Entry
Town of Norton
Essex County, Vermont

January 21, 2025

Prepared for:

United States General Services Administration

Prepared by:

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List of Abbreviations and Acronyms

CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
GSA	U.S. General Services Administration
HUC	Hydrologic Unit Code
LPOE	Land Port of Entry
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	Ordinary High-Water Mark
PEM	Palustrine Emergent
PFO	Palustrine Forested
QA/QC	Quality Assurance/Quality Control
USACE	U.S. Army Corps of Engineers
VANR	Vermont Agency of Natural Resources
Vermont DEC	Vermont Department of Environmental Conservation
VSA	Vermont Statutes Annotated
VSWI	Vermont Significant Wetland Inventory Map
VTrans	Vermont Agency of Transportation
WSP	WSP USA, Inc.

1 Introduction and Study Area Description

This report presents the results of a wetlands and waterbodies delineation effort undertaken by WSP USA, Inc. (WSP) on behalf of the United States General Services Administration (GSA). WSP conducted fieldwork to determine the presence and extent of freshwater wetlands and/or waterbodies on a Study Area comprised of portions of nine land parcels in the town of Norton, Essex County, Vermont. The fieldwork was conducted on October 21, 2023 and April 17, 2024.

The fieldwork was performed in support of proposed improvements to the Norton Land Port of Entry (LPOE), along VT Route 114, at the United States – Canada border. The GSA proposes to reconfigure, expand, and fully modernize the Norton LPOE, which is exclusively occupied by the Department of Homeland Security. The parcels that comprised the Study Area are listed below in Table 1-1.

Table 1-1 – Study Area Parcels

GSA #	Tax Parcel Identifier	Acreage
1	447-141-10213	0.25
2	447-141-10223	0.5
3	447-141-10239	0.25
4	447-141-10005	0.5
6	447-141-10085	11.63
8	447-141-10214	1
9	447-141-10153	0.22
10a	447-141-10233	1.2
USA	LPOE	
n/a	VTrans ROW	4.3
	Total Study Area Acres	**19.85**

The Norton LPOE faces north onto Vermont State Highway 114 adjacent to the town of Norton, VT, and directly below the Canada border where the intersection of route 114 bisects into Route 147 northward into Canada.
The Study Area is located on the *Norton, Vermont – Norton OE N* 7.5-Minute series quadrangle (USGS 2019) (Figure 1), centering approximately at the following coordinates (WGS 1984):

	"x"	*"y"*
Geodetic:	-71.792008° West	45.009320° North
NAD 1983 State Plane Vermont FIPS 4400 Feet	1,823,525 meters East	915,478 meters North

Additional details are provided in Appendix A (Figures), Appendix B (Photographs and Wetland Determination Data Forms), and Appendix C (Wetlands and Waterbodies Delineation Map).

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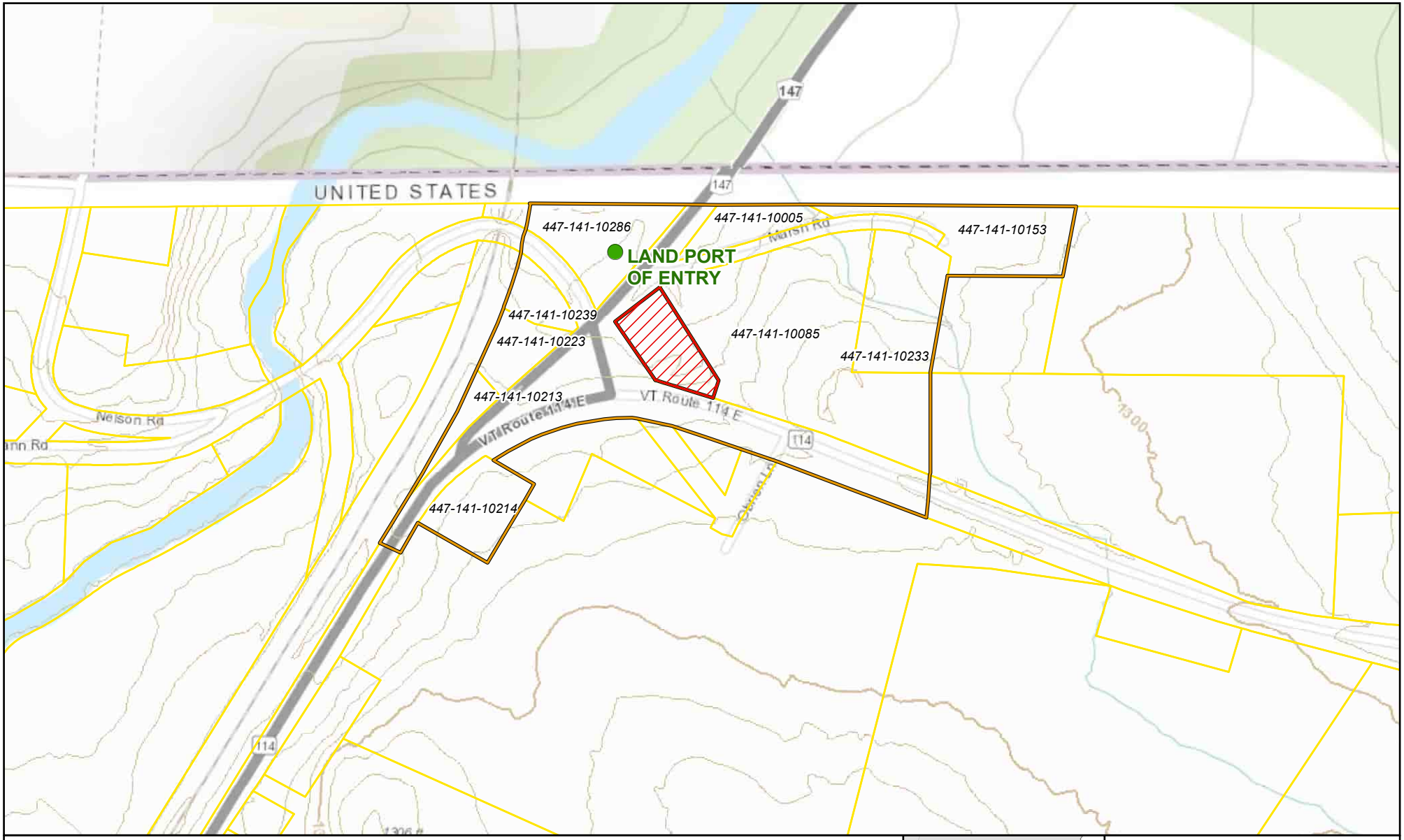

- Norton Land Port of Entry
- Norton Study Area
- Parcel Boundaries
- Excluded Parcel
- U.S. / Canada Border

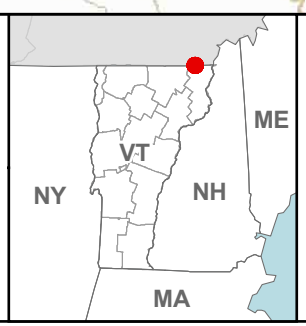

Figure 1
Project Location
Norton LPOE
Essex County, VT

0 200 400 Feet

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Data Sources: ESRI World Imagery Map 2021

2 Regulatory Review and Permit Requirements

2.1 Clean Water Act

Certain activities that may impact waters of the United States require authorization under Sections 404 and 401 of the Clean Water Act (CWA). Waters of the United States, including federal jurisdictional wetlands, are defined by 33 Code of Federal Regulations Section 328, Part 328.3. The U.S. Army Corps of Engineers (USACE) New England District is the agency responsible for issuing Section 404 permits in the Study Area.

Section 401 of the CWA requires state water quality certification or waiver for any federally permitted action involving discharges into waters of the United States to ensure the permitted action will not violate a state's water quality standards or impair designated uses. The Vermont Agency of Natural Resources (VANR) is the agency responsible for administering Vermont's Section 401 program.

2.2 The Vermont Statutes, Title 10, Chapter 037

The Vermont Statutes (VSA) Title 10, Chapter 37 subchapter 1 (10 V.S.A. § 901), Water Resources Management Policy, regulates activities that could impact protected watercourses within Vermont. Protected waters include all waters classified by the Vermont Department of Environmental Conservation (Vermont DEC) as wetlands, streams and all navigable waters. Chapter 27 of the Vermont Environmental Protection Rules covers disturbances of streambeds and banks and disposal of fill material and excavation in regulated waterbodies. An application for a permit per the Vermont Wetland Rules (VWR) is filed jointly with the USACE permit application.

Per Title 10 of the VSA, Chapter 37 subchapter 4 (10 V.S.A. § 913), Wetlands Determination and Protection, the Vermont DEC maintains a database of class I and II wetlands in the Vermont Significant Wetland Inventory Map (VSWI). However, the true extent of jurisdiction relies on the actual boundary of the wetland, which can differ from the mapped database boundary. Buffer zones of class II wetlands are 50ft while class I wetland buffer zones are 100ft, within which an applicant proposing an activity is advised to conduct field delineations to confirm the jurisdictional boundary and/or check with the local Vermont DEC regional office to identify the true jurisdictional extent of the mapped feature.

Chapter 30 of the VWR provides for regulation of certain activities that could adversely affect Class I freshwater wetlands, as well as smaller Class II wetlands identified by the Vermont DEC as having significant ecologic types, functions, or values. Activities that occur within 100 feet (approximately 30.5 meters) of a Vermont DEC Class I wetland boundary are also regulated. An application for a permit under Chapter 30 is filed jointly with the USACE permit application.

3 Methodology

3.1 Preliminary Data Review

Prior to fieldwork WSP reviewed federal and state agency resources for potential locations of wetlands and waterbodies in and near the Study Area. WSP accessed Natural Resources Conservation Services (NRCS) soil maps (USDA 2022), the Vermont DEC Significant Wetland Inventory (VSWI) (VANR 2023a), the National Wetlands Inventory (NWI) (USFWS 2022), the U.S. Environmental Protection Agency's WATERS GeoViewer (EPA 2022), the National Hydrography Dataset (USGS 2022), and current and historic ESRI aerial imagery. Most of this information is presented in Appendix A as Figure 2 Topographic map, Figure 3 Soils map, Figure 4 NWI and NHD Mapped Wetlands and Streams., and Appendix C as Figure 5 Delineated Features.

NRCS Mapped Soils – The soils mapped by the NRCS are listed below in Table 3-1.

Table 3-1 – Soils Mapped in the Study Area

Map Unit Symbol	Map Unit Name	Hydric Rating*
SIE11N	Cabot silt loam, 3 to 8 percent slopes	88
SIE32	Colonel-Peru complex, 8 to 15 percent slopes, very stony	12
SIE12N	Cabot-Colonel complex, 8 to 15 percent slopes	52
SIE21N	Wilmington-Colonel complex, 3 to 8 percent slopes	47
SIE21	Wilmington-Colonel complex, 0 to 8 percent slopes, very stony	50
SIE21N	Wilmington-Colonel complex, 3 to 8 percent slopes	47

*Hydric Rating refers to the percentage of a map unit that is comprised of hydric (wetland) soils.

Vermont DEC Wetlands - The Vermont DEC wetland classification system is described at Vt. Code R. 12 004 056 (VANR 2023). Essentially, Class I wetlands are offered the highest level of protection and Class III receive the lowest.

Vermont DEC Streams - The Vermont DEC maintains a database of stream maps and their classifications at the Rivers Management Program (VANR 2023c). The Study Area lies within the Lake Memphremagog Drainage Basin. The Vermont DEC Rivers Management Program Identified two state regulated streams within the Study Area.

NWI Wetlands - The NWI maps one Unknown Perennial Riverine Stream (map unit R5UBH) on parcels 447-141-10005, 447-141-10085, and 447-141-10233.

The Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts of 0.5 ppt or greater. A channel is an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water (FGDC 2013).

The NWI does not map any waterbodies such as ponds or lakes in the Study Area. The Coaticook River is located west of the Study Area and is mapped as a Riverine Upper Perennial waterbody.

Watershed – The Study Area is assigned by the U.S. Environmental Protection Agency (EPA) to the 12-digit Hydrologic Unit Code (HUC) 041505000601, the Headwaters Coaticook Rivers sub watershed. This sub watershed is within the St. Francois River basin, HUC 041505 (EPA 2022).

3.2 Wetland Delineation Methodology

The wetland delineation methodologies outlined in the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) (87 Manual), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0) (USACE 2011) (the Supplement), were applied to identify and delineate wetlands.

Wetland scientists used a hand-held Eos Arrow global positioning system (GPS) receiver capable of sub-meter accuracy was used to mark the wetland boundaries. The scientists photographed representative wetland and upland habitats and completed Wetland Determination Data Forms developed by the USACE. Although the wetland delineation occurred over two site visits, there were no wetland features delineated during the initial site visit and, therefore, no data forms from the initial site visit.

The three-parameter approach to identify and delineate wetlands presented in the 87 Manual and the Supplement requires that except for atypical and disturbed situations wetlands possess hydrophytic vegetation, hydric soils, and wetland

hydrology. The methods used to characterize and evaluate vegetation, soils, and hydrology are described below.

3.2.1 Vegetation

Sampling plots were established at representative wetland and upland points along the delineated boundary. Wetland scientists visually estimated species absolute percent cover to determine the total percent cover of each vegetation stratum. Vegetation scientific names and wetland indicator statuses conform to those listed in *The National Wetland Plant List:2020 Wetland Ratings, version 3.5* (USACE 2020). Per the 87 Manual and Supplement, an area is considered to support hydrophytic vegetation community if any of the following indicators are present at the sample site.

Indicator 1, Rapid Test for Hydrophytic Vegetation - All dominant species across all strata, based on the 50:20 rule, are rated as obligate (OBL) wetland plants and/or facultative wetland (FACW) plants.

Indicator 2, Dominance Test - More than 50 percent of the dominant plant species across all strata are rated OBL, FACW, or facultative (FAC).

Indicator 3, Prevalence Index - The result of the Prevalence Index is less than or equal to 3.0, in the absence of disturbed or problematic hydrology and/or soils.

Indicator 4, Morphological Adaptations - The plant community passes either the dominance test or the prevalence index after reconsideration of the indicator status of certain plant species that exhibit morphological adaptations for life in wetlands, in the absence of disturbed or problematic hydrology and/or soils.

3.2.2 Soils

The soil profile within each sampling plot was assessed for the presence of hydric soil indicators. A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994).

Soil borings were advanced with a hand-held shovel to depths of approximately 18 inches, unless otherwise restricted. Information collected at each soil profile included horizon depth and range, texture, color, and redoximorphic features. Colors of the soil matrix and any redoximorphic features were identified using standard notations in Munsell® soil color charts (Munsell Color 2009).

Hydric soil indicators established in the 1987 Manual, the Supplement, and in *Field Indicators of Hydric Soils in the United States, Version 8.2* (USDA-NRCS 2018) were used to determine the presence of characteristic soil morphologies resulting from prolonged saturation and/or inundation. Per *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin* (USDA-NRCS 2006), hydric soil indicators for Major Land Resource Area 143 (MLRA 143) of Land Resource Region R (LRR R) apply to the Survey Area.

Indicators that are not applicable to LRR R as a whole or specifically to MLRA 143 were not considered on Wetland Determination Data Forms.

3.2.3 Hydrology

The Supplement lists 18 primary and 11 secondary wetland hydrology indicators that apply to the Survey Area. Wetland hydrology exists if at least one primary indicator is present or, in the absence of primary indicators, at least two secondary indicators described in the Supplement are present.

3.3 Waterbody Identification Methodology

The limits of jurisdiction for non-tidal waters of the United States in the absence of adjacent wetlands is the ordinary high-water mark (OHWM) 33 CFR 328.4(c). The OHWM is established by observations of water fluctuation, physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the soil character, destruction of terrestrial vegetation, presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas [33 CFR 328.3(e)].

The flow regime of streams is based on the following definitions developed by the EPA for perennial, intermittent, and ephemeral streams.

Perennial - These are streams that typically have water flowing in them year-round. Most of the water comes from smaller upstream waters or groundwater, while runoff from rainfall or other precipitation is supplemental.

Intermittent - These are seasonal streams that flow during certain times of the year when smaller upstream waters are flowing and when groundwater provides enough water for stream flow. Runoff from rainfall or other precipitation supplements the flow of seasonal stream. During dry periods, intermittent streams may not have flowing surface water. Larger seasonal streams are more common in dry areas.

Ephemeral - These are rain-dependent streams that flow only after precipitation. Runoff from rainfall is the primary source of water for these streams. Like seasonal streams, they can be found anywhere but are most prevalent in arid areas.

Additional features included in delineations of waterbodies are anthropogenic ditches, natural drainages, and swales that lack a defined bed and bank and/or an OHWM. Other waterbodies such as ponds and lakes are delineated based upon visual evidence of normal pool elevation using many shoreline indicators used for stream OHWMs. Wetland scientists used a hand-held Eos Arrow GPS to delineate waterbodies, including ditches and drainages.

Presumed jurisdiction of ditches is based on the joint USACE and EPA definitions as follows (USACE and EPA 2007). Certain geographic features (e.g., ditches, canals) that transport relatively permanent (continuous at least seasonally) flow directly or indirectly into Traditional Navigable Waters or between two (or more) WOTUS, including wetlands, are jurisdictional waters regulated under the CWA.

Certain geographic features (e.g., swales, ditches, pipes) may contribute to a surface hydrologic connection where the features:

- Replace or relocate a water of the United States;
- Connect a water of the United States to another water of the United States; or
- Provide relatively permanent flow to a water of the United States.

Certain geographic features generally are not jurisdictional waters:

- Swales, erosional features (e.g., gullies), and small washes characterized by low volume, infrequent, and short duration flow.
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.
- Uplands transporting over land flow generated from precipitation (i.e., rain events and snowmelt).

3.4 Quality Assurance/Quality Control

The field team included an experienced wetland scientist as the delineation team leader. Field data, including GPS data, Wetland Determination Data Forms, photographs, and logbooks, were subjected to quality assurance/quality control (QA/QC) reviews by the field team. Data forms and GPS data were subjected to QA/QC review by the field team and the geographic information system (GIS) support team at the conclusion of the field survey. A final QA/QC review of the data was performed in the office by a senior scientist and the GIS team.

4 Results and Discussion

WSP delineated three wetlands, two streams, fifteen roadside drainage ditches and twelve culverts within the Study Area. The wetlands were comprised of two NWI classes. Appendix B provides photographs of the delineated features and Wetland Determination Data Forms. Appendix C provides a map of the results of the field delineation. A brief description of the delineated resources follows.

Table 4-1 – Summary of Delineated Features Within the Study Area

Feature	Latitude (Decimal Degree)	Longitude (Decimal Degree)	Cowardin Code	Area within Study Area (Acres)	Length within Study Area (Linear Ft)	Vermont DEC Wetland Class	USACE Jurisdictional
W02001	45.009154	-71.791671	PSS	0.03	NA	2	No
W02002	45.009714	-71.793175	PFO	0.33	NA	3	Yes
W02003	45.010226	-71.792215	PFO	0.01	NA	3	Yes
T02001	45.010249	-71.79376	R3	NA	85.88	NA	Yes
T02002	45.010214	-71.79209	R4	NA	412.17	NA	Yes
D02001	45.01015	-71.79463	R6	NA	142.18	NA	No
D02002	45.0099	-71.79476	R6	NA	71.60	NA	No
D02003	45.00962	-71.79522	R6	NA	81.60	NA	No
D02004	45.00958	-71.79471	R6	NA	30.22	NA	No
D02005	45.00967	-71.79464	R6	NA	95.75	NA	No
D02006	45.00896	-71.79556	R6	NA	33.78	NA	No
D02007	45.00881	-71.79572	R6	NA	105.20	NA	No
D02008	45.0086	-71.79525	R6	NA	320.22	NA	No
D02009	45.00945	-71.79401	R6	NA	541.99	NA	No
D02010	45.01063	-71.79491	R6	NA	16.80	NA	No

Feature	Latitude (Decimal Degree)	Longitude (Decimal Degree)	Cowardin Code	Area within Study Area (Acres)	Length within Study Area (Linear Ft)	Vermont DEC Wetland Class	USACE Jurisdictional
D02011	45.0091	-71.79211	R6	NA	334.52	NA	No
D02015	45.00952	-71.79319	R6	NA	271.92	NA	Yes
D02017	45.01051	-71.79264	R6	NA	129.60	NA	Yes
D02018	45.01039	-71.7931	R6	NA	123.35	NA	No
D02019	45.00926	-71.79222	R6	NA	283.14	NA	Yes
C02001	45.010496	-71.794945	NA	NA	82.66	NA	No
C02002	45.010228	-71.794727	NA	NA	60.73	NA	No
C02003	45.009854	-71.794515	NA	NA	77.21	NA	No
C02004	45.009914	-71.794583	NA	NA	39.58	NA	No
C02005	45.009458	-71.794642	NA	NA	61.84	NA	No
C02006	45.008948	-71.795691	NA	NA	49.22	NA	No
C02007	45.009531	-71.793767	NA	NA	55.76	NA	No
C02008	45.010612	-71.792533	NA	NA	57.42	NA	No
C02009	45.010328	-71.793715	NA	NA	178.76	NA	No
C02010	45.009324	-71.792719	NA	NA	58.88	NA	No
C02012	45.010269	-71.793508	NA	NA	115.71	NA	No
C02013	45.009176	-71.791915	NA	NA	79.68	NA	No
Total				0.37	3,997.37		

4.1 General Wetland Descriptions

Three freshwater, non-tidal wetland classes in the Palustrine System were identified in the Study Area, in accordance with the NWI classification system (FGDC 2013). WSP assumes that the water regime for the wetlands is likely Seasonally Saturated/Flooded, although the delineation was conducted toward the edges of the growing season and hydrology information was limited. Brief descriptions of the dominant hydrophytic vegetation observed within the different wetland classes are presented below.

Palustrine Scrub Shrub (PSS) - This class is characterized by shrub species less than 6 meters tall and are the dominant plant type with at least 30 percent arial

cover. These wetlands are usually dominated by true shrubs and stunted tree species, and woody vegetation is present for the growing season. Scrub-Shrub wetlands may represent a successional stage leading to forested wetlands, or they may be relatively stable communities (FGDC 2013).

The PSS (W02001) wetland was delineated in the eastern portion of the study area, east of VT Route 147. The following were common in the PSS wetlands:

Canada Goldenrod	*(Solidago canadensis)*
Stiltgrass	*(Microstegium vimineum)*
Black Willow	*(Salix nigra)*
Pussy Willow	*(Salix discolor)*
Silky Dogwood	*(Cornus amomum)*

Palustrine Forested (PFO) – This class is characterized as trees being the dominant species with at least 30 percent areal coverage and tree species needing to be at least 6 meters in height (FGDC 2013).

There was two PFO wetlands (W02002, W02003) occupying the eastern portion of the study area, north of VT Route 114. The following were common in the PFO wetlands:

Gray Alder	*(Alnus incana)*
Balsam Poplar	*(Populus balsamifera)*
Eastern Hemlock	*(Tsuga canadensis)*
American Elm	*(Ulmus americana)*

Wetland Soils – Soils observed in wetlands were typically loamy clayey. In the deep wetland interior, organic material was present as a mucky layer over the mineral horizons. Hydric soil indicators for soils of all textures applied, specifically indicator F3 (Depleted Matrix).

4.2 General Waterbody Descriptions

WSP identified two streams within the Study Area as well as fifteen roadside ditches and twelve culverts. Two of the roadside drainage ditches are associated with one PSS wetland (W02002) and one stream (T02002) with one culvert connecting the two ditches which flow northwest into the southern portion of W02002. The remaining ditches and culverts direct stormwater westward and northwestward of VT Route 147 towards the direction of the Coaticook River off the Study Area. The two streams found in the Study Area are North of VT Route 114 both flowing to Northwest direction presumably into the Coaticook River off the Study Area.

4.3 USACE Regulated Wetlands and Waterbodies

WSP assumes that the two of the three on-site wetlands are jurisdictional waters of the United States, as they drain directly to an unnamed perennial stream off-site to the west. Although the stream flows northwestward across the international border to its mouth, the segment within the United States would likely be considered a Relatively Permanent Waterbody subject to regulations under the Clean Water Act and the associated wetland would assume similar regulatory jurisdiction. The drainages other than D02017, D02015 and D02019, are likely not federal jurisdictional, as they do not directly connect to waters of the United States.

4.4 Vermont DEC Regulated Wetlands and Waterbodies

The determination of stream T02001 within the Study Area is consistent with the desktop reviews of the VANR Wetlands inventory map, the VANR Rivers Protection Program, the NWI, and the NHD. Stream T02002 and the wetlands identified within the Study Area from delineations were not identified on the NWI, VSWI or the NHD maps. Additionally, the topographic map of the Norton, Vermont – Norton OE N 7.5-Minute quadrangle (USGS 2019) does not indicate the presence of stream T02002 or any wetlands in the Study Area. However, T02002 will likely be jurisdictional due to the proximity and connection to the Coaticook River outside of the Study Area. Due to the fact that W02001 is not abutting any riverine system, is of small size and isolated to navigable waters of the US, it will likely be considered a Vermont DEC class III wetland. Due to the fact that W02002 and W02003 are connected to a riverine system, they will likely be considered Vermont DEC class II wetlands (Table 4-1). Although W02002 is smaller than 0.5 acres which classifies a class II wetland, this only reflects its size within the Study Area. It continues off the Study Area boundary increasing in size. Although W02003 is smaller than 0.5 acres which classifies a class II wetland, it connects directly to T02001 and holds a higher functional value than small roadside wetlands.

5 References

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-81-1. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Federal Geographic Data Committee (FGDC). 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Federal Register. February 24, 1994. Changes in Hydric Soils of the United States. Washington, DC.

Munsell Color. 2009 (2021 production). Munsell Soil Color Book. Grand Rapids, Michigan.

Vermont Agency of Natura Resources (VANR). 2023a. Vermont Wetland Inventory Map. Available online at: Vermont ANR - Wetlands Inventory Map (WIM). Accessed October 31, 2023.

Vermont Agency of Natural Resources (VANR). 2023b. River Management Program. Available online at: River Management | Department of Environmental Conservation (vermont.gov) Accessed October 31, 2023.

Vermont Agency of Natural Resources (VANR). 2023c. Vermont Wetland Rules. Vt. Code R. 12 004 056. Available online at: wsmd_VermontWetlandRules.pdf Accessed October 30 2023.

U.S. Army Corps of Engineers (USACE). 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0), ed. J. S. Wakeley, R. W. Lichvar, C. V. Noble, and J. F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

U.S. Army Corps of Engineers 2020. National Wetland Plant List, version 3.5 U.S. Army Corps of Engineers. Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH. Available online at: http://wetland-plants.usace.army.mil/ Accessed throughout fieldwork.

U.S. Army Corps of Engineers (USACE). 2007. Jurisdictional Determination Form Instruction Guidebook. May 30.

U.S. Department of Agriculture (USDA). 2022. Natural Resources Conservation Service Soil Survey Staff. Web Soil Survey. Available online at: http://websoilsurvey.sc.egov.usda.gov/. Accessed February 9, 2024.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). 2018. Field Indicators of Hydric Soils in the United States, Version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS). 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture handbook 29.

U.S. Environmental Protection Agency (EPA). 2022. EPA WATERS GeoViewer. Available online at: https://www.epa.gov/waterdata/waters-geoviewer Accessed on April 14, 2024.

U.S. Fish and Wildlife Service (USFWS). 2022. National Wetlands Inventory. Available online at: https://www.fws.gov/wetlands/data/mapper.html Accessed on February 9, 2024.

U.S. Geological Survey (USGS). 2022. National Hydrography Dataset. Available online at: https://www.usgs.gov/national-hydrography/national-hydrography-dataset Accessed on February 9. 2024.

U.S. Geological Survey. 2019. Norton, Vermont – Norton Pond OE N Quadrangle. 7.5-Minute Series (Topographic).

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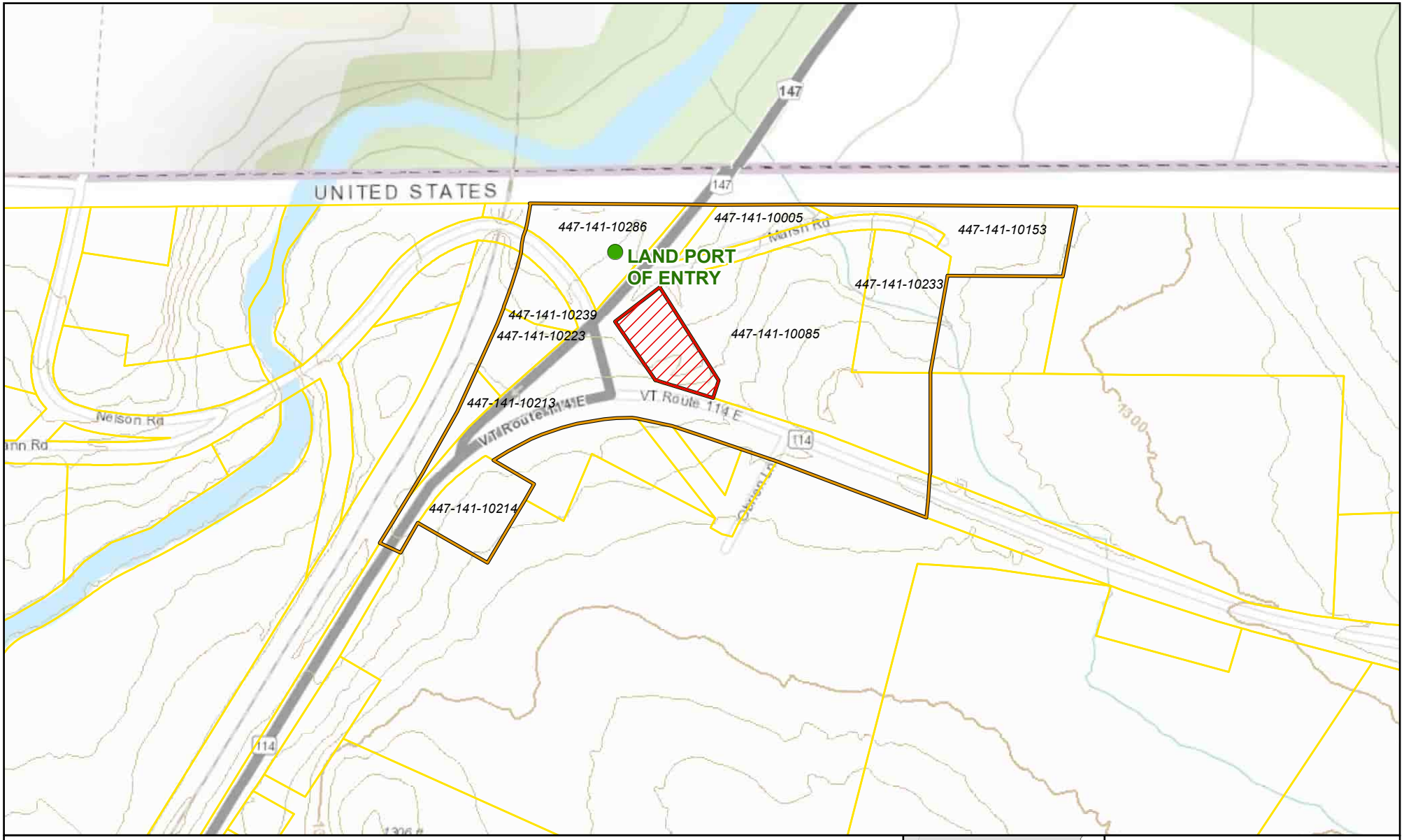

- Norton Land Port of Entry
- Norton Study Area
- Parcel Boundaries
- Excluded Parcel
- U.S. / Canada Border

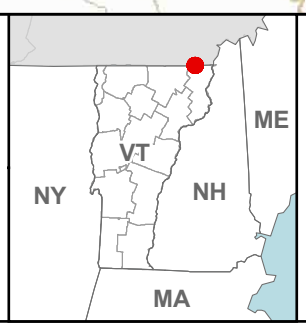

Figure 2
Topographic
Norton LPOE
Essex County, VT

0 200 400 Feet

N

Data Sources: ESRI World Imagery Map 2021

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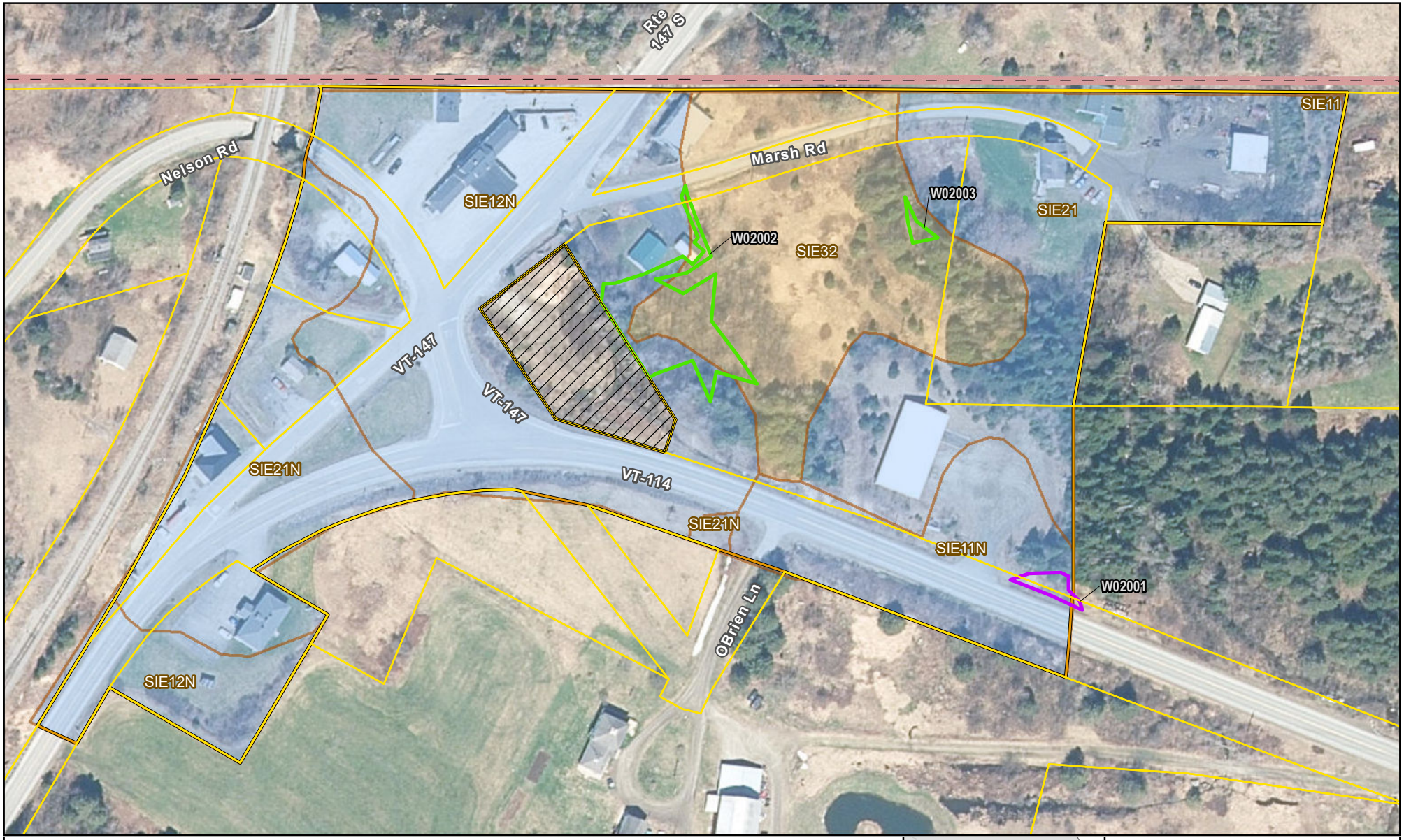


Delineated Wetland Boundary
- PFO
- PSS

- Soil Unit Boundary

Hydric Rating
- No
- Yes

- Norton Study Area
- Parcel Boundaries
- Excluded Parcel
- U.S. / Canada Border

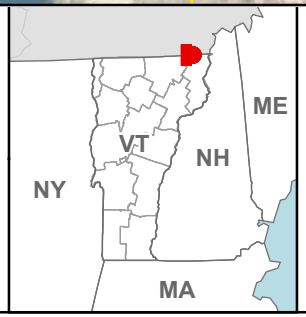


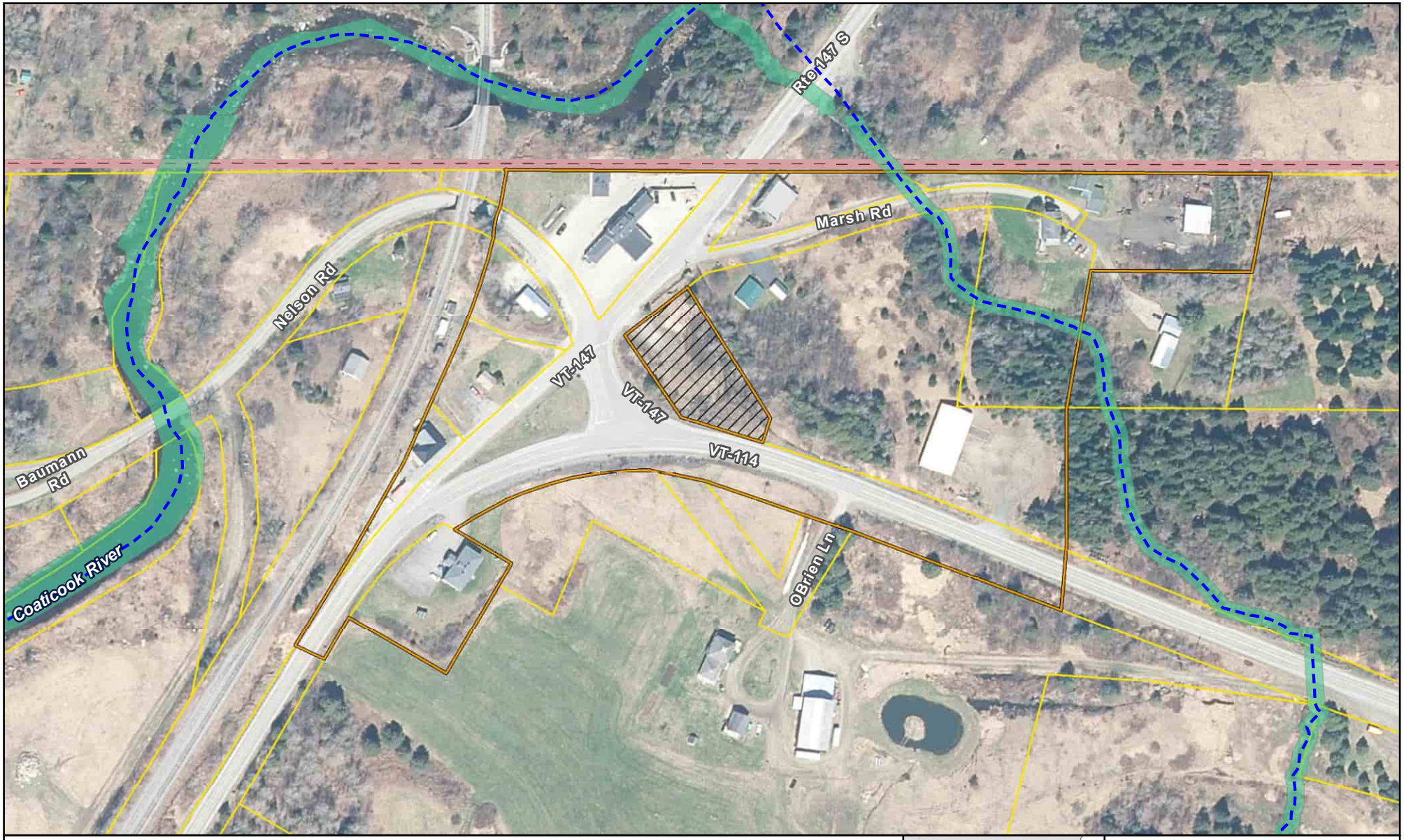
Figure 3
NRCS Soils
Norton LPOE
Essex County, VT

0 100 200 Feet

N

Data Sources: ESRI World Imagery Map 2021

L:\PROJECTS\GSA_LPOE\Norton\Maps\MXD\WDR\A-4_Norton_NWI_NHD.mxd 6/7/2024

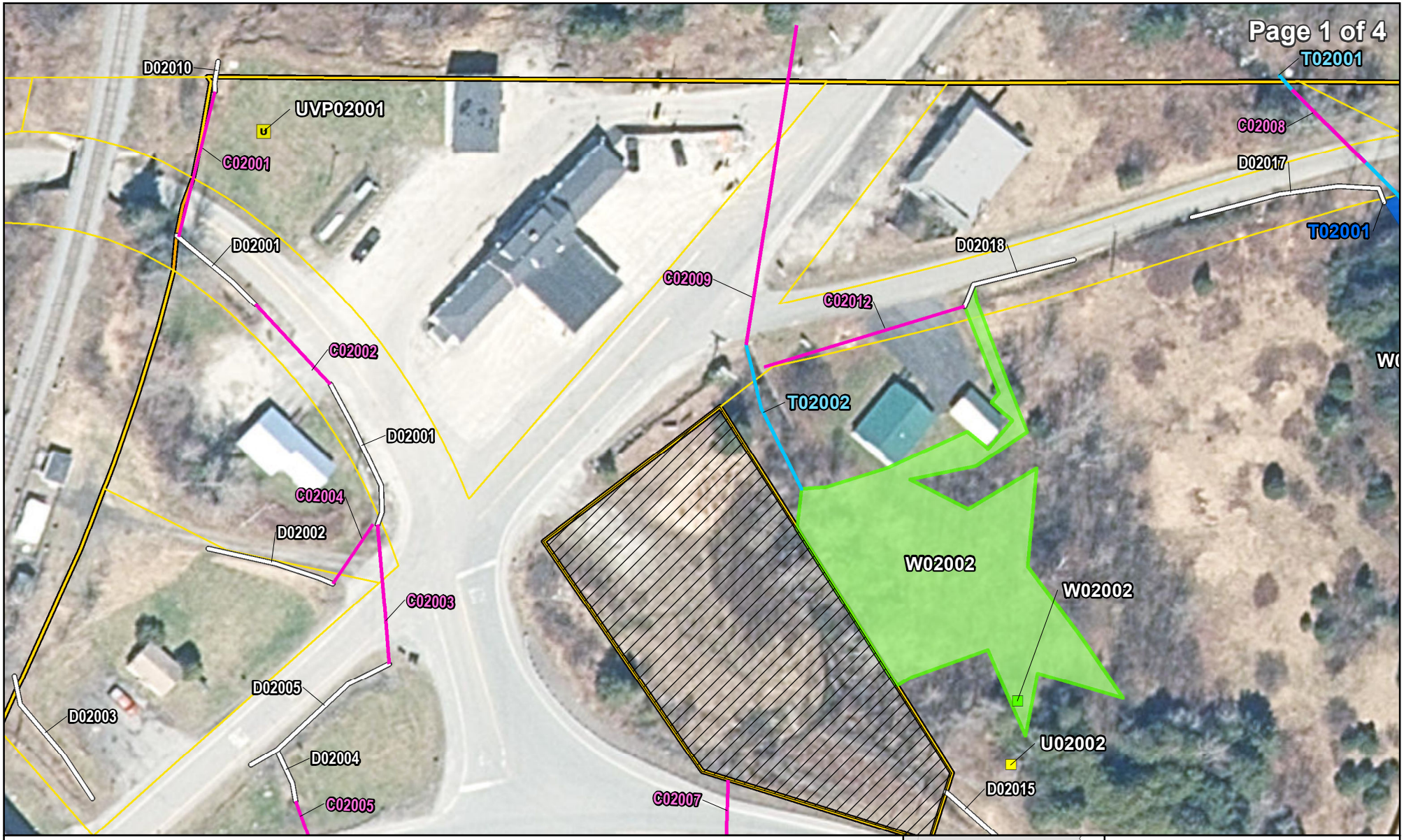


NHD Stream/River
NWI Mapped Wetland
Riverine
Norton Study Area
Parcel Boundaries
Excluded Parcel
U.S. / Canada Border

Figure 4
NWI Mapped Wetlands and NHD Streams
Norton LPOE
Essex County, VT

0 150 300 Feet N

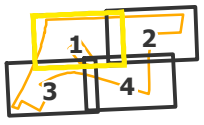
Data Sources: ESRI World Imagery Map 2024, NWI 2023, NHD, 2023.



Data Point/Photograph Locations
- Upland
- Upland Verification
- Wetland
- Drain
- Culvert
- Tributary

- Tributary Polygon
- Delineated Wetland Boundary
- PFO

- Norton Study Area
- Parcel Boundaries
- Excluded Parcel



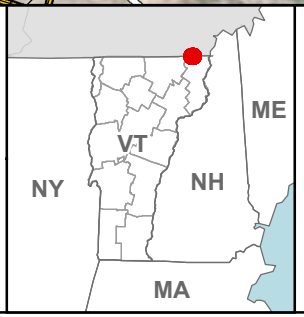


Figure 5
Delineated Features
Norton LPOE
Essex County, VT

0 50 100 Feet

N

Data Sources: ESRI World Imagery Map 2021

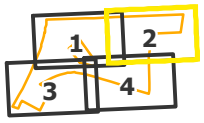
Data Point/Photograph Locations
- Upland Verification
- Wetland
- Drain
- Culvert
- Tributary

Tributary Polygon

Delineated Wetland Boundary
- PFO

Norton Study Area

Parcel Boundaries



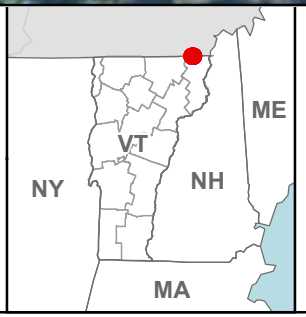
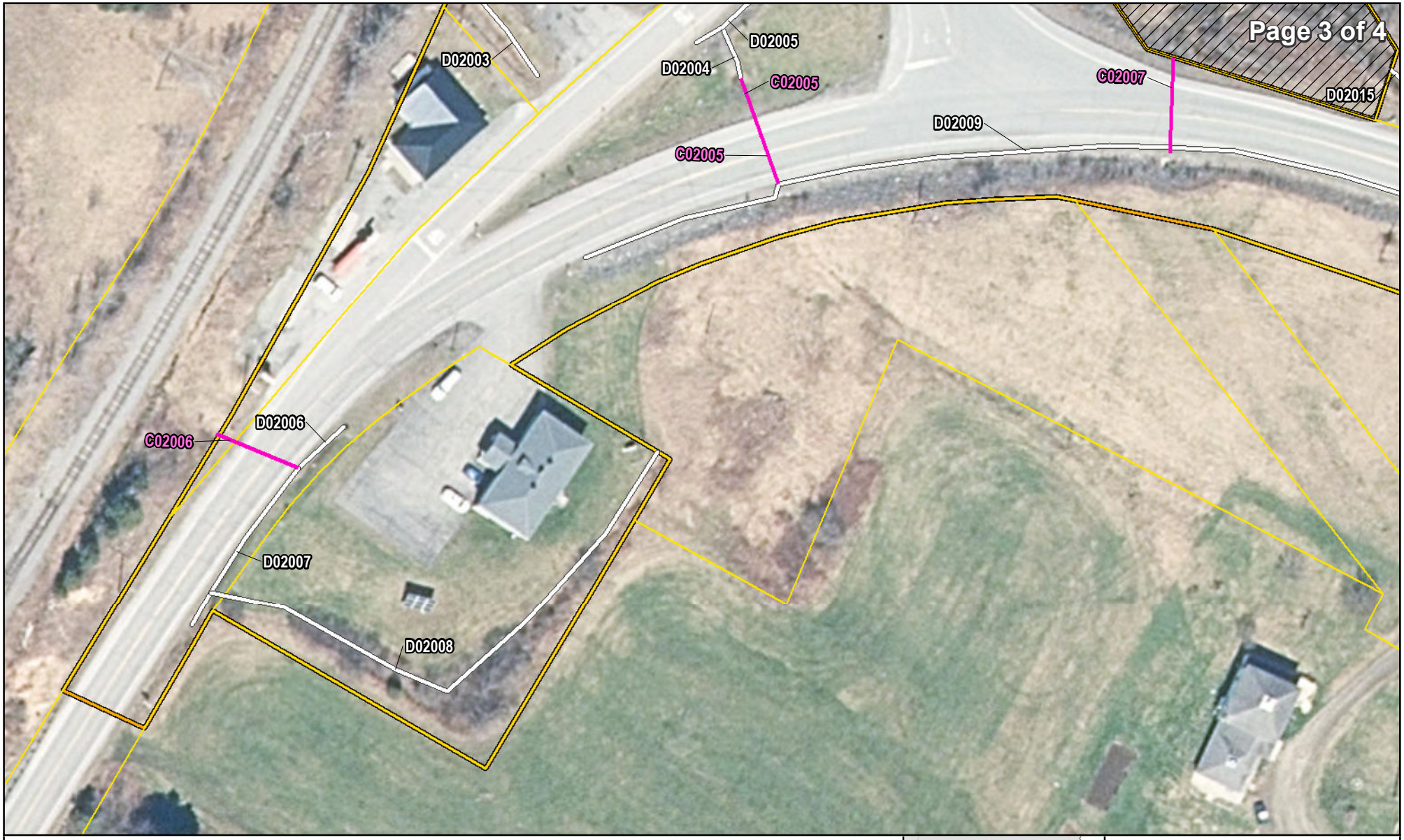


Figure 5
Delineated Features
Norton LPOE
Essex County, VT

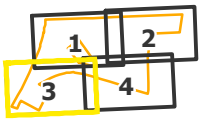
0 50 100 Feet

N

Data Sources: ESRI World Imagery Map 2021



Drain
Culvert
Norton Study Area
Parcel Boundaries
Excluded Parcel



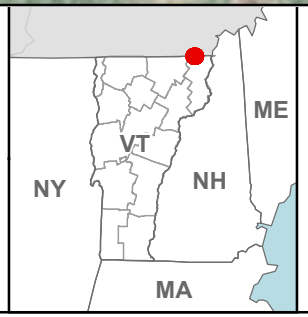
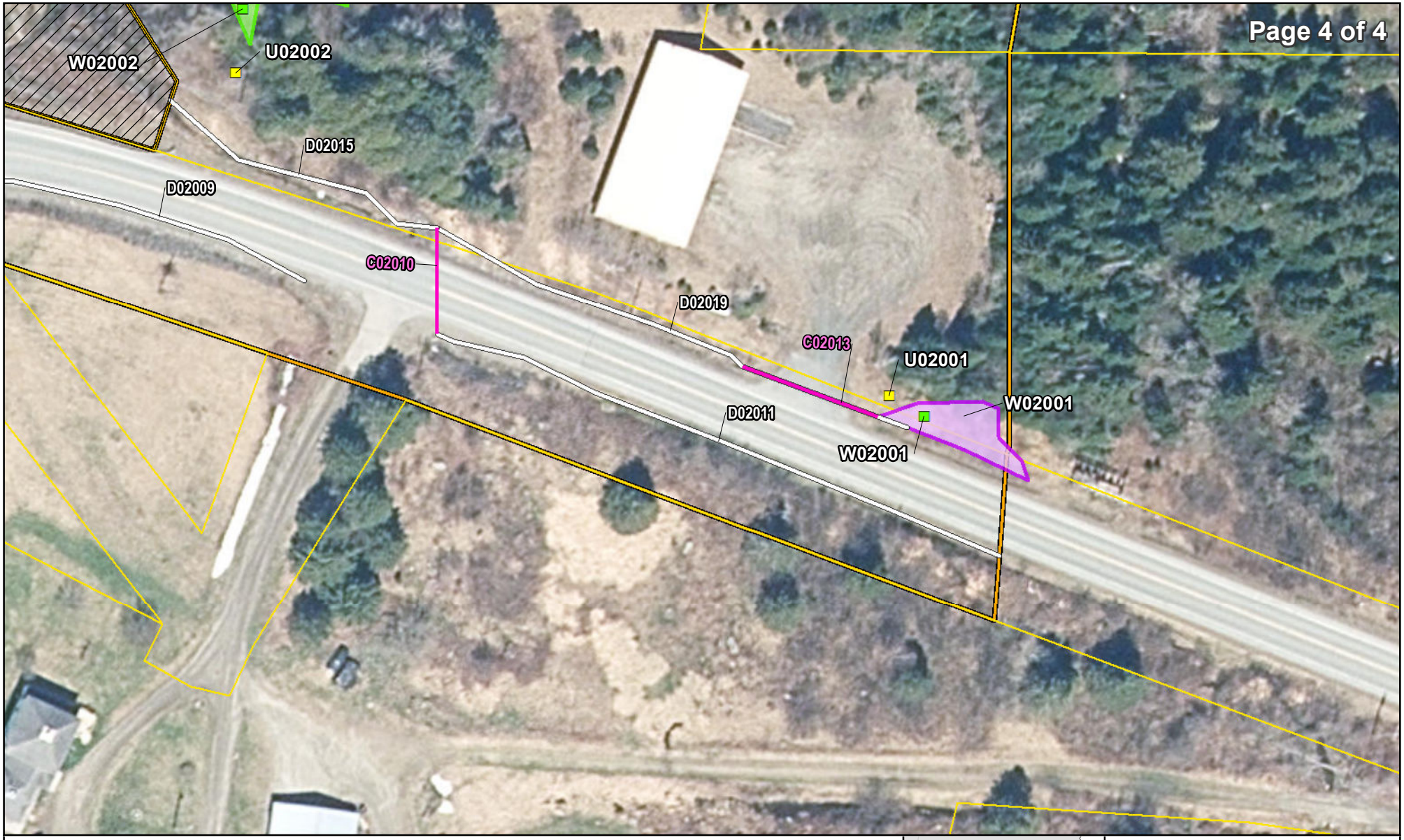


Figure 5
Delineated Features
Norton LPOE
Essex County, VT

0 50 100 Feet

N

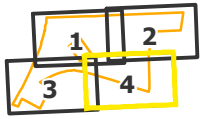
Data Sources: ESRI World Imagery Map 2021



Data Point/Photograph Locations
- Upland
- Wetland
- Drain
- Culvert

Delineated Wetland Boundary
- PFO
- PSS

- Norton Study Area
- Parcel Boundaries
- Excluded Parcel



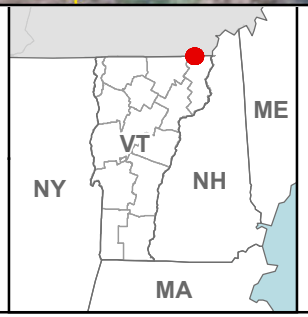


Figure 5
Delineated Features
Norton LPOE
Essex County, VT

0 50 100 Feet

N

Data Sources: ESRI World Imagery Map 2021

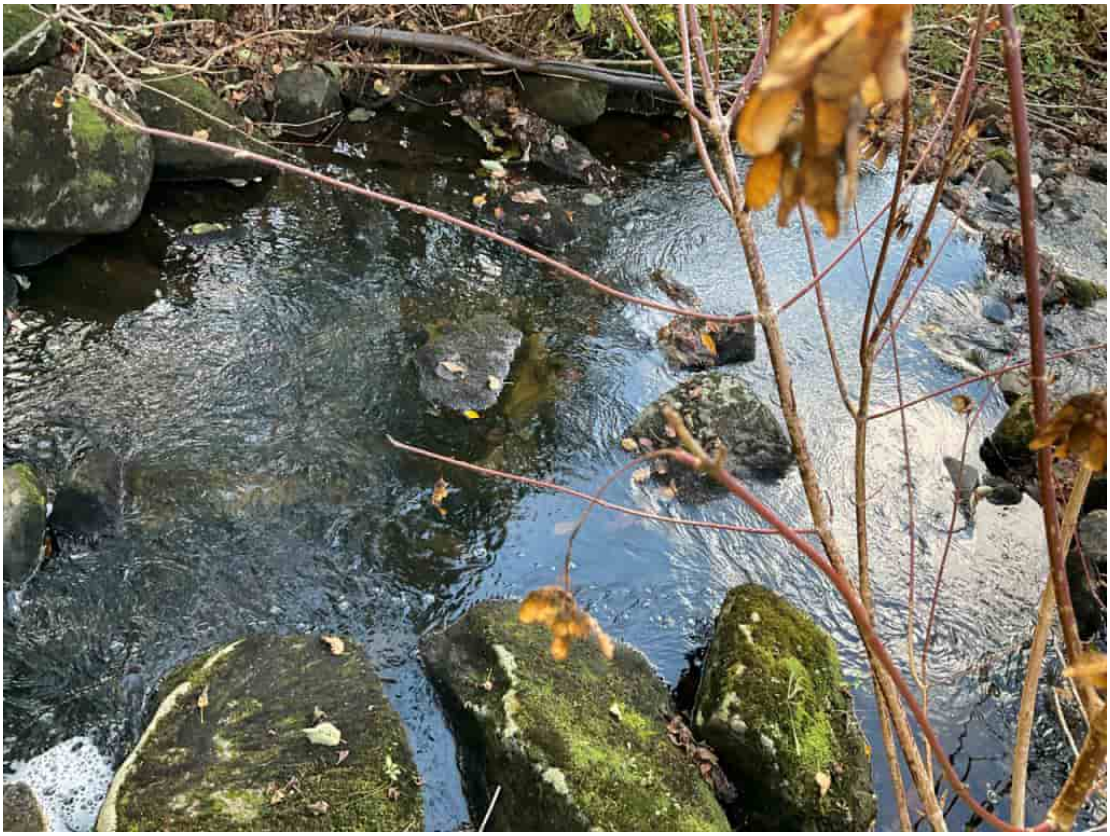
B

Photographs and Wetland Determination Data Forms

T02001 - Photo Log

ID: T02001 Date: 10/19/2023 Direction: S Position: Upstream

ID: T02001 Date: 10/19/2023 Direction: N Position: Downstream



ID: T02001 Date: 10/19/2023 Direction: W Position: Across

ID: T02002 Date: 4/17/2024 Direction: SE Position: Upstream

ID: T02002 Date: 4/17/2024 Direction: NW Position: Downstream

ID: T02002 Date: 4/17/2024 Direction: N Position: Across

W020 - Photo Log

ID: W02001 Date: 4/17/2024 Direction: SE Class: PSS Position: Wetland Overview

ID: W02001 Date: 4/17/2024 Direction: S Class: PSS Position: Wetland Pit

ID: W02002 Date: 4/17/2024 Direction: NW Class: PFO Position: Wetland Overview

ID: W02002 Date: 4/17/2024 Direction: S Class: PFO Position: Wetland Pit

ID: W02003 Date: 4/17/2024 Direction: N Class: PFO Position: Wetland Overview

ID: W02003 Date: 4/17/2024 Direction: S Class: PFO Position: Wetland Pit

ID: U02001 Date: 4/17/2024 Direction: N Class: UPL Position: Upland Overview

ID: U02001 Date: 4/17/2024 Direction: SE Class: UPL Position: Upland Pit

ID: U02002 Date: 4/17/2024 Direction: N Class: UPL Position: Upland Overview

ID: U02002 Date: 4/17/2024 Direction: S Class: UPL Position: Upland Pit

ID: UVP02001 Date: 10/19/2023 Direction: N Class: UPL Position: Upland Overview

ID: UVP02002 Date: 10/19/2023 Direction: NE Class: UPL Position: Upland Overview

ID:D02001 Date:10/19/2023 Direction:NW

ID:D02002 Date:10/19/2023 Direction:SE

ID:D02003 Date:10/19/2023 Direction:NW

ID:D02004 Date:10/19/2023 Direction:S

ID:D02005 Date:10/19/2023 Direction:SW

ID:D02006 Date:10/19/2023 Direction:W

ID:D02007 Date:10/19/2023 Direction:NE

ID:D02008 Date:10/19/2023 Direction:NW

ID:D02008 Date:10/19/2023 Direction:SE

ID:D02009 Date:10/19/2023 Direction:SW

ID:D02010 Date:10/19/2023 Direction:N

ID:D02011 Date:10/19/2023 Direction:W

ID:D02015 Date:4/16/2024 Direction:NW

ID:D02019 Date:4/17/2024 Direction:NW

ID:C02001 Date:10/19/2023 Direction:S

ID:C02002 Date:10/19/2023 Direction:W

ID:C02003 Date:10/19/2023 Direction:N/A

ID:C02004 Date:10/19/2023 Direction:SW

ID:C02005 Date:10/19/2023 Direction:S

ID:C02006 Date:10/19/2023 Direction:NW

ID:C02007 Date:10/19/2023 Direction:N/A

ID:C02008 Date:10/19/2023 Direction:S

ID:C02009 Date:10/19/2023 Direction:N

ID:C02010 Date:4/16/2024 Direction:SE

ID:C02011 Date:4/16/2024 Direction:N

ID:C02012 Date:4/16/2024 Direction:E

ID:C02013 Date:4/16/2024 Direction:SE

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: GSA-LPOE - Norton City/County: Essex County Sampling Date: 04/17/2024

Applicant/Owner: WSP State: VT Sampling Point: W02001

Investigator(s): Justin Baker, Joe Dalrymple Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none):

Subregion (LRR or MLRA): Slope (%): 2 Lat: 45.009146 Long: -71.791665 Datum: WGS 1984

Soil Map Unit Name: Cabot silt loam, 3 to 8 percent slopes NWI classification:Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✔ No	**Is the Sampled Area within a Wetland?** Yes ✔ No
Hydric Soil Present? Yes ✔ No	If yes, optional Wetland Site ID:
Wetland Hydrology Present? Yes ✔ No	

Remarks: (Explain alternative procedures here or in a separate report.)

wetland is a PSS wetland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): surface

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: W02001

Tree Stratum (Plot size: 30 ft rad)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft rad)			
1. black willow - Salix nigra	15	Yes	OBL
2. pussy willow - Salix discolor	10	Yes	FACW
3. silky dogwood - Cornus amomum	25	Yes	FACW
4.			
5.			
6.			
7.			
	50 = Total Cover		
Herb Stratum (Plot size: 5 ft rad)			
1. sensitive fern - Onoclea sensibilis	15	Yes	FACW
2. stiltgrass - Microstegium vimineum	35	Yes	FAC
3. Canada goldenrod - Solidago canadensis	25	Yes	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft rad)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

✔ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W02001

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 4/2	85	10 YR 5/1	10	D	M	Silt Loam	
			10 YR 4/6	5	C	PL		
6-15	10 YR 4/1	85	10 YR 5/1	10	D	M	Silt Loam	
			10 YR 4/6	5	C	PL		
15-20+	10 YR 5/1	90	10 YR 4/2	10	D	M	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ✔ **No** ___

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: GSA-LPOE - Norton City/County: Essex County Sampling Date: 04/17/2024

Applicant/Owner: WSP State: VT Sampling Point: U02001

Investigator(s): Justin Baker, Joe Dalrymple Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none):

Subregion (LRR or MLRA): Slope (%): 3 Lat: 45.009197 Long: -71.791753 Datum: WGS 1984

Soil Map Unit Name: Cabot silt loam, 3 to 8 percent slopes NWI classification:Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No ✔	**Is the Sampled Area within a Wetland?** Yes ___ No ✔
Hydric Soil Present?	Yes ___	No ✔	
Wetland Hydrology Present?	Yes ___	No ✔	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✔	Depth (inches): _____
Water Table Present?	Yes ___	No ✔	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes ___	No ✔	Depth (inches): _____

Wetland Hydrology Present? Yes ___ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: U02001

Tree Stratum (Plot size: 30 ft rad)	Absolute % Cover	Dominant Species?	Indicator Status
1. white spruce - Picea glauca	15	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft rad)			
1. white spruce - Picea glauca	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10 = Total Cover		
Herb Stratum (Plot size: 5 ft rad)			
1. stiltgrass - Microstegium vimineum	80	Yes	FAC
2. brackenfern - Pteridium aquilinum	15	No	FACU
3. Canada goldenrod - Solidago canadensis	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft rad)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: U02001

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 4/3	100					Silt Loam	
8-17	10YR 4/2	95	10 YR 5/3	5	C	M	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rocks

Depth (inches): 17

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: GSA-LPOE - Norton City/County: Essex County Sampling Date: 04/17/2024

Applicant/Owner: WSP State: VT Sampling Point: W02002

Investigator(s): Justin Baker, Joe Dalrymple Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none):

Subregion (LRR or MLRA): Slope (%): 10 Lat: 45.009733 Long: -71.793141 Datum: WGS 1984

Soil Map Unit Name: Cabot-Colonel complex, 8 to 15 percent slopes NWI classification:Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✔ No	**Is the Sampled Area within a Wetland?** Yes ✔ No
Hydric Soil Present? Yes ✔ No	If yes, optional Wetland Site ID:
Wetland Hydrology Present? Yes ✔ No	

Remarks: (Explain alternative procedures here or in a separate report.)

wetland is a PFO wetland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✔ No _____ Depth (inches): 1

Water Table Present? Yes ✔ No _____ Depth (inches): 10

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): surface

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: W02002

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. gray alder - Alnus incana	20	Yes	FACW
2. balsam poplar - Populus balsamifera	10	Yes	FACW
3. American elm - Ulmus americana	10	Yes	FACW
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. gray alder - Alnus incana	20	Yes	FACW
2. balsam poplar - Populus balsamifera	15	Yes	FACW
3.			
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. cinnamon fern - Osmunda cinnamomea	5	Yes	FACW
2. sensitive fern - Onoclea sensibilis	5	Yes	FACW
3. spinulose woodfern - Dryopteris carthusiana	10	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20 = Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ✔ Rapid Test for Hydrophytic Vegetation
- ✔ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W02002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 4/2	95	10 YR 4/1	5	D	M	Silt Loam	
6-18	10 YR 5/2	90	10 YR 6/1	5	D	M	Silt Loam	
			10 YR 4/1	5	D	M	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rocks

Depth (inches): 18

Hydric Soil Present? Yes ✔ No ___

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: GSA-LPOE - Norton City/County: Essex County Sampling Date: 04/17/2024

Applicant/Owner: WSP State: VT Sampling Point: U02002

Investigator(s): Justin Baker, Joe Dalrymple Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none):

Subregion (LRR or MLRA): Slope (%): 5 Lat: 45.009604 Long: -71.793161 Datum: WGS 1984

Soil Map Unit Name: Cabot-Colonel complex, 8 to 15 percent slopes NWI classification:Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No
Hydric Soil Present?	Yes	No ✔
Wetland Hydrology Present?	Yes	No ✔

Is the Sampled Area within a Wetland? Yes ___ No ✔

If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✔	Depth (inches): ___
Water Table Present?	Yes ___	No ✔	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No ✔	Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: U02002

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. gray alder - Alnus incana	10	No	FACW
2. eastern hemlock - Tsuga canadensis	40	Yes	FACU
3. white spruce - Picea glauca	15	Yes	FACU
4.			
5.			
6.			
7.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size:)			
1. gray alder - Alnus incana	10	Yes	FACW
2. white spruce - Picea glauca	5	No	FACU
3. balsam poplar - Populus balsamifera	35	Yes	FACW
4.			
5.			
6.			
7.			
	= Total Cover		

Herb Stratum (Plot size:)			
1. white avens - Geum canadense	5	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75 = Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✔ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: U02002

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 3/2	100					Silt Loam	
4-15	10 YR 4/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: rocks

Depth (inches): 15

Hydric Soil Present? **Yes** _____ **No** ✔

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: GSA-LPOE - Norton City/County: Essex County Sampling Date: 04/17/2024

Applicant/Owner: WSP State: VT Sampling Point: W02003

Investigator(s): Justin Baker, Joe Dalrymple Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none):

Subregion (LRR or MLRA): Slope (%): 5 Lat: 45.010263 Long: -71.792279 Datum: WGS 1984

Soil Map Unit Name: Colonel-Peru complex, 8 to 15 percent slopes, very stony NWI classification:Upland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No	**Is the Sampled Area within a Wetland?** Yes ✔ No
Hydric Soil Present?	Yes ✔ No	
Wetland Hydrology Present?	Yes ✔ No	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

wetland is a PFO wetland

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No ✔	Depth (inches): _____
Water Table Present?	Yes ✔	No _____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes ✔	No _____	Depth (inches): surface

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: W02003

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. eastern hemlock - Tsuga canadensis	30	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. gray alder - Alnus incana	45	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. spinulose woodfern - Dryopteris carthusiana	10	Yes	FACW
2. creeping buttercup - Ranunculus repens	5	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✔ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✔ No ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W02003

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 4/2	82	10 YR 4/6	3	C	PL	Silt Loam	
			10 YR 4/1	5	D	M		
			10 YR 5/2	10	D	M		
8-16	10 YR 5/2	84	10 YR 6/1	10	D	M	Silt Loam	
			10 YR 3/1	3	C	M		
			10 YR 4/6	3	C	PL		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rocks

Depth (inches): 16

Hydric Soil Present? Yes ✔ No ___

Remarks:

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
WETLANDS PROGRAM

Wetland Classification Form

2024-0701_Norton LPOE_115 Route 147 N

Field assessment date: August 28, 2024
Present: WSP, ACOE, VT DEC Wetlands
District Wetland Ecologist: Krystal T. Sewell

Location: CBP facility, 115 Route 147 N, Norton VT

Wetlands W02001, W02002, W02003 were assessed in the field.

Wetland W02001

☒Class II

☐Class III

☐No wetland present

Check one of the following:

☒The entire wetland was assessed in the field.

☐The wetland extends off the property and I have used imagery and mapping to complete my assessment.

The wetland was found to have the following characteristics (check all that apply):

☐ Wetland area assessed was within a Vermont Significant Wetlands Inventory (VSWI) mapping unit.

☒ Wetland area is contiguous with a VSWI mapping unit.

☐§4.6(a) The wetland is of the same type and threshold size as those mapped on the VSWI maps: i.e.; open water (pond); emergent marsh; shrub swamp; forested swamp; wet meadow; beaver pond or beaver meadow; bog or fen; and is greater than 0.5 acres in size.

☐§4.6(b) The wetland contains dense, persistent non-woody vegetation or a prevalence of woody vegetation; is adjacent to a stream, river, or open body of water; and is over 2,500 square feet in size.

☐§4.6(c) The wetland is a vernal pool that provides amphibian breeding habitat.

☐§4.6(d) The wetland is a headwater wetland.

☐§4.6(e) The wetland contains a species that appears in the Vermont Natural Heritage Inventory (VNHI) database as rare, threatened, endangered or uncommon; or is an exemplary natural community as mapped by VNHI.

☐ The wetland is adjacent to streams, rivers, or any open body of water and does not meet the 2,500 square foot size threshold in subparagraph b above and should be evaluated for significance by a wetland ecologist before work is done.

☐None of the above.

Wetland Characteristic Notes:

Palustrine Scrub-Shrub, seasonally saturated and dominated by silky dogwood and late goldenrod; underlain by loamy soils of lodgment till parent material. This wetland is located on the north side of Route 114, adjacent to the road, and is hydrologically connected to the VWSI polygon on the south side of Route 114. It is bound by fill slope for a utility substation east and driveway for 189 VT Route 114E to the west.

Wetland W02002

☐Class II

☒Class III

☐No wetland present

Check one of the following:

☐The entire wetland was assessed in the field.

☒The wetland extends off the property and I have used imagery and mapping to complete my assessment.

The wetland was found to have the following characteristics (check all that apply):

☐ Wetland area assessed was within a Vermont Significant Wetlands Inventory (VSWI) mapping unit.

☐ Wetland area is contiguous with a VSWI mapping unit;

☐§4.6(a) The wetland is of the same type and threshold size as those mapped on the VSWI maps: i.e.; open water (pond); emergent marsh; shrub swamp; forested swamp; wet meadow; beaver pond or beaver meadow; bog or fen; and is greater than 0.5 acres in size.

☐§4.6(b) The wetland contains dense, persistent non-woody vegetation or a prevalence of woody vegetation; is adjacent to a stream, river, or open body of water; and is over 2,500 square feet in size.

☐§4.6(c) The wetland is a vernal pool that provides amphibian breeding habitat.

☐§4.6(d) The wetland is a headwater wetland.

☐§4.6(e) The wetland contains a species that appears in the Vermont Natural Heritage Inventory (VNHI) database as rare, threatened, endangered or uncommon; or is an exemplary natural community as mapped by VNHI.

☐ The wetland is adjacent to streams, rivers, or any open body of water and does not meet the 2,500 square foot size threshold in subparagraph b above and should be evaluated for significance by a wetland ecologist before work is done.

☒None of the above.

Wetland Characteristic Notes:
Palustrine Forested, seasonally flooded/saturated and dominated by eastern hemlock, red maple, and various asters; underlain by loamy soils of lodgment till parent material, with organic layers in a seep area. This wetland is located approximately 130 feet east from the intersection of Route 147 and Route114. The wetland is less than 0.5 acres in size and drains into roadside stormwater ditches. Stormwater drainage along Marsh Road conveys water to a perennial stream.

Wetland W02003
☐Class II
☒Class III
☐No wetland present

Check one of the following:
☒The entire wetland was assessed in the field.
☐The wetland extends off the property and I have used imagery and mapping to complete my assessment.

The wetland was found to have the following characteristics (check all that apply):
☐ Wetland area assessed was within a Vermont Significant Wetlands Inventory (VSWI) mapping unit.
☐ Wetland area is contiguous with a VSWI mapping unit;
☐§4.6(a) The wetland is of the same type and threshold size as those mapped on the VSWI maps: i.e.; open water (pond); emergent marsh; shrub swamp; forested swamp; wet meadow; beaver pond or beaver meadow; bog or fen; and is greater than 0.5 acres in size.
☐§4.6(b) The wetland contains dense, persistent non-woody vegetation or a prevalence of woody vegetation; is adjacent to a stream, river, or open body of water; and is over 2,500 square feet in size.

☐§4.6(c) The wetland is a vernal pool that provides amphibian breeding habitat.
☐§4.6(d) The wetland is a headwater wetland.
☐§4.6(e) The wetland contains a species that appears in the Vermont Natural Heritage Inventory (VNHI) database as rare, threatened, endangered or uncommon; or is an exemplary natural community as mapped by VNHI.
☐ The wetland is adjacent to streams, rivers, or any open body of water and does not meet the 2,500 square foot size threshold in subparagraph b above, and should be evaluated for significance by a wetland ecologist before work is done.
☒None of the above.

Wetland Characteristic Notes:
Palustrine Forested, seasonally flooded/saturated and dominated by eastern hemlock, red maple, and various asters; underlain by organic soils. This wetland is located approximately 90 feet south of Marsh Road and is adjacent to a perennial stream. The wetland is less than 2500 square feet in size and there are no similar features nearby.

Class II: Please be advised that I have confirmed that one or more wetlands on your property has characteristics that make it a Class II significant wetland. Class II significant wetlands and their 50 ft buffers are protected under the Vermont Wetland Rules (VWR). This report outlines the reasons for this decision, and serves as notice that any activity in the wetland or 50ft buffer zone may need a Vermont wetland permit before you start work. If you disagree with this decision you can appeal it pursuant to 10 V.S.A. § 917 and petition for a wetland classification determination of Class III as outlined under the petition section of this report. The following table(s) document the reasons for this decision.

Class III: Please be advised that I have confirmed that you have one or more Class III wetlands on your property. Class III wetlands are not protected under the Vermont Wetland Rules (VWR). No State Wetland permit is required for activities occurring in Class III wetlands. This report outlines the reasons for this decision. Because wetland character, size, and function can change over time, the Wetlands Program recommends seeking a reevaluation of wetland status every 5 years, to avoid a potential violation of the VWR. If you disagree with this decision you can appeal it pursuant to 10 V.S.A. § 917 and petition for a wetland classification determination of Class II as outlined under the petition section of this report. The following table(s) document the reasons for this decision.

Other Wetland Permit Obligations
In addition, the U.S. Army Corps of Engineers (Corps) regulates the discharge of dredged and/or fill material, including mechanized land clearing and grading, in all waters of the United States, including inland rivers, lakes, streams and wetlands. For detailed information on Corps permits and regulations call (802) 872-2893. It is the applicants responsibility to determine if your project also requires an Corps permit. In addition, your town may have local regulations regarding wetland protection. Please call your town clerk to verify any local regulations.

Dalrymple, Joe

From: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Sent: Monday, December 2, 2024 3:05 PM
To: Dalrymple, Joe; Baker, Justin
Cc: Long, Ryan
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Follow Up Flag: Follow up
Flag Status: Flagged

The decisions included on this form are valid for 5 years. I will add that note to the Classification reports for the other projects- I can also update this one and send a new version.

If the project area changes so that there are new wetlands to assess- then we would just need to evaluate those.

Krystal T. Sewell (she/her) | District Wetlands Ecologist
Vermont Department of Environmental Conservation
Watershed Management Division, Wetlands Program
Davis 3, 1 National Life Dr | Montpelier, VT 05620-3901
802-490-6758
https://dec.vermont.gov/watershed/wetlands

For resources related to flood recovery: https://anr.vermont.gov/flood

VERMONT

From: Dalrymple, Joe <joe.dalrymple@wsp.com>
Sent: Monday, December 2, 2024 12:53 PM
To: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>; Baker, Justin <Justin.Baker@wsp.com>
Cc: Long, Ryan <Ryan.Long@wsp.com>
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.
Thanks Krystal! That's all I needed for now.

Along those lines, GSA does anticipate eventually getting right-of-entry for that parcel. Would we need to submit another request when that happens, or would this classification form remain valid?

Joe

Joe Dalrymple
Senior Consultant, Environmental Planner
Federal Programs, Environment
Pronouns (he/him)

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From: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Sent: Monday, December 2, 2024 12:50 PM
To: Dalrymple, Joe <joe.dalrymple@wsp.com>; Baker, Justin <Justin.Baker@wsp.com>
Cc: Long, Ryan <Ryan.Long@wsp.com>
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Hi Joe,

The drawings on the form are approximate based on lidar and desktop analysis!

Krystal T. Sewell (she/her) | District Wetlands Ecologist
Vermont Department of Environmental Conservation
Watershed Management Division, Wetlands Program
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802-490-6758
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For resources related to flood recovery: https://anr.vermont.gov/flood

VERMONT

From: Dalrymple, Joe <joe.dalrymple@wsp.com>
Sent: Monday, December 2, 2024 12:47 PM
To: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>; Baker, Justin <Justin.Baker@wsp.com>
Cc: Long, Ryan <Ryan.Long@wsp.com>
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

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Hi Krystal,

Thanks for getting back to me. This all looks good. I just have one question regarding wetland W02001. The classification form shows that feature partially on parcel 6 (the parcel on the corner of VT-114 and VT-147). We didn't actually go on that parcel because GSA was not able to obtain right-of-entry from the owner. Are the boundaries shown on the form an estimation based on what we saw from the adjacent parcels, topography, etc.?

I'm sure that question will come up so just want to make sure I can answer it correctly.

Thanks,

Joe

Joe Dalrymple
Senior Consultant, Environmental Planner
Federal Programs, Environment
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From: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Sent: Monday, December 2, 2024 12:28 PM
To: Baker, Justin <Justin.Baker@wsp.com>
Cc: Dalrymple, Joe <joe.dalrymple@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Good afternoon,

I was out for a run this weekend and realized I did not finish up and send over the classification reports as promised! I apologize.

I have attached the Classification Report for the Norton project. My decisions are different than the ones you anticipated. Please look over the report and let me know if you have questions. The only wetland that is Class II is W02001. I recall there being a culvert connecting it with the south side of the road.

Krystal T. Sewell (she/her) | District Wetlands Ecologist
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For resources related to flood recovery: https://anr.vermont.gov/flood

VERMONT

From: Baker, Justin <Justin.Baker@wsp.com>
Sent: Wednesday, November 20, 2024 1:10 PM
To: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Cc: Dalrymple, Joe <joe.dalrymple@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

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Good afternoon, Krystal. I hope you are doing well. GSA needs to request a wetland jurisdictional determination from VT DEC for the features associated with the Norton Vermont LPOE Project. Attached is the final wetland delineation report. I couldn't find a form or website to request the wetland JD; please let me know if this email will suffice or if there is another method GSA needs to follow to request the JD. GSA has already submitted a PJD request to USACE and are awaiting a decision. Please let me know if you have any questions or need anything else.

Thanks,
Justin

Justin Baker
SR. Consultant/Environmental Scientist
PWS, CE, CERP

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M+ 1 914 462 9912

From: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Sent: Thursday, August 22, 2024 1:28 PM
To: Dalrymple, Joe <joe.dalrymple@wsp.com>; Repella, Angela C CIV USARMY CENAE (USA) <Angela.C.Repella@usace.army.mil>; john.maurer@gsa.gov; pam.howe@gsa.gov
Cc: Baker, Justin <Justin.Baker@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>; Newhouse, Michael <Michael.Newhouse@wsp.com>; adam.hunter@gsa.gov
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Good afternoon,

I am looking forward to meeting those of you who are attending next Wednesday at 11am.

Joe and GSA folks- I am throwing a bit of a curveball here. I need to bring a DEC Wetlands Program colleague with me- we have some sites in the area to visit later that day. Is there anyway to have them vetted in time?

Thank you.

Krystal T. Sewell (she/her) | District Wetlands Ecologist
Vermont Department of Environmental Conservation
Watershed Management Division, Wetlands Program
Davis 3, 1 National Life Dr | Montpelier, VT 05620-3901
802-490-6758
https://dec.vermont.gov/watershed/wetlands

For resources related to flood recovery: https://anr.vermont.gov/flood

VERMONT

From: Dalrymple, Joe <joe.dalrymple@wsp.com>
Sent: Wednesday, July 24, 2024 10:30 AM
To: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>; Repella, Angela C CIV USARMY CENAE (USA)

<Angela.C.Repella@usace.army.mil>; Missy Mertz - 3PTN <melissa.mertz@gsa.gov>
Cc: Baker, Justin <Justin.Baker@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>; Newhouse, Michael <Michael.Newhouse@wsp.com>; adam.hunter@gsa.gov
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.

Hi Angela and Krystal,

GSA has confirmed that CBP will not require any additional vetting prior to the Norton LPOE site visit on 8/28. You were already cleared for the Richford site visit, which satisfies CBP's requirements.

Thanks,

Joe

Joe Dalrymple
Senior Consultant, Environmental Planner
Federal Programs, Environment
Pronouns (he/him)

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From: Dalrymple, Joe
Sent: Tuesday, July 23, 2024 12:40 PM
To: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>; Repella, Angela C CIV USARMY CENAE (USA) <Angela.C.Repella@usace.army.mil>; Missy Mertz - 3PTN <melissa.mertz@gsa.gov>
Cc: Baker, Justin <Justin.Baker@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>; Newhouse, Michael <Michael.Newhouse@wsp.com>; adam.hunter@gsa.gov
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Hi Angela and Krystal,

11 am on 8/28 works for me.

Adam or Missy – Do Angela and Krystal need to fill out the CBP vetting form for the Norton site visit? They've both been on site at the Richford LPOE but not Norton to my knowledge. I'm not sure if the vetting form applies to government personnel outside CBP, or just to contractors.

Thanks,

Joe

Joe Dalrymple
Senior Consultant, Environmental Planner
Federal Programs, Environment
Pronouns (he/him)

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From: Sewell, Krystal T <Krystal.T.Sewell@vermont.gov>
Sent: Tuesday, July 23, 2024 12:07 PM
To: Repella, Angela C CIV USARMY CENAE (USA) <Angela.C.Repella@usace.army.mil>; Dalrymple, Joe <joe.dalrymple@wsp.com>; Missy Mertz - 3PTN <melissa.mertz@gsa.gov>
Cc: Baker, Justin <Justin.Baker@wsp.com>; Long, Ryan <Ryan.Long@wsp.com>; Newhouse, Michael <Michael.Newhouse@wsp.com>; adam.hunter@gsa.gov
Subject: RE: [Non-DoD Source] Re: 2024-0701_Norton Vermont LPOE Wetland Delineation Report

Good afternoon,

I have held Wednesday 8/28 at 11am on my schedule for this visit. Will we need to provide any advanced information to CBP?

Krystal T. Sewell (she/her) | District Wetlands Ecologist
Vermont Department of Environmental Conservation
Watershed Management Division, Wetlands Program
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VERMONT

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U.S. Army Corps of Engineers (USACE)

PRELIMINARY JURISDICTIONAL DETERMINATION (PJD)

For use of this form, see Sec 404 CWA, Sec 10 RHA, Sec 103 MPRSA; the proponent agency is CECW-COR.

Form Approved - OMB No. 0710-0024 Expires 2024-04-30

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Program of the U.S. Army Corps of Engineers; Final Rule for 33 CFR Parts 320-332.

Principal Purpose The information that you provide will be used in evaluating your request to determine whether there are any aquatic resources within the review area that may be subject to federal jurisdiction under the regulatory authorities referenced above.

Routine Uses This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public, and may be made available as part of a public notice or FOIA request as required by federal law. Your name and property location where federal jurisdiction is to be determined will be included in any resulting jurisdictional determination (JD), which may be made available to the public on the District's website and/or on the Headquarters USACE website.

Disclosure Submission of requested information is voluntary; however, if information is not provided, the request for a JD cannot be evaluated nor can a PJD be issued.

The Agency Disclosure Notice (ADN)

The public reporting burden for this collection of information, 0710-0024, is estimated to average 25 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

SECTION I - BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 2025-01-29

B. NAME AND ADDRESS OF PERSON REQUESTING PJD:
Justin A Baker

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:
CENAE-RNH/VT, U.S. General Services Administration / Norton LPOE, NAE-2024-00350

D. PROJECT LOCATION AND BACKGROUND INFORMATION:
(*USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES*)

State: Vermont County/Parish/Borough: Essex City: Norton

Center coordinates of site (*lat/long in degree decimal format*): Latitude: 45.010392 ° Longitude: -71.79419 °

Universal Transverse Mercator: 19

Name of nearest waterbody: Coaticook River

E. REVIEW PERFORMED FOR SITE EVALUATION (*CHECK ALL THAT APPLY*):

☒ Office (*Desk*) Determination. Date: 2025-01-29

☒ Field Determination

Date(s): 2024-08-28

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

	Site Number	Latitude (*decimal degrees*)	Longitude (*decimal degrees*)	Estimated amount of aquatic resource in review area (*acreage and linear feet, if applicable*)	Type of aquatic resource (*i.e., wetland vs. non-wetland waters*)	Geographic authority to which the aquatic resource "may be" subject (*i.e., Section 404 or Section 10/404*)
	W02001	45.009154	-71.791671	0.03 acre	Wetland	Section 404

	Site Number	Latitude (*decimal degrees*)	Longitude (*decimal degrees*)	Estimated amount of aquatic resource in review area (*acreage and linear feet, if applicable*)	Type of aquatic resource (*i.e., wetland vs. non-wetland waters*)	Geographic authority to which the aquatic resource "may be" subject (*i.e., Section 404 or Section 10/404*)
	W02002	45.009714	-71.791671	0.33 acre	Wetland	Section 404
	W02003	45.010226	-71.792215	0.01 acre	Wetland	Section 404
	T02001	45.010249	-71.79376	85.88 LF	R3	Section 404
	T02002	45.010214	-71.79209	412.17 LF	R4	Section 404
	D02001	45.01015	-71.79463	142.18 LF	R6	Section 404
	D02002	45.0099	-71.79476	71.60	R6	Section 404
	D02003	45.00962	-71.79522	81.60	R6	Section 404
	D02004	45.00958	-71.79471	30.22	R6	Section 404
	D02005	45.00967	-71.79464	95.75	R6	Section 404
	D02006	45.00896	-71.79556	33.78	R6	Section 404
	D02007	45.00881	-71.79572	105.20	R6	Section 404
	D02008	45.0086	-71.79525	320.22	R6	Section 404
	D02009	45.00945	-71.79401	541.99	R6	Section 404
	D02010	45.01063	-71.79491	16.80	R6	Section 404
	D02011	45.0091	-71.79211	334.52	R6	Section 404
	D02015	45.00952	-71.79319	271.92	R6	Section 404
	D02017	45.01051	-71.79264	129.60	R6	Section 404
	D02018	45.01039	-71.7931	123.35	R6	Section 404

	Site Number	Latitude (*decimal degrees*)	Longitude (*decimal degrees*)	Estimated amount of aquatic resource in review area (*acreage and linear feet, if applicable*)	Type of aquatic resource (*i.e., wetland vs. non-wetland waters*)	Geographic authority to which the aquatic resource "may be" subject (*i.e., Section 404 or Section 10/404*)
	D02019	45.00926	-71.79222	283.14	R6	Section 404
	C02001	45.010496	-71.794945	82.66	R6	Section 404
	C02002	45.010228	-71.794727	60.73	R6	Section 404
	C02003	45.009854	-71.794515	77.21	R6	Section 404
	C02004	45.009914	-71.794583	39.58	R6	Section 404
	C02005	45.009458	-71.794642	61.84	R6	Section 404
	C02006	45.008948	-71.795691	49.22	R6	Section 404
	C02007	45.009531	-71.793767	55.76	R6	Section 404
	C02008	45.010612	-71.792533	57.42	R6	Section 404
	C02009	45.010328	-71.793715	178.76	R6	Section 404
	C02010	45.009324	-71.792719	58.88	R6	Section 404
	C02012	45.010269	-71.793508	115.71	R6	Section 404
	C02013	45.009176	-71.791915	79.68	R6	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.

2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD or no JD whatsoever, which do not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the USACE has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD or reliance on no JD whatsoever; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of USACE permit authorization based on a PJD or no JD whatsoever constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the USACE will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

F. SUPPORTING DATA. Data reviewed for PJD (*check all that apply)*

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

☒ Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:

Map: See report titled "Wetlands and Waterbodies Delineation Report Norton Land Port of Entry Town of Norton Essex County, Vermont" dated "January 21, 2025"

☒ Data sheets prepared/submitted by or on behalf of the PJD requestor.

☒ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

Rationale:

☐ Data sheets prepared by the USACE:

☐ Corps navigable waters' study:

☐ U.S. Geological Survey Hydrologic Atlas:

☐ USGS NHD data.

☐ USGS 8 and 12 digit HUC maps.

☐ U.S. Geological Survey map(s). Cite scale & quad name:

☒ USDA Natural Resources Conservation Service Soil Survey.

Citation: See Figure 3 in report titled ""Wetlands and Waterbodies Delineation Report Norton Land Port of Entry Town of Norton Essex County, Vermont" dated "January 21, 2025"

☒ National Wetlands Inventory map(s).

Cite Name: See Figure 4 in report titled "Wetlands and Waterbodies Delineation Report Norton Land Port of Entry Town of Norton Essex County, Vermont" dated "January 21, 2025"

☐ State/Local Wetland Inventory map(s):

Print Form Save As

☐ FEMA/FIRM maps

☐ 100-year Floodplain Elevation is: _____. (National Geodectic Vertical Datum of 1929)

☒ Photographs: ☐ Aerial (*Name & Date*): _____

or ☒ Other (*Name & Date*): See report titled "Wetlands and Waterbodies Delineation Report Norton Land Port of Entry Town of Norton Essex County, Vermont" dated "January 21, 2025"

☐ Previous determination(s). File no. and date of response letter:

☒ Other information (*please specify*):

Additional note regarding report titled "Wetlands and Waterbodies Delineation Report Norton Land Port of Entry Town of Norton Essex County, Vermont" dated "January 21, 2025":

In an email dated December 18, 2024, WDR acknowledges that, "the USACE column on the right [of 'Table 4-1 - Summary of Delineated Features Within the Study Area' of the report] represents the anticipated determination based on the professional judgment of the lead delineator, as presented in the WDR, but is not meant to be representative of USACE's final determination."

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the USACE and should not be relied upon for later jurisdictional determinations.

Name of Regulatory Staff Member Completing PJD	Date	Signature of Regulatory Staff Member Completing PJD
Angela C. Repella	2025-01-29	Angela Repella Digitally signed by Angela Repella Date: 2025.01.29 14:20:55 -05'00'
Name of Person Requesting PJD	Date	Signature of Person Requesting PJD (*REQUIRED, unless obtaining the Signature is Impracticable*)
Justin A. Baker	2/4/25	

[1] Districts may establish timeframes for requester to return signed PJD forms. If the requester does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

APPENDIX B—SCOPING SUMMARY REPORT

Scoping Summary Report

for the

United States General Services Administration Environmental Impact Statement to Modernize the U.S. Customs and Border Protection Land Port of Entry (LPOE) in Norton, Essex County, Vermont.

March 2024

Prepared for:

US General Services Administration Design & Construction Division (1PCTB)
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222-1077

Prepared by:

WSP USA
5411 Skycenter Drive, Suite 650
Tampa, Florida 33067

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Appendices

List of Tables

Acronyms and Abbreviations

CBP	U.S. Customs and Border Protection
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
GSA	U.S. General Services Administration
LPOE	Land Port of Entry
NEPA	National Environmental Policy Act
NOI	Notice of Intent

1 Introduction

This Scoping Summary Report presents a summary and overview of the scoping process conducted pursuant to the U.S. General Services Administration (GSA) procedures for compliance with the National Environmental Policy Act (NEPA) of 1969 (40 Code of Federal Regulations [CFR] 1500-1508).

The report is organized as follows: Section 2 discusses the public scoping process, including notification methods used by the GSA to inform the public of opportunities for involvement during the scoping period; Section 3 summarizes the scoping meeting, including location, attendance, and format; and Section 4 describes the methods by which comments were received, the number of comments received, and the stakeholders who provided them.

1.1 Purpose of Scoping

Under NEPA, scoping is defined as the process by which lead agencies solicit input from the public and interested agencies on the nature and extent of issues and impacts to be evaluated and the appropriate level of analysis. The scoping process also provides ample opportunity for the public and agencies to learn about and comment on the Proposed Action (see Section 1.2, Description of Proposed Action) and proposed alternatives. This Scoping Summary Report discusses the materials prepared for, as well as public input obtained during, the scoping process. Although this report identifies the scoping comments obtained during the scoping period, it does not make decisions regarding the Proposed Action, nor does it set forth policies.

1.2 Description of Proposed Action

GSA intends to prepare an Environmental Impact Statement (EIS) to evaluate and inform a decision on the modernization of the Land Port of Entry (LPOE) in Norton, Vermont. The EIS will consider the potential effects and impacts from the Proposed Action. GSA is proposing to modernize the Norton LPOE to fulfill tenant needs and meet current safety and security requirements. U.S. Customs and Border Protection (CBP) currently inspects private vehicular and commercial truck traffic at the subject LPOE on the U.S.–Canada Border. The proposed improvements would increase separation between public and secure areas, add an enclosed area for non-commercial secondary inspections, renovate the existing Main Building and Garage, increase transportation efficiency, construct a Secondary Commercial Inspection Facility and Staging Facility, and update existing infrastructure.

2 Public Scoping Process

2.1 Scoping Periods

GSA initiated a 45-day public scoping period, from January 24, 2024, to March 8, 2024, through the publication of a Notice of Intent (NOI) in the Federal Register, publication of a notice in the *News and Sentinel* newspaper, and the mailing of stakeholder notification letters.

2.2 Scoping Notification

GSA utilized several methods to notify the public of opportunities for involvement and comment during scoping. These methods included:

- A newspaper public notice
- A press release
- Posts on GSA Facebook and X accounts
- Posts on the Town of Norton Facebook account
- A stakeholder notification letter
- Coordination with the Town of Norton Clerk's office
- Letters to all Town of Norton landowners

Details of these notification methods are outlined in the following subsections and copies of these materials are provided in Appendix A.

2.2.1 Newspaper Public Notice

GSA published a notice on January 24, 2024, in the *News and Sentinel* newspaper announcing the opening of the formal scoping period, as well as the date, time, location, and purpose of the scoping meeting. The newspaper notice is provided in Appendix A.

2.2.2 Notification Letter

GSA compiled a mailing list of government officials, federal and state agencies, utility providers, non-governmental organizations, corporations, citizen groups, and potentially impacted property owners. A notification letter was mailed to interested parties and stakeholders announcing the scoping period, as well as the date, time, location, and purpose of the scoping meeting; methods to comment; general Project information; and instruction on how to obtain additional information. The notification letter and mailing list are provided in Appendix A.

3 Public Scoping Meetings

A public scoping meeting was held to provide the opportunity for local communities, government agencies, special interest groups, and the general public to learn about the Project and to express their thoughts regarding the Proposed Action. The meeting was held Tuesday, January 30, 2024, in Norton, Vermont.

3.1 Scoping Meeting Attendance

Table 3-1 summarizes the public scoping meeting time, location, and the number of attendees.

Table 3-1 Schedule of Public Scoping Meeting and Attendance

Meeting Date	Location	Time	Attendance
January 30, 2024	Norton Town Office 12 VT-114 East, Norton, VT 05907	5:30 p.m. – 7:30 p.m.	18

3.2 Scoping Meeting Format

The public scoping meeting was presented as a brief presentation on the Project and the NEPA process, followed by an "open comment period." This format that was specifically designed to ensure attendees understood the Project requirements and timeline and were able to ask GSA any questions they had. The goal of this meeting was to introduce the community to the EIS process, provide available Project information, answer questions, and solicit public input on important issues and concerns.

The meeting format consisted of a sign-in table at the meeting room entrance that included a comment station where attendees were able write comments. The meeting presentation was displayed on the north wall, and seating was made available for all attendees. Banner posters on the Project's purpose and need, the NEPA process, and information on how attendees could submit their comments were located next to the sign-in and comment station.

Materials presented and available at the public scoping meetings continue to be available at the Project website (www.gsa.gov/norton) and are provided in Appendix B.

4 Public Scoping Comment Summary

4.1 Comment Methods

The public was offered the opportunity to provide comments during the scoping period via a number of methods including submitting a comment form at the scoping meeting, email, and mail. GSA advertised these methods in the local newspaper notice, in the notification letter, in the NOI published to the Federal Register, and on the scoping meeting comment sheets and display boards. Fifteen stakeholders submitted 28 individual comments covering various themes related to the Project during the public scoping period. Sections 4.2 and 4.3 discuss the stakeholders that submitted comments and the major themes. The comments are included in Appendix C.

Table 4-1 provides a detailed breakdown of how comments were provided.

Table 4-1 Comments Received During the Public Scoping Period

Comment Method	Number of Comments Received
Scoping Meeting	11
Mail	0
Email	17
Totals	**28**

4.2 Stakeholder Groups

During the public scoping period for the Proposed Action, comments were received from a variety of stakeholder and interest groups, including local citizens and landowners, and local recreation organizations. Table 4-2 illustrates the various stakeholder groups that submitted comments during the public scoping period.

Some commenting stakeholders used multiple commenting mechanisms to voice their opinions. No comments were received via mail. It is important to note that the numbers discussed in this section represent all the comments that were received. All comments are provided in Appendix C.

Table 4-2 Commenting Stakeholder Groups

Stakeholder	Comment Method			Totals
	Meeting	Mailed	Emailed	
Landowner/Citizen	5	0	2	**7**
Agency	2	0	9	**11**
Local Government	0	0	4	**4**
Other Organization	4	0	2	**6**
Totals	**11**	**0**	**17**	**28**

4.3 Scoping Comments

A variety of issues were identified in the comments received during the scoping period. Many of these issues were also voiced during the public scoping meeting to Project team members. Based on comments heard and received in writing, the most pressing concerns about the Project include the following:

Table 4-3 Comment Concern Topics

Comment Concern	Number of Comments Received
Impacts to Nearby Property	4
Road Alignment	3
Additional Data	2
Hydrology	2
Railroad Impacts	2
Recreation Impacts	2
Stakeholder Involvement	2
Wetlands	2
Act 250	1
Bridge	1
Meeting Materials	1
Permitting	1
Similar Projects	1
Stormwater	1

Issues identified during the public scoping period will be incorporated into the EIS. Each of the concerns identified by the public will be analyzed as part of the analysis for various resource areas. The analysis will consider these issues and address potential environmental or socioeconomic impacts.

Appendix A

Public Notification Documentation

Appendix A

Public Notification Documentation

Appendix A.1

Notice of Intent

key word searches, including name, agency, dates, subject, Privacy Act request tracking number, and other information retrievable with full-text searching capability.

POLICIES AND PRACTICES FOR RETENTION AND DISPOSAL OF RECORDS:

Privacy Act records are maintained for three years or longer, in accordance with item 001 of General Records Schedule 4.2, as approved by the Archivist of the United States. Disposal is by shredding and/or by deletion of the electronic record.

ADMINISTRATIVE, TECHNICAL, AND PHYSICAL SAFEGUARDS:

Computer records are maintained in a secure, password-protected computer system. Paper records are maintained in secure offices or lockable file cabinets. All records are maintained in secure, access-controlled areas or buildings.

RECORD ACCESS PROCEDURES:

Individuals wishing access to records about them should contact the System Manager. Individuals must furnish the following information for their records to be located and identified:

a. Full name.

b. Approximate date of the Privacy Act request or appeal.

Individuals requesting access must comply with the FLRA's Privacy Act regulations regarding access to records (5 CFR 2412).

CONTESTING RECORD PROCEDURES:

Individuals wishing to request amendment of records about them should contact the System Manager. Individuals must furnish the following information for their records to be located and identified:

a. Full name.

b. Approximate date of the Privacy Act request or appeal.

Individuals requesting amendment must follow the FLRA's Privacy Act regulations regarding amendment of records (5 CFR 2412).

NOTIFICATION PROCEDURES:

Individuals wishing to determine whether this system of records contains information about them should contact the System Manager. Individuals must furnish the following for their records to be located and identified:

a. Full name.

b. Approximate date of the Privacy Act request or appeal.

Individuals making inquiries must comply with the FLRA's Privacy Act regulations regarding the existence of records (5 CFR 2412).

EXEMPTIONS PROMULGATED FOR THE SYSTEM:

None.

HISTORY:

None.

Approved: January 3, 2024.

Thomas Tso,

Solicitor and Senior Agency Official for Privacy, Federal Labor Relations Authority.

[FR Doc. 2024–00104 Filed 1–5–24; 8:45 am]

BILLING CODE 7627–01–P

GENERAL SERVICES ADMINISTRATION

[Notice–PBS–2024–01; Docket No. 2024–0002; Sequence No. 1]

Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

AGENCY: Public Buildings Service (PBS), General Services Administration (GSA).

ACTION: Notice of Intent (NOI); Announcement of meeting.

SUMMARY: Pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) GSA intends to prepare an Environmental Impact Statement (EIS) to analyze the potential environmental impacts from the proposed modernization of the Land Port of Entry (LPOE) in Norton, Vermont. The proposed project would allow the U.S. Customs and Border Protection (CBP) to more efficiently carry out its agency mission at the international border crossing between Norton, Vermont and Stanhope, Quebec. The project study area is located in an area susceptible to flooding and therefore project alternatives will be reviewed in accordance with Executive Orders 11988, and 13690. GSA also intends to initiate consultation as required by Section 106 of the National Historic Preservation Act.

DATES: *Public Scoping*—Interested parties are encouraged to provide written comments regarding the scope of the EIS. Written comments must be submitted to GSA by March 8, 2024 (see **ADDRESSES** section for where to submit comments).

Meeting Date—A public scoping meeting will be held on January 30, 2024, from 5:30 p.m. to 7:30 p.m., EST, with a presentation to begin at 6 p.m. The meeting will be held at the Norton Town Office (see **ADDRESSES** section for location address). In the event of inclement weather, the meeting will be rescheduled, and a new notice will be posted.

Requests for Accommodations: Persons requiring accommodations shall notify Kelly Morrison at *Kelly.morrison@gsa.gov* by January 17, 2024.

ADDRESSES: *Public Scoping Comments*—The public is encouraged to provide written comments regarding the scope of the EIS at the meeting and throughout the comment period. Submit comments by any of the following methods:

In-person: Submit written comments at the public scoping meeting via comment forms distributed at the meeting. There will be a stenographer present to capture comments voiced at the meeting.

Email: Send an email to *Norton.LPOE@gsa.gov* and reference ''Norton LPOE EIS'' in the subject line.

Mail: U.S. General Services Administration, Attention: U.S General Services Administration, Attention: Adam Hunter, Norton Project Manager, Thomas P. O'Neill, Jr. Federal Building, 10 Causeway Street, 11th Floor, Boston, MA 02222–1077.

Meeting Location—A public scoping meeting will be held at the Norton Town Office, 12 VT–114 East, Norton, VT 05907.

FOR FURTHER INFORMATION CONTACT: Adam Hunter, Norton Project Manager, (347) 255–7483, *adam.hunter@gsa.gov.*

SUPPLEMENTARY INFORMATION:

Background

The project scope consists of the modernization of a LPOE in order to meet the U.S. Customs and Border Protection (CBP) current Program of Requirements to carry out their agency mission at the international border crossing between Norton, Vermont and Stanhope, Quebec. The existing LPOE was constructed in 1933, with a truck facility constructed in 1961. Two additional garages were built in 2003. The main building is listed on the National Register of Historic Places. The current facilities are significantly outdated and do not meet the CBP's current LPOE design standards.

The proposed modernization of the Norton, Vermont LPOE would help improve traffic flow, enhance security, and facilitate trade and travel in the region. The proposed new facility will strengthen supply chains, improve operational capabilities and facility infrastructure, spur economic growth, and bolster the country's security.

Alternatives Under Consideration

GSA intends to prepare an EIS to analyze the potential environmental impacts resulting from the proposed modernization of the Norton, Vermont LPOE. The EIS will consider at a minimum, one ''action'' alternative and one ''no action'' alternative. The action

alternative(s) will consist of modernizing the LPOE to improve public and officer safety, and provide for the long-term, safe and efficient flow of current and projected traffic volumes. The action alternative(s) will be developed and refined based on resource impact considerations, floodplain management, site and design logistics, and information obtained through public scoping and agency consultation.

The EIS will address the potential environmental impacts of the proposed alternatives on environmental resources which may include aesthetics, air quality, geology and soils, hazardous materials, hydrology and water quality, cultural resources, biological resources including wetlands and threatened and endangered species, land use, noise, utilities, and traffic. The EIS will also address the socioeconomic effects of the project as well as impacts on Environmental Justice populations.

Scoping Process

The views and comments of the public are necessary to help determine the scope and content of the environmental analysis. The scoping process will be accomplished through a public scoping meeting, direct mail correspondence to appropriate federal, state, and local agencies, and to private organizations and citizens who have previously expressed or are known to have an interest in the project. Agencies and the public are encouraged to attend the public scoping meeting and provide written comments regarding the scope of the EIS. There will be a project presentation at 6:00 p.m. with a public comment period to follow. After the meeting GSA will post the following items at the project website, *gsa.gov/norton.*

- Meeting handouts
- Presentation slide deck
- Meeting transcript
- Audio/video of the meeting with closed captions

See information provided above for dates, addresses, and contact information.

Patrick Sbardelli,

Director, LPOE Project Management Office; Design and Construction Division, U.S. General Services Administration, PBS New England Region.

[FR Doc. 2024–00138 Filed 1–5–24; 8:45 am]

BILLING CODE 6820–RB–P

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Administration for Children and Families

Submission for OMB Review; Release of Unaccompanied Alien Children From ORR Custody (OMB #0970–0552)

AGENCY: Office of Refugee Resettlement; Administration for Children and Families; Department of Health and Human Services.

ACTION: Request for public comments.

SUMMARY: The Office of Refugee Resettlement (ORR), Administration for Children and Families (ACF), U.S. Department of Health and Human Services, is inviting public comments on revisions to an approved information collection. The request consists of several forms that allow the Unaccompanied Children (UC) Program to process release of unaccompanied children from ORR custody and provide services after release.

DATES: *Comments due within 30 days of publication.* Office of Management and Budget (OMB) must make a decision about the collection of information between 30 and 60 days after publication of this document in the **Federal Register**. Therefore, a comment is best assured of having its full effect if OMB receives it within 30 days of publication.

ADDRESSES: Written comments and recommendations for the proposed information collection should be sent within 30 days of publication of this notice to *www.reginfo.gov/public/do/PRAMain.* Find this particular information collection by selecting ''Currently under 30-day Review—Open for Public Comments'' or by using the search function.

SUPPLEMENTARY INFORMATION:

Description: ORR is proposing revisions to four forms (Forms R–1, R–2, R–4, and R–6), the addition of one new form (Form R–9), removal of one form (Form R–3), continued use of the current version of one form (Form R–6), and alternate versions of two forms (R–2 and R–4). See below for a detailed description of the proposed revisions for each instrument.

Verification of Release (Form R–1)

There are two currently approved versions of this form under this information collection—one for UC Portal and one for UC Path. ORR proposes discontinuing the UC Portal version, incorporating the UC Path version into the UC Portal system, and making the below-listed revisions. ORR also updated the burden estimates for this form to account for an increase in the number care provider facilities and in the number of children placed in ORR care. The annual number of respondents increased from 216 to 300 and the annual number of responses per respondent increased from 253 to 428.

Proposed Revisions

- Child's Information
  - Retitle section from *Minor's Information* to *Child's Information*
  - Remove the term ''minor'' from the *Name, Date of Birth,* and *A#* fields.
  - Remove the *Height, Weight,* and *Hair Color* fields. ORR determined that these fields are not a good fit for this form given that height and weight will change quickly as the child grows and hair color is often altered.
  - Add fields for *Primary Language* and *Country of Birth*. These fields will be auto-populated.
- Sponsor Information
  - Rephrase *Name of Sponsor* to *Name*
  - Rephrase *Telephone #* to *Primary Phone #*
  - Remove *Alias (if any)* field
- Acknowledgement of the Sponsor Care Agreement
  - Rephrase *Name of ORR Care Provider* to *ORR Care Provider Name*
  - Rephrase *Date* to *Discharge Date*
  - Add the following statement: *In agreeing to these provisions, the sponsor holds authority to consent to medical and mental health care on behalf of the child.*

Discharge Notification (Form R–2)

There are two currently approved versions of this form under this information collection—one for UC Portal and one for UC Path. ORR proposes discontinuing the UC Path version and revising the UC Portal version.

To support making iterative improvements, ORR proposes two versions of the form. The first version will be rolled out in the current UC Portal system. The second version will be rolled out in a modernized version of UC Portal. ORR expects to begin rolling out features in the new modernized system in 2024. Once the second version is rolled out, ORR will submit a nonsubstantive change request to remove the first version from the information collection.

ORR also updated the burden estimates for this form to reflect the revisions and to account for an increase in the number of care provider facilities and in the number of children placed in

Appendix A

Public Notification Documentation

Appendix A.2

Newspaper Notice and Affidavit

Snowmobile Crashes

(Continued From Page 3)

According to CO Austin Valladares, Mr. Ghilherme was ejected from his snowmobile and suffered serious, but non-life-threatening injuries. His riding companions evaluated his injuries and called 911. Colebrook Fire Department and 45th Parallel EMS responded, placing Mr. Guilherme on a backboard and transporting him on CFD's Argo vehicle to the ambulance, which took him to UCVH for treatment. "The investigation into the cause of the crash is still ongoing," stated CO Valladares, "but from an evaluation of the scene and statements from his riding companions, it appears that inexperience is the leading factor."

Two crashes occurred in Pittsburg on Sunday, the first at 10:36 a.m. on Primary Trail 141. CO Valladares reported that Pasquale Carbone, 47, of Waltham, Mass., was traveling north when he failed to navigate a left-hand turn and was ejected from his snowmobile after hitting a tree. He suffered serious, but non-life-threatening injuries, and passersby called 911. Pittsburg Fire and Rescue responded to the scene and used rescue snowmobiles to transport Mr. Carbone on a backboard to an awaiting ambulance. He was taken to UCVH for further evaluation.

Another crash occurred at around 2 p.m. on Primary Trail 144 near Magalloway Road. Paula Sylvia, 59, of Taunton, Mass., was riding with a group of friends when she failed to slow down at an intersection and hit a tree. PFD used its rescue snowmobiles to transport her to a 45th Parallel EMS ambulance on Magalloway Road and she was taken to UCVH for treatment.

School Administrative Unit #58

15 Preble Street • Groveton, NH 03582 • (603) 636-1427

Stratford School District
School Clerk Vacancy

The Stratford School Board is seeking a person to fill a vacancy as the School Clerk until the March 2024 election. Interested candidates need to submit a letter of interst to the Superintendent of Schools, 15 Preble Street, Groveton, NH 03582.

EOE

SCHOOL ADMINISTRATIVE UNIT #58
Northumberland-Stark-Stratford
PUBLIC NOTICE

The school districts of SAU #58 announce the following details regarding the filing of candidates for public office. Information for the filing of candidates will be available in the Office of the Superintendent of Schools, 15 Preble Street, Groveton, NH 03582 (tel. 603-636-1437).

FILING OF CANDIDATES FOR OFFICE

Filing period: January 24, 2024 through February 2, 2024 at 5:00 p.m.

Northumberland - Positions open: Moderator, one-year term; Clerk, one-year term; Treasurer, one-year term; School Board, one 3-year term.

Stark – Positions open: Moderator, one-year term; Clerk, one-year term; Treasurer, one year term; School Board, one 3-year term.

Stratford – Positions open: Moderator, one-year term; Clerk, one-year term; Treasurer, one-year term; School Board, one 3-year term.

The SAU #58 school districts operate under the non-partisan ballot system for the election of school officials. Filing forms for candidates for Northumberland School District positions may be obtained at the Office of the Superintendent of Schools, 15 Preble Street, Groveton, NH; filing forms for Stark and Stratford positions should be obtained at the respective Town Clerks' offices.

NOTICE: School district officers for all three districts are to be elected at the Town Meetings in the respective towns in accordance with the statutory election procedures adopted by the school districts.

Notice of Intent to Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

Pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA), the U.S. General Services Administration (GSA) intends to prepare an Environmental Impact Statement (EIS) to analyze the potential environmental impacts from the proposed modernization of the Land Port of Entry (LPOE) in Norton, Vermont. The proposed project would allow the U.S. Customs and Border Protection (CBP) to more efficiently carry out its agency mission at the international border crossing between Norton, Vermont and Stanhope, Quebec.

GSA is initiating a public scoping period to identify community interests and local issues to be addressed in the EIS and to solicit input from the public. A public scoping meeting will be held on the following date and at the following location:

Tuesday, January 30, 2024
5:30 – 7:30 pm ET
Norton Town Office, 12 VT-114 East, Norton, VT 05907

A presentation on the project will begin at 6:00 pm, followed by an open comment period. Agencies and the public are encouraged to attend the public scoping meeting and provide comments regarding the scope of the EIS. See information provided below for available comment submission methods. Comments must be submitted by March 8, 2024.

Mail: U.S. General Services Administration
Attention: Adam Hunter, Norton Project Manager
Thomas P. O'Neill, Jr., Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222-1077

Email: Norton.LPOE@gsa.gov and reference "Norton LPOE EIS" in the subject line

In Person: Submit written comments at the public scoping meeting via comment forms. There will also be a stenographer to capture comments voiced during the meeting.

If you would like more information, have an accommodation request, or have specific questions relating to this project, please email Norton.LPOE@gsa.gov

SAU #58 VACANCIES
2024-2025

Groveton Middle/High School
- **Special Education Teacher (ID#4201562)**
- **Speech Pathologist-All 3 Districts (ID#44245633)**
- **Student Assistant Program Coordinator (ID#4163406)**
- **Paraprofessional (ID#4341796)**

Groveton Elementary School
- **Special Education Teacher (ID#4113966)**
- **Anticipated Elementary Teacher (ID#4500971)**

Stratford Public School
- **Paraprofessional (ID#4341796)**
- **Special Education Teacher (ID#4433758)**
- **Early Childhood Teacher (Pre-K/K) (ID#4458797)**
- **Title I Teacher (ID#4458797)**
- **Anticipated Speech & Language Pathologists Assistant (ID#4503996)**

Stark Village School
- **Anticipated Speech & Language Pathologists Assistant (ID#4503996)**

Central Office
- **Superintendent of Schools (ID#4485700)**

For more information or to apply, please go to ***www.SchoolSpring.com*** and reference the above job ID. All applications must go through SchoolSpring for the positions listed above.

SAU 58 is looking for substitute School Nurses to provide nursing support to students throughout the day (8:00am - 2:30pm) in the absence of the school nurse at any of our schools. RN license (preferred); must have CPR and First Aid certification. Previous experience in a health care setting, preferably in pediatrics or school nursing, required. Experience with Type 1 diabetes is preferred. If interested, please contact:

Jo Robinson, Secretary
SAU #58, 15 Preble Street, Groveton, NH 03582
Ph: 603-636-1437 • Fax: 603-636-6102 *EOE*

Cyan Magenta Yellow Black

The NEWS and SENTINEL

The North Country's hometown newspaper since 1870

PROOF OF PUBLICATION

I, Linda Young, as a designated agent duly authorized by THE NEWS and SENTINEL, a newspaper of general circulation, do hereby certify that a notice, a printed copy of which is attached, was inserted and published in THE NEWS and SENTINEL on the following date(s):

1/24/2024

Notice of Intent to Prepare an Environmental Impact Statement for The Modernization of the Land Port of Entry in Norton, Vermont

Linda Young
Name

Signed and sworn to before me
On this 25th day of January, 2024

Jolene M. Martunas
Notary Public

My Commission expires: 10/19, 2027

Jolene M. Martunas
NOTARY PUBLIC
State of New Hampshire
My Commission Expires 10/19/2027

Appendix A

Public Notification Documentation

Appendix A.3

Stakeholder Notification Letter

January 24, 2024

RE: Scoping for the Preparation of an Environmental Impact Statement for the Proposed Modernization Project at the Norton Land Port of Entry in Norton, Vermont

Dear Interested Party:

In compliance with the National Environmental Policy Act (NEPA), the U.S. General Services Administration (GSA) will prepare an Environmental Impact Statement (EIS) to analyze the potential natural and human environmental impacts from the proposed modernization project at the Norton Land Port of Entry (LPOE) in Norton, Vermont (VT) (Figure 1). You are receiving this letter because you have been identified as an interested party and/or stakeholder for this project. We encourage you to review the project information and provide any comments you may have.

GSA is the lead agency for the EIS, acting on behalf of its federal agency tenant, U.S. Customs and Border Protection (CBP). The project would help CBP to carry out its agency mission more efficiently at the international border crossing between Norton, VT, and Stanhope, Quebec, Canada. CBP currently inspects private vehicular and commercial truck traffic at the Norton LPOE. The proposed project would modernize the LPOE to meet current safety and security requirements. Currently, the LPOE has insufficient separation between public and secure areas, no enclosed area for non-commercial secondary inspections, and the inspection lanes are difficult to enter and lack adequate turning space for oversized vehicles.

Concurrently with NEPA compliance, GSA will initiate consultation under the National Historic Preservation Act Section 106, as the current main building is eligible for listing on the National Register of Historic Places (NRHP).

GSA is initiating a public scoping period to identify community interests and local issues to be addressed in the EIS and to solicit input from the public. A public scoping meeting, including a project presentation and open public comment period, will be held on the following date and time at the following location:

Tuesday, January 30, 2024
5:30 – 7:30PM EST
Norton Town Office, 12 VT-114 East, Norton, VT 05907

A presentation on the project will begin at 6:00PM. An American Sign Language translator will be available during the meeting and a stenographer will capture comments voiced during the meeting. Agencies and the public are encouraged to attend the public scoping meeting and provide comments regarding the scope of the EIS.

Your participation in the EIS process is greatly appreciated. Comments must be submitted to GSA by March 8, 2024 using one of the following methods:

Mail: U.S. General Services Administration
Attention: Adam Hunter, Norton LPOE Project Manager
Design & Construction Division (1PCTB)
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222-1077

Email: Norton.LPOE@gsa.gov and reference "Norton LPOE EIS" in the subject line

In Person: Submit written comments at the public scoping meeting via comment forms. There will also be a stenographer to capture comments voiced during the meeting.

Additional information on the meeting and weather updates can be found on the Town of Norton Facebook page. If you would like more information, have an accommodation request, or have specific questions relating to this project, please email Norton.LPOE@gsa.gov.

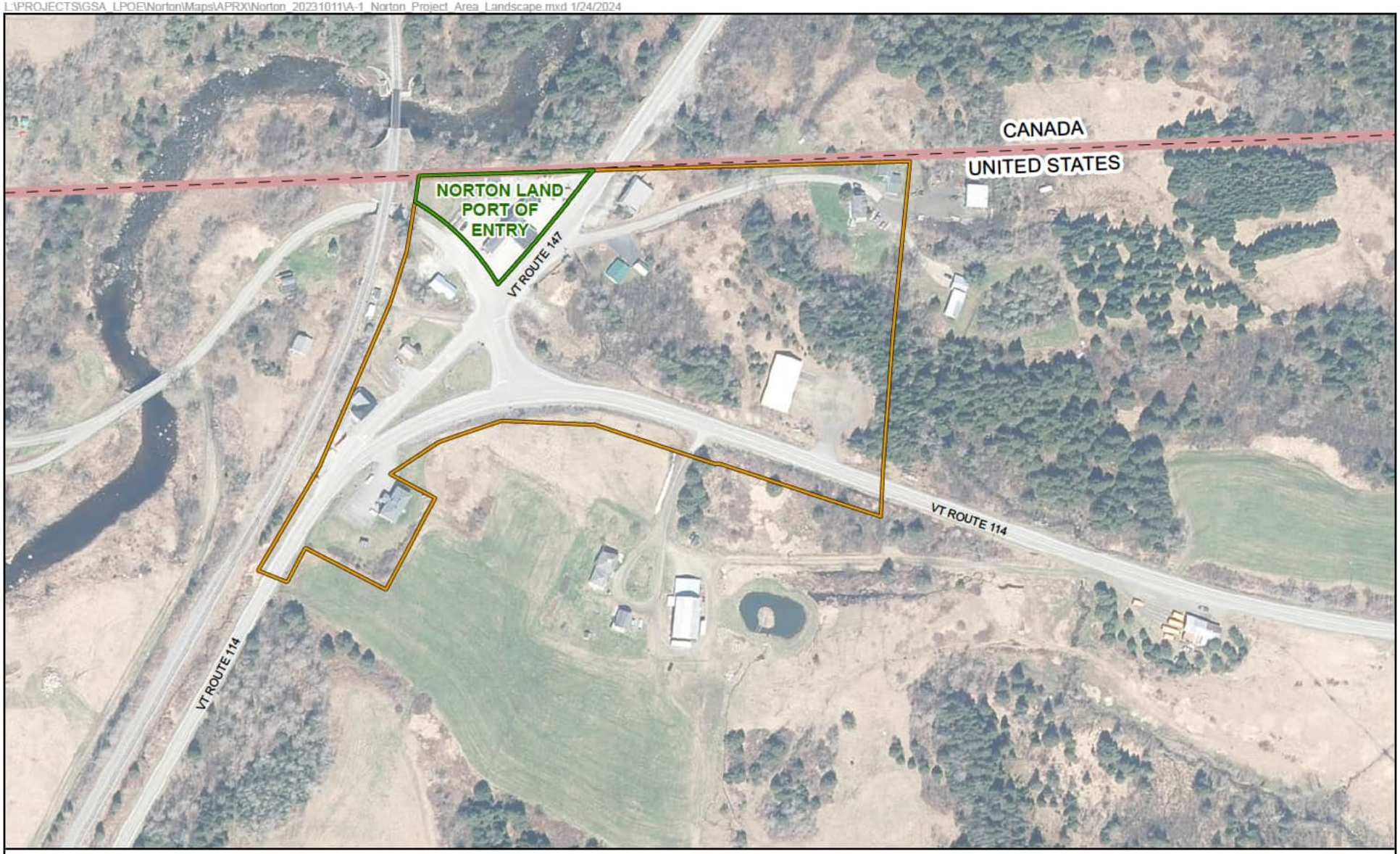
Sincerely,

JOHN MAURER Digitally signed by JOHN MAURER
Date: 2024.01.25 08:38:21 -05'00'

John Maurer
GSA Project Executive
Vermont BIL Land Port of Entry Projects

Attachment

L:\PROJECTS\GSA_LPOE\Norton\Maps\APRX\Norton_20231011\A-1_Norton_Project_Area_Landscape.mxd 1/24/2024



Norton Land Port of Entry
Norton NEPA Study Area Boundary
U.S. / Canada Border

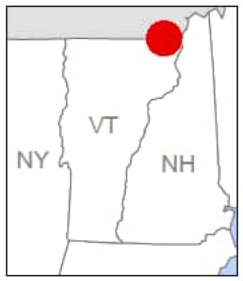


Figure 1
LPOE
GSA LPOE
Norton
Essex County, VT

0 100 200
Feet

N

Data Sources: ESRI Aerial Imagery Map

Appendix A

Public Notification Documentation

Appendix A.4

Mailing List

Name	Agency, Title	Address 1	Address 2	Town	State	Zip Code
Norton Local Government						
Gina Vigneault	Norton Town Hall, Town Clerk, Emergency Management Director, Lister, Treasurer	Norton Municipal Building	12 VT Rte 114 E	Norton	VT	5907
Christopher Fletcher	Town of Norton Select Board, Member 1	2335B VT Route 114 S		Norton	VT	5907
Daniel Keenan	Town of Norton Select Board, Member 2	320 Nelson Road		Norton	VT	5907
Franklin Henry	Town of Norton Select Board, Member 3		PO Box 1	Norton	VT	5907
Tonilyn Fletcher	Town of Norton, Planning Commission		PO Box 49	Norton	VT	5907
Suzanne Isabelle	Town of Norton, Planning Commission		PO Box 49	Norton	VT	5907
Jocelyn (Jody) Gordon	Town of Norton, Planning Commission		PO Box 49	Norton	VT	5907
Community/Area EMS Personnel						
Steve Young	Beecher Falls Fire Department, Fire Chief	1252 VT Route 253		Beecher Falls	VT	5902
Regional and State Government						
Irene Nagle	Northeastern Vermont Development Association (NVDA), Planner	36 Eastern Ave., Suite 1	P.O. Box 630	St. Johnsbury	VT	5819
Heather Johnson	Essex County Natural Resource Conservation District, Manager		PO Box 566	Waitsfield	VT	5673
Kathleen Taft	Vermont Agency of Natural Resources, Office of Planning	One National Life Drive	Davis Building, 2nd Floor	Montpelier	VT	5620
Michael Booth	VT Agency of Transportation, District 9 Transportation Administrator	4610 U.S. Route 5		Derby	VT	5829
Dave Pelletier	VT Agency of Transportation, Systems Planning Manager	219 North Main Street		Barre	VT	5641
Laura V. Trieschmann	State Historic Preservation Office, State Historic Preservation Officer	One National Life Drive	Deane C. Davis Building, 6th Floor	Montpelier	VT	05620-0501
Regional Organizations						
	North Country Chamber of Commerce	104 Main St	Suite 206	Colebrook	NH	3576
	Essex North Supervisory Union 19	5 Park Street	PO Box 100	Canaan	VT	5903
	Northlands Job Corps Center	100A MacDonough Dr		Vergennes	VT	5491
Jennifer Carlo	Northeast Kingdom Collaborative		PO Box 4043	St Johnsbury	VT	5819
Cindy Locke	VAST - Vermont Association of Snowtravelers	26 Vast Lane		Barre	VT	5641
John Hull	Northeast Kingdom Snow Blasters		PO Box 212	Norton	VT	5907
Kenn Stransky	Northeast Kingdom (NEK) Broadband		PO Box 4012	St. Johnsbury	VT	5819
Local Buisiness						
	Lake View Store	4531 VT Route 114E		Norton	VT	5907
	Chez Pidgeon	1282 VT Route 114 E		Norton	VT	5907
	April's Maple	6507 VT Rt 114		Canaan	VT	5907
	Norton Country Store	Rt 114		Norton	VT	5907
	A1 Compliance (trucking indutry) - Rt 148	51 Vt Route 147 N		Norton	VT	5907
	JJ Busing Company (school buses), VT 115		PO Box 269	Norton	VT	5907
	Steve R Devost		PO Box 2	Norton	VT	5907
	Gerald Devost & Ronald Devost	49 Railroad Ave		Norton	VT	5907
	Quimby Country Cottages	1127 Forest Lake Rd		Averill	VT	5901
U.S. Federal Agencies						
Kyla Hastie	USFWS, Deputy Reional Director, Northeast Region, USFWS	300 Westgate Center Dr.		Hadley	MA	1035
David Cash	EPA, EPA New England Region 1	5 Post Office Square - Suite 100		Boston	MA	02109-3912
Lori Ehrlich	FEMA, FEMA Region 1	99 High Street 6th Floor		Boston	MA	2110
	USACE, Vermont Project Office	11 Lincoln Street, Room 210	Room 210	Essex Junction	VT	5452
Canadian Federal Agencies						
President France Pégeot	Department of Transportation and Infrastructure, Canadian Transportation Agency (CTA)	60 Laval Street, Unit 01		Gatineau	QC	JBX 3G9
Minister Pablo Rodriguez	Transport Canada, Ministry of Transport	8595 Maurice-Duplpessis Blvd Suite 208		Montréal	QC	H1E 4H7
President Erin O'Gorman	Canada Border Services Agency (CBSA), Canada Border Services Agency	191 Laurier Avenue West, 6 étage		Ottowa	ON	K1A 0L8
Jean-Yves Duclos	Public Services & Procurement Canada (PSPC) , Minister of Public Services and Procurement	600 Charest Blvd East Suite 201	PO Box 30014	Québec	QC	G1K 3J4
Quebec Provincial Departments/Agencies (Canada)						
Miniter Martine Biron	Quebec Ministry of International Relations and La Francophonie, Ministry of International Relations	525, boulevard René-Lévesque Est 4e étage		Québec	QC	G1R 5R9
Minister Geneviève Guilbault	Transports Quebec, Ministry of Transport and Sustainable Mobility	700 René-Lévesque Boulevard East 27 étage		Québec	QC	G1R 5H1
Minister Benoit Charette	Ministry of the Environment, the Fight against Climate Change, Wildlife and Parks, Ministry of the Environment, the Fight Against Climate Change, Wildlife, and Parks	675, boulevard René-Lévesque Est 30e étage		Québec	QC	G1R 5V7
MRC Croatiacook	MRC Coaticook, MRC Croatiacook	294 St-Jacques Street North		Coatticook	QC	J1A 2R3
City of Croatiacook	City of Coaticook, City of Croatiacook	150 Child Street		Coatticook	QC	J1A 2B3
Municipality of Dixville	Municipality of Dixville, Municipality of Dixville	251 Parker Road		Dixville	QC	J0B 1P0

Appendix A

Public Notification Documentation

Appendix A.5

Town of Norton Facebook Post

facebook

Email or phone | Passw

Town of Norton

Intro

Town of Norton VT

Page · Town Hall

12 VT Rt 114 E, Norton, VT, United States, Vermont

(802) 822-9935

townofnorton@gmail.com

Not yet rated (0 Reviews)

Photos

See all photos

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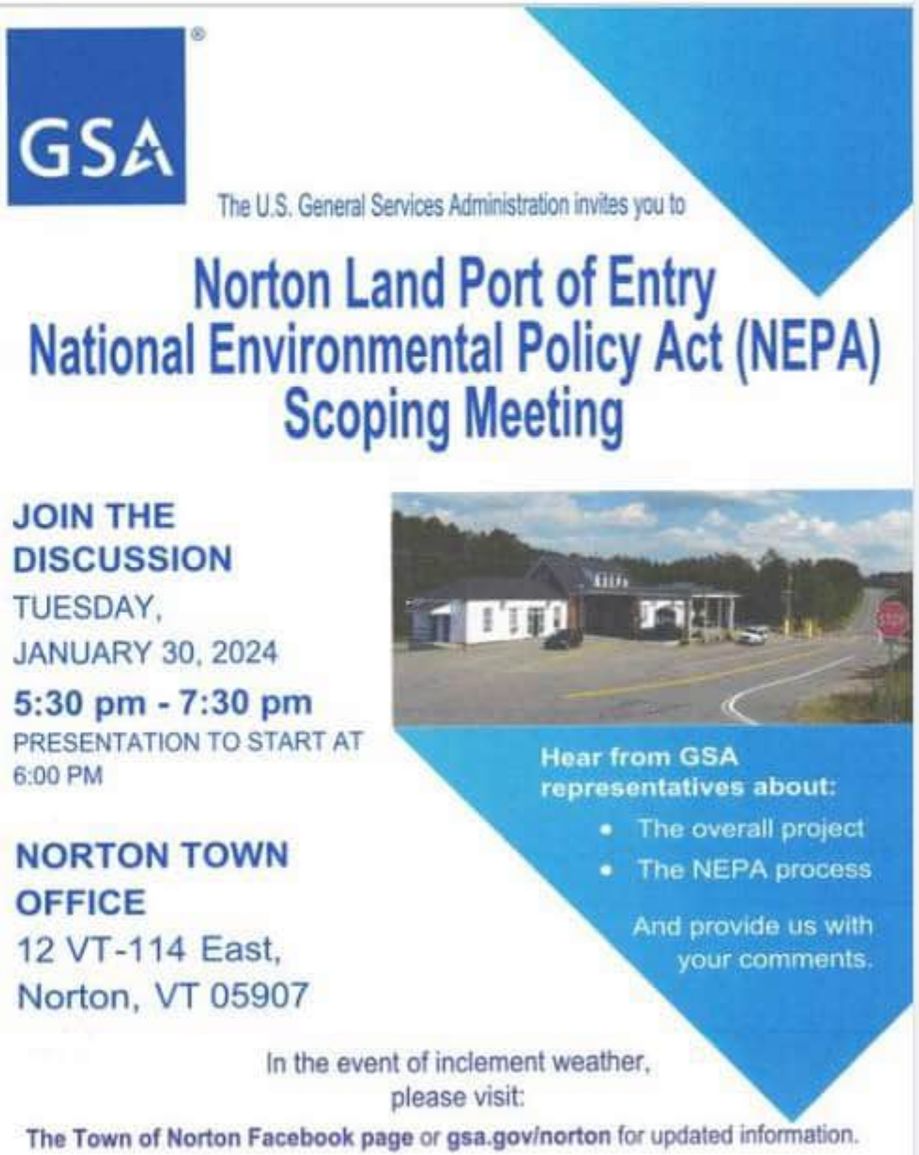
Town of Norton
January 11 at 7:01 PM ·



Appendix A

Public Notification Documentation

Appendix A.6

GSA Social Media Posts

U.S. General Services Administration New England Region
Published by Hootsuite · January 23 ·

BOSTON – In compliance with the National Environmental Policy Act, the U.S. General Services Administration (GSA) will host a public meeting in support of an Environmental Impact Statement for the proposed modernization and expansion project of the Land Port of Entry in Norton, Vermont. https://ow.ly/K7ex50QtFnh

See insights and ads Boost post

Like Comment Share

Settings

← Post

GSA New England
@US GSAR1

The U.S. General Services Administration (GSA) will host a public meeting in support of an Environmental Impact Statement for the proposed modernization and expansion project of the Land Port of Entry in Norton, Vermont. ow.ly/Wn6x50QtFng

11:49 AM · Jan 23, 2024 · **54** Views

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People on X are the first to know.

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Appendix A

Public Notification Documentation

Appendix A.7

Newspaper Coverage

FREE

The Colebrook Chronicle

COVERING THE TOWNS OF THE UPPER CONNECTICUT RIVER VALLEY

FRIDAY, FEBRUARY 2, 2024 603-246-8998 OUR 24TH YEAR

New Norton Port Of Entry Planners Seek Public Input

By Thomas Jordan

A public meeting was held in Norton, Vt., on Tuesday evening to discuss the Norton Land Port of Entry border crossing. Representatives of the U.S. General Services Administration were present to discuss the border crossing, which has been identified as being in need of modernization. This followed an August meet-and-greet style meeting, where the proposal was first introduced to the town.

Region 1 U.S. General Ser-

(Continued on page 2)

On Friday, Jan. 26, a tractor trailer truck overturned beneath the railroad underpass on Route 110 in Groveton. The road was closed for several hours during the clean up. Northumberland Police Dept. photo.

Crash At Underpass On Route 110

On Friday, Jan 26, at about 9:49 a.m., Northumberland Police Lt. William Daisey was on his way into work when he came upon a rollover crash on Route 110 at the underpass in the Town of Northumberland, approximately one mile east of the Route 110 intersection with Rte. 3.

Lt. Daisey reported to the **Chronicle** that one person appeared to sustain minor injuries and was transported to a nearby medical facility via ambulance. The motor carrier vehicle sustained major structural dam-

(Continued on page 2)

Clarksville And Pittsburg School Budget Proposals

By Donna Jordan

Public Budget hearings are underway for area school districts and towns as voters begin to get a look at warrant articles ahead of the annual meetings in March. The information below represents the local school tax rates for 2024-25.

This week, Clarksville and Pittsburg held their public hearings on Monday evening, starting with Clarksville at 5 p.m. Besides the three school board members and two representa-

(Continued on page 2)

Multiple Fire Departments Respond To Lost Nation Road Fire In Groveton

At 12:15 on Saturday afternoon, the Groveton Fire Dept. received a 911 call reporting a fire in a residence on Lost Nation Road. Fire Chief Andre Brasseur said that, with the information that was provided to dispatch from the caller, mutual aid from neighboring communities was immediately requested at the same time that Groveton Fire Dept. was initially dispatched.

When fire fighters arrived, the fire was primarily in the basement and spreading to other parts of the house. "Unfortunately, two pets perished in the fire. The shell of the home still stands, however it is considered a loss," Brasseur told the **Chron-**

(Continued on page 2)

Multiple fire departments and first responders were called to this fire on Lost Nation Road in Groveton last Saturday. Charles Jordan photo.

Linda Dexter, owner of the new Linda's Diner situated at her former Chinese Restaurant on Parsons Street, is set to open to the public with its all-new menu on Monday, Feb. 5. Charles Jordan photo.

New Menu: Linda's Diner Ready To Open Its Doors

By Thomas Jordan

In January 2022, Xiao Fei's Chinese buffet opened for business at the former Moose Muck Coffee House on Route 26 in Colebrook. Now, two years later, after a brief closure, the buffet has undergone changes and will be reopening as "Linda's Diner" this coming week.

The proprietor, Xiao Fei, who adopted Linda as her English name, explained that all-new offerings will be coming to the restaurant.

"This will be totally American style," she explained in an interview with the **Chronicle** this week, as she and her employees were busily preparing for their upcoming opening. Recently, she had introduced an American-style breakfast at the buffet,

(Continued on page 3)

Port Of Entry

(Continued from page 1)

vices Administration Public Affairs Officer Paul Hughes spoke to the **Chronicle** at Tuesday's meeting. "We're at the very early stages of a long, complex process," said Hughes. "We're here tonight to get comments so that we can develop the plan for this port so we know what is best for the port, for CBP, as well as the community."

The current Port of Entry, built in 1933, covers 1.5 acres. During the meeting, a large footprint was marked out on a map surrounding the U.S. side of the currently existing port, and it was asked if the station's footprint would expand. It was explained that this was marking the area that the GSA would be looking at in their varied studies, which will include any potential impact of the station's modernization on things such as wetlands, wildlife, and the community. "We're way too early to know if the footprints don't expand, or stay in the same place," said Hughes. "We're too soon in that process."

The purpose of the project was identified as modernizing the Norton Land Port of Entry "to fulfill tenant and traveling public needs," aiming to improve the process of the U.S. Customs and Border Protection's inspection of private and commercial traffic at the U.S. side of the Canadian border crossing. Some of the needs listed include increased separation between public and secure areas, an enclosed area for non-commercial secondary inspections, the renovation or expansion of the current building and garage and infrastructure, and an increase in transportation efficiency.

"The Norton Project is part of the bipartisan infrastructure law," explained Hughes, through which $3.4 billion was supplied to the GSA for the modernization and construction of land ports of entry along U.S. borders. "A lot of these ports were built in the 1930s and are no longer up to the modern standard of what we need the ports to do to protect the security interests of the United States–not only the security interests, but the cross-border relationship, trade, and supply chain," said Hughes.

He said that projects are done independently of the Canadian sides of each crossing, but with regard to things such as line of sight, which was discussed at Tuesday's meeting as being something that will be a consideration with the Norton Land Port of Entry's work. "We always try to coordinate with CBSA to make sure that our efforts don't negatively impact theirs," said Hughes.

An estimated timeframe given during the presentation estimated a completion date of Fall 2028. "Generally, a capital construction project like this, from concept to completion, takes anywhere from 4 to 7 years," said Hughes. "There's a lot of things that go into it as the federal government. We have to go through the National Environmental Policy Act process. We have to worry about funding. There's a lot of priorities and a lot of things that go into a process of this nature."

Tuesday's meeting moved along at a brisk pace and concluded with some feedback from those in attendance, mostly from townspeople and town officials wanting to make sure that they are kept informed of the project as it progresses. Up-to-date information on the project can be found online through www.gsa.gov/norton, and GSA representatives urged anyone seeking information or providing feedback to get in touch during this stage in their process.

School Budgets

(Continued from page 1)

tives of SAU 7, there were two selectmen and two residents attending. The board presented its two warrant articles: article number three asked for $40,000 to be added to the School District Tuition Expendable Trust Fund. That fund currently has a balance of $116,505. Adding the proposed $40,000 in 2024-2025 would bring it up to $156,505. Warrant article number four proposes $747,695 for the general school budget. This includes the addition of four unanticipated students, as well as tuition for the 20 students anticipated to attend Pittsburg and Canaan schools next year. The school board expects 18 students in Grades PK-8, and two students in grades 9-12, one student in Canaan High School, one student in a Canaan CTE program, and one student in a charter school. The budget proposed covers a total "potential" of 28 students (which includes five students who are home schooled).

After much discussion with those attending the meeting, noting that all costs of living have risen over the past year, the board agreed to reduce warrant article number three from $40,000 to $20,000 and reduced the unanticipated in the general budget from $747,695 to $705,145. The original proposal called for a school tax increase of $5.03 per thousand, while the revised proposal brought that increase down to $3.87 per thousand. (This amount could change up or down at the time the final tax rate is set by the N.H. Dept. of Revenue in the fall.) The annual school meeting is on March 12 (Town Meeting Day), starting at 6 p.m. (the town meeting portion is held the same night).

The general budget includes increases for special education costs, CTE tuition, special services, physical and occupational therapy, a rise in costs for the SAU office, and charter school enrollment. Estimated revenues are projected to decrease by $106,379.79.

Pittsburg reportedly had around 20 residents and voters attending. All proposed budgeted items were passed by the school board and will be headed to the annual meeting on March 7 at 6 p.m.

The school district is looking at an increase of 84 cents per thousand on its tax rate. The budget reflects an increase of $491,583 over last year's costs, and a decrease in revenues of $26,167.01.

Pittsburg is looking to repair the school building roof at a cost of $150,000, and is looking to use $70,000 from a Maintenance Expendable Trust Fund, with the balance ($80,000) to come from taxes. Additional warrant articles are requesting: $20,000 for the School Bus Expendable Trust Fund and $4,074,328 for the general budget. Revenues for the Pittsburg School District are anticipated to decrease by $26,167.01, and expenses anticipated to increase by $491,583. Projected increases include special education, $86,291; Co-curricular and athletic, $52,542; SAU office, $30,854; and more. Pittsburg has a total of 54 students in school, including 31 in Grades PK-8, and 23 in high school. With the addition of students tuitioned from Clarksville and Stewartstown, this brings the total number of students in the school to 80.

A portion of the tractor trailer-unit which overturned on Route 110 in Groveton last Friday. It took several hours to remove the truck and clean the roadway before it could be reopened to traffic. The driver appeared to sustain only minor injuries. Northumberland Police Dept. photo.

Underpass Crash

(Continued from page 1)

age. The underpass also sustained some damage. St. Lawrence Railroad Company was also on scene to inspect the underpass. It took two heavy wrecker services with specialized equipment to remove the vehicle from the roadway. It required several hours to remove the vehicle, which effectively shut down Route 110 during that time.

The Groveton Fire Dept., Northumberland Police Dept. and N.H. State Police–Troop G (motor carrier unit) responded to the scene. The Northumberland Police Dept. conducted the investigation. No charges are expected at this time. Lt. Daisey said that the roads were wet and had snow on them, and that speed is considered a contributing factor with those existing conditions, among others.

Groveton Fire

(Continued from page 1)

icle this week. The exact cause of the fire is undetermined, thought Brasseur said it seems to have originated in the area of a wood pellet stove.

On the scene were Groveton Fire Dept., Groveton Ambulance, Lancaster Fire Dept., Stratford Fire Dept., Stark Fire Dept., Northumberland Police, Lancaster Police and the Town of Northumberland Water Dept. The Colebrook Fire Dept. provided station coverage in Groveton. Eversource was on scene to remove electric service to the home. There were no injuries to any responders.

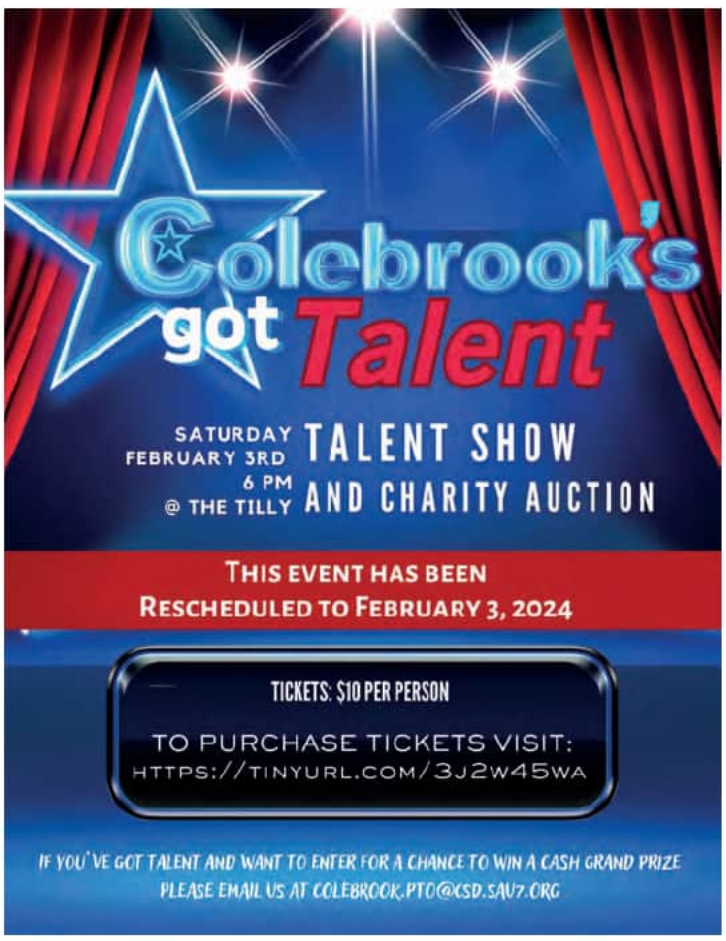
"We appreciate the quick response and invaluable assistance from our mutual aid partners during incidents such as this," said Brasseur.

Left photo: The Lancaster Fire Dept. tanker helps keep the water coming during last Saturday's structure fire at a home on Lost Nation Road in Groveton. Right photo: Crews from various departments prepare to enter the home. Charles Jordan photos.

Community News

Town officials and townspeople gathered on Tuesday evening in the Norton Town Offices to provide comments on planned upgrades to the U.S. Port of Entry situated in town. A video report of the meeting can be seen in the Video News of the Week at www.colebrookchronicle.com. Charles Jordan photo.

Present Port of Entry in Norton, Vt. Courtesy photo.



Appendix A

Public Notification Documentation

Appendix A.8

Press Release

An official website of the United States government

U.S. General Services Administration

U.S. General Services Administration to host public meeting for the new Land Port of Entry at Norton, Vermont

January 23, 2024

BOSTON – In compliance with the National Environmental Policy Act, the U.S. General Services Administration (GSA) will host a public meeting in support of an Environmental Impact Statement for the proposed modernization and expansion project of the Land Port of Entry in Norton, Vermont.

The public is encouraged to attend and participate in the public meeting on:

WHEN:

Tuesday, Jan. 30*
5:30 p.m. to 7:30 p.m. ET

WHERE:

Norton Town Office
12 VT-114 East
Norton, VT 05907

A presentation will start at 6 p.m. where GSA will provide project information to the attendees. The public will have an opportunity to hear about the project and learn how they can provide input on the issues that are important to the community. This input is a valuable step in the process and will be used by GSA to determine the scope and content of the Environmental Impact Statement.

The new facility, funded by the Bipartisan Infrastructure Law, will strengthen supply chains, improve operational capabilities and facility infrastructure, spur economic growth, and bolster the country's security.

The proposed project will increase the inspection and operational capabilities, as well as modernize the port to meet federal inspection facility requirements. A contract for architectural and engineering services was awarded last year.

The Norton project will incorporate sustainability features that will reduce greenhouse gas emissions, mitigate environmental impact, and simultaneously increase the mission readiness of the federal government by increasing resilience to climate change.

This project will strengthen the relationship between the two communities of Norton, Vermont, and Stanhope, Quebec, Canada and the two countries by improving the conditions for economic, cultural and familial connections.

Written comments must be received by 5 p.m. ET on March 8, using one of the following methods:

- **In-Person**: Submit written comments at the public meeting via comment forms to be distributed at the meeting.
- **Email**: Send an email to norton.lpoe@gsa.gov and reference “Norton LPOE EIS” in the subject line.
- **Mail**: Send written comments to the following address:
  U.S General Services Administration
  Attention: Adam Hunter, Norton LPOE Project Manager
  Thomas P. O’Neill, Jr., Federal Building
  10 Causeway Street, 11th Floor
  Boston, MA 02222-1077

*In the event of inclement weather, please visit gsa.gov/norton for updated information.

About GSA: GSA provides centralized procurement and shared services for the Federal Government, managing a nationwide real estate portfolio of nearly 370 million rentable square feet, overseeing over $100 billion in products and services via federal contracts, and delivering technology services that serve millions of people across dozens of federal agencies. GSA’s mission is to deliver the best customer experience and value in real estate, acquisition, and technology services to the government and the American people. For more information, visit GSA.gov and follow us at @USGSA.

Last updated: Jan 23, 2024

Appendix A

Public Notification Documentation

Appendix A.9

Public Meeting Flyer

The U.S. General Services Administration invites you to

Norton Land Port of Entry National Environmental Policy Act (NEPA) Scoping Meeting

JOIN THE DISCUSSION

TUESDAY,
JANUARY 30, 2024

5:30 pm - 7:30 pm

PRESENTATION TO START AT 6:00 PM

NORTON TOWN OFFICE

12 VT-114 East,
Norton, VT 05907

Hear from GSA representatives about:

- The overall project
- The NEPA process

And provide us with your comments.

In the event of inclement weather, please visit:

The Town of Norton Facebook page or **gsa.gov/norton** for updated information.

For accommodation requests email: norton.LPOE@gsa.gov or call 617-620-7597

Appendix B

Public Scoping Meeting Materials

B.1 PowerPoint Presentation

B.2 Banners

B.3 Comment Sheet

B.4 Sign-in Sheets

Appendix B

Comments Received During Public Scoping Periods

Appendix B.1

PowerPoint Presentation

Land Port of Entry Modernization Project - Norton, Vermont

National Environmental Policy Act - Public Scoping Meeting

Meeting Agenda

- Welcome and Introductions
- Purpose of the Meeting
- Project Information and Background
- National Environmental Policy Act (NEPA) Overview and Process
- Project Resource and Impact Areas
- Submitting Public Comments

Introductions

- Paul Hughes, GSA, Regional Public Affairs Officer
- Ryan Long, WSP USA Inc., Assistant Vice President, Environmental Planner
- Adam Hunter, GSA, Project Manager
- Kelly Morrison, GSA, Community Engagement Specialist
- Missy Mertz, GSA, NEPA Specialist
- Carey Bergeron, NEPA Specialist
- Sara Massarello, GSA, Realty Specialist

What is the purpose of this meeting?

Scoping is an early public involvement process to help determine which issues the Environmental Impact Statement (EIS) will address. GSA welcomes public input on what resources and issues are important to you. Today we will:

- Share project information with you
- Describe the NEPA Process
- Inform you of the next steps in the NEPA Process
- Provide you with information on how to make comments on the project

Land Port of Entry Modernization Project - Norton, Vermont

National Environmental Policy Act - Project Information

Project: Purpose & Need

The purpose of this project is to modernize the Norton LPOE to address CBP, GSA, and the public's needs:

- Increase inspection and operational capabilities
- Meet new and evolving security requirements
- Incorporate new sustainability features and technologies
- Increase resilience to climate change
- Meet everyday needs of the GSA, CBP, and the public
- Allow for easier and safer public flow through the port
- Address traffic pattern concerns
- Resolve topographic issues

Project: Anticipated Schedule

Plan	Design	Construct
NEPA Complete: 2025	Start: Fall 2024 Complete: Spring 2026	Start: Fall 2026 Complete: Fall 2028

Project: NEPA Study Area

Land Port of Entry Modernization Project - Norton, Vermont

National Environmental Policy Act - Overview and Process

What is the National Environmental Policy Act?

NEPA requires Federal agencies (GSA) to consider the potential impacts to the natural and human environment from their proposed action and disclose the potential impacts in a document that is circulated for public review.

GSA will prepare an Environmental Impact Statement (EIS) to document potential impacts from the proposed action (the Norton LPOE Project).

Throughout the NEPA process, the public has opportunities to submit written comments to GSA about the Norton LPOE Project including the scoping period (now), and during public review of the Draft EIS.

GSA will review all written comments and consider substantive comments during the preparation of the EIS. All comments will be part of the administrative record and be included in appendices to the EIS.

The NEPA Umbrella

National Historic Preservation Act

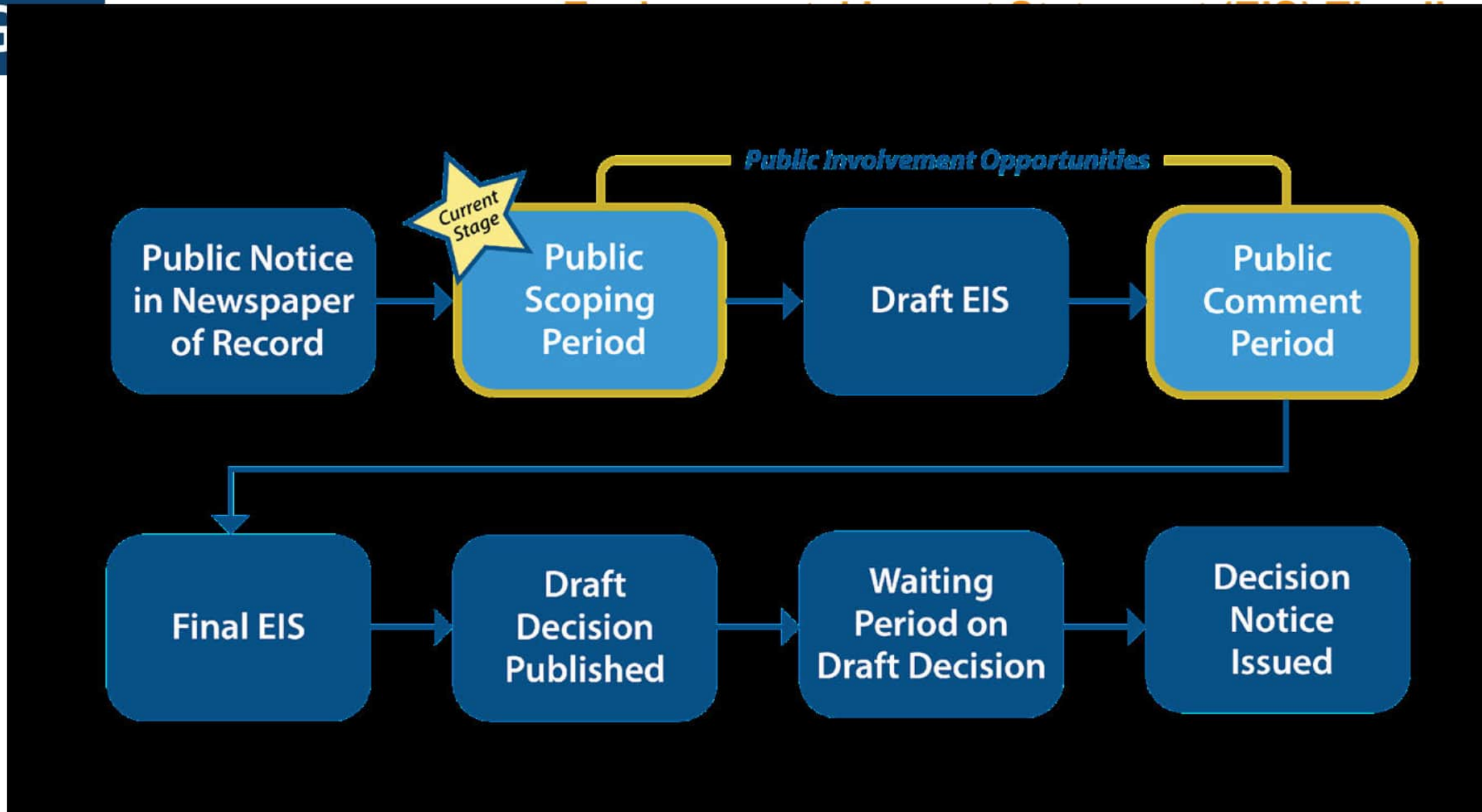
Clean Air Act

Clean Water Act

Archeological Resources Protection Act

Endangered Species Act

Environmental Justice


Public Involvement Opportunities
Current Stage
Public Notice in Newspaper of Record
Public Scoping Period
Draft EIS
Public Comment Period
Final EIS
Draft Decision Published
Waiting Period on Draft Decision
Decision Notice Issued

Documenting Existing Conditions (the Affected Environment)

The EIS includes a description of the resources that may be impacted by the proposed action. For this project examples of the resource areas we anticipate to be analyzed are:

- Climate Change
- Socioeconomics
- Environmental Justice
- Noise
- Cultural Resources
- Biological Resources
- Water Resources
- Utilities
- Traffic & Public Transportation
- Floodplains

Project Resource Area: Cultural Resources

Section 106 of the National Historic Preservation Act of 1996 (NHPA) requires GSA to consider the effects of federal undertakings on historic properties.

Step 1: Initiate Section 106
GSA identifies potential stakeholders and creates a plan for public involvement.

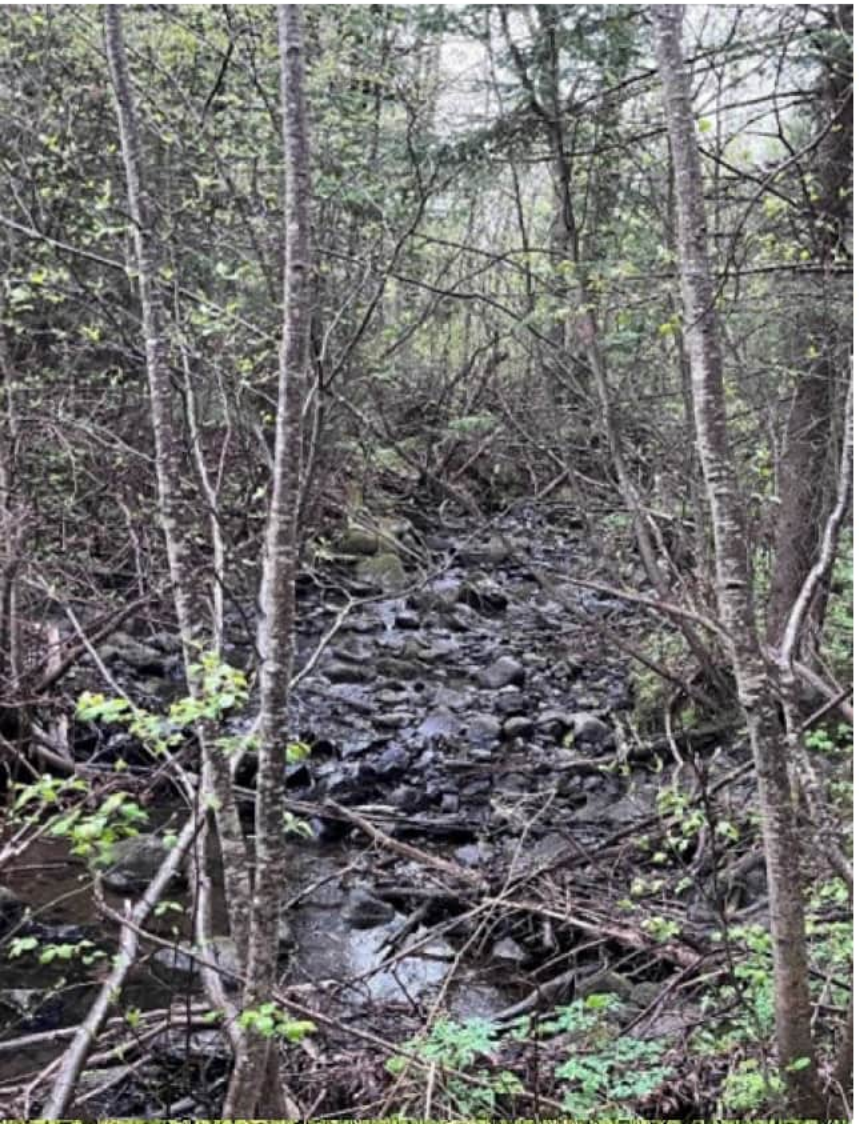
Step 2: Establish the Area of Potential Effect (APE)
The geographic area that the project may impact is established.

Step 3: Identify Historic Resources
Historic resources that are either listed in or are eligible for listing in the National Register of Historic Places are identified through survey, research, and public input.

Step 4: The potential effects of identified historic resources are evaluated. If there are no potential adverse impacts, the process may end here.

Step 5: If there are potential adverse effects, GSA will explore measures to avoid, minimize, or mitigate those effects.
The resolution may result in a Memorandum of Agreement (MOA) or Programmatic Agreement (PA) recording the agreed upon measures to resolve the adverse effects.

Project Resource Area: Wetlands



- Field surveys will be conducted to determine the presence and extent of wetlands and/or waterbodies in the project area and evaluate potential impacts.
- Certain activities that may impact wetlands and waters of the United States require authorization under the Clean Water Act (CWA).
- The U.S. Army Corps of Engineers (USACE) and the Vermont Department of Environmental Conservation (Vermont DEC) are responsible for issuing CWA permits.
- If impacts to wetlands are unavoidable, the GSA would comply with all USACE and Vermont DEC permitting requirements to minimize or mitigate impacts.

Project Resource Area: Floodplains

- Under Executive Order (E.O.) 11988 (Floodplain Management) GSA is required to evaluate the effects of our actions on the floodplain.
- GSA is required to attempt to locate all structures outside of the floodplain area in compliance with federal regulation and GSA's Floodplain Management Desk guide and P100.
- The current Norton LPOE is located in a FEMA-mapped 100-year floodplain.
- GSA will study the floodplain area near the Norton LPOE to determine 100- and 500-year flood elevations and possible risks.

Project Resource Area: Biological Resources

- GSA will evaluate the Project Area to determine if any threatened or endangered species may be present.
- The Endangered Species Act of 1973 requires GSA to consult with the US Fish and Wildlife Service (USFWS) when taking an action that may affect federally listed threatened or endangered species or designated critical habitat.
- GSA will consult with the USFWS to avoid, minimize, or mitigate potential adverse impacts to threatened or endangered species and their habitats if necessary.

Project Resource Area: Community Items

In the EIS, GSA will analyze items raised during our Community Listening Session on August 23, 2023, such as:

- **Light pollution**
- **Traffic and Circulation** -
  - Change in LPOE building footprints and/or LPOE site area
  - Changes to surrounding roads and coordination with Vermont Agency of Transportation
  - Traffic increase through and around the LPOE
  - Other than cars/trucks - snowmobiles, farm equipment, bikes, etc.
- **Utilities and Community Resources** -
  - Water availability for fire department use
  - Internet access

Land Port of Entry Modernization Project - Norton, Vermont

National Environmental Policy Act - Submitting Public Comments

Tell us what you think!

Written Comments must be submitted by **March 8, 2024.**

In Person: Fill out a comment form and leave it here with us tonight or have your comment recorded by our stenographer.

Send written comments to:

U.S General Services Administration

Attention: Adam Hunter, Norton Project Manager

Thomas P. O'Neill, Jr., Federal Building

10 Causeway Street, 11th Floor

Boston, MA 02222-1077

Send email to:

Norton.LPOE@gsa.gov

Reference "Norton LPOE EIS" in the subject line

Commenting Etiquette

- Please utilize the microphone
- Say and spell your first and last name at the start of your comment.
- Remain quiet while others are speaking for stenographer.
- Verbal comments will be held to a 2-minute time limit.
- If time allows, participants may be permitted to speak again after all commenters have had the opportunity to speak. Additional comments can also be submitted in writing.
- A recording of the meeting will be made available, and your comments will be included in the administrative record.

THANK YOU FOR YOUR PARTICIPATION!


GSA

Appendix B

Comments Received During Public Scoping Periods

Appendix B.2

Banners

PURPOSE AND NEED

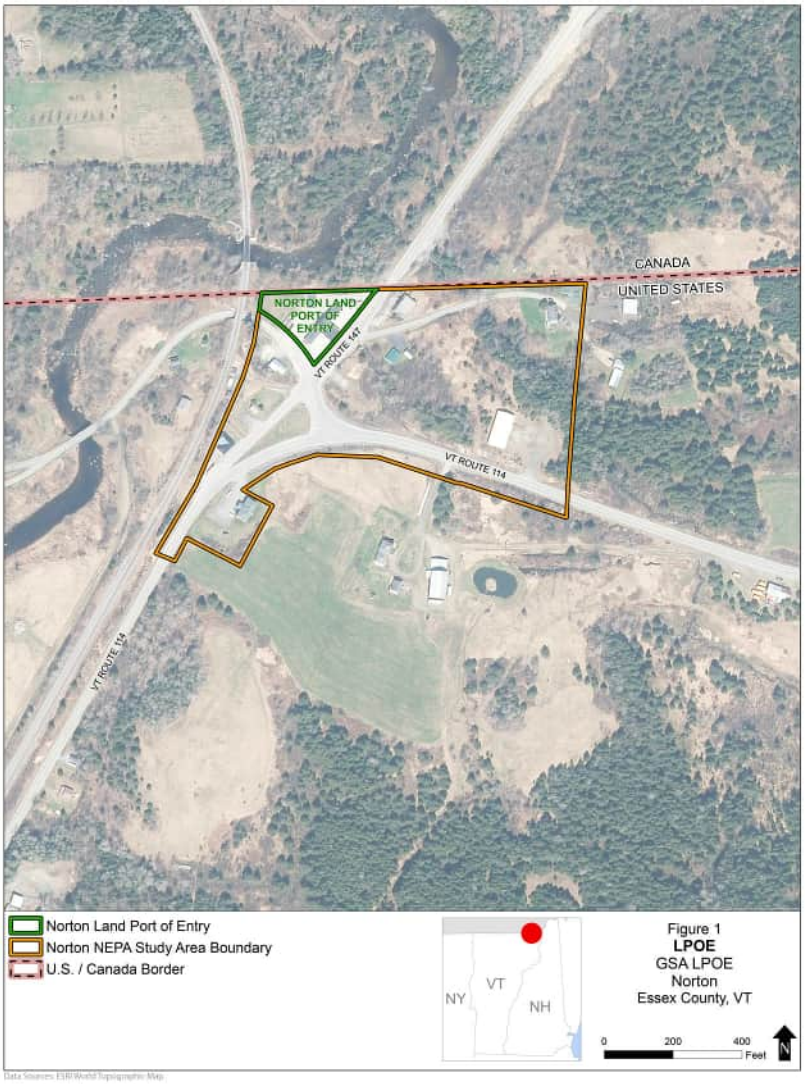
Purpose:

The purpose of this project is to modernize the Norton Land Port of Entry (LPOE) to fulfill tenant and traveling public needs. U.S. Customs and Border Protection (CBP) currently inspects private vehicular and commercial truck traffic at the subject LPOE on the U.S.-Canada Border. The proposed project would modernize the LPOE to meet current safety and security requirements.

Need:

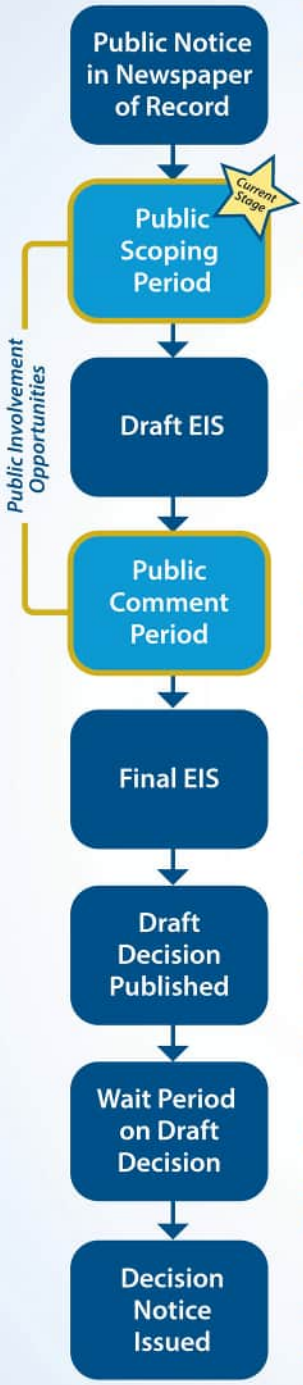
The Proposed Action is needed to:

- Increase separation between public and secure areas
- Add an enclosed area for non-commercial secondary inspections
- Reuse, renovate, and/or expand the existing Main Building and Garage
- Increase transportation efficiency
- Construct a Secondary Commercial Inspection Facility and Staging Facility
- Expand and update existing infrastructure



NEPA PROCESS AND TIMELINE

The National Environmental Policy Act (NEPA) is the federal law that requires all federal agencies to evaluate the potential environmental impacts of any major actions they propose and to inform and involve the public in the decision-making process.



Internal Scoping

- GSA identifies a need to update the Norton Land Port of Entry (LPOE) with current land port design standards and operational requirements of CBP.
- GSA conducts a Feasibility Study to explore viable alternatives to accommodate the Norton LPOE operations.

Public Scoping

- GSA publishes a Notice of Intent (NOI) which marks the beginning of the public scoping period, when the public can submit their feedback, note their interests, and voice concerns.
- GSA informs local, state, and federal agencies of the proposed project through a stakeholder scoping letter.
- A Public Scoping Meeting is held to describe the project and solicit feedback from the public, including community concerns and interests, before preparation of the Environmental Impact Statement (EIS).

Preparing the Draft EIS

- A Draft EIS is developed to analyze potential impacts to the natural and human environment.
- Public comments received during the public scoping period are considered during the preparation of the Draft EIS.
- Required consultations are initiated with federal and state agencies to comply with laws and regulations (e.g., Endangered Species Act, National Historic Preservation Act).

Draft EIS Public Comment

- GSA notifies the public that the Draft EIS is available for public review.
- A Public Comment Period of at least 45-days is held, which will include a public meeting.
- Written comments on the contents of the Draft EIS are accepted via U.S. mail, e-mail, or in-person at the public meeting.

Final EIS and Decision Notice

- Complete required consultations with agencies.
- Review, consider, and address, as appropriate, the public comments received during the Draft EIS Public Comment Period.
- Revise and finalize the EIS.
- Issue a Draft Decision.
- 30-day waiting period.
- Issue Final Record of Decision (ROD)

HOW TO COMMENT

GSA encourages public input on the resources and issues that are important to you. Public scoping comments must be submitted to GSA by March 8, 2024.

IN-PERSON. Fill out a comment form and submit at this scoping meeting or a stenographer will capture comments voiced during the meeting.

BY E-MAIL. Send comments to:
Norton.LPOE@gsa.gov

BY MAIL. Send comments to:

U.S. General Services Administration
Attention: Adam Hunter, Norton Project Manager
Thomas P. O'Neill, Jr., Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222-1077

Appendix B

Comments Received During Public Scoping Periods

Appendix B.3

Comment Sheet

COMMENT SHEET

Proposed Modernization Project at the
Norton Land Port of Entry
Public Scoping Meeting
Norton, VT
Tuesday, January 30, 2024

(*PLEASE PRINT*)

NAME and AFFILIATION (*OPTIONAL*): _____

ADDRESS: _____

EMAIL:_____ **ZIP CODE:** _____

Public participation is an essential component of the National Environmental Policy Act (NEPA) process, and GSA welcomes comments on the Proposed Modernization Project at the Norton Land Port of Entry.

Please fill out the following form to ensure that the analysis, and ultimately the decision, considers the affected communities' opinions.

If you would like to be added to the mailing list and receive information about the project, please provide your email or mailing address above.

1. **Provide us with any environmental or design information or concerns, which you feel should be addressed in the Environmental Impact Statement (EIS) for this project.**

_____
_____
_____
_____
_____
_____

2. **Use this space to provide any additional comments you might have:**

_____
_____
_____
_____
_____

Please leave this comment sheet at the designated "drop box" or mail your comments to the address below:

General Services Administration
Attention: Adam Hunter, Norton Project Manager
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222

You may also email your comment to Norton.LPOE@gsa.gov with subject line "Norton LPOE EIS"

FOLD

_____

_____

_____

RETURN ADDRESS

PLACE STAMP HERE POST OFFICE WILL NOT DELIVER WITHOUT PROPER POSTAGE

General Services Administration
Attention: Adam Hunter Norton Project Manager
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222

FOLD

TAPE HERE

Appendix B

Comments Received During Public Scoping Periods

Appendix B.4

Sign-in Sheets

Norton LPOE
Public Scoping Meeting
Sign In Sheet
January 30, 2024

Name	Organization	Address and/or Email	Phone
Jody Gordon	Town of Norton auditor / JP	[redacted]	
Julie Lavallee	Town of Norton Auditor		
Keith + Tricia O'Brien	~~Town~~		
Betsy Fontaine	Town of Norton Ass't Town Clerk & Treasurer		
Jane Vigneault	Town of Norton Town Clerk & Treasurer		
Dan Koenen			
★ Chris Fletcher	Town of Norton ~~★Rail Road~~ POC★		
Sharyl Shepherd	Town of Norton		
RONALD GERAN	TOWN OF NORTON		

Norton LPOE
Public Scoping Meeting
Sign In Sheet
January 30, 2024

Name	Organization	Address and/or Email	Phone
Kenn Stansky	Town	[redacted]	
Franklin Hurley	TOWN		
Ricky Burgess	TOWN		
GILLET SYLVIE	CBSA		
Charlie Jordan	Colebrook Chronicle		
Pat Mooney	TOWN		
John Perrotte	GSA		

Norton LPOE
Public Scoping Meeting
Sign In Sheet
January 30, 2024

Name	Organization	Address and/or Email	Phone
Thomas Jordan	Colebrook Chronicle	[redacted]	
☆ John Hurd	NEK Snow Blasters		
↳ Snowmobile POC			

Appendix C

Comments Received During Public Scoping Period

C.1 Emailed Comments

C.2 Public Meeting Transcript

Appendix C

Comments Received During Public Scoping Period

Appendix C.1

Emailed Comments

Comment 1:
Page 1 of 2

Norton LPOE <norton.lpoe@gsa.gov>

Norton LPOE EIS

3 messages

Volpe, Krysta <Krysta.Volpe@cbsa-asfc.gc.ca> Fri, Jan 26, 2024 at 6:58 AM
To: "Norton.LPOE@gsa.gov" <Norton.LPOE@gsa.gov>

Good morning,

In reference to the communication attached, is it possible to confirm if there's a possibility to share the presentation with CBSA after the meeting has occurred since we won't be able to attend in person.

Thank you,

Krysta Volpé Thériault

Agente principale de projets, Programme d'infrastructure | Portefeuille de l'Est

Direction générale des finances et de la gestion organisationnelle

Agence des services frontaliers du Canada | Gouvernement du Canada

Krysta.Volpe@cbsa-asfc.gc.ca | Tél. cell : 438-462-6124

Senior Project Officer, Infrastructure Program | Eastern Portfolio

Finance and Corporate Management Branch

Canada Border Services Agency | Government of Canada

Krysta.Volpe@cbsa-asfc.gc.ca | Cell : 438-462-6124

VT LPOE Norton Scoping Stakeholder Notification Letter_24JAN2024.pdf
1516K

Norton LPOE <norton.lpoe@gsa.gov> Tue, Jan 30, 2024 at 9:21 AM
To: "Volpe, Krysta" <Krysta.Volpe@cbsa-asfc.gc.ca>

Good morning Krysta,

Thank you for your interest in the project. Yes, the slide deck and a recording of the presentation will be posted on the website as soon as the materials are compiled and uploaded to www.gsa.gov/norton

Thank you,
Kelly Morrison

Comment 1:
Page 2 of 2

[Quoted te t hidden]

Norton LPOE <norton.lpoe@gsa.gov> Thu, Feb 29, 2024 at 3:46 PM
To: "Volpe, Krysta" <Krysta.Volpe@cbsa-asfc.gc.ca>

Hello Krysta,

I wanted to follow up and let you know that the scoping meeting presentation is uploaded along with a copy of the slide presentation on the website: www.gsa.gov/norton

As a reminder the deadline for public comment is March 8, 2024

Thank you,
Kelly Morrison
[Quoted text hidden]

Comment 2:
Page 1 of 1

Norton LPOE <norton.lpoe@gsa.gov>

Norton LPOE EIS

1 message

Alexandre Côté-Breton <a.cote-breton@coaticook.ca> Thu, Mar 7, 2024 at 9:39 AM
To: "norton.lpoe@gsa.gov" <norton.lpoe@gsa.gov>, "adam.hunter@gsa.gov" <adam.hunter@gsa.gov>

Hi,

My name is Alexandre Côté-Breton, I'm running the Hydro-Coaticook division and we are often going to Norton Pond and the Averill Lakes in order to manage their levels and to keep an even flow of water in the Coaticook river.

I am the point of entry for the communications for the City of Coaticook and Coaticook River Water Power Company and if we can help you in you project, we will.

Furthermore, I have some questions concerning the scope of the project as per :

- The access for us into the USA in order to manage the level of the lakes. Will we be able to continue to enter the USA by Norton when in all the steps of the project?

- The hydrology study and actions taken. Can it have an impact on how we manage the opening/closure of our dam gates, or on the water flow of the Coaticook river?

- Can we be informed of the results of your studies and the actions taken in this project?

I thank you for your time.

Cordialy,

Alexandre Côté-Breton, ing.

Chef de la division Hydro-Coaticook

Chief of Hydro-Coaticook's Division

VILLE DE Coaticook

77 avenue de La Gravière,

Coaticook (Québec), J1A 3E5

Téléphone : 819 849-6331

a.cote-breton@coaticook.ca

Comment 3:
Page 1 of 3

Norton LPOE <norton.lpoe@gsa.gov>

"Norton LPOE EIS"

1 message

Patricia Moody [redacted] Thu, Feb 29, 2024 at 3:45 PM
To: Norton.LPOE@gsa.gov

Attached is my Environmental Impact Statement. Please let me know that you received and can open this.
Thank you,
Patricia K. Moody

Norton crossing comment.docx
16K

Contact Information:

Name: Patricia K. Moody, property owner Norton, Vt.

Property address: [redacted]

Mailing address: [redacted]

[redacted]

Design considerations:

Although my property is closest to the current location of the Border Station, it doesn't seem to offer much use to any project designed to upgrade the crossing. It is a very small property located between the public road that goes under the train rail and a very steep hill. My plot of land is at the bottom of a long and winding graded street that water runs through on the way to the river.

This road is the only access point for the many residents on the other side of the tracks. The hill is not obvious from the scoping maps, but it does effectively cut off my property from the remaining land between route 114 and Nelson Rd. Unless the road connecting the Norton residents on the other side of the train tracks to the rest of the world is closed, I can see no reason why my property would remain a part of the crossing modernization project.

I understand why certain aspects of the crossing need to be modernized, and the issue of the leaking basement needs to be addressed. I do not understand why this would need to be a massive project. It is a very lightly travelled crossing. In fact, if not for the need to cover the trains coming in from Canada, I think this crossing would have been slated for reduced hours like others in the area. Now that travel has risen to pre-Covid levels, the average number of vehicles crossing is two per hour based on the bts.dot.gov border crossing entry data. I can see the number, or lack thereof, of vehicles that cross from my window and hours can elapse with no activity at all.

If, for some reason, there is a desire to increase the number of lanes and create more office space, there is nothing that my piece of property can offer. The scoping map shows other areas that have the available space for some increases.

Additional comments:

First of all, I love my little house on my small piece of property. I purchased this in 2018 and have been putting my heart and soul and discretionary income into it since then. After purchasing and putting a bathroom and new heating in, the roof started leaking and my husband went through the floor. It needed a new roof and we had to make plans to firm up the floor. The entire main area was stripped, new wiring, new insulation, new sheetrock, new paint, new flooring and rugs, and new furniture. It was a lot, but this was where I decided I would be spending much of my retirement so I didn't worry about resale.

The loading dock was another project. The garage door was broken, so the space was transformed into a useable light space. Work included a heater being installed, a sliding glass door put in where the garage door used to be, new lighting, paint and flooring and out in front of the new sliders, I had a small deck built. I also had snow guards installed of the roof. It was almost where I wanted it to be when I got the call about the proposed changes to the crossing. This was four days after I finalized the sales agreement on another property I had in Norton. I sold it because who needs two small properties in the same town?

As it turns out, all of the effort and money put into the loading dock section took place after the government had decided to do this project but before anyone felt a need to communicate this with the town or landowners. It is disheartening to know all of that work might be for nothing.

The benefits this property has for me and why I put my energy into renovating it may not seem obvious. There is no land for the most part, but for me that means that there is little exterior maintenance to be concerned with. The amount of lighting by the station may bother some, but for me it is a godsend. I can walk the dogs at night or put them out in the back and not have to worry about any wild animals hurting them. The steep hill makes a natural fence. Operating costs are at a minimum due to the small size and amazingly effective insulation.

I am retiring this year and had plans to finish up the exterior and enjoying the house while I still can. This project has put my husband and me in an awful position. We can't look for an alternate property because all of our discretionary money is tied up in 25 Nelson. I can't go through another long distance renovation and the current housing market is out of reach for anything but the worst fixer-uppers for which there would be no funds available to fix up.

In closing, this may not make a huge difference, but I felt I needed to express how this project negatively impacts people. Norton means so much to my husband and me that I purchased our burial plots up on Church Hill Road. I honestly hate the idea of having to find another location that would be meaningful enough to spend eternity, but Norton will be out of reach for us and we will have to find someplace else. There is a human impact to this project.

Thank you for allowing me to comment.

Sincerely,

Patricia K. Moody

Norton LPOE <norton.lpoe@gsa.gov>

Norton LPOE EIS - USACE / S. 404 CWA

Repella, Angela C CIV USARMY CENAE (USA) <Angela.C.Repella@usace.army.mil>
Wed, Feb 7, 2024 at 10:54 AM

To: "Norton.LPOE@gsa.gov" <Norton.LPOE@gsa.gov>

Hello,

This is in reference to the proposed improvements at the Norton Land Port of Entry in Norton, Vermont. I am contacting you regarding the U.S. Army Corps of Engineers (USACE) regulatory program and potential permitting requirements.

Permits are required under Section 404 of the Clean Water Act (33 U.S.C. 1344) for those activities involving the discharge of dredged and/or fill material, excavation, or mechanized land clearing in all waters of the United States, including not only navigable waters of the United States, but also inland rivers, lakes, streams and wetlands. In interior waters, our jurisdiction under the Clean Water Act extends landward to the ordinary high water mark of a waterbody or the landward limit of any wetlands.

Please ensure that you have clearly delineated, both in the field and on drawings, the precise limits of any waters of the United States under the Corps of Engineers' jurisdiction which are located within the entire project area. A qualified wetland consultant familiar with the methodology in the 1987 "Corps of Engineers Wetlands Delineation Manual" and regional supplement should delineate any and all wetlands on the subject property.

More information on the USACE regulatory program can be found in the attached Vermont General Permits and on the regulatory request system website: https://rrs.usace.army.mil/. Please call or email with any questions.

Thank you,

Angela C. Repella

U.S. Army Corps of Engineers

New England District - Vermont Project Office

11 Lincoln Street, Room 210

Essex Junction, Vermont 05452

Cell: (802) 881-9565

Office: (978) 318-8639 or (802) 872-2893

In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at https://regulatory.ops.usace.army.mil/customer-service-survey/

2022-2027 VTGPs NAE-2022-00024.pdf
425K

General Permit No.: NAE-2022-00024 Effective Date: December 6, 2022
Applicant: General Public in the State of Vermont Expiration Date: December 6, 2027

DEPARTMENT OF THE ARMY GENERAL PERMITS
FOR THE STATE OF VERMONT

The New England District of the U.S. Army Corps of Engineers (USACE) hereby issues twenty-one (21) regional general permits (GPs) for activities subject to USACE jurisdiction in waters of the United States (WOTUS), including navigable waters, within the boundaries of the state of Vermont. These GPs are issued in accordance with USACE regulations at 33 CFR 320–332 (see 33 CFR 325.2(c)(1)). These GPs will provide protection to the aquatic environment and the public interest while effectively authorizing activities that have no more than minimal individual and cumulative adverse environmental effects.

This document contains the following sections: **Page**

In issuing these GPs, the Federal Government does not assume any liability for the following: (a) damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; (b) damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest; (c) damages to persons, property or to other permitted or unpermitted activities or structures caused by the activity authorized by any of the GPs; (d) design or construction deficiencies associated with the permitted work; or (e) damage claims associated with any future modification, suspension or revocation of these permits.

Tammy R. Turley
Tammy R. Turley
Chief, Regulatory Division

December 6, 2022
Date

SECTION I. JURISDICTION/AUTHORITY TO ISSUE PERMITS

1. A Department of the Army Permit is required from USACE for the following regulated activities:

a. The construction of any structure in, over, or under any navigable water of the U.S. (see 33 CFR 328), the excavating or dredging from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. The USACE regulates these activities under Section 10 of the Rivers and Harbors Act of 1899 (see 33 CFR 322); and

b. The discharge of dredged or fill material and certain discharges associated with excavation into WOTUS including wetlands. The USACE regulates these activities under Section 404 of the Clean Water Act (see 33 CFR 323).

2. Related laws: 33 CFR 320.3 includes a list of related laws including, but not limited to, Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408, "Section 408"), Section 401 of the Clean Water Act, Section 402 of the Clean Water Act, Section 307(c) of the Coastal Zone Management Act of 1972, Section 106 of the National Historic Preservation Act of 1966, Section 7 of the Endangered Species Act, the Fish and Wildlife Coordination Act of 1956, the Magnuson-Stevens Fishery Conservation and Management Act, Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, and Section 7(a) of the Wild and Scenic Rivers Act.

3. In order for an authorization under these GPs to be valid, a Water Quality Certification (WQC) under Section 401 of the CWA (33 USC 1341) or waiver thereof must be obtained from the Vermont Agency of Natural Resources (VT ANR), Watershed Management Division prior to the commencement of work in USACE jurisdiction. The VT ANR has granted an Individual WQC for all activities authorized under these GPs provided those activities meet the criteria as contained in these GPs and USACE notifies VT ANR of projects obtaining written verification under these GPs. The VT ANR will respond within the same response times required of the Federal resource agencies.

SECTION II. REVIEW CATEGORIES AND APPLICATION PROCEDURES

1. In order for activities to qualify for these GPs, they shall meet the terms and conditions of this document, including the eligibility criteria listed in Section III and the general conditions (GCs) listed in Section IV. The USACE will consider any activity requiring USACE authorization to be unauthorized if that activity is under construction or completed and does not comply with all of the terms and conditions of the GPs. The USACE will evaluate unauthorized activities for enforcement action under 33 CFR part 326. Any activity not specifically listed may still be eligible for authorization under these GPs; prospective permittees are advised to contact USACE for specific eligibility determinations.

2. Project proponents are encouraged to contact the USACE Vermont Project Office (VPO) with questions at any time (mailing address: 11 Lincoln Street, Room 210, Essex Junction, Vermont 05452; email: cenae-r-vt@usace.army.mil; phone: (802) 872-2893). Pre-application meetings (see 33 CFR 325.1(b)), whether arranged by USACE or requested by applicants, are encouraged to facilitate the review of projects. Pre-application meetings and/or site visits can help streamline the permit process by alerting the applicant to potentially time-consuming concerns that may arise during the evaluation

of a project (e.g., avoidance, minimization and compensatory mitigation requirements, historic properties, and endangered species).

3. Federal and state jurisdiction may differ in some instances. Applicants are responsible for applying for and obtaining all required federal, state or local approvals (see GC 1). A permit from USACE may be required for specific activities regardless of state of Vermont jurisdiction.

These GPs may also be used to authorize projects that are not regulated by the state of Vermont.

4. How to Obtain/Apply for Authorization:

Project proponents must read each GP and the GCs to see if an activity is eligible for authorization.

a. Self-Verification (SV):

May proceed without application or notification to USACE provided the project proponent verifies that the activity will meet the terms and conditions of applicable GPs. Project proponents shall comply with other federal laws such as the National Historic Preservation Act (NHPA), the Endangered Species Act (ESA) and the Wild and Scenic Rivers Act (WSRA). Consultation with outside experts, such as the State Historic Preservation Officer (SHPO), federally-recognized tribes in the state of Vermont (Tribal Historic Preservation Officers, or THPOs), National Park Service (NPS), and the U.S. Fish and Wildlife Service (USFWS) listed in Appendix V may also be necessary. The USACE relies on the VT ANR Environmental Notice Bulletin (ENB) for notification of SV projects, as applicable.

b. Pre-Construction Notification (PCN):

i. For activities that do not qualify for SV, the applicant must submit a PCN to obtain written verification from USACE before starting work in USACE jurisdiction. Digital submissions are encouraged and preferred and can be submitted directly to USACE staff by email, or at cenae-r-vt@usace.army.mil. Applicants must submit at least the following information:

- A completed USACE application form (ENG Form 4345[1]).
- Plans that illustrate the proposed work in reference to the limits of USACE jurisdiction as applicable. Plans should show existing and proposed conditions and contain all other appropriate information.
- Federal wetland delineation documentation (i.e., Wetland Determination Data Forms).
- Any information on federally listed endangered and threatened species and critical habitat that occur or may occur in the project area (See GC 12).
- Any correspondence with the SHPO and THPOs indicating coordination with these entities to ensure compliance with GC 11. Applicants are encouraged to submit a copy of their application materials to the SHPO and the THPOs, at the

[1] Located at www.nae.usace.army.mil/regulatory under "Useful Documents, Forms and Publications."

same time, or before, they apply to USACE to be reviewed for the presence of historic, archaeological or tribal resources in the permit area that the proposed work may affect.

The USACE will coordinate review of all PCN activities with the interagency review team (IRT) comprised of federal and state agencies and federally recognized tribes to ensure that the proposed activity results in no more than a minimal impact to the aquatic environment. This may require project modifications involving avoidance, minimization, and/or compensatory mitigation for unavoidable impacts to ensure the net effects of a project are minimal.

ii. Emergency Situations: Contact USACE immediately in the event of an emergency to obtain information on the verification process and coordination requirements. The USACE regulation at 33 CFR 325.2(e)(4) states that "an "emergency" is a situation which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen and significant economic hardship if corrective action requiring a permit is not undertaken within a time period less than the normal time needed to process the application under standard procedures." Emergency work is subject to the same terms and conditions of these GPs as non-emergency work, and similarly, must qualify for authorization under these GPs; otherwise, an individual permit (IP) shall be required. Upon notification, USACE will determine if a project qualifies for emergency procedures under the GPs and whether work may proceed prior to submittal of an application. Where an application is required, USACE staff will work with all applicable agencies to expedite verification according to established procedures in emergency situations.

5. Projects that are not authorized by these GPs require an IP (33 CFR 325.5(b)) and project proponents must submit an application directly to USACE. These GPs do not affect the USACE IP review process or activities exempt from USACE permit requirements. The USACE retains discretionary authority on a case-by-case basis to elevate an SV to PCN or an IP, or a PCN to an IP based on concerns for the aquatic environment or for any other factor of the public interest (33 CFR 320.4(a)). Whenever USACE notifies an applicant that a PCN or IP is required, no work in USACE jurisdiction may be conducted until USACE issues the required authorization in writing indicating that work may proceed. For IPs, an individual 401 WQC or waiver is required from the VT ANR. Contact the VT ANR for procedures on how to apply for a WQC.

SECTION III. GENERAL PERMITS

An activity listed below may be authorized by these GPs only if that activity and the permittee satisfy all of the GP's terms and conditions. Any activity not specifically listed below may still be eligible for the GPs; prospective permittees are advised to contact USACE for specific eligibility determinations.

"Permanent impacts" means WOTUS that are permanently affected by filling, flooding, excavation, drainage or clearing because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody. Temporary impacts include, but are not limited to, WOTUS that are temporarily filled, flooded, excavated, drained or cleared because of the regulated activity. Temporary

impacts are usually associated with construction activities and often involve the placement of cofferdams and construction mats. These fills are removed when construction is completed. Pilings and associated structures do not ordinarily constitute a discharge of fill material. Impacts resulting from activities eligible for exemptions under §404(f) of the CWA are not considered when calculating the impact area.

Vermont General Permits

1. Aids to navigation
2. Repair or maintenance of existing currently serviceable, authorized or grandfathered structures/fills and removal of structures and fills
3. Moorings
4. Pile-supported structures and floats, including boat lifts/hoists and other miscellaneous structures, temporary recreational structures and work
5. Boat ramps and marine railways
6. Utility line activities
7. Dredging, beach nourishment, rock and debris removal and rock relocation
8. U.S. Coast Guard Approved Bridges
9. Shoreline and bank stabilization projects
10. Aquatic habitat restoration, establishment and enhancement activities
11. Fish and wildlife harvesting activities
12. Oil spill and hazardous material cleanup
13. Cleanup of hazardous and toxic waste
14. Scientific measurement devices
15. Survey activities
16. Energy generation and renewable energy generation facilities and hydropower projects
17. New/expanded developments and recreational facilities
18. Linear transportation projects and stream/wetland crossings
19. Mining activities
20. Temporary fill not associated with any other GP activities
21. Agricultural activities

GP 1. AIDS TO NAVIGATION (Section 10): The placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard (USCG). See 33 CFR 66, Chapter I, subchapter C.	
Self-Verification Eligible	**Pre-Construction Notification Required**
Aids to navigation and regulatory markers approved by and installed in accordance with the requirements of the USCG. Not located within a USACE Federal Navigation Project (FNP).	1. Work not eligible for SV. 2. Aids to navigation and regulatory markers or temporary buoys, markers, floats, and similar structures that are located within a USACE FNP.

GP 2. REPAIR OR MAINTENANCE OF EXISTING CURRENTLY SERVICEABLE, AUTHORIZED OR GRANDFATHERED STRUCTURES/FILLS AND REMOVAL OF STRUCTURES AND FILLS (Sections 10 & 404): (a) Repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 (activities occurring before certain dates), provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, requirements of other regulatory agencies, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. Includes removal of structures and fill.

Not authorized under GP 2: Permanent impacts > 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other WOTUS.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Repair, replacement in-kind, or maintenance of existing, currently serviceable, authorized structures or fills with no substantial expansion or change in use: - Conditions of the original authorization apply. - Minor deviations in fill design allowed. - The repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events is authorized, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, USACE may waive the two-year limit in writing provided the permittee can demonstrate funding, contract, or other similar delays. - Maintenance includes, but it is not limited to, the removal of accumulated sediments and debris in the vicinity of existing structures (such as bridges, culverted road crossings, water intake structures, dams, etc.), provided: (a) removal is the minimum necessary to restore the waterway in the vicinity of the structure to the approximate dimensions that existed when the structure was built; and (b) all dredged or excavated materials are deposited and retained in an upland area. 2. Bulkhead replacement via installation of new bulkhead within 18” of existing bulkhead and backfill. 3. Construction mats of any area necessary to conduct activities that were previously authorized, authorized under SV, or not subject to regulation in all WOTUS. 4. Removal of previously authorized structures or fills and the restoration to pre-construction conditions.	1. Work not eligible for SV. 2. Dam and flood control or levee repair, rehabilitation, or replacement which involves a permanent change in the flood elevation or permanent water surface elevation of the impoundment. 3. The discharge of more than *de minimis* (i.e., inconsequential) quantities of accumulated bottom sediment occurring from or through a dam into downstream waters. **NOTE 1**: Grandfather dates include structures or work completed before December 18, 1968 and fill placed before July 25, 1975 for USACE purposes only. **NOTE 2**: This GP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the CWA §404(f) exemption for maintenance. See 33 CFR 323.4(a)(2).

GP 3. MOORINGS (Section 10): (a) New private, non-commercial, non-rental, single-boat moorings; (b) Minor relocation of previously authorized moorings; (c) Mooring field expansions, boundary reconfigurations, or modifications of previously authorized mooring fields; and (d) Maintenance and replacement of moorings. **Not authorized under GP 3:** Moorings or moored vessels that extend within the horizontal limits of FNPs and moorings associated with a new boating facility.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Private, non-commercial, non-rental, single-boat moorings. 2. Minor relocation of previously authorized moorings.	1. Work not eligible for SV. 2. New moorings associated with an existing boating facility.

GP 4. PILE-SUPPORTED STRUCTURES AND FLOATS, INCLUDING BOAT LIFTS/HOISTS AND OTHER MISCELLANEOUS STRUCTURES, TEMPORARY RECREATIONAL STRUCTURES AND WORK (Section 10): (a) New, expansions, reconfigurations, or modifications of structures for navigation access including docks, decks, floats, stairs, and boat/float lifts; and (b) Temporary buoys, markers, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use. **Not authorized under GP 4:** (a) Fill or excavation; (b) Structures within FNPs; or (c) Structures associated with a new boating facility.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Reconfiguration of existing authorized docks with no additional slips and no expansion, provided those structures do not extend beyond the existing perimeter of the facility. 2. Seasonal private, residential pile-supported or float-supported structures for navigational access extending no further waterward than 50 feet beyond mean high water (MHW), not >6 feet wide, and a cumulative dock deck area <500 SF, and not located within 25 feet of the property line. 3. Private, bottom-anchored seasonal swim floats that are <400 SF in size. 4. Private boat and float lifts. 5. Temporary buoys, markers, and similar structures: (a) placed for recreational use during specific events, provided that such structures are removed within 30 days after use has been discontinued and/or; (b) placed during winter events on ice and removed before spring thaw. Provided the above do not extend across >25% of the waterway width at mean low water (MLW).	1. Work not eligible for SV. 2. Piers, docks, decks, floats, and similar structures that provide public, community or government recreational uses such as boating, fishing, swimming, access, etc. 3. Structures or work in or affecting navigable WOTUS that are not defined under any other GP activity. 4. New structures within an existing boating facility, provided those structures do not extend beyond the existing perimeter of the boating facility. 5. Temporary buoys, markers, and similar structures that will not be removed within 30 days after use has been discontinued. 6. Cordoning off portions of public waters (e.g., swim areas). **NOTE:** The USACE may require a letter of no objection from the abutter if a structure is to be located within 25 feet of the property line.

GP 5. BOAT RAMPS AND MARINE RAILWAYS (Sections 10 and 404): Activities required for the construction of boat ramps and marine railways including excavation and fill. **Not authorized under GP 5:** (a) Permanent impacts ≥ 5,000 SF in Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands, and > 1 acre in all other WOTUS; (b) Temporary impacts > 1 acre in WOTUS; or (c) dredging in navigable WOTUS. (see GP 7).	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.	1. Work not eligible for SV. 2. < 5000 SF permanent impact and < 1 acre of temporary impact and excavation in Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands. 3. Permanent and temporary impacts ≥ 5,000 SF and < 1 acre in waterways and/or wetlands, other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. **NOTE**: The USACE may require a letter of no objection from the abutter if a structure is to be located within 25 feet of the property line.

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GP 6. UTILITY LINE ACTIVITIES (Sections 10 & 404): Activities required for (a) The construction, maintenance, relocation, repair, and removal of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for utility lines; (b) The construction, maintenance or expansion of utility line substation facilities associated with a power/utility line in WOTUS; and (c) The construction and maintenance of foundations for overhead utility line towers, poles, and anchors, provided the foundations are the minimum size necessary, and separate footings for each tower leg (rather than a larger single pad) are used where feasible. This GP authorizes the construction of access roads to facilitate construction of the above activities, provided the activity, in combination with all other activities included in one single and complete project, does not cause the permanent loss of greater than 1 acre of WOTUS. Impacts resulting from mechanized pushing, dragging or other similar activities that redeposit excavated soil material shall be figured into the area limit determination.

Not authorized under GP 6: Permanent and temporary impacts ≥ 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other WOTUS.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 2. Intake structures that are dry hydrants used exclusively for firefighting activities with no stream impoundments. 3. Seasonal waterlines installed on the lake or river bottom that are ≤ 2 inches in diameter.	1. Work not eligible for SV. 2. Overhead utility lines constructed over navigable WOTUS and submarine utility lines that are routed in or under such waters. 3. Permanent and temporary impacts are: a. < 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. b. ≥ 5,000 SF and < 1 acre in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 4. Work involves stream channelization, relocation or loss of streambed including impoundments. **NOTE**: Utility lines consisting of aerial electric power transmission lines crossing navigable WOTUS must comply with the applicable minimum clearances specified in 33 CFR 322.5(i).

NOTE: A utility line is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, data, and telegraph messages, and radio and television communication. The term utility line does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.
NOTE: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.

GP 7. DREDGING (Section 10), BEACH NOURISHMENT, (Sections 10 & 404); ROCK AND DEBRIS REMOVAL (Section 10) AND ROCK RELOCATION (Sections 10 & 404): (a) New and maintenance dredging, including disposal of dredged material for beach nourishment, provided USACE finds the dredged material to be suitable for such disposal; (b) Beach nourishment not associated with dredging; and (c) Rock removal and relocation for navigation.

Not authorized under GP 7: (a) New and maintenance dredging ≥ 5,000 CY; (b) Permanent fill ≥ 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other WOTUS; (c) Regulated discharges associated with excavation, and disposal > 1/2 acre; and (d) Temporary fill > 1 acre in all WOTUS.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. No new or maintenance dredging in navigable WOTUS. 2. < 5,000 SF of temporary impact associated with dredging in waterways and/or wetlands. 3. ≤ 200 SF of impact associated with rock removal and relocation. 4. Removal of debris (e.g. woody and plant material deposited after a storm event) in navigable WOTUS.	1. Work not eligible for SV. 2. New and maintenance dredging up to 5,000 CY with upland disposal or beach nourishment in navigable WOTUS. 3. ≥ 5,000 SF and < 1 acre of temporary impact associated with dredging in all waterways and/or wetlands. 4. Disposal of dredged material for beach nourishment: a. < 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. b. ≥ 5,000 SF and < 1 acre in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.

GP 8. U.S. COAST GUARD APPROVED BRIDGES (Section 10 & 404; navigable WOTUS): Discharges of dredged or fill material incidental to the construction and modification of bridges across navigable WOTUS, including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided that the USCG authorizes the construction of the bridge structure under Section 9 of the Rivers and Harbors Act of 1899 or other applicable laws. A USCG Authorization Act Exemption or a STURRA (144h) exemption do not constitute USCG authorization (see GP 18). **Not authorized under GP 8:** Causeways and approach fills (see GP 18)	
Self-Verification Eligible	**Pre-Construction Notification Required**
Discharges of dredged or fill material incidental to the construction and modification of bridges.	

GP 9. SHORELINE AND BANK STABILIZATION PROJECTS (Sections 10 & 404): Bank stabilization activities necessary for erosion protection along the banks of lakes, ponds, streams, and any other open waters. Includes bulkheads, seawalls, riprap, revetments or slope protection and similar structures, as well as vegetative planting, soil bioengineering, or alternative techniques that are a combination of the two (e.g. living shorelines), specifically for the purpose of shoreline protection.

Not authorized under GP 9: (a) Bank stabilization ≥ 500 LF in total length and/or involving more than an average of 1 CY of fill per linear foot placed below the plane of the ordinary high water mark (OHWM) in Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands; (b) Stream channelization or relocation activities; or (c) breakwaters, groins and jetties.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. No fill in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 2. Bank stabilization < 200 linear feet long and does not exceed an average of 1 CY of fill per linear foot placed below the plane of OHWM in WOTUS other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 3. < 5,000 SF of temporary fill associated with bank stabilization in waterways and/or wetlands, other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.	1. Work not eligible for SV. 2. Bank stabilization <500 linear feet and an average of < 1 CY of fill per linear foot placed below the plane of OHWM in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.

GP 10. AQUATIC HABITAT RESTORATION, ESTABLISHMENT AND ENHANCEMENT ACTIVITIES (Sections 10 and 404): Activities in waters of the United States associated with the restoration, enhancement, and establishment of wetlands and riparian areas; the restoration and enhancement of streams and other open waters; the relocation of non-navigable WOTUS, including streams and associated wetlands for reestablishment of a natural stream morphology and reconnection of the floodplain; and the restoration and enhancement of shellfish, finfish and wildlife, provided those activities result in net increases in aquatic resource functions and services. **Not authorized under GP 10:** Stream channelization activities.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. No fill in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 2. Permanent and temporary impacts are < 5,000 SF in waterways and/or wetlands. 3. The activity does not convert a stream to wetland or vice versa, or wetland to a pond or uplands. 4. Temporary structures in navigable WOTUS not exceeding 30 days.	1. Work not eligible for SV. 2. Permanent or temporary impacts are: a. In Lake Champlain, Lake Memphremagog, Wallace Pond, adjacent wetlands; or b. ≥ 5,000 SF in all other waterways and/or wetlands. 3. Permanent structures in navigable WOTUS. 4. Sea Lamprey control projects. 5. Water impoundments. 6. Dam removals. 7. Restoration, establishment and/or enhancement activities approved for use by a USACE-approved in-lieu fee program or USACE-approved mitigation bank, with impacts of any size.

Comment

GP 11. FISH AND WILDLIFE HARVESTING ACTIVITIES (Sections 10 and 404): Activities in waters of the United States associated with fish and wildlife harvesting devices, such as duck blinds, fish shanties, and small fish aggregating and attraction devices. **Not authorized by GP 11:** (a) Artificial reefs; and (b) Permanent and temporary fill > 5,000 SF in all waterways and/or wetlands.	
Self-Verification Eligible	**Pre-Construction Notification Required**
Non-fill activities associated with fish and wildlife harvesting devices including duck blinds, fish shanties and small fish aggregating and attraction devices in navigable waters.	1. Work not eligible for SV. 2. Permanent and temporary impacts < 5,000 SF in all waterways and/or wetlands.

GP 12. OIL SPILL AND HAZARDOUS MATERIAL CLEANUP (Sections 10 and 404): (a) Activities conducted in response to a discharge or release of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) including containment, cleanup, and mitigation efforts, provided activities are done under either (i) The Spill Prevent, Control and Countermeasure Plan required by 40 CFR 112.3; (ii) The direction or oversight of the Federal on-site coordinator designated by 40 CFR 300; or (iii) Any approved existing state, regional or local contingency plan, provided that the Regional Response Team concurs with the proposed response efforts or does not object to the response effort; (b) Activities required for the cleanup of oil releases in WOTUS from electrical equipment that are governed by EPA's polychlorinated biphenyl (PCB) spill response regulations at 40 CFR 761; (c) Booms placed in navigable WOTUS; and (d) Use of structures and fills for spill response training exercises. Special Aquatic Sites (SAS) must be restored to their original condition and elevation	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Activities that are conducted in accordance with (a) or (b) above. 2. Booms placed in navigable WOTUS for hazardous and toxic waste containment, absorption and prevention, provided they are removed upon completion of the cleanup. 3. Temporary impacts for spill response training exercises < 1000 SF in navigable WOTUS and < 5000 SF in all other WOTUS, and in place ≤ 30 days.	1. Work not eligible for SV. 2. Permanent structures or impacts for spill response training exercises.

GP 13. CLEANUP OF HAZARDOUS AND TOXIC WASTE (Sections 10 and 404): Specific activities to effect the containment, stabilization or removal of hazardous or toxic waste materials, including court ordered remedial action plans or related settlements which are performed, ordered or sponsored by a government agency with established legal or regulatory authority. SAS must be restored to their original condition and elevation. **Not authorized under GP 13:** (a) the establishment of new disposal sites; or (b) the expansion of existing sites used for the disposal of hazardous or toxic waste.	
Self-Verification (SV) Eligible	**Pre-Construction Notification Required**
1. Permanent and temporary impacts are < 5,000 SF in WOTUS. 2. No fill in navigable WOTUS. 3. Booms placed in navigable WOTUS for oil and hazardous substance containment, absorption and prevention, provided they are removed upon completion of the cleanup.	1. Work not eligible for SV. 2. Permanent and temporary impacts: a. ≥ 5,000 SF in all WOTUS; or b. Located in navigable WOTUS. 3. Work involves stream channelization, relocation, impoundments or loss of streambed.

GP 14. SCIENTIFIC MEASUREMENT DEVICES (Sections 10 and 404): Scientific devices for measuring and recording scientific data, such as staff gauges, tide and current gauges, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Also eligible are small temporary weirs and flumes constructed primarily to record water quantity and velocity, provided the discharge is < 25 CY.

Not authorized under GP 14: (a) Permanent and temporary impacts > 1/2 acre in navigable WOTUS; and (b) Permanent and temporary impacts > 1 acre in all other WOTUS.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. Permanent and temporary impacts are ≤ 1,000 SF in WOTUS. 2. Temporary structures in navigable WOTUS. Provided the activity does not: • Restrict or concentrate movement of aquatic organisms; • Result in a hazard to navigation.	1. Work not eligible for SV. 2. Permanent and temporary impacts > 1000 SF in WOTUS. 3. Permanent structures in navigable WOTUS. 4. The activity involves permanent biological sampling devices in non-navigable WOTUS, temporary or permanent biological sampling devices in navigable WOTUS, or weirs and flumes.

NOTE: Upon completion of the use of the device to measure and record scientific data, the measuring device, and any other structures or fills associated with that device (e.g., foundations, anchors, buoys, lines, etc.), must be removed to the maximum extent practicable.

<table>
<tr><td colspan="2">GP 15. SURVEY ACTIVITIES (Sections 10 and 404): Survey activities such as soil borings, core sampling, seismic exploratory operations, plugging of seismic shot holes, and other exploratory-type bore holes, exploratory trenching and historic resources surveys.

Not authorized under GP 15: (a) Permanent impacts > 5,000 SF in Lake Champlain, Lake Memphremagog and Wallace Pond, and > 1 acre in all other waterways and/or wetlands, (b) Temporary impacts > 1 acre in all WOTUS, excluding temporary mats.</td></tr>
<tr><td>Self-Verification Eligible</td><td>Pre-Construction Notification Required</td></tr>
<tr><td>1. No fill in Lake Champlain, Lake Memphremagog and Wallace Pond.

2. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog and Wallace Pond.

3. No impacts, other than soil borings or core sampling, in navigable WOTUS.

4. No permanent structures or drilling and discharge of excavated material from test wells for oil and gas exploration allowed.</td><td>1. Work not eligible for SV.

2. < 5000 SF permanent impact and < 1 acre of temporary impact in Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands.

3. Permanent and temporary impacts are ≥ 5,000 SF and < 1 acre of impact in waterways and/or wetlands, other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.</td></tr>
<tr><td colspan="2">NOTE: The area in which the exploratory trench is dug must be restored to its preconstruction elevation upon completion of the work and must not drain a water of the United States. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench.
NOTE: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.</td></tr>
</table>

GP 16. ENERGY GENERATION AND RENEWABLE ENERGY GENERATION FACILITIES AND HYDROPOWER PROJECTS (Sections 10 and 404): Structures and work in navigable WOTUS and discharges of dredged or fill material into WOTUS for the construction, expansion, modification or removal of: (a) land-based renewable energy production facilities, including attendant features; (b) water-based wind production facilities or hydrokinetic renewable energy generation projects and their attendant features; and (c) discharges of dredged or fill material associated with hydropower projects.

Attendant features may include, but are not limited to, land-based collection and distribution facilities, control facilities, and parking lots. For each single and complete project in (b) above, no more than 10 generation units (e.g., wind turbines or hydrokinetic devices) are authorized in navigable WOTUS.

Not authorized under GP 16: Permanent and temporary impacts that are (a) > 1 acre in non-navigable WOTUS; (b) > 5,000 SF in navigable WOTUS; and (c) > 5,000 SF in wetlands adjacent to Lake Champlain, Lake Memphremagog, and Wallace Pond.

Self-Verification Eligible	**Pre-Construction Notification Required**
For land-based facilities: 1. < 5,000 SF of permanent and temporary impacts in non-navigable WOTUS.	1. Work not eligible for SV. 2. Permanent and temporary impacts are: a. ≥ 5000 SF and < 1 acre in non-navigable WOTUS, and b. < 5000 SF in navigable WOTUS. 3. Work involves stream channelization, relocation or loss of streambed including impoundments.

NOTE: Utility lines constructed to transfer the energy from the land-based renewable generation or collection facility to a distribution system, regional grid, or other facility may be authorized by GP 6.
NOTE: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.

GP 17. NEW/EXPANDED DEVELOPMENT AND RECREATIONAL FACILITIES (Sections 10 and 404): Discharges of dredged or fill material for the construction or expansion of developments and/or recreational facilities. This GP authorizes attendant features that are necessary for the use of the development. Attendant features may include but are not limited to roads, parking lots, garages, yards, utility lines, storm water management facilities, and septic fields. Fill area includes all temporary and permanent fill, and regulated discharges associated with excavation.

Not authorized under GP 17: Permanent and temporary impacts > 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other waterways and/or wetlands.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands.	1. Work not eligible for SV. 2. Permanent and temporary impacts are: a. < 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. b. ≥ 5,000 SF and < 1 acre in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 3. Work involves stream channelization, relocation, or loss of streambed, including impoundments.

NOTE: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.

GP 18. LINEAR TRANSPORTATION PROJECTS AND STREAM/WETLAND CROSSINGS (Sections 10 & 404): Activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., driveways, roads, highways, railways, trails, airport runways, and taxiways), and attendant features. Any stream channel modification is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

Not authorized under GP 18: Permanent and temporary impacts > 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other waterways and/or wetlands.

Self-Verification Eligible	**Pre-Construction Notification Required**
1. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog and Wallace Pond and adjacent wetlands. 2. Permanent and temporary stream crossings that comply with GC 20. 3. Existing crossings (e.g., culverts, elliptical or arch pipes, etc.) are not modified by (a) decreasing the diameter of the crossing or (b) changing the friction coefficient, such as through sliplining (retrofitting an existing culvert by inserting a smaller diameter pipe), culvert relining or invert lining.	1. Work not eligible for SV. 2. Permanent and temporary impacts are: a. < 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. b. ≥ 5,000 SF and < 1 acre in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 3. Work involves stream channelization, relocation or loss of streambed including impoundments. **NOTE:** Time of year for instream work is not limited for PCN authorizations unless specifically required by special conditions.

NOTE: Non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars may be authorized by GP 17.
NOTE: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.

GP 19. MINING ACTIVITIES (Sections 10 and 404): Discharges of dredged or fill material into WOTUS for mining activities. **Not authorized under GP 16:** Permanent and temporary impacts > 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands, and > 1 acre in all other waterways and/or wetlands.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. The activity does not occur in, over, or under navigable WOTUS. 2. < 5,000 SF of permanent and temporary impacts in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands.	1. Work not eligible for SV. 2. Permanent and temporary impacts are: a. < 5,000 SF in Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. b. ≥ 5,000 SF and < 1 acre in waterways and/or wetlands other than Lake Champlain, Lake Memphremagog, Wallace Pond and adjacent wetlands. 3. Work occurs in a navigable WOTUS. 4. Work involves stream channelization, relocation, impoundment, loss of streambed, or discharge of tailings into streams.

GP 20. TEMPORARY FILL NOT ASSOCIATED WITH ANY OTHER GP ACTIVITIES (Sections 10 and 404): Temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites that are not authorized under another GP activity. **Not authorized under GP 20:** (a) Permanent structures or impacts; (b) Temporary impacts > 1 acre in WOTUS; (c) use of cofferdams to dewater wetlands or other aquatic areas to change their use; or (d) Structures or fill left in place after construction is completed.	
Self-Verification Eligible	**Pre-Construction Notification Required**
1. Temporary impacts including land clearing in WOTUS are ≤ 5000 SF.	1. Work not eligible for SV.
NOTE: Temporary stream crossings may be authorized under GP 18. **NOTE**: Construction mats of any area necessary to conduct activities do not count towards the SV and PCN thresholds and should be removed as soon as work is completed.	

<table>
<tr><td colspan="2">GP 21. AGRICULTURAL ACTIVITIES (Section 404): Discharges of dredged or fill material into WOTUS for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include: (a) installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches; and similar activities; (b) discharges of dredged or fill material to relocate existing serviceable drainage ditches constructed in streams.

Not authorized under GP 21: (a) Permanent impacts > 1 acre in non-navigable WOTUS; (b) Work in navigable WOTUS; or (c) Construction of farm ponds in perennial streams.</td></tr>
<tr><td>Self-Verification Eligible</td><td>Pre-Construction Notification Required</td></tr>
<tr><td>1. For those activities subject to USACE jurisdiction, < 5,000 SF of permanent and temporary impacts.</td><td>1. ≥ 5,000 SF to < 1 acre of permanent and temporary impacts.

2. Work involves stream channelization, relocation or loss of streambed including impoundments.</td></tr>
</table>

SECTION IV. GENERAL CONDITIONS

1. Other Permits. Permittees shall obtain other federal, state, or local authorizations as required by law. Permittees are responsible for applying for and obtaining all required state or local approvals. Work that is not regulated by the state of Vermont, but is subject to USACE jurisdiction, may be eligible for these General Permits (GPs).

2. Federal Jurisdictional Boundaries.

a. Applicability of these GPs shall be evaluated with reference to federal jurisdictional boundaries. Activities shall be evaluated with reference to "WOTUS" under the Clean Water Act (33 CFR 328) and "navigable WOTUS" under §10 of the Rivers and Harbors Act of 1899 (33 CFR 329). Applicants are responsible for ensuring that the boundaries used satisfy the federal criteria defined at 33 CFR 328-329. These sections prescribe the policy, practice and procedures to be used in determining the extent of USACE jurisdiction. Note: WOTUS includes all waters pursuant to 33 CFR 328.3(a), and adjacent wetlands as that term is defined in 33 CFR 328.3(c).

b. Applicants shall identify all aquatic resources on the project site. All aquatic resources are presumed to be WOTUS unless an approved jurisdictional determination has been obtained from USACE that determines otherwise. Wetlands shall be delineated in accordance with the Corps of Engineers Wetlands Delineation Manual and the most recent Northcentral/Northeast Regional Supplement.

3. Mitigation (Avoidance, Minimization, and Compensatory Mitigation).

a. Activities shall be designed and constructed to avoid and minimize direct, indirect, secondary, and cumulative adverse effects, both temporary and permanent, to WOTUS to the maximum extent practicable at the project site (i.e., on site). Consideration of mitigation (avoiding, minimizing, rectifying, reducing, or compensating) is required to the extent necessary to ensure that the adverse effects to the aquatic environment are no more than minimal.

b. Applicants should consider riparian/forested buffers for stormwater management and low impact development (LID) best management practices (BMPs) to reduce impervious cover and manage stormwater to minimize impacts to the maximum extent practicable.

c. Compensatory mitigation[1] for effects to WOTUS, including direct, secondary and temporal[2], may be required for projects with permanent and temporary impacts that exceed the SV area limits to offset unavoidable impacts, which remain after all appropriate and practicable avoidance and minimization has been achieved, and to ensure that the adverse effects to the aquatic environment are no more than minimal. Proactive restoration projects or temporary impact work with no secondary effects may generally be excluded from this requirement.

d. Mitigation proposals shall follow the guidelines found in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule April 10, 2008; 33 CFR 332. Permittees considering the use of a monetary payment in-lieu of permittee-responsible mitigation as compensation for unavoidable impacts to WOTUS in the state of Vermont may utilize the Vermont In-Lieu Fee Program.

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[1] Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR 332. Also reference the New England District Compensatory Mitigation Guidance at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.

[2] Temporal loss: The time lag between the losses of aquatic resource functions caused by the permitted impacts and the replacement of aquatic resource functions at the compensatory mitigation site(s) (33 CFR 332.2).

e. Mitigation will likely be required for fills >5,000 SF. Information is provided at https://www.nae.usace.army.mil/Missions/Regulatory/Mitigation/.

4. Discretionary Authority. Notwithstanding compliance with the terms and conditions of this permit, USACE retains discretionary authority to require an IP review based on concerns for the aquatic environment or for any other factor of the public interest (33 CFR 320.4(a)). This authority is invoked on a case-by-case basis whenever USACE determines that the potential consequences of the proposal warrant IP review based on the concerns stated above. This authority may be invoked for projects with cumulative adverse environmental effects that are more than minimal, or if there is a special resource or concern associated with a particular project. Whenever USACE notifies an applicant that an IP may be required, authorization under these GPs is voided and no work may be conducted until a USACE IP is obtained or until USACE notifies the applicant that further review has demonstrated that the work may be reviewed under these GPs.

5. Fills Within 100-Year Floodplains. The activity shall comply with applicable Federal Emergency Management Agency (FEMA)-approved state of Vermont or municipal floodplain management requirements. Permittees should contact FEMA and/or the state of Vermont Floodplain Management Program regarding floodplain management requirements (see Section V for Federal and state-specific contact info).

6. Single and Complete Project. The term “single and complete project” is defined at 33 CFR 330.2(i) as the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. The GPs shall not be used for piecemeal work and shall be applied to single and complete projects.

a. For non-linear projects, a single and complete project must have independent utility. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

b. Unless USACE determines the activity has independent utility, all components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be treated together as constituting one single and complete project.

c. For linear projects such as power lines or pipelines with multiple crossings, a “single and complete project” is all crossings of a single water of the U.S. (i.e. single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly-shaped wetland or lake, etc., are not separate waterbodies, and crossings of such features cannot be considered separately. If any crossing requires a PCN review or an IP review, then the entire linear project shall be reviewed as one project under PCN or the IP procedures.

7. Use of Multiple General Permits. The use of more than one GP for a single and complete project is prohibited, except when the acreage loss of WOTUS authorized by the GPs does not exceed the acreage limit of the GPs with the highest specified acreage limit. For example, if a road crossing over waters is constructed under GP 18, with an associated utility line crossing authorized by GP 6, if the maximum acreage loss of WOTUS for the total project is ≥1 acre it shall be evaluated as an IP.

8. USACE Property and Federal Projects.

a. Corps projects and property can be found at:*www.nae.usace.army.mil/Missions/Civil-Works and www.nan.usace.army.mil/missions/civil-works*

b. In addition to any authorization under these GPs, proponents must contact the USACE Real Estate Division at (978) 318-8585 for work occurring on or potentially affecting USACE properties and/or USACE-controlled easements to initiate reviews and determine what real estate instruments are necessary to perform work. Permittees may not commence work on USACE properties and/or USACE-controlled easements until they have received any required USACE real estate documents evidencing site-specific permission to work.

c. Any proposed temporary or permanent modification or use of a Federal project (including but not limited to a levee, dike, floodwall, channel, anchorage, seawall, bulkhead, jetty, wharf, pier or other work built but not necessarily owned by the United States), or any use which would obstruct or impair the usefulness of the Federal project in any manner, and/or would involve changes to the authorized Federal project's scope, purpose, and/or functioning, is not eligible for SV and will also require review and approval by USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408) (Section 408).

d. A PCN is required for all work in, over, under, or within a distance of three times the authorized depth of a USACE FNP and may also require permission under Section 408.

e. Any structure or work that extends closer than a distance of three times the project's authorized depth to the horizontal limits of any FNP shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys.

f. Where a Section 408 permission is required, written verification for the PCN will not be issued prior to the decision on the Section 408 permission request.

9. National Lands. Activities that impinge upon the value of any National Wildlife Refuge, National Forest, or any area administered by the NPS, USFWS or U.S. Forest Service (USFS) are not eligible for SV and require either a PCN or IP.

10. Wild and Scenic Rivers.

a. The following activities in designated rivers of the National Wild and Scenic River (WSR System, or in a river designated by Congress as a "study river" for possible inclusion in the system, require a PCN unless the NPS has determined in writing to the proponent that the proposed work will not adversely affect the WSR designation or study status:

i. Activities that occur in WSR segments, in and 0.25 miles up or downstream of WSR segments, or in tributaries within 0.25 miles of WSR segments;

ii. Activities that occur in wetlands within 0.25 miles of WSR segments;

iii. Activities that have the potential to alter free-flowing characteristics in WSR segments.

b. As of December 19, 2014, affected rivers in Vermont include: the Missisquoi River, from its headwaters at the Lowell/Westfield town line to the Canadian border in Troy (20.5 miles) and from the Canadian border in East Richford to Enosburgh Falls (14.6 miles); and the Trout River.

11. Historic Properties.

a. No undertaking shall cause effects (defined at 33 CFR 325 Appendix C and 36 CFR 800) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on

the National Register of Historic Places[3], including previously unknown historic properties within the permit area, unless USACE or another Federal action agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act (NHPA). The SHPO, THPO and the National Register of Historic Places can assist with locating information on: i) previously identified historic properties; and ii) areas with potential for the presence of historic resources, which may require identification and evaluation by qualified historic preservation and/or archaeological consultants in consultation with USACE and the SHPO and/or THPO(s).

b. For activities eligible for SV, proponents must ensure and document that the activity will not cause effects as stated in 11(a).

c. Permittees must submit a PCN to USACE as soon as possible if the authorized activity may cause effects as stated in 11(a) to ensure that USACE is aware of any potential effects of the permitted activity on any historic property or cultural resource so that the consultation requirements of Section 106 of NHPA can be satisfied.

d. If a project proponent discovers any previously unknown historic, cultural, or archeological remains or artifacts while accomplishing the activity authorized by this permit, they must immediately notify the District Engineer of what they have found, and to the maximum extent practicable, avoid construction activities that may affect the remains and artifacts until the required coordination has been completed. The District Engineer will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

e. Federal agencies should follow their own procedures for complying with the requirements of Section 106 NHPA. Along with the application, Federal applicants shall provide USACE with the appropriate documentation to demonstrate compliance with those requirements.

f. Federal and non-federal applicants should coordinate with USACE before conducting any onsite archeological work (reconnaissance, surveys, recovery, etc.) requested by the SHPO or the THPO, as USACE will determine the permit area for the consideration of historic properties based on 33 CFR 325 Appendix C. This is to ensure that work done is in accordance with USACE requirements.

12. Federal Threatened and Endangered Species.

a. No activity is authorized under any GP which: i) is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species; or ii) “may affect” a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed; or iii) is “likely to adversely affect” a listed species or critical habitat unless Section 7 consultation has been completed by USACE or another lead action agency in coordination with USACE; or iii) violates the ESA.

b. All prospective permittees shall obtain an Official Species List from the USFWS’s Information for Planning and Consultation (IPAC) found at: https://ecos.fws.gov/ipac/. This is applicable to SV eligible and PCN activities.

c. Non-federal permittees must submit a PCN if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized.

[3] The majority of historic properties are not listed on the National Register of Historic Places and may require identification and evaluation by qualified historic preservation and/or archaeological consultants in consultation with USACE and the SHPO and/or THPO.

An activity may remain eligible for SV if the only listed species affected is the northern long-eared bat (*Myotis septrionalis*), and

(i) the activity: 1) will not remove trees ≥3 inches dbh at any time of the year; or ≤10 trees ≥ 3 inches dbh between November 1 – March 31; and 2) is not within the "buffer" of a NLEB hibernacula or maternity roost tree; and 3) does not involve work on bridges or existing riprap associated with dams; or

(ii) only after Section 7 consultation has been completed by USACE under the 4(d) Rule Streamlined Consultation.

d. Federal agencies shall follow their own procedures for complying with the requirements of the ESA while ensuring that USACE and any other federal action agencies are included in the consultation process.

e. Non-federal representatives designated by USACE to conduct informal consultation or prepare a biological assessment shall follow the requirements in the designation document(s) and the ESA. Non-federal representatives shall also provide USACE with the appropriate documentation to demonstrate compliance with those requirements. USACE will review the documentation and determine whether it is sufficient to address ESA compliance for the GP activity, or whether additional ESA consultation is necessary.

f. The requirements to comply with Section 7 of the ESA may be satisfied by a programmatic agreement (PA) or programmatic consultation (PC) with USACE, the New England District, or another federal agency. New England District PAs and PCs are found at: *www.nae.usace.army.mil/Missions/Regulatory*

13. Navigation.

a. No activity may cause more than a minimal adverse effect on navigation.

b. Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations must be installed and maintained at the permittee's expense on authorized facilities in navigable WOTUS.

c. Any structure or work that extends closer to the horizontal limits of any USACE FNP than a distance of three times the project's authorized depth shall be subject to removal at the owner's expense prior to any future USACE dredging or the performance of periodic hydrographic surveys. This is applicable to SV eligible and PCN activities.

d. There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein, and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.

e. The permittee understands and agrees that if future U.S. operations require the removal, relocation, or other alteration of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from USACE, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

f. A PCN is required for all work in, over or under an FNP or its buffer zone unless otherwise indicated in Section III as the work may also require a Section 408 permit.

14. Heavy Equipment in Wetlands. Operating heavy equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall: a) have low ground pressure (typically <3

psi); b) be placed on swamp/construction/timber mats (herein referred to as “construction mats” or “mats”) that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation; or c) be operated on adequately dry or frozen wetlands such that shear pressure does not cause subsidence of the wetlands immediately beneath equipment and upheaval of adjacent wetlands. Construction mats are to be placed in the wetland from the upland or from equipment positioned on swamp mats if working within a wetland. Construction mats should be carried, and not dragged, into position, where feasible. Other support structures that are capable of safely supporting equipment may be used with written USACE authorization. Similarly, the permittee may request written authorization from USACE to waive use of mats during frozen or dry conditions. An adequate supply of spill containment equipment shall be maintained on site. Construction mats should be managed in accordance with the following construction mat best management practices:

• Mats should be in good condition to ensure proper installation, use and removal.
• Where feasible, mats should be carried and not dragged unless they are being used as a grading implement.
• Where feasible, place mats in a location that would minimize the amount needed for the wetland crossing.
• Minimize impacts to wetland areas during installation, use, and removal.
• Install adequate erosion and sediment controls at approaches to mats to promote a smooth transition to, and minimize sediment tracking onto, mats.
• In most cases, mats should be placed along the travel area so that the individual boards are resting perpendicular to the direction of traffic. No gaps should exist between mats. Mats should be placed far enough on either side of the resource area to rest on firm ground.
• Provide standard construction mat BMP details to work crews.
• Construction mats shall be thoroughly cleaned before re-use to minimize spread of invasive species.

15. Temporary Fill.

a. Temporary fill, construction mats and corduroy roads shall be entirely removed as soon as they are no longer needed to construct the authorized work. Temporary fill shall be placed in its original location or disposed of at an upland site and suitably contained to prevent its subsequent erosion into WOTUS.

b. All temporary fill and disturbed soils shall be stabilized to prevent its eroding into WOTUS where it is not authorized. Work shall include phased or staged development to ensure only areas under active development are exposed and to allow for stabilization practices as soon as practicable. Temporary fill must be placed in a manner that will prevent it from being eroded by expected high flows.

c. Unconfined temporary fill authorized for discharge into WOTUS shall consist of material that minimizes impacts to water quality (e.g. washed stone, stone, etc.).

d. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable when temporary structures, work, and discharges of dredged or fill material, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Materials shall be placed in a location and manner that does not adversely impact surface or subsurface water flow into or out of the wetland. Temporary fill authorized for discharge into wetlands shall be placed on geotextile fabric or other appropriate material laid on the pre-construction wetland grade where practicable to minimize impacts and to facilitate restoration to the original grade. Construction mats are excluded from this requirement.

e. Construction debris and/or deteriorated materials shall not be located in WOTUS.

16. Restoration of Wetland Areas.

a. Upon completion of construction, all disturbed wetland areas (the disturbance of these areas must be authorized) shall be stabilized with a wetland seed mix containing only plant species native to New England and shall not contain any species listed in the "Invasive and Other Unacceptable Plant Species" Appendix D in the "New England District Compensatory Mitigation Guidance" found at http://www.nae.usace.army.mil/Missions/Regulatory/Mitigation.aspx.

b. The introduction or spread of invasive plant species in disturbed areas shall be controlled. If construction mats are to be used, they shall be thoroughly cleaned before re-use.

c. In areas of authorized temporary disturbance, if trees are cut they shall be cut at or above ground level and not uprooted in order to prevent disruption to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.

d. Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.

17. Bank Stabilization. Projects involving construction or reconstruction/maintenance of bank stabilization structures within USACE jurisdiction should be designed to minimize environmental effects, effects to neighboring properties, scour, etc. to the maximum extent practicable. For example, vertical bulkheads should only be used in situations where reflected wave energy can be tolerated. This generally eliminates bodies of water where the reflected wave energy may interfere with or impact on harbors, marinas, or other developed shore areas. A revetment is sloped and is typically employed to absorb the direct impact of waves more effectively than a vertical seawall. It typically has a less adverse effect on the beach in front of it, abutting properties and wildlife.

18. Soil Erosion and Sediment Controls.

a. Appropriate soil erosion and sediment controls[4] (hereinafter referred to as "controls") must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the OHWM, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within WOTUS during periods of low-flow or no-flow. Areas of temporary fill and/or cofferdams must be included in total waterway/wetlands impacts to determine applicability of the GPs.

b. No dewatering shall occur with direct discharge to waters or wetlands. Excess water in isolated work areas shall be pumped or directed to a sedimentation basin, tank or other dewatering structures in an upland area adequately separated from waters or wetlands where suspended solids shall be removed prior to discharge back into waters or wetlands. All discharge points back into waters and wetlands shall use appropriate energy dissipaters and erosion and sedimentation control BMPs.

c. Temporary controls shall be removed upon completion of work, but not until all exposed soil and other fills, as well as any work waterward of the OHWM, are permanently stabilized at the

[4] Appropriate soil erosion, sediment and turbidity controls include cofferdams, bypass pumping around barriers immediately up and downstream of the work footprint (i.e., dam and pump), installation of sediment control barriers (i.e., silt fence, vegetated filter strips, geotextile silt fences, filter tubes, erosion control mixes, hay bales or other devices) downhill of all exposed areas, stream fords, retention of existing vegetated buffers, application of temporary mulching during construction, phased construction, and permanent seeding and stabilization, etc.

earliest practicable date. Sediment and debris collected by these devices shall be removed and placed at an upland location in a manner that will prevent its later erosion into a waterway or wetland. Controls may be left in place if they are biodegradable, and flows and aquatic life movements are not disrupted.

d. The material within sandbags shall not be released during their removal, and trenches must be backfilled as soon as practicable to reduce turbidity impact duration.

19. Aquatic Life Movements and Management of Water Flows.

a. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Unless otherwise stated, activities permanently impounding water in a stream require a PCN to ensure impacts to aquatic life species are avoided and minimized. All permanent and temporary crossings of waterbodies and wetlands shall be:

i. Suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of aquatic species; and

ii. Properly aligned and constructed to prevent bank erosion or streambed scour both adjacent to and inside the crossing.

b. To avoid adverse impacts on aquatic organisms, the low flow channel/thalweg shall remain unobstructed during periods of low flow, except when it is necessary to perform the authorized work.

c. To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities. The activity must be constructed to withstand expected high flows. The activity shall not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

d. Activities that temporarily or permanently impact upstream or downstream flood conditions require a PCN.

20. Waterway/Wetland Work and Crossings.

a. All permanent crossings of rivers, streams, brooks, etc. (hereon referred to as "streams") shall meet the following performance standards in order to qualify for SV:

i. Design the structure to maintain a streambed composition and form throughout the culvert similar to and continuous with the adjacent reaches. To do this:
- Design and install streambed material and bedforms if not adequately supplied and developed naturally,
- Design profile and alignment through structure similar to those of adjacent stream reaches,
- Design culvert elevation to remain embedded for the life of the structure and in consideration of future channel conditions.

ii. Maintain velocities, turbulence and depths within the structure similar to those found in adjacent stream reaches across a range of desired flows.

b. The requirements to comply with the performance standards in GC 20a. above in order to proceed as a SV project do not apply to the following:

i. Temporary crossings in place for less than 90 days. Temporary culverts must be embedded unless they're installed during low flow (July 1 – October 1) and it's placed on geotextile fabric laid on the stream bed to ensure restoration to the original grade.

c. Applicants proposing new crossings, or maintenance or replacement of serviceable crossings should refer to the Guidelines for the Design of Stream/Road Crossings for Passage of Aquatic Organisms in Vermont.

d. Applicants shall use the least intrusive and environmentally damaging method to construct the stream crossing, following this sequential minimization process: bridge spans, open bottom arches or embedded culverts.

e. Permanent and temporary crossings of waterbodies and wetlands shall be installed in such a manner as to preserve hydraulic and ecological connectivity, on either side of the crossing. The permittee shall take necessary measures to correct wetland damage due to lack of hydraulic connectivity.

f. Projects using retrofit methods increasing flow velocity or slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe) require a PCN, either as new or maintenance activities.

g. No projects involving open trench excavation in flowing waters, except riprap installation, are allowed under SV. Open trench excavation projects may qualify for SV provided (1) the work doesn't occur in flowing waters (requires using management techniques such as temporary flume pipes, culverts, cofferdams, etc.) and (2) normal flows are maintained upstream and downstream of the project area.

h. For projects that otherwise meet the terms of SV, in-stream construction work shall be conducted only during the low flow period of July 1 to October 1 in any year. Projects that are conducted outside that time period require a PCN, regardless of the waterway and/or wetland impact area.

21. Discharge of Pollutants. All activities involving any discharge of pollutants into WOTUS authorized under these GPs shall comply with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the CWA (33 U.S.C. 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this permit, the authorized work shall be modified to conform with these standards within 6 months of the effective date of such revision or modification, or within a longer period of time deemed reasonable by the District Engineer in consultation with the Regional Administrator of the EPA. Applicants may presume that State Water Quality Standards are met with the issuance of a 401 WQC or waiver (Applicable only to the Section 404 activity).

22. Spawning, Breeding, and Migratory Areas.

a. Jurisdictional activities and impacts such as excavations, discharges of dredged or fill material, and/or suspended sediment producing activities in jurisdictional waters that provide value as fish migratory areas, fish and shellfish spawning or nursery areas, or amphibian and migratory bird breeding areas, during spawning or breeding seasons shall be avoided and minimized to the maximum extent practicable.

b. Jurisdictional activities in WOTUS that provide value as breeding areas for migratory birds must be avoided to the maximum extent practicable. The permittee is responsible for obtaining any "take" permits required under the USFWS's regulations governing compliance with the Migratory Bird Treaty Act or the Bald and Golden Eagle Protection Act. The permittee should contact the appropriate local office of the USFWS to determine if such "take" permits are required for a particular activity.

23. Storage of Seasonal Structures. Seasonal or recreational structures such as pier sections, floats, etc., that are removed from the waterway for a portion of the year shall be stored in an upland location, located above the OHWM and not in wetlands.

24. Environmental Functions and Values. The permittee shall make every reasonable effort to carry out the construction or operation of the work authorized herein in a manner that minimizes any adverse impacts on existing fish, wildlife, and the environmental functions to the extent practicable. The permittee will discourage the establishment or spread of plant species identified as non-native invasive species by any federal or state agency.

25. Vernal Pools.

a. On projects requiring a PCN, vernal pools must be identified on the plan showing aquatic resource delineations.

b. A PCN is required if a discharge of dredged or fill material is proposed in a vernal pool located within WOTUS.

c. Adverse impacts to vernal pools, vernal pool envelopes, and critical terrestrial habitats should be avoided and minimized to the maximum extent practicable.

d. GC 25(b) and (c) do not apply to projects that are within a municipality that meets the provisions of a USACE-approved VP Special Area Management Plan (VP SAMP) and are otherwise eligible for SV, and the applicant meets the requirements to utilize the VP SAMP.

26. Invasive Species. The introduction, spread, or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work shall be avoided. Hence, swamp and timber mats and construction equipment shall be thoroughly cleaned before reuse/relocation.

27. Permit/Authorization Letter On-Site. For PCN projects, the permittee shall ensure that a copy of these GPs and the accompanying authorization letter are at the work site (and the project office) whenever work is being performed, and that all personnel with operational control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affect areas of USACE jurisdiction at the site of the work authorized by these GPs. This shall be achieved by including the entire permit authorization in the specifications for work. The term “entire permit authorization” means these GPs, including general conditions and the authorization letter (including its drawings, plans, appendices and other attachments), and also includes permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract as a change order. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire authorization letter, and no contract or sub-contract shall require or allow unauthorized work in areas of USACE jurisdiction.

28. Inspections. The permittee shall allow USACE to make periodic inspections at any time deemed necessary in order to ensure that the work is being or has been performed in accordance with the terms and conditions of this permit. To facilitate these inspections, the permittee shall complete and return the Work Start Notification Form and the Compliance Certification Form to

USACE when provided with a PCN verification letter. The USACE may also require post-construction engineering drawings for completed work or post-dredging survey drawings for any dredging work.

29. Maintenance. The permittee shall maintain the activity authorized by these GPs in good condition and in conformance with the terms and conditions of this permit. This does not include maintenance of dredging projects. Maintenance dredging is subject to the review thresholds in General Permit 7 in Appendix A, as well as any conditions included in a written USACE authorization. Maintenance dredging includes only those areas and depths previously authorized and dredged. Some maintenance activities may not be subject to regulation under Section 404 in accordance with 33 CFR 323.4(a)(2).

30. Property Rights. Per 33 CFR 320.4(g)(6), these GPs do not convey any property rights, either in real estate or material, or any exclusive privileges, nor does it authorize any injury to property or invasion of rights or any infringement of federal, state, or local laws or regulations.

31. Transfer of GP Verifications. If the permittee sells the property associated with a GP verification, the permittee may transfer the GP verification to the new owner by submitting a letter to USACE to validate the transfer. A copy of the GP verification shall be attached to the letter, the letter shall contain the name, address, phone number and email of the transferee (new owner), shall include the following statement and signature, and be emailed to cenae-r-vt@usace.army.mil or mailed to: U.S. Army Corps of Engineers, Vermont Project Office, 11 Lincoln Street, Room 210, Essex Junction, Vermont 05452.

When the structures or work authorized by this general permit are still in existence at the time the property is transferred, the terms and conditions of this general permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this general permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____*(Transferee Printed Name)*
_____(Transferee Signature)
_____(Date)

32. Modification, Suspension, and Revocation. These GPs and any individual authorizations issued thereof may be modified, suspended, or revoked in whole or in part pursuant to the policies and procedures of 33 CFR 325.7, and any such action shall not be the basis for any claim for damages against the United States.

33. Special Conditions. The USACE may impose other special conditions on a project authorized pursuant to these GPs that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. These may be based on concerns from the VT ANR, SHPO, THPO or a Federal resource agency. Failure to comply with all conditions of the authorization, including special conditions, will constitute a permit violation and may subject the permittee to criminal, civil, or administrative penalties and/or restoration.

34. False or Incomplete Information. If USACE makes a determination regarding the eligibility of a project under this permit and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the permittee, the authorization will not be valid, and the U.S. government may institute appropriate legal proceedings.

35. Abandonment. If the permittee decides to abandon the activity authorized under this GP, unless such abandonment is merely the transfer of property to a third party, he/she may be required to restore the area to the satisfaction of USACE.

36. Enforcement cases. These GPs do not apply to any existing or proposed activity in USACE jurisdiction associated with an ongoing USACE or EPA enforcement action, until such time as the enforcement action is resolved or USACE determines that the activity may proceed independently without compromising the enforcement action.

37. Water Quality. Applicants shall satisfy any conditions imposed by the State of Vermont and EPA, where applicable, in their Clean Water Act Section 401 WQC for these GPs, or in any Individual Section 401 WQC. See Section V. for state-specific contact information and to determine if any action is required to obtain a 401 WQC. USACE may require additional water quality management measures to ensure that the authorized activity does not cause or contribute to a violation of water quality standards. All projects authorized by these GPs shall be designed, constructed and operated to minimize or eliminate the discharge of pollutants.

38. Duration of Authorization.

a. These GPs expire five years from the date issued as listed at the top of the cover sheet. Activities authorized by these GPs that have either commenced (i.e., are under construction) or are under contract to commence in reliance upon this authorization will have an additional year from the expiration date to complete the work. The permittee must be able to document to USACE's satisfaction that the project was under construction or under contract by the expiration date of these GPs. If work is not completed within the one-year extended timeframe, the permittee must contact USACE. The USACE may issue a new authorization, provided the project meets the terms and conditions of the GPs in effect at the time.

b. Activities authorized under these GPs will remain authorized until the GPs expire, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend, or revoke the authorization in accordance with 33 CFR 325.2(e)(2). Activities completed under the SV or PCN authorizations of these GPs will continue to be authorized after its expiration date.

V. CONTACTS FOR VERMONT GENERAL PERMITS

1. Federal

U.S. Army Corps of Engineers
New England District, Regulatory Division
Vermont Project Office
11 Lincoln Street, Room 210
Essex Junction, Vermont 05452
(802) 872-2893, (802) 879-7638 fax
www.nae.usace.army.mil/missions/regulatory
cenae-r-vt@usace.army.mil

U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Boston, Massachusetts 02109
(617) 918-1692

U.S. Fish and Wildlife Service
70 Commercial Street, Suite 300
Concord, New Hampshire 03301-5087
(603) 223-2541

National Park Service
North Atlantic Region
15 State Street
Boston, Massachusetts 02109
(617) 223-5203

2. Historic Resources

State Historic Preservation Officer
Division for Historic Preservation
National Life Building
Drawer 20
Montpelier, Vermont 05620-0501
(802) 828-3211

Tribal Historic Preservation Officer
c/o Stockbridge-Munsee Community
86 Spring Street
Williamstown, Massachusetts 01267
(413) 884-6048
Area of concern: Addison, Rutland and Bennington Counties
thpo@mohican-nsn.gov

Tribal Historic Preservation Officer
c/o Wampanoag Tribe of Gay Head (Aquinnah)
20 Black Brook Road
Aquinnah, Massachusetts 02535
(508) 645-9265 THPO@wampanoagtribe-nsn.gov
Area of Concern: All Vermont counties except Addison, Rutland and Bennington

3. Vermont Agency of Natural Resources

Department of Environmental Conservation
Wetlands Program
Watershed Management Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Department of Environmental Conservation
River Management Program
Watershed Management Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Department of Environmental Conservation
Lakes and Ponds Program
Watershed Management Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Department of Environmental Conservation
Dam Safety Program
Facilities Engineering Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

Vermont Department of Fish & Wildlife
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

State endangered species
Vermont Department of Fish & Wildlife
Nongame and Natural Heritage Program
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

VI. DEFINITIONS

Action Area: The "Endangered Species Consultation Handbook – Procedures for Conducting Consultation and Conference Activities Under Section 7 of the ESA," defines action area as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. [50 CFR 402.02]."
Artificial Reef: A structure which is constructed or placed in waters for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities.
Attendant Features: Occurring with or as a result of; accompanying.
Biodegradable: A material that decomposes into elements found in nature within a reasonably short period of time and will not leave a residue of plastic or a petroleum derivative in the environment after degradation. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Examples of biodegradable materials include jute, sisal, cotton, straw, burlap, coconut husk fiber (coir) or excelsior. In contrast, degradable plastics break down into plastic fragments that remain in the environment after degradation. Photodegradable, UV degradable or Oxo- (bio)degradable plastics are not considered biodegradable under this GP.
Boating facilities: These provide, rent, or sell mooring space, such as marinas, boat/yacht clubs, boat yards, dockominiums, town facilities, etc. Not classified as boating facilities are piers shared between two abutting properties or town mooring fields that charge an equitable user fee based on the actual costs incurred.
Compensatory mitigation: The restoration (reestablishment or rehabilitation), establishment (creation), enhancement, and/or, in certain circumstances, preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved.
Construction mats: Construction, swamp and timber mats (herein referred to as "construction mats") are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together.
Currently serviceable: Useable as is or with some minor maintenance, but not so degraded as to essentially require reconstruction.
Direct effects: The loss of aquatic ecosystem within the footprint of the discharge of dredged or fill material. Direct effects are caused by the action and occur at the same time and place.
Dredged material and discharge of dredged material: These are defined at 33 CFR 323.2(c) and (d). The term "dredged material" means material that is excavated or dredged from waters of the United States.
Discharge: The term "discharge" means any discharge of dredged or fill material into waters of the United States.
Enhancement: The manipulation of the physical, chemical, or biological characteristics of an aquatic resource to heighten, intensify, or improve a specific aquatic resource function(s). Enhancement results in the gain of selected aquatic resource function(s), but may also lead to a decline in other aquatic resource function(s). Enhancement does not result in a gain in aquatic resource area.
Ephemeral stream: A stream with flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

Establishment (creation): The manipulation of the physical, chemical or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site. Establishment results in a gain in aquatic resource area.
Expansions: Work that increases the footprint of fill, depth of basin or drainage feature, structures or floats, or slip capacity.
Fill material & discharge of fill material: These are defined at 33 CFR 323.2(e) and (f). The term fill material is defined as material placed in WOTUS where the material has the effect of either replacing any portion of a water of the U.S. with dry land or changing the bottom elevation of any portion of a water of the U.S.
Federal navigation projects (FNPs): These areas are maintained by USACE, authorized, constructed and maintained on the premise that they will be accessible and available to all on equal terms. They are comprised of USACE Federal anchorages, Federal channels and Federal turning basins. The following are FNPs in VT, and more information, including the limits, is provided at www.nae.usace.army.mil/missions/navigation and www.nan.usace.army.mil/Missions/Civil-Works/:

Burlington Harbor
Channel Between the North and South Hero Islands
Gordons Landing
Narrows of Lake Champlain
Otter Creek
St. Albans Harbor
Swanton Harbor

Flume: An open artificial water channel, in the form of a gravity chute that leads water from a diversion dam or weir completely aside a natural flow. A flume can be used to measure the rate of flow.
Historic Property: Any prehistoric or historic district, site (including archaeological site), building, structure, or other object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR 60).
Independent utility: A test to determine what constitutes a single and complete non-linear project in the USACE regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.
Indirect effects: Effects that are caused by the activity and are later in time or farther removed in distance, but are still reasonably foreseeable.
Individual Permit: A Department of the Army authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of 33 CFR 322, or a specific project involving the proposed discharge(s) in accordance with the procedures of 33 CFR 323, and in accordance with the procedures of 33 CFR 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR 320.
Intermittent stream: A stream with flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.
Maintenance: Maintenance does not include any modification that changes the character, scope, or size of the original fill design.

Mechanized land clearing: Land clearing activities using mechanized equipment such as backhoes or bulldozers with sheer blades, rakes or discs constitute point source discharges and are subject to section 404 jurisdiction when they take place in wetlands are waters of the U.S (Regulatory Guidance Letter 90-05).
Minor deviations: Deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards, which are necessary to make repair, rehabilitation, or replacement are permitted, provided the adverse environ-mental effects resulting from such repair, rehabilitation, or replacement are minimal.
Navigable waters of the United States: These are a subset of WOTUS and are defined at 33 CFR 329. The jurisdictional limits (33 CFR 329.11) extend laterally to the entire water surface and bed of a navigable waterbody, which include all the land and waters below OHWM. Jurisdiction thus extends to the edge (as determined above) of all such waterbodies, even though portions of the waterbody may be extremely shallow or obstructed by shoals, vegetation or other barriers. Marshlands and similar areas are thus considered navigable in law, but only so far as the area is subject to inundation by the ordinary high waters. In Vermont these waters are: the Connecticut River, Lake Champlain, Lake Memphremagog, Wallace Pond, Ompompanoosuc River (to mile 3.8), Waits River (to mile 0.9), the Black River (mouth to mile 25 in Craftsbury), the Battenkill River (to mile 50 in Manchester), the Lamoille River (mouth to mile 79 in Greensboro), the Missisquoi River (including the North Branch, from the mouth to mile 88.5 in Lowell), Otter Creek (mouth to mile 63.8 in Procter), Winooski River (mouth to Marshfield), Moose River (from Passumpsic River to the Victory Town Line), Nulhegan River (mouth to its source including the East Branch, the Black Branch and the Yellow Branch), Paul Stream (mouth to the source), East Branch of the Passumpsic River (from the confluence with the Passumpsic River to East Haven), Passumpsic River (mouth to confluence with the East Branch), White River (mouth to its source), Wells River (mouth to Groton Pond).
Ordinary High Water Mark (OHWM): A line on the shore established by the fluctuations of water and indicated by physical characteristics, or by other appropriate means that consider the characteristics of the surrounding areas. See 33 CFR 328.3(e).
Perennial stream: A stream with flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.
Practicable: Available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes.
Permanent impacts: Permanent impacts means WOTUS that are permanently affected by filling, flooding, excavation, or drainage because of the regulated activity. Permanent impacts include permanent discharges of dredged or fill material that change an aquatic area to dry land, increase the bottom elevation of a waterbody, or change the use of a waterbody.
Preservation: The removal of a threat to, or preventing the decline of, aquatic resources by an action in or near those aquatic resources. This term includes activities commonly associated with the protection and maintenance of aquatic resources through the implementation of appropriate legal and physical mechanisms. Preservation does not result in a gain of aquatic resource area or functions.
Re-establishment: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former aquatic resource. Reestablishment results in rebuilding a former aquatic resource and results in a gain in aquatic resource area and functions.
Rehabilitation: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of repairing natural/historic functions to a degraded aquatic resource.

Rehabilitation results in a gain in aquatic resource function, but does not result in a gain in aquatic resource area.

Restoration: The manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/historic functions to a former or degraded aquatic resource. For the purpose of tracking net gains in an aquatic resource area, restoration is divided into two categories: reestablishment and rehabilitation.

Secondary effects: These are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material. Information about secondary effects on aquatic ecosystems shall be considered prior to the time final Section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are a) aquatic areas drained, flooded, fragmented, or mechanically cleared, b) fluctuating water levels in an impoundment and downstream associated with the operation of a dam, c) septic tank leaching and surface runoff from residential or commercial developments on fill, and d) leachate and runoff from a sanitary landfill located in WOTUS See 40 CFR 230.11(h).

Special aquatic sites (SAS): These include inland wetlands, mud flats, vegetated shallows (submerged aquatic vegetation), and riffle and pool complexes. These are defined at 40 CFR 230.3 and listed in 40 CFR 230 Subpart E.

Streambed: The substrate of the stream channel between the OHW marks. The substrate may be bedrock or inorganic particles that range in size from clay to boulders. Wetlands contiguous to the streambed, but outside of the OHW marks, are not considered part of the streambed.

Stream channelization: The manipulation of a stream's course, condition, capacity, or location that causes more than minimal interruption of normal stream processes. A channelized stream remains a water of the United States.

Structure: An object that is arranged in a definite pattern of organization. Examples of structures include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other manmade obstacle or obstruction.

Temporary impacts: Temporary impacts include, but are not limited to, WOTUS that are temporarily filled, flooded, excavated, drained or mechanically cleared because of the regulated activity.

Utility Line: Any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, data, and telegraph messages, and radio and television communication. The term "utility line" does not include activities that drain a water of the U.S., such as drainage tile or French drains, but it does apply to pipes conveying drainage from another area.

Vegetated shallows: Permanently inundated areas that under normal circumstances support communities of rooted aquatic vegetation in rivers and lakes. Note: These areas are also commonly referred to as submerged aquatic vegetation (SAV).

Vernal pools (VPs): For the purposes of these GPs, VPs are depressional wetland basins that typically go dry in most years and may contain inlets or outlets, typically of intermittent flow. Vernal pools range in both size and depth depending upon landscape position and parent material(s). In most years, VPs support one or more of the following obligate indicator species: wood frog, spotted salamander, blue-spotted salamander, marbled salamander, Jefferson's salamander and fairy shrimp. However, they should preclude sustainable populations of predatory fish.

Water diversions: Water diversions are activities such as bypass pumping (e.g., “dam and pump”) or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary’s confines aren’t water diversions. “Normal flows” are defined as no change in flow from pre-project conditions.
Weir: A barrier across a river designed to alter the flow characteristics. In most cases, weirs take the form of a barrier, smaller than most conventional dams, across a river that causes water to pool behind the structure (not unlike a dam) and allows water to flow over the top. Weirs are commonly used to alter the flow regime of the river, prevent flooding, measure discharge and help render a river navigable.
Waters of the United States (WOTUS): Waters of the United States are defined in 33 CFR 328.3. These waters include more than navigable WOTUS and are the waters where permits are required for the discharge of dredged or fill material pursuant to Section 404 of the Clean Water Act. WOTUS include jurisdictional wetlands.

Norton LPOE <norton.lpoe@gsa.gov>

RE: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER24/0006 - Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

3 messages

Simmons, David <david_simmons@fws.gov> Thu, Jan 11, 2024 at 12:46 PM
To: "Norton.LPOE@gsa.gov" <Norton.LPOE@gsa.gov>
Cc: "ERs, FWS HQ" <FWS_HQ_ERs@fws.gov>, "Mayer, Audrey" <audrey_mayer@fws.gov>, "Morse, Kaisha R" <kaisha_morse@fws.gov>

Greetings,

The US Fish and Wildlife Service has no comments on the subject action at this time. Please use our Information for Planning and Consultation website (https://ipac.ecosphere.fws.gov/) to inform the GSA's evaluation of the project's potential impacts on wetlands, migratory birds of Federal conservation concern, and species listed or proposed for listing under the Endangered Species Act. Please contact me with any questions or concerns. Regards,

David

~~~~~~

David Simmons

Supervisor, Endangered Species & FERC/Hydro Programs

U.S. Fish and Wildlife Service, New England Field Office

70 Commercial Street, Suite 300, Concord, New Hampshire 03301

Cell: 603-333-5440

~~~~~~

From: ERs, FWS HQ <FWS_HQ_ERs@fws.gov>
Sent: Tuesday, January 9, 2024 1:14 PM
To: Mayer, Audrey <audrey_mayer@fws.gov>; Simon, Spencer <spencer_simon@fws.gov>; Jahn, Kathryn <kathryn_jahn@fws.gov>
Cc: Thatcher, Ben <ben_thatcher@fws.gov>
Subject: Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER24/0006 - Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

Project Title: Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

FWS Directions:

FO - Comments due to GSA (Norton.LPOE@gsa.gov) by 3/8/24.

Please provide a copy of comments to HQ Branch of Environmental Review (FWS_HQ_ERs@fws.gov).

Thank you,

HQ Branch of Environmental Review*

*We check this inbox regularly. If you have time-sensitive questions, please contact:

Frankie Green

Fish and Wildlife Biologist

U.S. Fish and Wildlife Service

Branch of Environmental Review

5275 Leesburg Pike

Falls Church, VA 22041-3803

(703) 358-1884

From: oepchq@ios.doi.gov <oepchq@ios.doi.gov>
Sent: Tuesday, January 9, 2024 8:30 AM
To: Brueggeman, Louis C <louis_brueggeman@ios.doi.gov>; Alam, Shawn K <Shawn_Alam@ios.doi.gov>; Braegelmann, Carol <carol_braegelmann@ios.doi.gov>; Kelly, Cheryl L <cheryl_kelly@ios.doi.gov>; Cobbs, Molly R <molly_cobbs@ios.doi.gov>; Lytle, Myles <Myles.Lytle@bia.gov>; Vaivai, Justine C <Justine.Vaivai@bia.gov>; Yazzie, Harrilene J <Harrilene.Yazzie@bia.gov>; ERs, FWS HQ <FWS_HQ_ERs@fws.gov>; Stedeford, Melissa <Melissa_Stedeford@nps.gov>; Runkel, Roxanne <Roxanne_Runkel@nps.gov>; Gordon, Alison D <agordon@usgs.gov>; Janowicz, Jon A <jjanowicz@usgs.gov>; McGhee, Chester <Chester.Mcghee@bia.gov>; oepchq@ios.doi.gov <oepchq@ios.doi.gov>; Lazinsky, Diane <Diane_Lazinsky@ios.doi.gov>; Raddant, Andrew <Andrew_Raddant@ios.doi.gov>
Subject: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER24/0006 - Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

This e-mail alerts you to a Environmental Review (ER) request from the Office of Environmental Policy and Compliance (OEPC). This ER can be accessed here.

To access electronic ERs visit the Environmental Assignments website: https://ecl.doi.gov/ERs.cfm. For assistance, please contact the Environmental Review Team at 202-208-5464.

Comments due to Agency by: 03/08/24

Norton LPOE <norton.lpoe@gsa.gov> Thu, Jan 11, 2024 at 2:27 PM
To: Carey Bergeron - 1P1 <carey.bergeron@gsa.gov>, Missy Mertz - 3PTN <melissa.mertz@gsa.gov>, Adam Hunter - 1PCTB <adam.hunter@gsa.gov>

Good afternoon & FYI.
[Quoted text hidden]

Kopec, Brett A <bkopec@usgs.gov> Sat, Jan 13, 2024 at 11:45 AM

To: "Norton.LPOE@gsa.gov" <Norton.LPOE@gsa.gov>
Cc: "Janowicz, Jon A" <jjanowicz@usgs.gov>

Thanks.

Brett Kopec
USGS
Budget Analyst

From: Gordon, Alison D <agordon@usgs.gov>
Sent: Friday, January 12, 2024 4:41 PM
To: Kopec, Brett A <bkopec@usgs.gov>
Cc: Janowicz, Jon A <jjanowicz@usgs.gov>
Subject: Fw: ENVIRONMENTAL REVIEW (ER) NEW POSTING NOTIFICATION: ER24/0006 - Notice of Intent To Prepare an Environmental Impact Statement for the Modernization of the Land Port of Entry in Norton, Vermont

The USGS has no comment at this time. Thank you.
[Quoted te t hidden]

Comment 7:
Page 1 of 1

Norton LPOE <norton.lpoe@gsa.gov>

Norton LPOE EIS

1 message

Matthew Tetreault <Matt@vtvast.org> Fri, Mar 8, 2024 at 10:13 AM
To: "norton.lpoe@gsa.gov" <norton.lpoe@gsa.gov>, "Long, Ryan" <Ryan.Long@wsp.com>
Cc: [redacted]

John /Ryan/Adam,

I would like to make some public comments on behalf of The Vermont Association of Snow Travelers, Inc (VAST) for the proposed Norton, VT Land Port of Entry Environmental Impact Statement. I realize that the local snowmobile club, The Northeast Kingdom Snow Blasters has already submitted public comment at the meeting held on January 30th at the Norton Town Offices. Officers of the snowmobile club also met with GSA personnel on site at the border crossing to discuss plans for a designated snowmobile crossing that would work well for all parties.

The Northeast Kingdom Snow Blasters, affiliated with VAST, would like to work with GSA and the neighboring Canadian Snowmobile Clubs across the border (Le Club De Montoneige Etoile De Lest Inc, and/or Club Montoneige Trois Villages intersect near the crossing) to maintain a legal trail crossing in this location that is safe and sustainable for vehicular traffic, snowmobile traffic and border patrol agents. The alignment of the current trails in and around the border crossing require riders to travel a distance along side the vehicle highway, which is not ideal for anyone. A realignment of the trail would be beneficial to all parties involved, and we would support this.

There are few border crossings available, so it is critical that we keep this crossing open to riders from both countries.

We thank you for reaching out and allowing us to comment and look forward to working with you as this project progresses. If there are any questions or if we can be of help in any way, please do not hesitate to reach out.

Matt Tetreault

VAST Trails Administrator

802-793-0929

VT LPOE Norton Scoping Stakeholder Notification Letter_24JAN2024.pdf
1516K

Comment 8: Page 1 of 8

Norton LPOE <norton.lpoe@gsa.gov>

Re: Norton VT Land Port of Entry EIS

Kelly Morrison - 1P1 <kelly.morrison@gsa.gov> Fri, Mar 1, 2024 at 3:02 PM
To: Missy Mertz - 3PTN <melissa.mertz@gsa.gov>, Norton LPOE <norton.lpoe@gsa.gov>
Cc: Adam Hunter - 1PCTB <adam.hunter@gsa.gov>, "Long, Ryan" <Ryan.Long@wsp.com>, "Dalrymple, Joe" <joe.dalrymple@wsp.com>, Sara Massarello - 1PZS <sara.massarello@gsa.gov>, Carey Bergeron - LD1 <carey.bergeron@gsa.gov>

Thank you Missy,

I've added the norton.lpoe@gsa.gov email address so it "lives" with the other comments we've received during the comment period.

Happy Friday all!
Kelly

U.S. General Services Administration

Kelly Morrison
(she/her/hers) Why is this important?
Community Engagement Coordinator
Office of the Regional Commissioner, 1P1
Public Buildings Service (PBS)
Boston, MA
Office: (617) 565-6640
Mobile: (617) 620-7597

On Fri, Mar 1, 2024 at 1:56 PM Missy Mertz - 3PTN <melissa.mertz@gsa.gov> wrote:

> Hello all,
>
> My apologies, I thought I forwarded this to everyone for their records but I can't find it in my sent box. This letter is responding to the Norton LPOE notice (sort of). I would like it kept for the records (along with my response). Normally I wouldn't respond directly but I wanted VT ANR to know we are doing a delineation at the site.
>
> ---------- Forwarded message ---------
> From: **Missy Mertz - 3PTN** <melissa.mertz@gsa.gov>
> Date: Tue, Feb 20, 2024 at 2:20 PM
> Subject: Re: Norton VT Land Port of Entry EIS
> To: Taft, Kathleen <Kathleen.Taft@vermont.gov>
>
> Hi Kathleen!
>
> Yes, we started a wetlands delineation at Norton but we didn't have access to one parcel. We have it now but will need to wait until spring to complete it. There are a fair amount of already delineated wetlands on site and we are aware of them. Thank you for proactively reaching out. We plan to submit for a JD as soon as we have everything delineated (so to answer your question, yes we hope to review this project early this field season as well, along with Richford LPOE for wetlands). Feel free to reach out about any of the Vermont Land Ports of Entry projects, I am involved with all of them :-)
>
> And I guess we never really talked about that, but we have potential projects at: Highgate LPOE, Norton LPOE, Alburg Springs LPOE, Beebe Plain LPOE and Richford LPOE. Several of these are very early in the NEPA process (or not even into NEPA yet) but I should have given you this information from the start, my apologies.

Norton LPOE <norton.lpoe@gsa.gov>

Vermont Agency of Natural Resources Comments

1 message

Taft, Kathleen <Kathleen.Taft@vermont.gov> Fri, Mar 8, 2024 at 11:21 AM
To: "Norton.LPOE@gsa.gov" <Norton.LPOE@gsa.gov>

Please find attached "Norton LPOE VT ANR Comment Form 03.08.2024.pdf" and "Norton LPOE VT ANR Written Comments 03.08.2024.pdf" regarding the Proposed Modernization Project at the Norton Land Port of Entry.

Thank you,

Kathleen Taft (s/h) | Regulatory Policy Analyst
Vermont Agency of Natural Resources | Office of Planning
Davis 2, 1 National Life Dr | Montpelier, VT 05620-3901
802-461-8812 (c) | kathleen.taft@vermont.gov

The Agency of Natural Resources supports telework, and there are times when I may be working from another office location I am available to connect by phone and email I am also available to connect in person upon request
Written communications to and from state officials regarding state business are considered public records and may be subject to public scrutiny

2 attachments

Norton LPOE VT ANR Comment Form 03.08.2024.pdf
316K

Norton LPOE VT ANR Written Comments 03.08.2024.pdf
207K

COMMENT SHEET

Proposed Modernization Project at the
Norton Land Port of Entry
Public Scoping Meeting
Norton, VT
Tuesday, January 30, 2024

(*PLEASE PRINT*)

NAME and AFFILIATION (*OPTIONAL*): Kathleen Taft, Office of Planning, Vermont Agency of Natural Resources

ADDRESS: 1 National Life Dr, Davis 2, Montpelier, VT 05620-3901

EMAIL: kathleen.taft@vermont.gov **ZIP CODE:** 05620

Public participation is an essential component of the National Environmental Policy Act (NEPA) process, and GSA welcomes comments on the Proposed Modernization Project at the Norton Land Port of Entry.

Please fill out the following form to ensure that the analysis, and ultimately the decision, considers the affected communities' opinions.

If you would like to be added to the mailing list and receive information about the project, please provide your email or mailing address above.

1. **Provide us with any environmental or design information or concerns, which you feel should be addressed in the Environmental Impact Statement (EIS) for this project.**

Please see attached written comments: "Norton LPOE VT ANR Written Comments 03.08.2024.pdf"

2. **Use this space to provide any additional comments you might have:**

Please leave this comment sheet at the designated "drop box" or mail your comments to the address below:

General Services Administration
Attention: Adam Hunter, Norton Project Manager
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222

You may also email your comment to Norton.LPOE@gsa.gov with subject line "Norton LPOE EIS"

FOLD

_____

_____

_____

RETURN ADDRESS

PLACE STAMP HERE POST OFFICE WILL NOT DELIVER WITHOUT PROPER POSTAGE

General Services Administration
Attention: Adam Hunter Norton Project Manager
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222

FOLD

TAPE HERE

State of Vermont
Office of Planning
1 National Life Drive, Davis 2
Montpelier, VT 05620-3901 Ph: (802) 461-8812

Agency of Natural Resources

March 8, 2024

VIA ELECTRONIC MAIL

General Services Administration
Attention: Adam Hunter Norton Project Manager
Thomas P. O'Neill, Jr. Federal Building
10 Causeway Street, 11th Floor
Boston, MA 02222
Norton.LPOE@gsa.gov

RE: Proposed Modernization Project at the Norton Land Port of Entry – Norton, VT

Dear Mr. Hunter –

Thank you for the opportunity to present comments as part of the NEPA process for the Proposed Modernization Project at the Norton Land Port of Entry. The Agency of Natural Resources reviewed available preliminary information and known site data and offers the following comments intended for use as the project proceeds to regulatory review. For clarity, the Agency of Natural Resources is comprised of three departments – Department of Environmental Conservation (DEC), Department of Forests, Parks and Recreation (FPR), and the Department of Fish and Wildlife (DFW).

Wetlands – The project parcel contains mapped hydric soils, an indicator of wetland presence. The Vermont DEC Wetland Program regulates Class I and II wetlands and their respective 100' and 50' buffers through the Vermont Wetland Rules[1]. Any impacts to jurisdictional wetlands or their buffers require a permit from the DEC Vermont Wetland program. The Program requires field verification of the wetland delineations prior to any permit application. Due to the dynamic nature of wetlands, wetland assessments, delineations and classifications are valid for up to five years from the delineation date. The timing of this field review should be considered as it needs to occur during the growing season. Please contact Shannon Morrison, District Ecologist, at 802-490-6178 or shannon.morrison@vermont.gov with questions regarding state wetlands permitting, or when planning any infrastructure footprint expansion or additions, or expansion of vegetation management areas on parcels with mapped wetlands or wetland indicators.

Stormwater – Available information does not provide enough information for the DEC Stormwater Program to determine if the project falls under their jurisdiction. If the project is considered a federal facility, then any applicable NPDES construction permitting occurs through the EPA. Please contact

[1] Available online at https://dec.vermont.gov/content/vermont-wetland-rules

Thomas Benoit, Construction Section Supervisor (802-490-6164, Thomas.Benoit@vermont.gov) and Sam Hughes, District Stormwater Analyst (802-261-1865, samuel.hughes@vermont.gov) to discuss state stormwater permitting.

Act 250 – Parcels bordering the existing Land Port of Entry which are within the proposed project study area have existing Act 250 jurisdiction. The Act 250 Program[2] is administered by the Natural Resources Board (NRB) which is a separate entity from the Agency of Natural Resources. Projects with Act 250 jurisdiction are subject to additional standards of review from Agency Staff, including but not limited to the DFW Fisheries and Wildlife Programs and DEC Rivers Programs. When planning this project, it is recommended an Act 250 Jurisdictional Determination[3] be obtained from the NRB to inform the full scope of applicable review. Please contact Kirsten Sultan, NRB District 7 Coordinator, at Kirsten.sultan@vermont.gov or 802-751-0126 to determine if the project is subject to Act 250 permitting. I am available to assist with coordination of other Agency reviews if the project does require an Act 250 permit.

Thank you for the opportunity to comment. Please don't hesitate to contact me at Kathleen.taft@vermont.gov or 802-461-8812 if there are additional questions or comments on the above or if you require additional assistance from the Agency as the project moves forward.

Sincerely,

/s/Kathleen Taft
Kathleen Taft
Regulatory Policy Analyst
ANR Office of Planning
802-461-8812

Cc: Shannon Morrison, DEC Wetlands Program, via email
Thomas Benoit, DEC Stormwater Program, via email
Sam Hughes, DEC Stormwater Program, via email
Kirsten Sultan, NRB, via email

[2] More information available online at: https://nrb.vermont.gov/act250-program
[3] More information available online at: https://nrb.vermont.gov/act250-permit/need-a-permit

Missy

On Tue, Feb 20, 2024 at 1:58 PM Taft, Kathleen <Kathleen.Taft@vermont.gov> wrote:

Hi Missy,

I received this notification and while I could not attend the meeting, I see your name is also listed as a contact for this Norton LPOE. It looks like the project is in the very early stages of review, but I did do a quick overview of the location. The area is in hydric soils, which we usually flag for wetland review, and looks to maybe have some stream channels within that our fish and wildlife team would also want to look at. Is your team hoping to review this project site this field season?

Thanks,

Kathleen Taft (s/h) | Regulatory Policy Analyst
Vermont Agency of Natural Resources | Office of Planning
Davis 2, 1 National Life Dr | Montpelier, VT 05620-3901
802-461-8812 (c) | kathleen.taft@vermont.gov

The Agency of Natural Resources supports telework, and there are times when I may be working from another office location. I am available to connect by phone and email. I am also available to connect in-person upon request.
Written communications to and from state officials regarding state business are considered public records and may be subject to public scrutiny.

From: Long, Ryan <Ryan.Long@wsp.com>
Sent: Thursday, January 25, 2024 1:18 PM
Subject: Norton VT Land Port of Entry Environmental Impact Statement Scoping Notification Letter

Some people who received this message don't often get email from ryan.long@wsp.com. Learn why this is important

EXTERNAL SENDER: Do not open attachments or click on links unless you recognize and trust the sender.

Dear Interested Party,

The U.S. General Services Administration (GSA) is preparing an Environmental Impact Statement (EIS) to analyze the potential natural and human environmental impacts from the proposed modernization project at the Norton Land Port of Entry (LPOE) in Norton, Vermont (VT). The attached letter contains additional details on the scoping process. GSA welcomes and thanks you for your participation.

Norton LPOE EIS Project Team

NOTICE: This communication and any attachments ("this message") may contain information which is privileged, confidential, proprietary or otherwise subject to restricted disclosure under applicable law This message is for the sole use of the intended recipient(s) Any unauthorized use, disclosure, viewing, copying, alteration, dissemination or distribution of, or reliance on, this message is strictly prohibited. If you have received this message in error, or you are not an authorized or intended recipient, please notify the sender immediately by replying to this message, delete this message and all copies from your e-mail system and destroy any printed copies.

-LAEmHhHzdJzBlTWfa4Hgs7pbKl

--

Missy Mertz

Environmental Protection Specialist

Portfolio Management
100 S Independence Mall West
Philadelphia, PA 19106

Cell: (215) 301-1246
melissa.mertz@gsa.gov

--

Missy Mertz

Environmental Protection Specialist

Portfolio Management
100 S Independence Mall West
Philadelphia, PA 19106

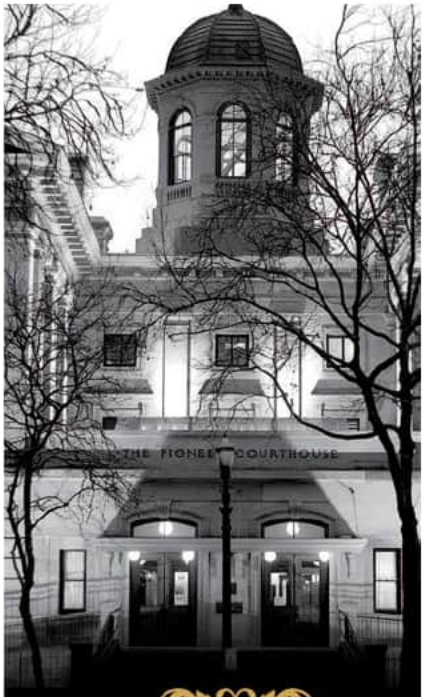
Cell: (215) 301-1246
melissa.mertz@gsa.gov

Appendix C

Comments Received During Public Scoping Periods

Appendix C.2

Public Meeting Transcript



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LAND PORT OF ENTRY MODERNIZATION PROJECT

NORTON, VERMONT

PUBLIC MEETING

HELD ON
TUESDAY, JANUARY 30, 2024
5:47 P.M.

12 VT-114 EAST
NORTON, VERMONT 05907

PRESENTERS

Paul Hughes, GSA, Regional Public Affairs Officer

Ryan Long, WSP USA Inc., Assistant Vice President, Environmental Planner

Adam Hunter, GSA, Project Manager

Kelly Morrison, GSA, Community Engagement Coordinator

Carey Bergeron, GSA, NEPA

Sara Massarello, GSA, Real Property

LAND PORT OF ENTRY MODERNIZATION PROJECT

NORTON, VERMONT

PUBLIC MEETING

HELD ON

TUESDAY, JANUARY 30, 2024

5:47 P.M.

MR. HUGHES: Good evening, everybody. My name is Paul Hughes. I'm your moderator for the GSA hearing. On behalf of U.S. General Services Administration and Customs and Border Protection. Thank you for joining us here tonight.

We're going to talk again about the land port entry here in Norton.

We're here a little bit differently this time. We're here as part of the entire middle -- the National Environment -- we're here tonight as part of the National Environmental Policy Act Environmental Impact Statement process for this port.

I thought he was coming to tell me to move the mic closer.

This meeting allows for early public involvement to help determine what points into the EIS we'll address, right?

As part of the meeting --

UNIDENTIFIED SPEAKER: (Audio disruption.)

MR. HUGHES: As part of this meeting, we're going to discuss the NEPA process; share project information with you. We've got about 20 slides. It won't take very long. And we're going to let you know what the next step is in the NEPA process.

All of this material is going to be available online after the event. I'll give you the websites and all that when we get to the end.

During the meeting, you're going to have the opportunity to hear about the project, the process and learn how you can provide input on the issues that are important to you all here in the community.

As we move through the meeting, please remember, does anybody remember what I said the last time we met? This is only the first opportunity to officially provide comments to us as part of the process. Last time we were here just to meet with you, for you to get to know us, what we do, what we were thinking about, this is an official first step in the process.

If you look at that chart over there, you

can see where the star is. That's where we are. We are at square one of a long and complex process that is going to take many, many years.

Your input is valuable and a critical step in this process and we're going to use it, GSA, to determine the scope and content of the EIS.

Some of the folks we've got here tonight you've met before. You've seen them.

Ryan Long is a new face for us. He's from WSP USA. He's our contractor for the EIS process as part of this National Environmental Policy Act.

You've met Adam before, the project manager. You all have met Kelly in the back before, Kelly Morrison, our community engagement coordinator; NEPA specialist Carey Bergeron and Missy Mertz. Carey in the black; Missy in the pink, realty specialist Sara Massarello and you know who I am, loud mouth.

Finally, it's important to remember tonight that we are here to listen. We don't know enough yet to answer questions. We have vague ideas. We need your input. I'm going to repeat it again. We are in the very early stages of a long and complex process. You have no idea how long it took us to write that statement.

While there will be a time and place for questions about the project, tonight we're primarily interested in your input, comments and page-flipping skills, comments and concerns regarding the project's impacts, but we can't -- won't be answering questions on what's on if someone disagrees, like I don't really care if the Bills are out, if the Chiefs win or San Francisco wins.

Again, on behalf of GSA, thank you all for being here with us tonight. Our first presenter tonight is Ryan from WSP.

UNIDENTIFIED SPEAKER: No.

MR. HUGHES: Oh. We are recording. If you don't want to be recorded when you provide your comments later, we'll turn the mic off.

UNIDENTIFIED SPEAKER: Let us know also, because we have (audio disruption) --

MR. HUGHES: Right.

UNIDENTIFIED SPEAKER: -- with the newspaper.

MR. HUGHES: Got that? All right.

Our first presenter tonight is Ryan from WSP.

UNIDENTIFIED SPEAKER: No.

MR. HUGHES: Oh, you guys changed the

order on me? Adam, are you first? Adam, you're the first one here tonight.

UNIDENTIFIED SPEAKER: (Inaudible) also not

(audio disruption.)

MR. HUNTER: So as Paul mentioned, this is kind of the first phase in this whole NEPA process.

Just to give you a general overview, we kind of went over this the last time, but this is a bit more in detail of what and why we're doing this project.

So overall, the purpose of this project is to modernize the Norton land port of entry and address CP GSA and public needs.

So what does this mean?

It means that we need to increase inspection operations and operational capabilities. We need to meet and review all security requirements, incorporate new sustainability features and technologies, increase resilience to climate change, meet every day needs of the GSA for public, allow for easier and safer public flow through the port, address traffic pattern concerns and resolve topographic issues. If you haven't noticed, it's in a moat. We're trying to address

that.

The next slide?

So we have all of the basic concerns. We've gone through that predesign process where we're trying to address what alternatives we're looking at. We're still in that pre-planning process of looking at those alternatives, what can we do to meet all those different objectives and things that we want to rectify and what we just went over in that last slide.

Now, we're kind of starting that NEPA process where we're reviewing those alternatives. We're reaching out to the public and that's where we are right now.

Next slide?

This just shows you a general study area. This is just the area that we are studying as part of the NEPA process. Does anyone have any questions before we move on to WSP?

Let me just go back one more slide just to kind of show you how far everything is out. So we're looking at design start in fall of 2024. With that being complete in spring of 2026. Construction starting fall of 2026, completion of fall of 2028.

So those are just kind of estimated

timelines at this point, so those probably will change as we move along and have all the alternatives in place. We know what we're actually building out. But right now, we're in the planning stage.

Any questions for me before I hand it over to WSP? All right.

MR. LONG: Thanks, Adam.

So I get the challenge of kind of going over NEPA, explaining some of the details of the act and how it kind of plays in to the overall assessment or process.

So as Paul mentioned, National Environmental Policy Act is what requires federal agency, in this case, GSA, to examine potential impacts on what the natural and the human environment, and then ultimately convey those potential impacts to the public.

So as Paul mentioned, GSA expects this to be an environmental impact statement. There are varying levels of documentation that can be done, so there is, you need schedule and requirements that go along with each one, and we'll get into that over the next few slides.

So throughout the NEPA process there will

be some opportunity for public involvement and comment to review the analysis and provide additional input. As was mentioned, this is kind of the first opportunity to get us started off on the right foot, making sure that we understand the concerns of the community and are analyzing the resources that are important to you guys.

So any comments that are submitted throughout this scoping process as well as later comment opportunities, will be considered as part of the analysis, and in the case of scoping comments, they'll be used to guide our initial effort in developing a draft document and as we move forward, those comments will help us refine the impact assessment and make sure that we're focusing on the areas that are important to the community.

So NEPA itself really is kind of an umbrella act. It consolidates and incorporates the environmental impact analysis requirements that are throughout the various other acts, whether it be the Clean Air Act, the Clean Water Act, Endangered Species, so all of those individual acts roll up into NEPA so that processes can be done simultaneously to create efficiencies in schedule, in budget, things like that, making sure that

everything gets captured and it allows a federal agency to coordinate with their counterparts whether it be fish and wildlife or State Historic Preservation Office to make sure that those activities are being done concurrently and any data or relevant information gets captured in the Environmental Impact Statement process.

So schedule wise, obviously Adam went over the larger schedule. The NEPA component is a subset within that schedule. Obviously, right now we are at the public scoping period process. Comments will be incorporated into the analysis and we will develop a draft Environmental Impact Statement. That document will be released for public review and comment along with state and federal agencies, interested parties, community groups, etcetera.

That comment process will be at least 45 days, maybe longer, and as those comments are received and will incorporate any of that data, make changes to the analysis and prepare the final EIS. That document will then have a draft decision released. That will be put out for review. Then there's waiting period. It's a 30-day wait period before a decision can be published, so again, there will be several opportunities over the next year,

plus, for input on the overall process.

So again, as we get into the actual resources that we expect to be analyzed as part of the document, this is an initial list. Obviously, your input will help guide which resources we feel are needing to be analyzed and in what level of detail. As we've kind of discussed, obviously, we know there are some cultural resources, obviously biological, the flooding and flood plain areas, so those are just a few of the ones that we kind of anticipate being more important or critical to the analysis process.

So again, one of those is for cultural resources. So that is part of Section 106 of the National Historic Preservation Act and it follows a similar process to the NEPA process but GSA is initiating that Section 106 process concurrently with NEPA. It has been initiated with the State Historic Preservation Office, officer. So obviously the first step is kind of this one, right? We identify stakeholders. We get input, establish the area potential affect which is the map that is on the poster in the back and Adam showed earlier in the presentation. Then we'll identify any resources within that area. Obviously, identify potential

impact, and then ultimately, if impacts affects are determined, how to potentially avoid, mitigate or minimize any of those potential impacts.

So again, one of the other potential areas where we expect to need to do some analysis is wetlands. There are known wetlands within the area. We are in process of surveying and analyzing and trying to determine where those are and what potential impacts might look like based on a footprint that GSA is in the process of working through in developing to figure out how the port will lay out and potential changes that may need to occur.

So again, that is a resource that involves consultation. In this case, with the United States Army Corps of Engineers. They would review and approve any surveys that are done to ensure that they agree on where wetlands are being identified and what the potential impacts on those may be.

Very similar for flood plains. Again, we should note the existing building is within a flood plain. We are in the early stages of working through a flood plain analysis where we will be modeling the results and trying to determine exactly what that flood plain looks like and where it may go

and ultimately what the potential impacts on the resource may be from the proposed action.

Again, biological resources is another one that requires some consultation with Fish and Wildlife Service and based on Endangered Species Act, if there are known endangered species or critical habitat that's been designated for those species in the area, obviously there is a higher priority put on those species in maintaining low to no impacts on them. So again, those will be the kind of surveys and data inquires that will be done over the course of the next few months to determine the resource areas.

Then of course, all of the issues that were previously noted during the listening session, we are obviously starting the NEPA process from building on the previous discussions that all of you had with GSA. So again, these are just the highlights from the listening session but obviously anything that was brought up during that session will be incorporated and used to make sure that everything is kind of tracking and being analyzed in the manner that the community agrees with.

So that is a very high level overview of NEPA. Obviously, we can answer any questions if you

have any more details, or if you would like any more details, but I will turn it back over to Paul to talk about ways to comment.

MR. HUGHES: Thank you, Ryan.

All right. So quick and easy on this. A lot of information there. So if you have questions on this process, we'll be here to answer those or you can email us.

I want to give you the ways to contact us on this. You have them probably from the community meeting.

In person, you can bring us a comment and drop it in the drop box. There will be a drop box here. You can email us at Norton.LPOE@GSA.gov, Norton.LPOE@GSA.gov. And in the subject line put, "Norton LPOE EIS." You can send it to us in writing. If you want to use regular mail, the address is U.S. General Services Administration, Attention: Adam Hunter, Norton LPOE Project Manager, Thomas P. O'Neill Junior Federal Building, 10 Causeway Street, 11th Floor, Boston, Massachusetts, 02222.

Those are all, all those comments have to be received by 5 p.m. Eastern on March 8th. I already mentioned the drop box.

Now, we're going to move on to your comments, but before we do, same ground rules as last time. Once you raise your hand for the microphone, I'll bring it over to you, say and spell your first and last name, start your comment. Everybody else in the room, I don't think this is going to be a problem, but be respectful of participants and presenters. Remain quiet while others are speaking, try to keep your comments to two minutes. You go a little longer, it's not the end of the world, but two minutes is what we're trying for.

If time allows, participants may be permitted to speak again after everybody's given their comments. Don't forget, you can also submit these in writing. If you do not want to be recorded, make sure you let me know so I can let everybody else know that we're not recording at this point, because we are recording this.

Questions on those ground rules? Addresses? Ways to contact us? Any of that?

Hearing none? Comments?

UNIDENTIFIED SPEAKER: Anybody? Nobody wants to step up.

MR. HUGHES: Perfect. I know asking for

the first comment is always tough. So who wants to provide the second comment? We were that clear?

Thank you for sitting in the front row and thank you for this comment.

PATRICIA MOODY: Do I have to give my name?

MR. HUGHES: Yes.

PATRICIA MOODY: Patricia Moody, P-a-t-r-i-c-i-a M-o-o-d-y, and I'm just curious, after looking at all of this and all of your timelines, at about what point will you know what property is going to be used for this?

MR. HUGHES: Sara?

MS. MASSARELLO: I can come back around. I was just bringing --

PATRICIA MOODY: I would have to imagine it would be before the design is set.

MS. MASSARELLO: Yes. So it's in the planning stage. This one?

MR. HUGHES: Yes.

MS. MASSARELLO: Oh. They're both working. If we go back to the beginning, it would be -- right. It would fall into -- it would fall in the NEPA, under the NEPA period for a decision to be made. If site is required, it happens in this phase

before we get into the design space, or before going through the design, I should say. Because it's like pre-design activities that are going on to try to figure out concepts that are in coordination with the NEPA process and so any decision on site requirements happens before this is completed.

PATRICIA MOODY: Okay. Like, beginning, middle, end of 2025?

MS. MASSARELLO: Yes. I mean, in -- slides are preparing it. I'm just looking at the moorage itself, NEPA process. It's during the preparation of the draft EIS as the alternatives are developed. And the alternatives that are being developed or the concepts that are being developed will be within the balance of this study.

But as a landowner that has property within the bounds, you and I will be in much more close contact on a regular basis as a concept, starting overseeing next year.

PATRICIA MOODY: Thank you.

MR. HUGHES: Other comments?

UNIDENTIFIED SPEAKER: (Inaudible) from CVSA. I received those papers just today.

Where you see the outline of the study, the NEPA study, if I understood correctly, the new

port of entry could be anywhere on that property? Is that --

MS. MASSARELLO: I mean, so what that just means is -- we have the port where it is right now.

UNIDENTIFIED SPEAKER: Yes.

MS. MASSARELLO: So it'll be either utilizing the port, incorporating the port, expanding the port, moving the port. I mean, concepts in general, but anything that's done from the impact area has to be done within this area.

UNIDENTIFIED SPEAKER: Okay.

MS. MASSARELLO: And if something changes, as we -- comments, and as the concepts are developed, if there's a significant change that has to be prearranged, let the community to discuss that.

UNIDENTIFIED SPEAKER: Thank you. And that brings me to question number 2.

Because it happened more than it used to, they changed the roads going into Canada. Is there anything in the project if you change a port of entry where it is that you would have to shift the road going into Canada?

MR. HUNTER: No. We're trying to keep the line of sights, so that's a big part of it. You're

CVSA, right?

UNIDENTIFIED SPEAKER: Yes.

MR. HUNTER: So we'll be reaching out to you once we actually identify which alternatives we're moving forward with and which direction we're going and especially during the NEPA process we'll be working with CVSA.

UNIDENTIFIED SPEAKER: Good.

MR. HUNTER: But we do have the whole line of sight part of our project.

MR. HUGHES: Others? Going once?

MR. HUNTER: I guess just so we're clear, and if anybody would like to make a comment anonymously, hang around. We can set up so the stenographer can capture your comments. You don't have to be on camera. You can make it anonymously if that's your choice, but that can be arranged.

UNIDENTIFIED SPEAKER: Or we can email or write.

MR. HUNTER: Absolutely.

UNIDENTIFIED SPEAKER: Just so you know, we do have forms over here you can take that are mailable, sort of aggregate comment. You can fill it out. It's folding, put a stamp on it and send it to us. You don't have to remember all that address

stuff.

MR. HUGHES: Which I will not repeat. I will remind you that we do have the email address. We also have the project website for this, GSA.gov/NortonLPOE.

UNIDENTIFIED SPEAKER: Just Norton.

MR. HUGHES: Just Norton? GSA.gov/Norton. That will bring you to the project page for this and as we get information, Adam talks to my team, we update the website. We have a standing meeting once a month for him to tell us whether there's updates, so you can always check that for the latest information.

Again, the critical date there is March 8th, so keep that in mind.

Other comments?

CURTIS WAGNER: I've got a quick one.

MS. MASSARELLA: It can be long. We got time.

CURTIS WAGNER: Curtis Wagner, and I just seen -- like I work for the railroad, and I'm here on their behalf. It looks like you're staying out of the right of way as far as that picture. Is --

MS. MORRISSON: Well, hard to say. I've worked with railroads a lot and (audio disruption)

of their operations, and so right now yes, the -- I mean, everything that we're doing, the impact is to be within the bounds, but we'll get your contact information if we need any like, we need to do any surveys or things like that, for access across the lines. No there's no expectation of us to be impacting the rail as of today.

CURTIS WAGNER: Would that include when they -- would that include like as you're building? Is the port going to stay open to run rail operations?

MR. HUNTER: We're working through that right now, but I'm pretty sure -- we're working through it.

CURTIS WAGNER: Good.

MS. MORRISON: I would say to your comment, you'd like us to keep the rail informed, so as more of like a comment, in addition to the question is, like make sure to consider the rail with regards to operations, not only the roads but when it stays open, how that might impact to what you're doing and where you're going.

MR. HUGHES: Thank you. Others?

JOHN HULL: John Hull with the Northeast Kingdom Snow Blasters Snowmobile Club. Our trail

runs basically through the middle of that, into Canada, looking forward to easier access and better access in and out of Canada. It could be a bigger asset to the community if you will, to get where it's (inaudible) everything to the northeast kingdom if that was made easier, we're excited to see what you come up with but as (audio disruption) that trail.

MR. HUGHES: Thank you.

UNIDENTIFIED SPEAKER: Would it be, just -- I just have a question. Would it be safe to say, and I'll get your contact information, as the concepts are being developed to engage with your organization directly to understand perhaps if things are moved, where they might be most beneficial to you? Okay.

MR. HUGHES: Others?

Seems to be that every time I say, "Okay, we're done," somebody else has a comment, so okay, we're done.

It didn't work.

UNIDENTIFIED SPEAKER: I'm thinking of the comments. I'm not trying to restate your words in a different way. Just, I wanted to kind of use examples, as to the types of comments that we're

trying to consider as we're going through this, so consideration of how rail might be impacted, consideration of the trail network, consideration of land owners in the area.

So things like that, that kind of stuff, if when you go home, think about it, talk with each other within the community as to what you want us to be thinking about as we're trying to develop concepts, so anything and all items that you might think about, like how we might (inaudible) CVSA with, you know, using the roadway system, folks that are up on March Road, how you access their properties. Things of that nature. Just like, those types of -- either small and direct or big in concept comments, those are what we're looking for, so don't be shy. No comment is a bad comment. Every comment would be great, and that will be focal for us to either reach out to organizations to make sure we better understand something or to consider an item that we had not yet, because you all know you're maybe around -- in operations more than us, so just send them our way. Kind of like what we did at the listening session, but even more specific if that's possible. That would be the most helpful for us.

I'm a communications person. That's why I keep

(audio disruption.)

MR. HUGHES: As am I, but I defer to my experts (audio disruption) any of this to even talking tech.

Other questions? Other comments?

JODY GORDON: Jody Gordon. Do you have another area or a similar situation that you worked on in the past, say three or four years, in another community that we can kind of look at how it transposed or what went down or what -- the before and after pictures and what that community, what their concerns were before you went there and -- or is this one of your first ones that --

MR. HUGHES: (Audio disruption) our first port, but similar --

JODY GORDON: Yes. I was going to say --

UNIDENTIFIED SPEAKER: The closest to here that has been recently -- would be Derby 91, so if you all have been to Interstate 91 at Derby that's the most recent or -- that we've done that's closest to here.

I'm not going to remember them all off the top of my head. At the same time as this project,

we have, I know it's on the opposite side of Vermont, but on I-89 was Highgate which is very different to me, because it's on an interstate and there aren't a lot of businesses. There are residents right there. Highgate itself is farther south but that's an ongoing project that's kind of on the same timeline to this.

We had a scope of meeting there already, and the others that have been recent have been in Maine. So Madawaska, Maine, which is a new international bridge (inaudible) Maine, is like from 2005. That was a new international bridge, Van Buren, Maine. Those are all in the county of Aroostook County, so those are the biggest ones that I can think of.

I've been working on border stations since 2007, so I was just trying to go through them all in my head. Those are the biggest ones. If anyone has ones, chime in.

UNIDENTIFIED SPEAKER: I've also worked on little ones.

MR. HUGHES: There is also currently another one in Richford, Auburn Springs.

UNIDENTIFIED SPEAKER: Yes, but those aren't complete. Those are --

MR. HUGHES: They're all like this. Same place.

UNIDENTIFIED SPEAKER: Further along.

UNIDENTIFIED SPEAKER: I'm sure I'm missing -- more in Benning, Maine, that somebody worked on, so Derby 91 is the closest.

MR. HUGHES: And that's setup for those, like we could go through (audio disruption.)

UNIDENTIFIED SPEAKER: Yes. So what we can do -- I believe if you go to GSA.gov, well if you just do a general Google search, and you put in like General Services Administration land ports of entry, there is one large, overarching site, and then you can see all the ports that are currently in progress and any other projects.

MR. HUGHES: If you go to GSA.gov/R1, there's a section down the bottom that has development projects. It will show you all the projects that we're currently working.

UNIDENTIFIED SPEAKER: I also think there's a NEPA site, too. It might not just be specific to Region 1, but it will give you some NEPA documents, if you want to look at that process.

UNIDENTIFIED SPEAKER: Send us a direct email with your questions, and then we'll see if we

can -- for folks, if we got contact information, we'll see what -- we're all saying a whole bunch of different sites, but that way you can see all of the NEPA published documents are public information and they're all supposed to be available for in perpetuity if you need to take a look at it, so you could see an example of a draft document and then a final document. Those would be available.

UNIDENTIFIED SPEAKER: But I would bear in mind that every project is different.

UNIDENTIFIED SPEAKER: Absolutely.

UNIDENTIFIED SPEAKER: Different purpose and different communities, so while obviously Madawaska was a different -- they moved a bridge, right? So that was -- so just bear in mind when you're looking at those documents, and what the comments from the public part, it's not all the same.

UNIDENTIFIED SPEAKER: You can see the process there.

UNIDENTIFIED SPEAKER: But initially the --

UNIDENTIFIED SPEAKER: The process will be the same, but obviously each project is different.

UNIDENTIFIED SPEAKER: You're not moving

the bridge.

UNIDENTIFIED SPEAKER: And I'm not moving there.

MR. HUGHES: Any other comments?

PATRICIA MOODY: Pat Moody again.

I'm just looking at this map and I can't remember your name, I'm sorry. Adam, yes.

Yous aid that you weren't going to be moving the roads. Like the idea is to keep them, the roads --

MR. HUNTER: We're kind of keeping the line of sight to the CVSA, which is up north. We would be kind of rerouting roads and figuring out better traffic pattern, because the way that it works right now with trucks going up (audio disruption) so we're trying to figure out a way that they can turn onto the highway better.

PATRICIA MOODY: It seems like this part on 114 that's below includes this building. There's just like this little bit of land and it's all mostly road, so if you're not planning to really do anything with the road, I'm just wondering why that's in the Stowe map.

MR. HUNTER: Well, it's also -- so NEPA also includes utilities. It includes looking at

wetlands. It includes looking at where's the swamp water runoff coming in and out, but that's the reason it's kind of such an expanded area.

PATRICIA MOODY: Okay.

MR. HUNTER: It's not like we're going to acquire this whole area. That's just like this study area, that slides that's coverages.

PATRICIA MOODY: Okay. Thanks.

MR. HUGHES: Others? Going once? Going twice?

UNIDENTIFIED SPEAKER: So (audio disruption) would stay in there?

MR. HUNTER: It's really in the works, but I mean, yeah.

UNIDENTIFIED SPEAKER: And part in Canada.

MR. HUNTER: In Canada. Yes, we're not touching Canada.

UNIDENTIFIED SPEAKER: Okay.

MR. HUNTER: The line of sight, it's the (audio disruption) not touching, so you need a line of sight. That gives you a good idea of what we're looking at.

UNIDENTIFIED SPEAKER: Thank you.

MR. HUGHES: Going once?

UNIDENTIFIED SPEAKER: Speed it up.

MR. HUGHES: Going twice?

MR. HUNTER: I saw a hand raised. No?

MS. MORRISSON: No.

MR. HUGHES: Sold to the woman in blue.

MS. MORRISON: Everyone, thank you for being here. It's Kelly Morrison again. And I just wanted to thank (inaudible) for being so (inaudible) to host us and allowing us to be here and assisting with the outreach efforts. So we certainly appreciate all of you and it's great that you're here and I hope that you'll stay engaged. And I have sent along this information in terms of grant opportunities, I've got in contact with the government and some potential opportunities in that arena, as the project progresses, so I hope you'll feel compelled to use that email address and reach out to us with any questions on expressing (audio disruption). Thank you.

UNIDENTIFIED SPEAKER: Thank you.

MR. HUGHES: (Audio disruption.) Drive safe.

UNIDENTIFIED SPEAKER: Feel free to take a cookie.

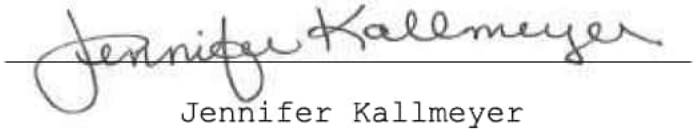
(WHEREUPON, the Meeting was concluded at 6:27 p.m.)

CERTIFICATE

I, Jennifer Kallmeyer, do hereby certify that I reported all proceedings adduced in the foregoing matter and that the foregoing transcript pages constitutes a full, true and accurate record of said proceedings to the best of my ability.

I further certify that I am neither related to counsel or any party to the proceedings nor have any interest in the outcome of the proceedings.

IN WITNESS HEREOF, I have hereunto set my hand this 23rd day of February, 2024.



Jennifer Kallmeyer

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APPENDIX C—OTHER AGENCY CONSULTATION

U.S. General Services Administration

Critical Action Determination Letter

Thomas C. Brown, Jr.
U.S. Customs and Border Protection
6650 Telecom Drive, Suite 210
Indianapolis, IN 46278

Subject: Flood Mitigation - Determination of Facility as a Critical Action Facility or Non-Critical Action Facility

Dear Mr. Brown:

We are requesting a determination from CBP on whether the future Norton LPOE facility will be considered a “Critical Action” facility.

The Department of Homeland Security Federal Emergency Management Agency has defined a facility as "Critical Action” when even a slight chance of flooding is too great.

We have provided additional information to assist you in determining whether or not your facility is a Critical Action facility below. This determination is necessary because GSA’s P100 sets requirements for Building enclosure and electrical equipment placement based on whether a facility is a “critical action” or not.

GSA’s baseline requirement for a building enclosure is to locate the Non Critical facilities above the 100-year base flood elevation + 2 feet. **Critical Action facilities** must be elevated above the 1% annual chance (100-year) base flood elevation + 3 feet, or the 0.2% annual chance flood (500-year) elevation, whichever is higher. In addition the P100 requires that electrical equipment for facilities classified as **Critical Action Facilities** must be located five feet above the 500 year flood plain.

Please use the enclosed form to designate whether or not your agency considers its proposed use to be a critical action, sign in the space provided, and return to me via e-mail no later than September 22, 2023.

If you have any questions, please contact me at (347) 255-7483 or adam.hunter@gsa.gov.

Sincerely,

Adam Hunter, Project Manager
U.S. General Services Administration

Enclosure to Critical Action Determination Letter

Based on the definition of critical actions below, please have your agency's national or regional facilities representative or other designated official indicate their selection and sign in the space provided.

A **critical action** is any activity for which even a slight chance of flooding would be too great.

Examples of actions that may be critical actions include, but are not limited to:

- Storage of national strategic and critical material
- Storage of irreplaceable records
- Acquisition of health facilities for client agencies
- Child care facilities
- Public benefit conveyances for schools, prisons, and some other institutional uses
- Site acquisition and construction of new courthouses
- Storage of volatile, toxic, or water-reactive materials
- Construction or operation of hospitals and schools
- Construction or operation of utilities and emergency services that would be inoperative if flooded

Additional considerations for critical actions include:

- If flooded, would the proposed action create an added dimension or consequence to the hazard?
  - Is the action a structure or facility producing or storing highly volatile, toxic, radioactive, or water-reactive materials?

- If the action involves structures such as hospitals, nursing homes, prisons, and schools, would occupants of these structures be sufficiently mobile and have available transport capability to avoid loss of life and injury given the flood warning lead times available?
  - Would emergency services functions be delayed or unavailable as a result of the location of the action?
  - Are there routes to and from the structure that would be inaccessible during a flood and hinder evacuation?
  - Would the location of the structure result in unacceptable hazards to human safety, health, and welfare of the occupants?

- Would essential or irreplaceable resources, utilities, or other functions be damaged beyond repair, destroyed, or otherwise made unavailable?
  - Would utilities, critical equipment, systems, networks, or functions be damaged beyond repair or destroyed?
  - Would physical or electronic records without backups or copies be destroyed or made unavailable as a result of where these items are located in a structure?
  - Would national laboratory research activities or items of significant value to research communities be damaged or destroyed as a result?
  - Would items or structures of substantial cultural significance be damaged, destroyed, or otherwise harmed?

- Would the damage or disruption from a local flooding event lead to regional or national catastrophic impacts (e.g., a port being closed for a period following a storm event, which has an impact on transportation of goods nationally)?
- Would damage or disruption to a given facility or infrastructure component have potential for cascading damage or disruption to other facilities and infrastructure classes, some of which may already be stressed by flood conditions (e.g., electricity outage due to substation damage resulting in wastewater treatment facility shutdown or gasoline pump outage)?

On behalf of U.S. Customs and Border Protection:

__x__ This agency DOES consider its proposed use (as described above and based on the definition) to be a Critical Action.

___ This agency DOES NOT consider its proposed use (as described above and based on the definition) to be a Critical Action .

_____ Date 9/28/23

Signature

Name and Title A. J. Palazzetti ADFO-Mission Support
Boston Field Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 07/22/2025 18:25:06 UTC
Project Code: 2025-0105119
Project Name: Norton LPOE

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Updated 4/12/2023 - Please review this letter each time you request an Official Species List, we will continue to update it with additional information and links to websites may change.

About Official Species Lists

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Federal and non-Federal project proponents have responsibilities under the Act to consider effects on listed species.

The enclosed species list identifies threatened, endangered, proposed, and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested by returning to an existing project's page in IPaC.

Endangered Species Act Project Review

Please visit the "**New England Field Office Endangered Species Project Review and Consultation**" website for step-by-step instructions on how to consider effects on listed

species and prepare and submit a project review package if necessary:

https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review

NOTE Please do not use the **Consultation Package Builder** tool in IPaC except in specific situations following coordination with our office. Please follow the project review guidance on our website instead and reference your **Project Code** in all correspondence.

Northern Long-eared Bat - (**Updated 4/12/2023**) The Service published a final rule to reclassify the northern long-eared bat (NLEB) as endangered on November 30, 2022. The final rule went into effect on March 31, 2023. You may utilize the **Northern Long-eared Bat Rangewide Determination Key** available in IPaC. More information about this Determination Key and the Interim Consultation Framework are available on the northern long-eared bat species page:

https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis

For projects that previously utilized the 4(d) Determination Key, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective. If your project was not completed by March 31, 2023, and may result in incidental take of NLEB, please reach out to our office at newengland@fws.gov to see if reinitiation is necessary.

Additional Info About Section 7 of the Act
Under section 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to determine whether projects may affect threatened and endangered species and/or designated critical habitat. If a Federal agency, or its non-Federal representative, determines that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Federal agency also may need to consider proposed species and proposed critical habitat in the consultation. 50 CFR 402.14(c)(1) specifies the information required for consultation under the Act regardless of the format of the evaluation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/service/section-7-consultations

In addition to consultation requirements under Section 7(a)(2) of the ESA, please note that under sections 7(a)(1) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species. Please contact NEFO if you would like more information.

Candidate species that appear on the enclosed species list have no current protections under the ESA. The species' occurrence on an official species list does not convey a requirement to

consider impacts to this species as you would a proposed, threatened, or endangered species. The ESA does not provide for interagency consultations on candidate species under section 7, however, the Service recommends that all project proponents incorporate measures into projects to benefit candidate species and their habitats wherever possible.

Migratory Birds

In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see:

https://www.fws.gov/program/migratory-bird-permit

https://www.fws.gov/library/collections/bald-and-golden-eagle-management

Please feel free to contact us at **newengland@fws.gov** with your **Project Code** in the subject line if you need more information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat.

Attachment(s): Official Species List

Attachment(s):

- Official Species List

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

PROJECT SUMMARY

Project Code: 2025-0105119
Project Name: Norton LPOE
Project Type: Border Security
Project Description: The U.S. General Services Administration (GSA) proposes to modernize and expand the Norton Land Port of Entry (LPOE). The LPOE is located in Norton, Vermont, on the U.S.-Canada border. The GSA is preparing an Environmental Assessment to analyze the effects of its proposed action on the natural and human environment.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@45.009767,-71.79324163906597,14z

Counties: Essex County, Vermont

ENDANGERED SPECIES ACT SPECIES

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Joe Dalrymple
Address: 10 Al Paul Lane
Address Line 2: Suite 103
City: Merrimack
State: NH
Zip: 03054
Email joe.dalrymple@wsp.com
Phone: 4384090984

LEAD AGENCY CONTACT INFORMATION

Lead Agency: General Services Administration

You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 07/22/2025 18:55:33 UTC
Project code: 2025-0105119
Project Name: Norton LPOE

Federal Nexus: yes
Federal Action Agency (if applicable): General Services Administration

Subject: Technical assistance for 'Norton LPOE'

Dear Joe Dalrymple:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on July 22, 2025, for 'Norton LPOE' (here forward, Project). This project has been assigned Project Code 2025-0105119 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (Dkey), invalidates this letter.**

Determination for the Northern Long-Eared Bat and Tricolored Bat

Based on your IPaC submission and a standing analysis completed by the Service, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered	May affect

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the northern long-eared bat and tricolored bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Canada Lynx *Lynx canadensis* Threatened
- Monarch Butterfly *Danaus plexippus* Proposed Threatened

You may coordinate with our Office to determine whether the Action may cause prohibited take of the species listed above.

Conclusion

Consultation with the Service is not complete. Further consultation or coordination with the Service is necessary for those species or designated critical habitats with a determination of "May Affect." A "May Affect" determination in this key indicates that the project, as entered, is not consistent with the questions in the key. Not all projects that reach a "May Affect" determination are anticipated to result in adverse impacts to listed species. These projects may result in a "No Effect", "May Affect, Not Likely to Adversely Affect", or "May Affect, Likely to Adversely Affect" determination depending on the details of the project. Please contact our New England Ecological Services Field Office to discuss methods to avoid or minimize potential adverse effects to those species or designated critical habitats.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Norton LPOE

2. Description

The following description was provided for the project 'Norton LPOE':

> The U.S. General Services Administration (GSA) proposes to modernize and expand the Norton Land Port of Entry (LPOE). The LPOE is located in Norton, Vermont, on the U.S.-Canada border. The GSA is preparing an Environmental Assessment to analyze the effects of its proposed action on the natural and human environment.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@45.009767,-71.79324163906597,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect" for a least one species covered by this determination key.

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed bats or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Is the action area wholly within Zone 2 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

3. Does the action area intersect Zone 1 of the year-round active area for northern long-eared bat and/or tricolored bat?

   Automatically answered
   No

4. Does the proposed action involve wind or solar energy?

   No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Note for projects in Pennsylvania: Projects requiring authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act would be considered as having a federal nexus. Since the U.S. Army Corps of Engineers (Corps) has issued the Pennsylvania State Programmatic General Permit (PASPGP), which may be verified by the PA Department of Environmental Protection or certain Conservation Districts, the need to receive a Corps authorization to perform the work under the PASPGP serves as a federal nexus. As such, if proposing to use the PASPGP, you would answer 'yes' to this question.

   Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

7. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   No

8. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

9. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

10. [Semantic] Is the action area located within 0.5 miles of a known bat hibernaculum? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered

    No

11. Does the action area contain any winter roosts or caves (or associated sinkholes, fissures, or other karst features), mines, rocky outcroppings, or tunnels that could provide habitat for hibernating bats?

    No

12. Does the action area contain (1) talus or (2) anthropogenic or naturally formed rock shelters or crevices in rocky outcrops, rock faces or cliffs?

    No

13. Will the action cause effects to a covered bridge?

    No

14. Are trees present within 1000 feet of the action area?

    Note: If there are trees within the action area that are of a sufficient size to be potential roosts for bats answer "Yes". If unsure, additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

15. Does the action include the intentional exclusion of bats from a building or building-like structure? **Note:** Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats or tricolored bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local Ecological Services Field Office to help assess whether northern long-eared bats or tricolored bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures.

    No

16. Does the action involve removal, modification, or maintenance of a human-made building-like structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

17. Will the action cause construction of one or more new roads open to the public?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

18. Will the action include or cause any construction or other activity that is reasonably certain to increase average night-time traffic permanently or temporarily on one or more existing roads? **Note:** For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    No

19. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

20. Will the proposed Action involve the creation of a new water-borne contaminant source (e.g., leachate pond, pits containing chemicals that are not NSF/ANSI 60 compliant)?

    Note: For information regarding NSF/ANSI 60 please visit https://www.nsf.org/knowledge-library/nsf-ansi-standard-60-drinking-water-treatment-chemicals-health-effects

    No

21. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

22. Will the action include drilling or blasting?

    No

23. Will the action involve military training (e.g., smoke operations, obscurant operations, exploding munitions, artillery fire, range use, helicopter or fixed wing aircraft use)?

    No

24. Will the proposed action involve the use of herbicides or other pesticides other than herbicides (e.g., fungicides, insecticides, or rodenticides)?

    No

25. Will the action include or cause activities that are reasonably certain to cause chronic or intense nighttime noise (above current levels of ambient noise in the area) in suitable summer habitat for the northern long-eared bat or tricolored bat during the active season?

    Chronic noise is noise that is continuous or occurs repeatedly again and again for a long time. Sources of chronic or intense noise that could cause adverse effects to bats may include, but are not limited to: road traffic; trains; aircraft; industrial activities; gas compressor stations; loud music; crowds; oil and gas extraction; construction; and mining.

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    No

26. Does the action include, or is it reasonably certain to cause, the use of permanent or temporary artificial lighting within 1000 feet of suitable northern long-eared bat or tricolored bat roosting habitat?

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

27. Will the action cause an increase in the extent of suitable forested habitat exposed to artificial lighting?

    Yes

28. Will the action use only downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting) when installing new or replacing existing permanent lights?

    Or for those transportation agencies using the Backlight, Uplight, Glare (BUG) system developed by the Illuminating Engineering Society, will all three ratings (backlight, uplight, and glare) be as close to zero as is possible, with a priority of "uplight" of 0?

    No

29. Does the action area intersect the northern long-eared bat species list area?

    Automatically answered
    Yes

30. [Semantic] Is the action area located within 0.5 miles of radius of an entrance/opening to any known NLEB hibernacula? Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

31. [Semantic] Is the action area located within 0.25 miles of a culvert that is known to be occupied by northern long-eared or tricolored bats? **Note:** The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.

    Automatically answered
    No

32. [Semantic] Is the action area located within 150 feet of a documented northern long-eared bat roost site?

    Note: The map queried for this question contains proprietary information and cannot be displayed. If you need additional information, please contact your State wildlife agency.Have you contacted the appropriate agency to determine if your action is within 150 feet of any documented northern long-eared bat roosts?

    Note: A document with links to Natural Heritage Inventory databases and other state-specific sources of information on the locations of northern long-eared bat roosts is available here. Location information for northern long-eared bat roosts is generally kept in state natural heritage inventory databases – the availability of this data varies by state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited.

    Automatically answered
    No

33. Is suitable summer habitat for the northern long-eared bat present within 1000 feet of project activities?
If unsure, answer "Yes."

    Note: Additional information defining suitable summer habitat for the northern long-eared bat and tricolored bat can be found in Appendix A of the USFWS' Range-wide Indiana Bat and Northern long-eared bat Survey Guidelines at: https://www.fws.gov/media/range-wide-indiana-bat-and-northern-long-eared-bat-survey-guidelines.

    Yes

34. Has a presence/probable absence summer bat survey targeting the northern long-eared bat following the Service's Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines been conducted within the project area?

    No

35. Do you have any documents that you want to include with this submission?

    No

PROJECT QUESTIONNAIRE

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Joe Dalrymple
Address: 10 Al Paul Lane
Address Line 2: Suite 103
City: Merrimack
State: NH
Zip: 03054
Email joe.dalrymple@wsp.com
Phone: 4384090984

LEAD AGENCY CONTACT INFORMATION

Lead Agency: General Services Administration

You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104

In Reply Refer To: 07/22/2025 18:59:07 UTC
Project code: 2025-0105119
Project Name: Norton LPOE

Federal Nexus: yes
Federal Action Agency (if applicable): General Services Administration

Subject: Technical assistance for 'Norton LPOE'

Dear Joe Dalrymple:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on July 22, 2025, for “Norton LPOE” (here forward, Project). This project has been assigned Project Code 2025-0105119 and all future correspondence should clearly reference this number.

The Service developed the IPaC system and associated species’ determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into the IPaC must accurately represent the full scope and details of the Project. Failure to accurately represent or implement the Project as detailed in IPaC or the Northeast Determination Key (Dkey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

To make a no effect determination, the full scope of the proposed project implementation (action) should not have any effects (either positive or negative effect(s)), to a federally listed species or designated critical habitat. Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (See § 402.17). Under Section 7 of the ESA, if a federal action agency makes a no effect determination, no further consultation with, or concurrence from, the Service is required (ESA §7). If a proposed Federal action may affect a listed species or designated critical habitat, formal consultation is required (except when the Service concurs, in writing, that a

proposed action "is not likely to adversely affect (NLAA)" listed species or designated critical habitat [50 CFR §402.02, 50 CFR§402.13]).

The IPaC results indicated the following species is (are) potentially present in your project area and, based on your responses to the Service's Northeast DKey, you determined the proposed Project will have the following effect determinations:

Species	Listing Status	Determination
Canada Lynx (*Lynx canadensis*)	Threatened	NLAA

Conclusion

Coordination with the Service is not complete. The project has a federal nexus (e.g., funds, permits); however, you are not the federal action agency. Therefore, the ESA consultation status is incomplete and no project activities on any portion of the parcel should occur until consultation between the Service and the Federal action agency (or designated non-federal representative), is completed. Section 7 consultation is not complete until the federal action agency submits a determination of effects, and the Service concurs with the federal action agency's determination. Please provide this technical assistance letter to the lead federal action agency or its designated non-federal representative with a request for its review.

As the federal agency deems appropriate, they should submit their determination of effects to the appropriate Ecological Services Field Office. The lead federal action agency or designated non-federal representative can log into IPaC system using their agency email account and click "Search by record locator" to find this Project using 031-165370645.

Other Species and Critical Habitat that May be Present in the Action Area

In addition to the species listed above, the following species and/or critical habitats may also occur in your project area and are not covered by this conclusion:

- Monarch Butterfly *Danaus plexippus* Proposed Threatened
- Northern Long-eared Bat *Myotis septentrionalis* Endangered

To complete consultation for species that have reached a "May Affect" determination and/or species may occur in your project area and are not covered by this conclusion, please visit the "New England Field Office Endangered Species Project Review and Consultation" website for step-by-step instructions on how to consider effects on these listed species and/or critical habitats, avoid and minimize potential adverse effects, and prepare and submit a project review package if necessary: https://www.fws.gov/office/new-england-ecological-services/endangered-species-project-review

If no changes occur with the Project or there are no updates on listed species, no further consultation/coordination for this project is required for the species identified above. However, the Service recommends that project proponents re-evaluate the Project in IPaC if: 1) the scope,

timing, duration, or location of the Project changes (includes any project changes or amendments); 2) new information reveals the Project may impact (positively or negatively) federally listed species or designated critical habitat; or 3) a new species is listed, or critical habitat designated. If any of the above conditions occurs, additional consultation with the Service should take place before project implements any changes which are final or commits additional resources.

Please Note: If the Action may impact bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d) by the prospective permittee may be required. Please contact the Migratory Birds Permit Office, (413) 253-8643, or PermitsR5MB@fws.gov, with any questions regarding potential impacts to Eagles.

If you have any questions regarding this letter or need further assistance, please contact the New England Ecological Services Field Office and reference the Project Code associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Norton LPOE

2. Description

The following description was provided for the project 'Norton LPOE':

> The U.S. General Services Administration (GSA) proposes to modernize and expand the Norton Land Port of Entry (LPOE). The LPOE is located in Norton, Vermont, on the U.S.-Canada border. The GSA is preparing an Environmental Assessment to analyze the effects of its proposed action on the natural and human environment.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@45.009767,-71.79324163906597,14z

QUALIFICATION INTERVIEW

1. As a representative of this project, do you agree that all items submitted represent the complete scope of the project details and you will answer questions truthfully?

   Yes

2. Does the proposed project include, or is it reasonably certain to cause, intentional take of listed species?

   Note: This question could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered, or proposed species.

   No

3. Does the proposed action involve wind or solar energy?

   No

4. Is the action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Note: for projects in Pennsylvania: Projects requiring authorization under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act would be considered as having a federal nexus. Since the U.S. Army Corps of Engineers (Corps) has issued the Pennsylvania State Programmatic General Permit (PASPGP), which may be verified by the PA Department of Environmental Protection or certain Conservation Districts, the need to receive a Corps authorization to perform the work under the PASPGP serves as a federal nexus. As such, if proposing to use the PASPGP, you would answer ‘yes’ to this question.

   Yes

5. Are you including in this analysis all impacts to federally listed species that may result from the entirety of the project (not just the activities under federal jurisdiction)?

   Note: If there are project activities that will impact listed species that are considered to be outside of the jurisdiction of the federal action agency submitting this key, contact your local Ecological Services Field Office to determine whether it is appropriate to use this key. If your Ecological Services Field Office agrees that impacts to listed species that are outside the federal action agency's jurisdiction will be addressed through a separate process, you can answer yes to this question and continue through the key.

   Yes

6. Are you the lead federal action agency or designated non-federal representative requesting concurrence on behalf of the lead Federal Action Agency?

   No

7. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)?

   No

8. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

9. Is the lead federal action agency the Natural Resources Conservation Service?

   No

10. Will the proposed project involve the use of herbicide where listed species are present?

    No

11. Will the proposed project involve herbaceous native vegetation removal (including prescribed fire that would result in burning of plants) or mowing?

    Yes

12. Will all activities occur within an area that is currently paved, graveled, routinely maintained lawn, and/or inside a structure?

    No

13. Does any component of the project associated with this action include activities or structures that may pose a collision risk to **birds** (e.g., plane-based surveys, communication towers, high voltage transmission lines, any type of towers with or without guy wires)?

    No

14. Will the proposed project involve earth moving or other ground disturbance that could cause erosion and sedimentation, and/or contamination within 300 feet of a freshwater wetland or along a stream or tributary of a stream where listed species may be present?

    Note: Answer "Yes" to this question if erosion and sediment control measures will be used.

    No

15. Will the proposed project impact streams or tributaries of streams where listed species may be present through activities such as, but not limited to, valley fills, large-scale vegetation removal that could result in ground destabilization, and/or change in site topography?

    No

16. Will the proposed project involve vegetation removal within 200 feet of a perennial stream bank where aquatic listed species may be present?

    No

17. Will erosion and sedimentation control Best Management Practices (BMPs) associated with applicable state and/or Federal permits, be applied to the project?

    Note: If BMPs have been provided by and/or coordinated with and approved by the appropriate Ecological Services Field Office, answer "Yes" to this question.

    Yes

18. Is the project being funded, lead, or managed in whole or in part by U.S Fish and Wildlife Restoration and Recovery Program (e.g., Partners, Coastal, Fisheries, Wildlife and Sport Fish Restoration, Refuges)?

    No

19. Does the project intersect the Canada lynx species list area?

    Automatically answered
    Yes

20. Will the project involve trapping, poisoning, or broadcasting disease control agents for wild animals (e.g. animal damage control, controlling or managing furbearer wildlife, capturing animals for research projects, rabies baits)?

    No

21. Will the project be enclosed by fencing that could unintentionally trap lynx (e.g. wind and solar development, waste treatment settling ponds, impervious fencing along roads)?

    No

22. Is this a road or highway project?

    No

23. Is the project in a non-forested habitat (fields, towns and urban areas, agricultural fields) and of a nature that will not result in take of lynx?

    Yes

24. Do you have any other documents that you want to include with this submission?

    No

PROJECT QUESTIONNAIRE

1. Approximately how many acres of trees would the proposed project remove?

   3.0

2. Approximately how many total acres of disturbance are within the disturbance/ construction limits of the proposed project?

   5.9

3. Briefly describe the habitat within the construction/disturbance limits of the project site.

   The proposed Project Area is fragmented and partially developed, containing existing infrastructure, residential homes, and human activity. It contains patches of forest, meadow, maintained lawn, and transportation and utility right of way. It is bordered on three sides by roads and bisected by a snowmobile trail. These characteristics make the site unsuitable for regular lynx use, as the species is highly sensitive to human disturbance and typically avoids areas with residential or commercial activity. Although the proposed Project Area may occasionally be traversed by lynx moving through the region, no core habitat features are present within the site, and regular use by the species is unlikely.

IPAC USER CONTACT INFORMATION

Agency: Private Entity
Name: Joe Dalrymple
Address: 10 Al Paul Lane
Address Line 2: Suite 103
City: Merrimack
State: NH
Zip: 03054
Email joe.dalrymple@wsp.com
Phone: 4384090984

LEAD AGENCY CONTACT INFORMATION

Lead Agency: General Services Administration

You have indicated that your project falls under or receives funding through the following special project authorities:

- BIPARTISAN INFRASTRUCTURE LAW (BIL) (OTHER)

APPENDIX D—HYDROLOGIC AND HYDRAULIC STUDY

FLOODPLAIN DETERMINATION
HYDROLOGIC AND HYDRAULIC STUDY
BIL LAND PORT OF ENTRY
Norton, Essex County, Vermont

September 2024

PREPARED FOR:

LPOE VT Team, 1 PQE
GSA PBS Region 1
10 Causeway Street, Room 1100
Boston, MA 02222

PREPARED BY:

WSP USA Inc.
2000 Lenox Drive | 3rd Floor
Lawrenceville, NJ 08648

Mark Peters, PE
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FIGURES

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IMAGES

APPENDIXES

1. INTRODUCTION

This report has been prepared as part of the National Environmental Policy Act (NEPA) Services Hydrology and Hydraulic Study - Floodplain Determination for Land Port of Entry (LPOE), Norton, Essex Country, Vermont. Currently, the Norton LPOE does not have a Federal Emergency Management Agency (FEMA) Flood Insurance Map to determine the 100-year or 500-year floodplain. The main flood source is the Coaticook River, which flows northwards to cross the U.S.-Canada border, and the LPOE is located on the east side of the Coaticook River at the U.S.-Canada border. WSP USA Inc. (WSP) developed a hydrology and hydraulic study to establish the aforementioned floodplain extent for the Coaticook River for the LPOE and its vicinity (Figure 1).The hydrologic analysis was performed to determine the design flow magnitude, and the detailed hydraulic analysis was performed to establish the floodplain limit for the Coaticook River reach within the vicinity of the LPOE.

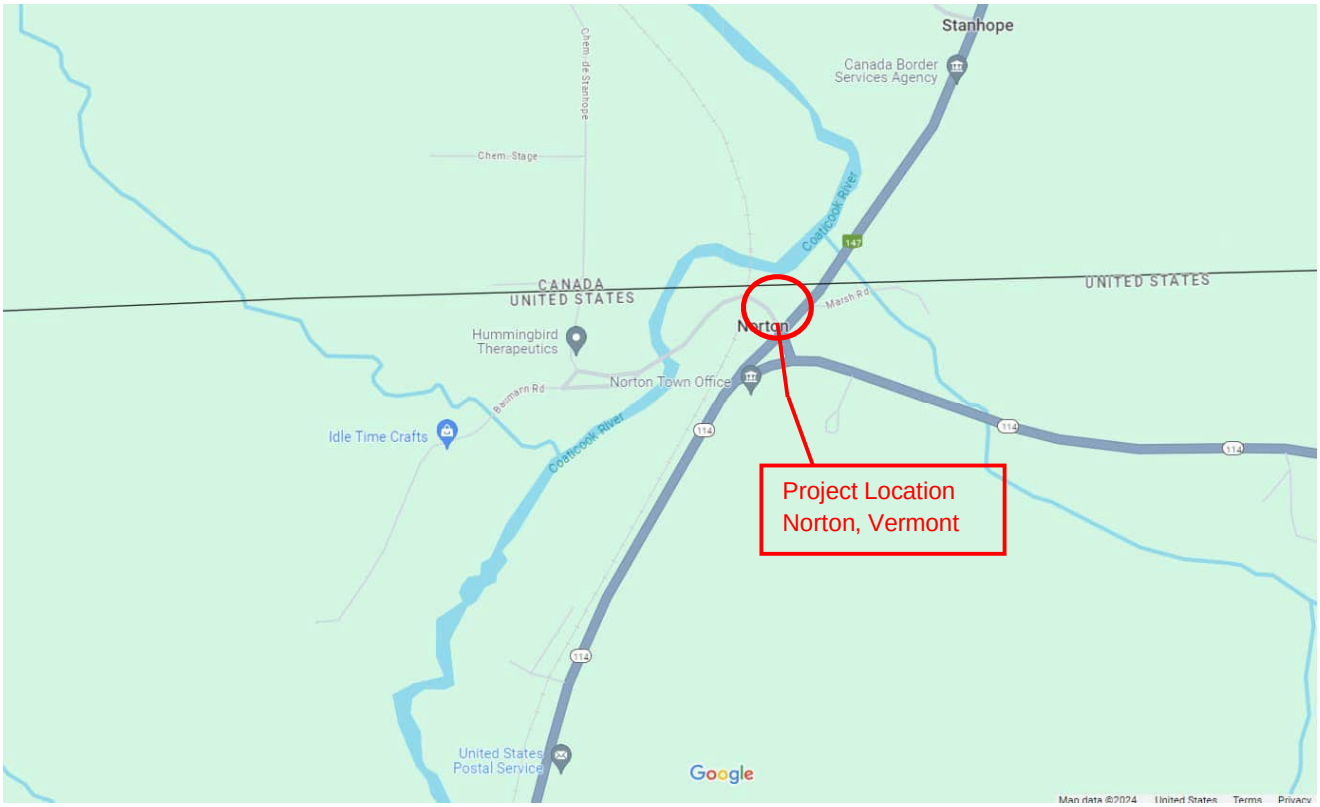


Figure 1, Project Location

2. HYDROLOGY ANALYSIS

The objective of the hydrologic analysis was to assess and determine the flood conditions. The flood source, the Coaticook River, originates from the North Pond, approximately 5 miles south of the LPOE, and flows northward, crossing the U.S.-Canada border, and joining the Massawipi River near Capelton, Quebec, approximately 25 miles downstream of the LPOE. The drainage area to the LPOE is approximately 57.9 square miles (mi^2). The drainage area was determined via the U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) and was delineated towards the LPOE using the USGS National Elevation Dataset (1 meter accuracy or higher) using ESRI ArcGIS Desktop. The drainage area map is shown in Figure 2. As a FEMA Flood Insurance Study (FIS) is not available for Essex County, the regional regression method and the gage analysis method were used to assess the hydrologic flood condition.

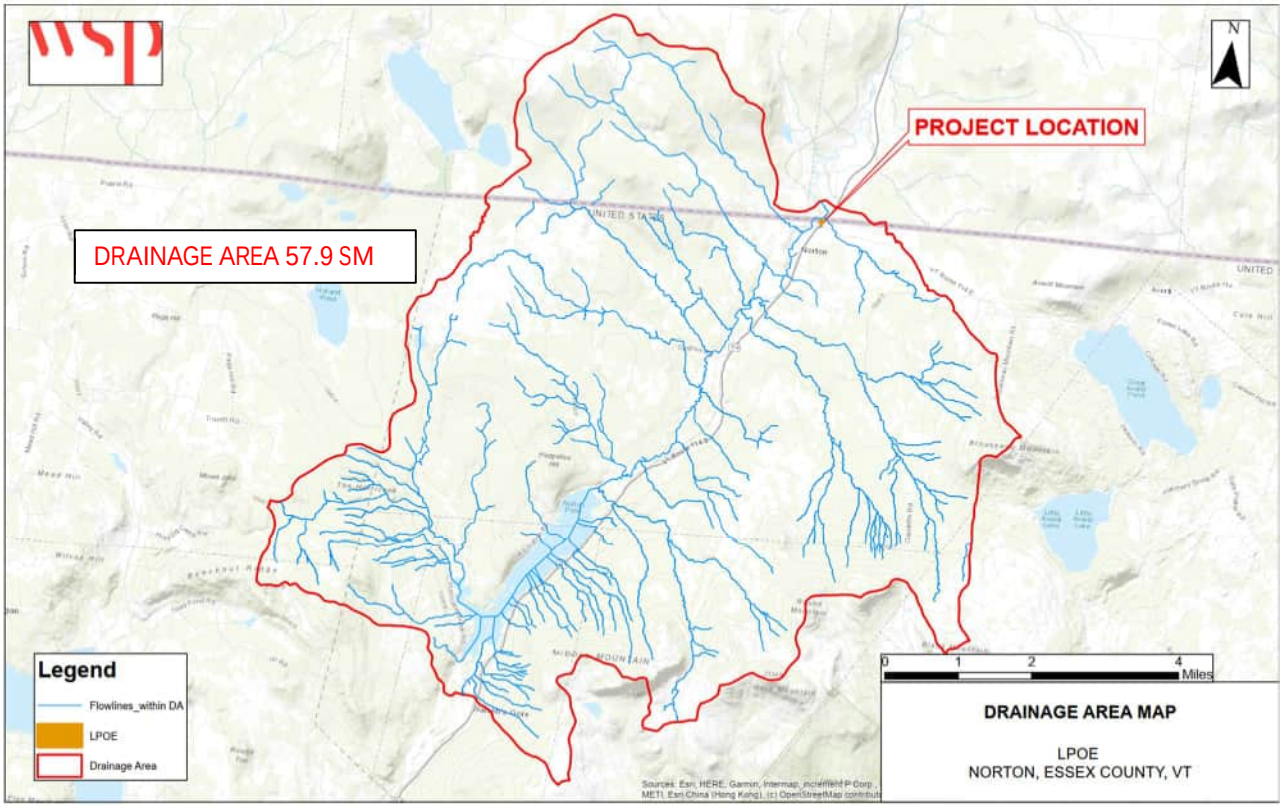


Figure 2. Drainage Area Map

2.1 Regional Regression Analysis

USGS, in cooperation with FEMA, has conducted and published national stream flow statistics through its National Streamflow Statistics Application since the late 2000s (USGS, 2019a). For Vermont, USGS Scientific Investigations Report 2014-5078 (USGS, 2014) outlines the methods to conduct flood peak estimates, which were utilized in this study. The regression analysis and

equations use the following three parameters to estimate the flood peaks: the drainage area of the basin, the percentage of wetland and water bodies determined from the 2006 National Land Cover Database (LC06STOR), and the basin-wide mean of average annual precipitation (Streamstats) (USGS, 2019b) which would be automatically pulled by the Streamstats online tool from the USGS database and estimate the flood peaks using these regression equations. However, due to the lack of comparable wetland and precipitation GIS database data available for Canada, Streamstats did not estimate flood peaks of any part of the drainage area that fell within Canada.

To address this issue, WSP used USGS Streamstats to determine the subwatershed drainage areas that are upstream of the LPOE within U.S. territory to estimate the wetland and open water percentage for the entirety of the drainage area to the LPOE, including the portion in Canada. The total combined area of the seven drainage areas of these subwatersheds (Appendix A, Figure A-1) is 44.03 mi^2, with an estimated LC06STOR of 5.14%. The NHD was used to compare the waterbody within these seven Streamstats watersheds and the project area. The waterbody defined by NHD for the seven Streamstats watersheds combined was 2.46% and was 1.88% for the project drainage area. An LC06STOR of 3.94% was then estimated for the project area using the NHD waterbody of the project drainage area by multiplying the ratio of LC06STOR over the NHD waterbody of the seven Streamstats watershed, assuming the ratio would not dramatically change. Alternatively, an estimated LC06STOR of 3.76% was reached by using only Streamstats watershed 1. As the estimated LC06STOR of 3.76% for the wetland/water body would result in an increased value of flow rates, this LC06STOR was used as a conservative estimation.

The basin-wide mean annual precipitation is estimated to be 48.3 inches (Oregon State University). Oregon State University, the source of this mean annual precipitation, has updated its database of the 30-year normal precipitation from 1981-2010 to 1991-2020, and the updated 1991-2020 mean annual precipitation is 50.1 inches for both Streamstats watershed 1 and the project area. However, the coefficients required for the regional regression analysis have not been published or calibrated for this new period. Therefore, the 1981-2010 mean annual precipitation of 48.3 inches is used for Streamstats watershed 1 and the project area in this analysis. Detailed calculations are provided in Appendix A.

With these estimated parameters, WSP calculated flood peaks for the 100-year and 500-year flood events using the regression equations outlined in USGS Scientific Investigations Report 2014-5078 (USGS, 2014) (Table 1). The 2-year flood event, which is often used to identify the bankfull limit, was also calculated for calibration of bankfull limits within the hydraulic model. Detailed calculations for the flood peaks are included in Appendix A.

USGS Scientific Investigations Report 2014-5078 also provides a set of regression equations for situations when the basin characteristics beyond the drainage area are not available. These

simplified equations consider the drainage area only. WSP also estimated flood peaks using these simplified equations (Table 1). Detailed calculations are provided in Appendix A.

2.2 Gage Analysis

While USGS establishes and maintains water gages across the nation through which gage records of flows and levels can be used to conduct statistical analysis to estimate flood peaks, there are no gages available on the Coaticook River. However, Environmental Canada maintains four gage stations on the Coaticook River on the Canada side. Of these four gage stations, only station number 02OE022 (Coaticook River 1.3 kilometers downstream of Highway 143) has more than 10 years of monitored flow data, which is required to conduct statistical analysis. The drainage area to this gage station is 521 square kilometers (201 mi^2). Figure 3 shows this gage location in context with the drainage area of the LPOE.

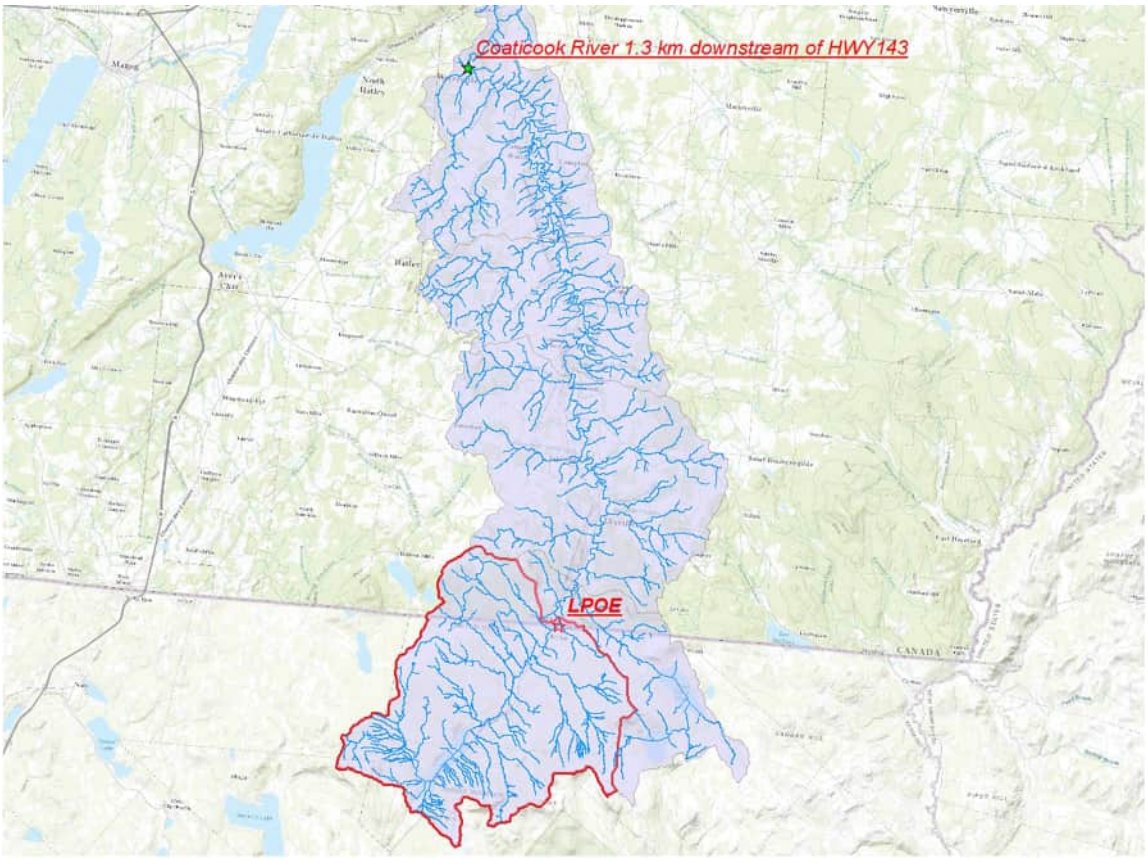


Figure 3. Streamflow Gage and the Drainage Areas

Gage station number 02OE022 has recorded continuous monitored flow data spanning from 1959 to the present day. A log-Pearson Type III flood frequency analysis was performed for this gage in accordance with the procedures outlined in the USGS Guidelines for Determining Flood Flow Frequency Bulletin 17C (USGS, 2019c). The 2-year, 100-year, and 500-year flood peaks are

estimated to be 3,926 cubic feet per second (cfs), 7,490 cfs and 8,430 cfs, respectively, for the gage site. Typically, FEMA FIS studies transpose these flood peaks at gages to points of interest along the same stream using the gage transpose method. The transpose method, sometimes referred to as the discharge drainage area ratio formula (FEMA, 2013), is defined as:

$$Q_1/Q_2 = (A_1/A_2)^x$$

Where "Q_1" and "Q_2" are the discharges at specific locations, "A_1" and "A_2" are the drainage areas at these locations, and "x" is a variable exponent determined by the flood-frequency region, which is a combination of meteorological and physiographic information. The value "x" tends to lean towards larger values for flat watersheds or less variation of precipitation across the watershed.

As no FIS report is available for Essex County, WSP reviewed the FIS reports of nearby counties to utilize the gage transpose method in determining the variable exponent as a means of comparison and selecting the most appropriate storm event flow rates. The nearest county with a published FIS report is Washington County, where the "x" value varies from 0.75 to 1.0. The flood peaks for LPOE were then estimated to be 1,544 cfs, 2,944 cfs, and 3,317 cfs when "x" was 0.75, or 1,132 cfs, 2,159 cfs, and 2,430 cfs when "x" was 1.0, for the 2-year, 100-year, and 500-year flood event, respectively. These flood peaks are substantially smaller than the results from the regional regression method. The flood peaks estimated from the regional regression method, simplified regional regression, and gage transpose method are presented in Table 1. Calculations and detailed information are provided in Appendix A.

Table 1. Flood Peaks from Different Method (cfs)

Methods	Regional Regression	Simplified Regression	Gage Transpose Method (when x=0.75)	Gage Transpose Method (when x=1.0)
2-yr event	1600	1640	1544	1132
100-yr event	5630	5650	2946	2159
500-yr event	7920	7930	3317	2430

The USGS Scientific Investigation Report also includes a method that utilizes regression equations near stream gages where the available gage flow information is considered through a weighted manner. To use this method, the site in question is required to have a drainage area between 50% and 150% of the streamgage drainage area at the monitored gage. The drainage area to the LPOE (57.9 mi^2) is less than 50% of the streamgage 02OE022 drainage area (201 mi^2). Therefore, this method is not applicable in this study.

The flood peaks from regional regression and simplified regression method are consistent with each other, while the gage transpose method results in substantially lower peaks. The regional regression

method results were selected for evaluation in the hydraulic analysis described in the following section.

3. HYDRAULIC ANALYSIS

Hydraulic analysis was carried out to establish the extent of the Coaticook River floodplain at the LPOE. The water surface profiles for various flow values have been computed using the U.S. Army Corps of Engineers Hydrologic Engineering Center River Analysis System (HEC-RAS) computer program, version 6.4.1, dated March 2024. The hydraulic study project reach is limited from 1,500 feet upstream of the LPOE to 2,900 feet downstream of LPOE (Figure 4).

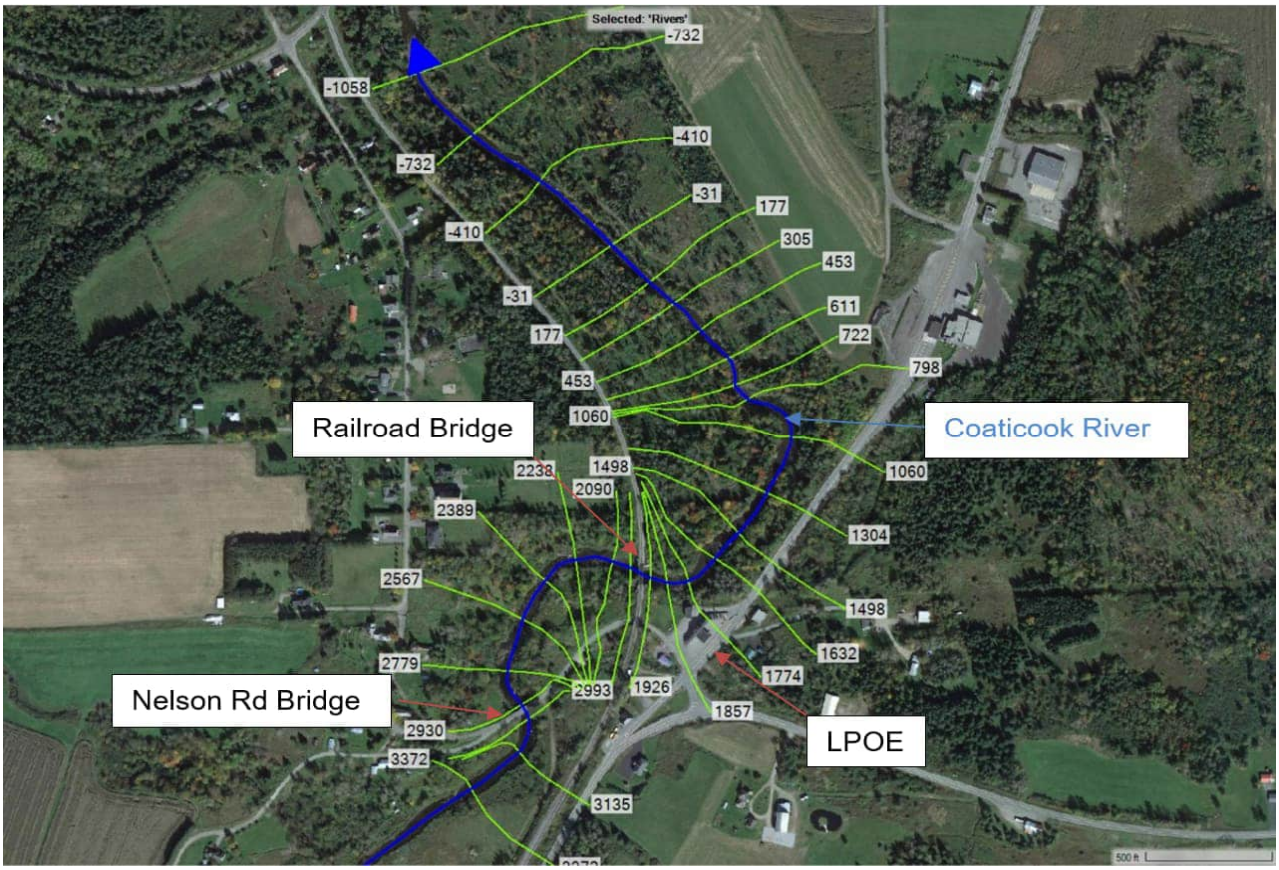


Figure 4. Hydraulic Model Layout

3.1 Terrain Data

The terrain used in HEC-RAS is the basis of the river geometry for hydraulic modeling. Digital elevation models obtained from the USGS National Elevation Dataset database and Environment Canada High Resolution Digital Elevation Model were used in establishing the hydraulic modeling terrain. Both datasets are produced from high resolution light detection and ranging (LiDAR) source data of 1-meter or higher resolution. The spatial reference used is State Plane Coordinate System, Vermont_FIPS_4400, and in conformance with the North American Datum of 1983 (NAD83). The elevation values are referenced to the North American Vertical Datum of 1988 (NAVD88). The bathymetric information, which is typically not available or not accurate within the LiDAR dataset, is supplemented with information obtained by WSP field personnel during a site investigation performed on April 17, 2024. Supplemental photos of this field investigation are provided in Appendix B. Figure 5 shows the generated hydraulic modeling terrain and associated cross-sections that were inspected by WSP field personnel to provide supplemental bathymetric depth data.

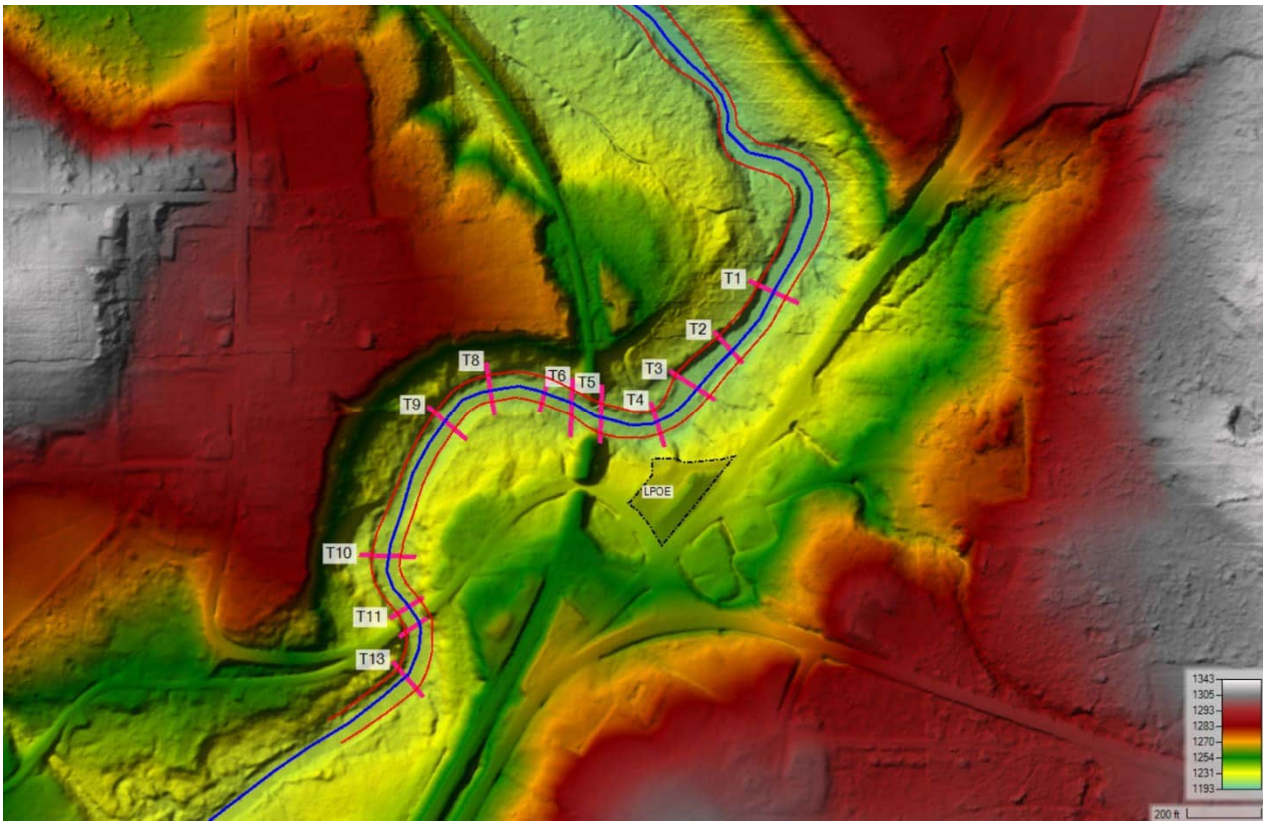


Figure 5. Terrain Data and the Field Visit Locations

3.2 Cross-section Data

The cross-sections were oriented throughout the project reach perpendicular to the flow at locations that represent the channel alignment and to account for structure crossings. The elevation information of the cross-sections was populated with the terrain data, supplemented by

the field visit information collected on April 17, 2024. In total, 27 cross-sections were developed for the model reach to represent the channel and overbank characteristics of the Coaticook River.

3.3 Hydraulic Structures

Two hydraulic structures cross the Coaticook River within the vicinity of the LPOE, the Nelson Road bridge in the United States and an unnamed railroad bridge in Canada (Image 1). Plan and section geometry data for these structures were obtained from Google imagery and the field visit on April 17, 2024. The railroad bridge was estimated from the channel bottom for safety reasons and lack of entry rights for railroad property. Both bridges are open-span structures. Geometric openings estimated from the field visit on April 17, 2024, were coded in relation to the terrain elevation top of deck crossing.

Image 1. Railroad Crossing Facing Upstream

3.4 Boundary Conditions

The HEC-RAS program requires a boundary condition at the upstream and downstream limits of the modeled reach to accurately model the stream reach. For this analysis, the normal depth was chosen to be the boundary condition type for both upstream and downstream as suggested by

FEMA guidance (FEMA, 2023), and the channel longitudinal slope at the upstream and downstream ends were estimated from the terrain data. The downstream reach has been deliberately extended a sufficient distance downstream to eliminate any uncertainty to the water surface elevation that may be caused by the inaccurate set of the boundary condition. The upstream and downstream boundary conditions are listed in Table 2.

Table 2. Upstream and Downstream Boundary Conditions

Upstream Slope	Downstream Slope
0.0070	0.0078

3.5 Manning's "n" Values

HEC-RAS uses three main loss coefficients to evaluate the total energy losses. These include Manning's "n" value for friction loss, contraction and expansion coefficients to analyze flow transition losses, and bridge loss coefficients to evaluate losses related to weir shape, pier configuration, and pressure flow.

Manning's "n" values have been estimated based on WSP's field investigation and engineering judgement. The HEC-RAS Hydraulic Reference Manual (HEC-RAS 2024) provides guidance on how to estimate Manning's "n" value based on *Open Channel Hydraulics* (Chow, 1959). In this analysis, a Manning's "n" value of 0.045 was selected for the channel based on the winding, pools, and shoals with some weeds and stone of the main channel. A Manning's "n" value of 0.06 was selected for the floodplain based on the light brush and trees present on the floodplain. The typical condition of the channel and floodplain is shown in Image 2.

Image 2.Typical Channel Characteristics

3.6 Contraction and Expansion Coefficients

Contraction and expansion of flow caused by changes in channel geometry are forms of energy losses within a reach. The losses are computed with the help of contraction and expansion coefficients specified in the cross-section data editor. The coefficients are multiplied by the absolute difference in velocity heads between the current cross-section and the next downstream section, which provides the energy loss caused by the flow transition. For this study, the standard contraction value (0.1) and expansion value (0.3) have been used for cross-sections where flow is unaffected by a structure, and values of 0.3 and 0.5 have been used for cross-sections in the vicinity of a structure.

3.7 Structure Modeling

The HEC-RAS bridge/culvert geometry use four cross-sections in the computations of energy losses due to a structure. The bridge deck elevation was obtained from the terrain data, and deck height estimated from the field investigation. Bridge spans were measured or estimated from Google

imagery. Values for the coefficient of discharge for weir flow were set to 2.6, a typical value where flows are not expected to overtop either of the bridges during a 100-year or 500-year flood event. The pressure and weir equation was not used in the bridge modeling approach.

The hydraulic model setup, with terrain, cross-sections, and structures is shown in Figure 6.

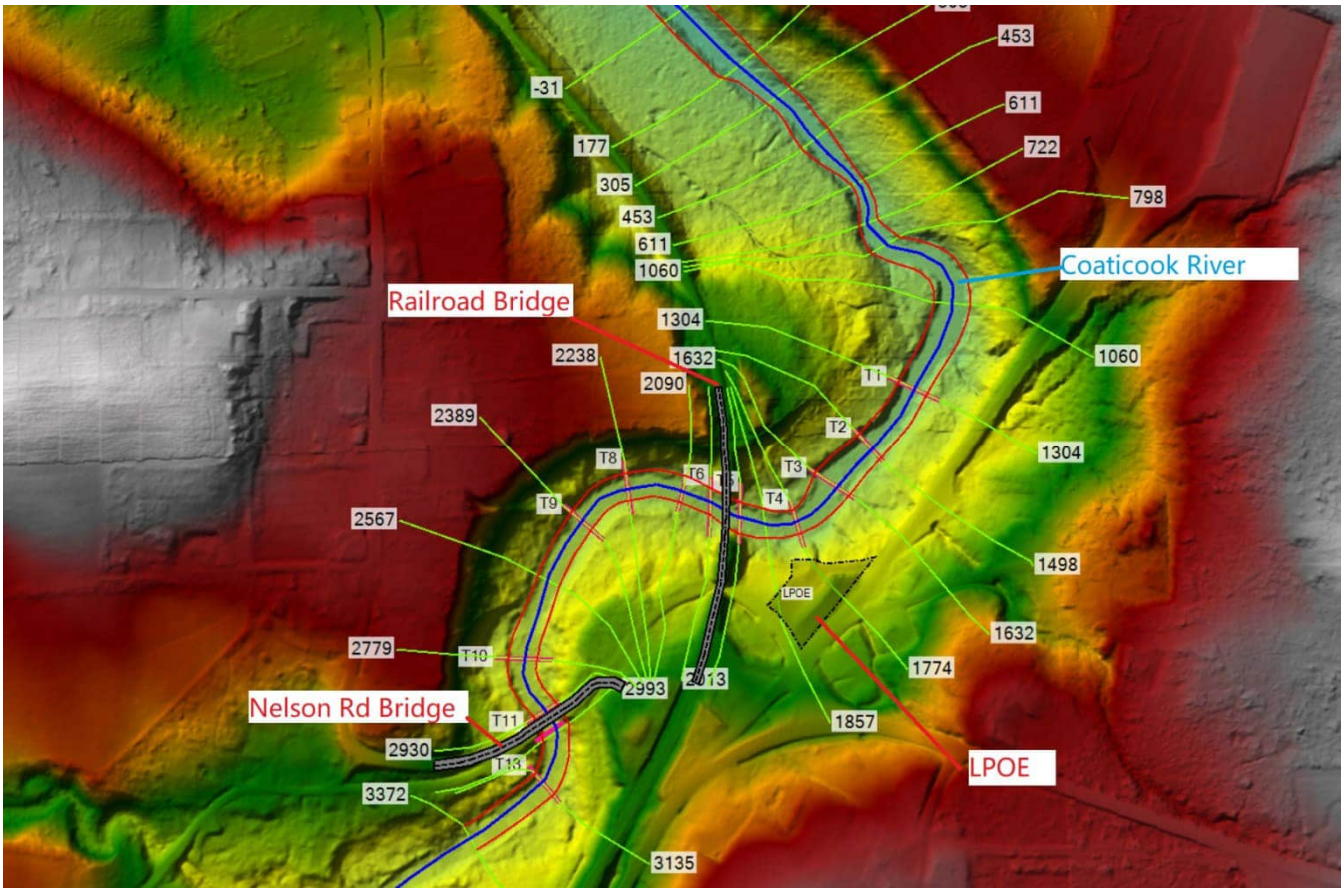


Figure 6. HEC-RAS Model Set Up

3.8 Hydraulic Modeling

The peak flows for the regional regression method from the hydrology analysis (Table 1) were input as flow values in the HEC-RAS modeling. The 2-year flood event steady flow analysis was first modeled. The resulting water surface elevation at each cross-section was then used as the revised top of bank identifier, which distinguishes the channel and floodplain by different Manning's "n" value. The bank point is also referred to as bankfull point. Bankfull discharge does not have a fixed recurrence interval. However, many researchers have discovered that the frequency of bankfull discharge occurs most often between a 1.5-year and 2-year flood frequency flow (T Endreny). Therefore, the bank station immediately below the 2-year flood event flood

elevation was used as the bank point stationing in this study. Table 3 provides the resulting bank stations utilized from this evaluation for calibration.

Table 3. Resulting Water Surface Elevations and Bank Station Elevations

Cross Section Station	2-yr Event Water Surface Elevation (Feet NAVD)	Left Bank Station	Right Bank Station
3372	1223.72	1223.67	1223.67
3135	1223.39	1223.29	1223.27
2993	1222.41	1222.38	1222.39
2950	Nelson Rd Bridge		
2930	1221.11	1221.01	1220.94
2779	1220.52	1220.47	1220.40
2567	1218.47	1218.45	1218.35
2389	1217.20	1216.94	1217.12
2238	1215.76	1215.65	1215.66
2090	1214.95	1214.71	1214.72
2013	1214.62	1214.55	1214.49
2000	Railroad Bridge		
1926	1212.93	1212.84	1212.78
1857	1212.67	1212.53	1212.44
1774	1212.16	1211.96	1211.95
1632	1211.25	1211.10	1211.11
1498	1210.22	1210.06	1210.11
1304	1208.89	1208.78	1208.78
1060	1207.39	1207.32	1207.33
798	1205.76	1205.55	1205.50
722	1205.14	1205.06	1205.04
611	1204.26	1204.19	1204.17

Cross Section Station	2-yr Event Water Surface Elevation (Feet NAVD)	Left Bank Station	Right Bank Station
453	1203.08	1202.99	1202.92
305	1201.68	1201.55	1201.55
177	1200.95	1200.83	1200.77
-31	1199.22	1199.20	1199.15
-410	1196.44	1196.42	1196.38
-732	1194.54	1194.48	1194.49
-1058	1192.24	1192.18	1192.18

Flood events of 100-year and 500-year occurrence are modeled using the steady flow analysis of the mixed flow regime to simulate water surface elevations. The steady flow analysis is the standard procedure for FEMA in performing a floodplain study. The mixed flow regime was selected because it considers both subcritical and supercritical flow conditions.

In order to depict the flood extents of the “100-year + 2-feet” and “100-year + 3-feet” scenarios, the additional depths for each scenario were added to the water surface elevation results for the 100-year event and then digitized within the digital terrain model utilizing AutoCAD Civil 3D.

3.9 Simulation Results

The hydraulic modeling results of the 100-year and 500-year flood event inundation extent, together with the “100-year + 2-feet” and “100-year + 3-feet” flood inundation extents are shown on maps provided in Appendix D. Figure 7 depicts the hydraulic simulated water surface elevations for the 100-year and 500-year results. Table 4 provides the resulting water surface elevations for each flood map scenario by cross-section stationing.

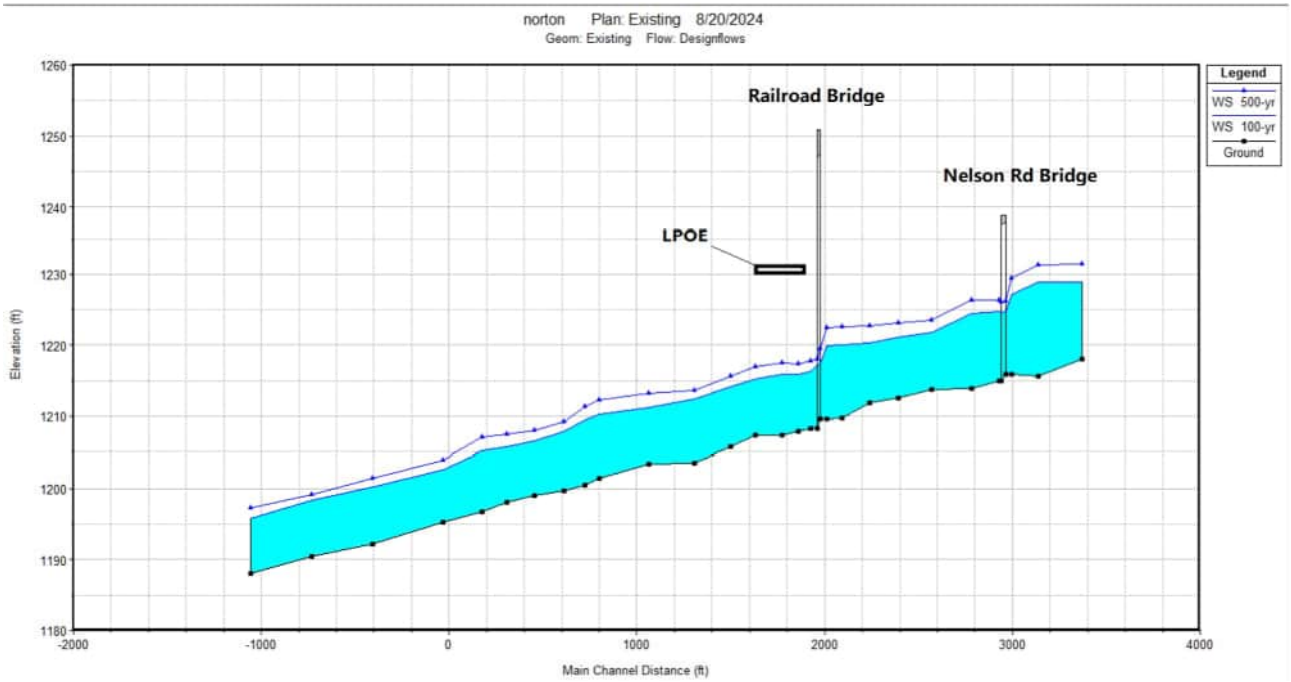


Figure 7.Water Surface Elevation Profiles

Table 4. Water Surface Elevation Model Results

Cross Section Station	Water Surface Elevations (Feet NAVD88)			
	100-Year	100-Year + 2-feet	100-Year + 3-feet	500-Year
3372	1228.97	1230.97	1231.97	1231.41
3135	1228.86	1230.86	1231.86	1231.34
2993	1227.13	1229.13	1230.13	1229.39
2950	Nelson Rd Bridge			
2930	1224.78	1226.78	1227.78	1226.36
2779	1224.51	1226.51	1227.51	1226.32
2567	1221.76	1223.76	1224.76	1223.5
2389	1221.10	1223.10	1224.10	1223.15
2238	1220.30	1222.30	1223.30	1222.72
2090	1220.08	1222.08	1223.08	1222.63
2013	1219.98	1221.98	1222.98	1222.53
2000	Railroad Bridge			
1926	1216.30	1218.30	1219.30	1217.82
1857	1215.87	1217.87	1218.87	1217.37
1774	1215.88	1217.88	1218.88	1217.48
1632	1215.27	1217.27	1218.27	1216.98
1498	1214.12	1216.12	1217.12	1215.61
1304	1212.39	1214.39	1215.39	1213.57
1060	1211.29	1213.29	1214.29	1213.18
798	1210.33	1212.33	1213.33	1212.27
722	1209.42	1211.42	1212.42	1211.41
611	1207.85	1209.85	1210.85	1209.20

Cross Section Station	Water Surface Elevations (Feet NAVD88)			
	100-Year	100-Year + 2-feet	100-Year + 3-feet	500-Year
453	1206.51	1208.51	1209.51	1208.04
305	1205.70	1207.70	1208.70	1207.52
177	1205.20	1207.20	1208.20	1207.01
-31	1202.68	1204.68	1205.68	1204.04
-410	1200.17	1202.17	1203.17	1201.43
-732	1198.38	1200.38	1201.38	1199.17
-1058	1195.83	1197.83	1198.83	1197.30

The ground elevation around the LPOE site is approximately 1,230 feet NAVD88. The resulting flood inundations, by scenario, at the LPOE site is presented in Table 5.

Table 5. Water Surface Elevation near the LPOE

Profile	Water Surface Elevations (Feet NAVD88)	
	Westside of the LPOE (ft)	Eastside of the LPOE (ft)
100-year Flood	1216.09	1215.88
500-year Flood	1217.67	1217.48
100-year + 2-feet Flood	1218.09	1217.88
100-year + 3-feet Flood	1219.09	1218.88

4. SUMMARY AND CONCLUSION

This report has been prepared as part of the Norton, Vermont, BIL LPOE National Environmental Policy Act Services Hydrologic and Hydraulic Study - Floodplain Determination. Hydrology analysis and hydraulic modeling has been performed to establish the food extent near the LPOE. 100-year, 500-year, “100-year + 2-feet” and “100-year + 3-feet” floodplains were produced. Reviewing the existing ground elevation of the LPOE relative to the flood elevations, it can be concluded that the current LPOE infrastructure falls outside of any potential flood scenario evaluated.

5. REFERENCES

Chow, V.T

1959 *Open Channel Hydraulics.* McGraw-Hill Book Company, NY.

FEMA

2013 Flood Insurance Study, Volume 1 of 3, Washington County, Vermont. https://map1.msc.fema.gov/data/50/S/PDF/50023CV001A.pdf?LOC=7e89dd3f4bf3cb60ff7f0ff2b9b9291f

2023 Guidance for Flood Risk Analysis and Mapping, MT-2 Requests. November 2023. https://www.fema.gov/sites/default/files/documents/fema_rm-incorporating_mitigation_planning_technical_assistance_into_rm_projects_nov_2023.pdf

Endreny, T. Flood Focus of FGM Analysis. Fluvial Geomorphology. SUNY College of Environmental Science and Forestry. https://fgmorph.eng.buffalo.edu/fg_2_7.php

HEC-RAS

2024 HEC-RAS Hydraulic Reference Manual. https://www.hec.usace.army.mil/confluence/rasdocs/ras1dtechref/latest/basic-data-requirements/geometric-data/energy-loss-coefficients

PRISM Climate Data

2024 *Parameter-elevation Regressions on Independent Slops Model Datasets, Oregon State University*. https://prism.oregonstate.edu/documents/PRISM_datasets.pdf

USGS

2014 *Estimation of Flood Discharges at Selected Annual Exceedance Probabilities for Unregulated, Rural Streams in Vermont*. *June 19, 2014.* https://pubs.usgs.gov/sir/2014/5078/

2019a *National Streamflow Statistics Application: Regional Regression Equation Publications by State or Territory.* February 26, 2019. https://www.usgs.gov/mission-areas/water-resources/science/national-streamflow-statistics-application-regional

2019b Streamstats v 4.20.1. March 4, 2019. https://streamstats.usgs.gov/ss/

2019c *Guidelines for Determining Flood Flow Frequency Bulletin 17C*. May 2019 https://pubs.usgs.gov/tm/04/b05/tm4b5.pdf

APPENDIX A HYDROLOGY

Drainage Area by Streamstats Tool

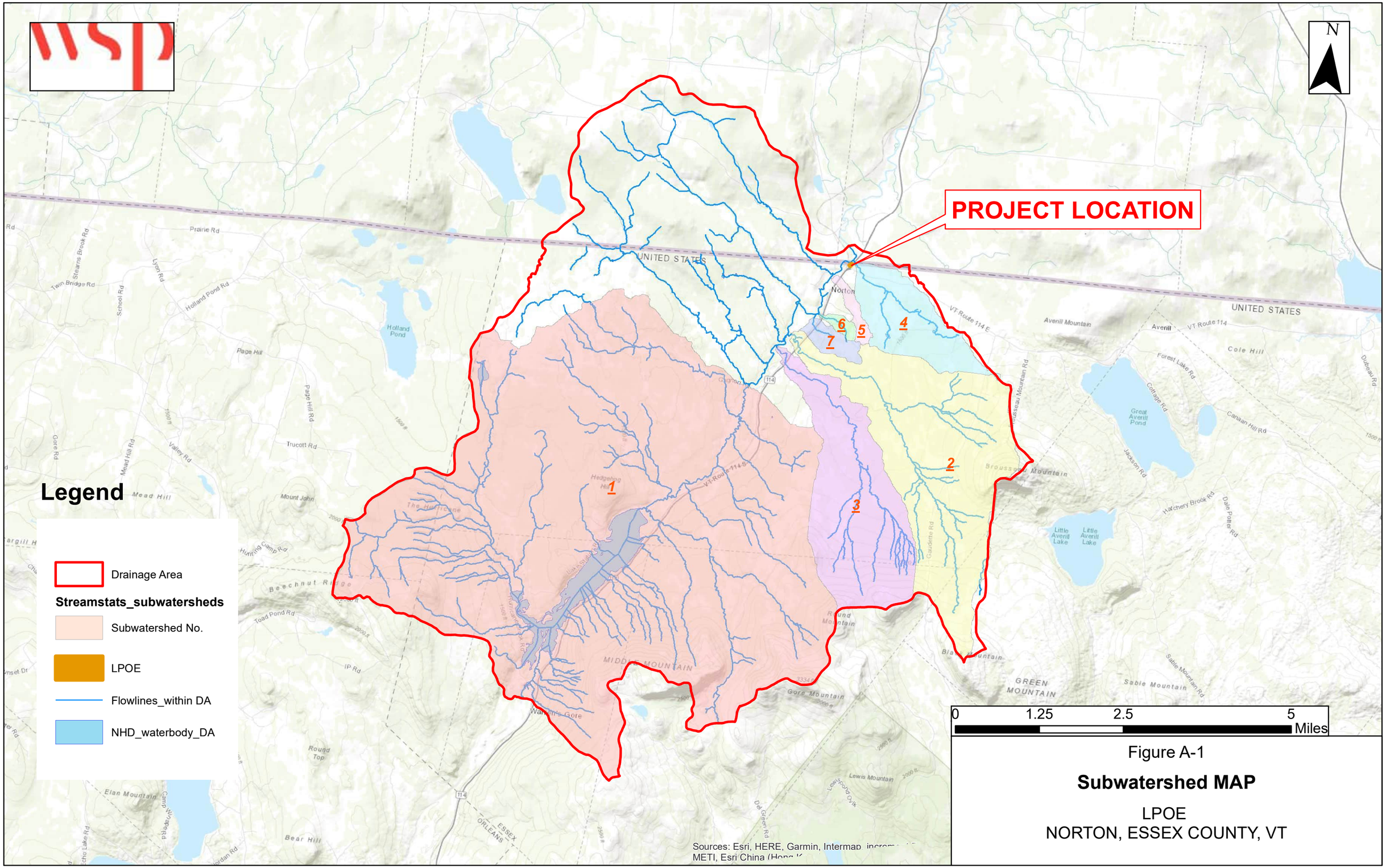


Figure A-1

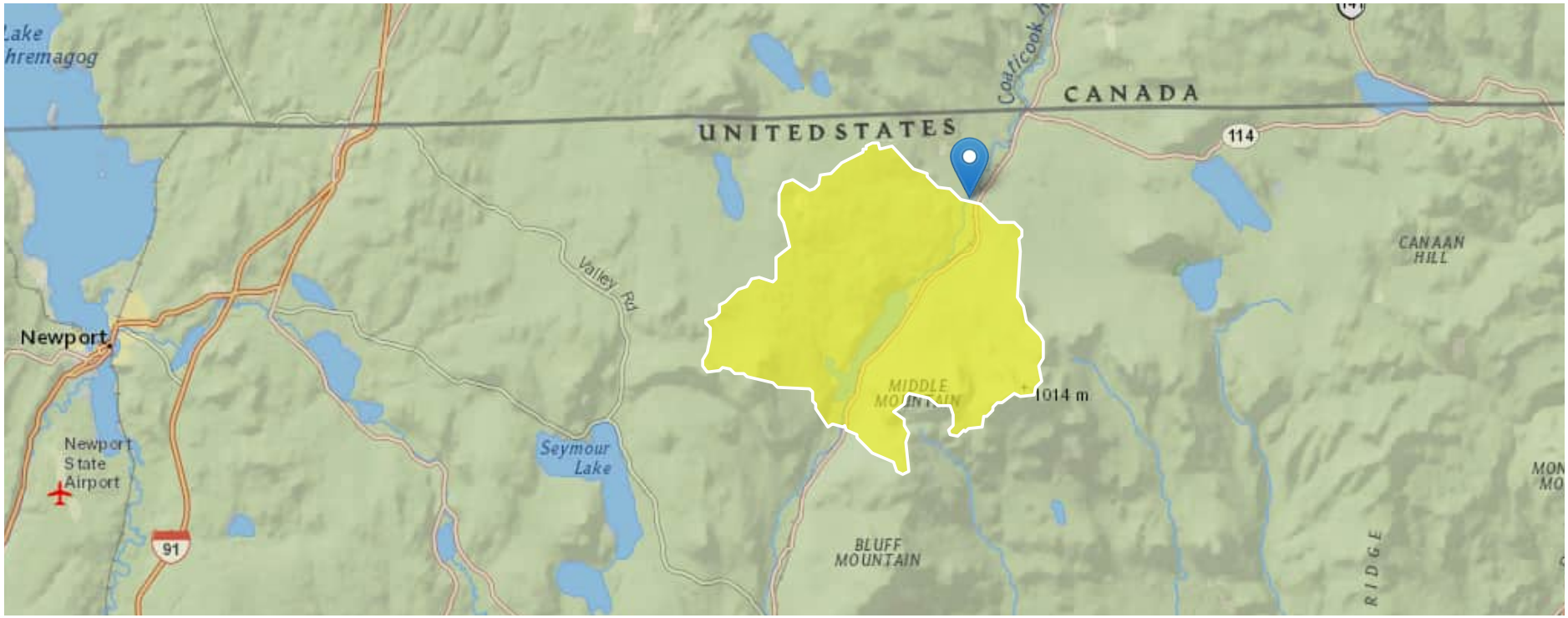
Subwatershed MAP

LPOE
NORTON, ESSEX COUNTY, VT

Streamstats Report on the 7 Subwatersheds

StreamStats Report 1

Region ID: VT
Workspace ID: VT20240613195855695000
Clicked Point (Latitude, Longitude): 44.98215, -71.82134
Time: 2024-06-13 15:59:17 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	31.3	square miles

Parameter Code	Parameter Description	Value	Unit
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	6.89	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	48.3	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	31.3	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	6.89	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	48.3	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	801	ft^3/s	459	1400	34.8
20-percent AEP flood	1230	ft^3/s	693	2180	36.1
10-percent AEP flood	1560	ft^3/s	845	2880	38.6
4-percent AEP flood	2040	ft^3/s	1050	3970	42.5
2-percent AEP flood	2440	ft^3/s	1210	4920	44.9
1-percent AEP flood	2860	ft^3/s	1370	5960	47.3
0.5-percent AEP flood	3330	ft^3/s	1520	7280	50.8
0.2-percent AEP flood	4030	ft^3/s	1740	9360	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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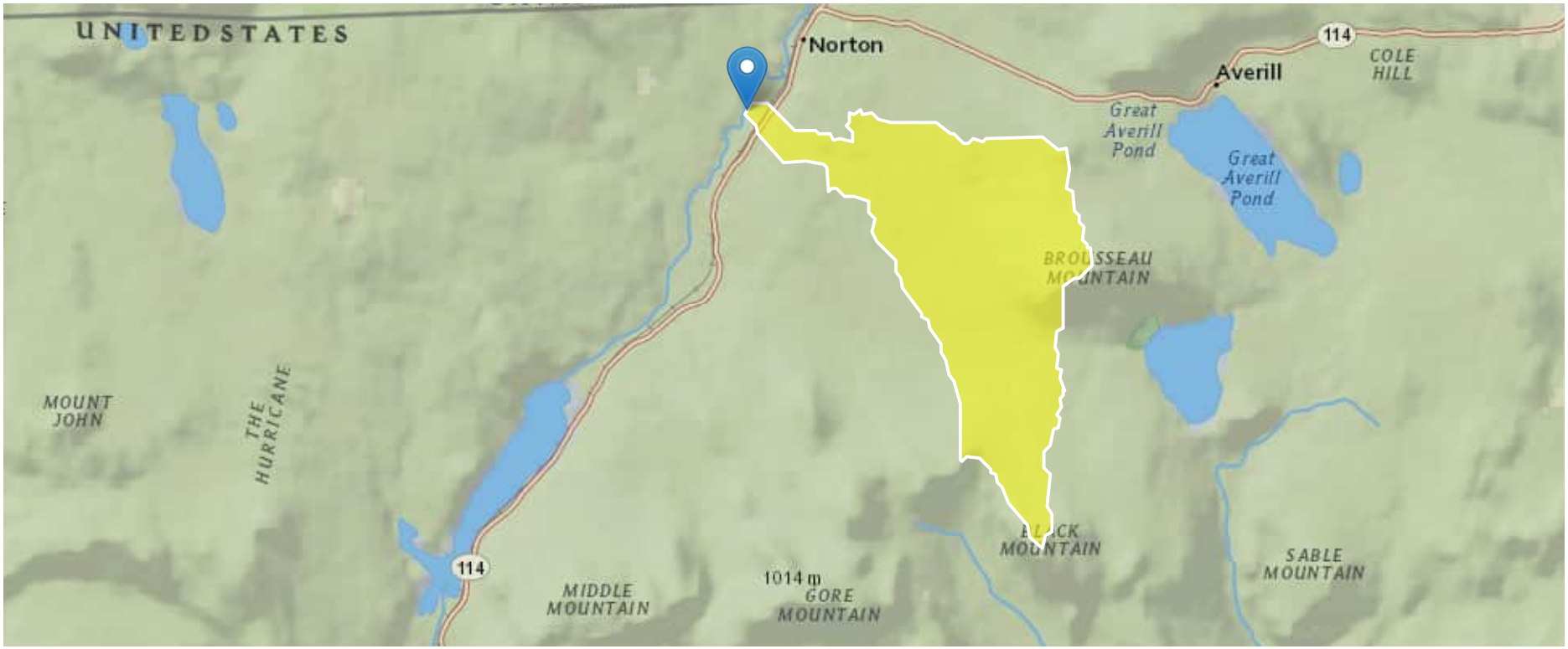
Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 2

Region ID: VT
Workspace ID: VT20240613200132779000
Clicked Point (Latitude, Longitude): 44.99397, -71.81070
Time: 2024-06-13 16:01:53 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	6.47	square miles
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0.93	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	49	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	6.47	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	0.93	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	49	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	292	ft^3/s	167	510	34.8
20-percent AEP flood	463	ft^3/s	261	823	36.1
10-percent AEP flood	598	ft^3/s	323	1110	38.6
4-percent AEP flood	798	ft^3/s	409	1560	42.5
2-percent AEP flood	971	ft^3/s	480	1970	44.9

Statistic	Value	Unit	PIL	PIU	ASEp
1-percent AEP flood	1160	ft^3/s	554	2430	47.3
0.5-percent AEP flood	1370	ft^3/s	623	3010	50.8
0.2-percent AEP flood	1690	ft^3/s	724	3950	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 3

Region ID: VT
Workspace ID: VT20240613200422599000
Clicked Point (Latitude, Longitude): 44.99132, -71.81387
Time: 2024-06-13 16:04:45 -0400

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	4.04	square miles

Parameter Code	Parameter Description	Value	Unit
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0.52	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	49.1	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	4.04	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	0.52	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	49.1	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	204	ft^3/s	117	357	34.8
20-percent AEP flood	328	ft^3/s	184	584	36.1
10-percent AEP flood	425	ft^3/s	229	789	38.6
4-percent AEP flood	570	ft^3/s	291	1120	42.5
2-percent AEP flood	697	ft^3/s	343	1420	44.9
1-percent AEP flood	837	ft^3/s	398	1760	47.3
0.5-percent AEP flood	992	ft^3/s	449	2190	50.8
0.2-percent AEP flood	1230	ft^3/s	524	2890	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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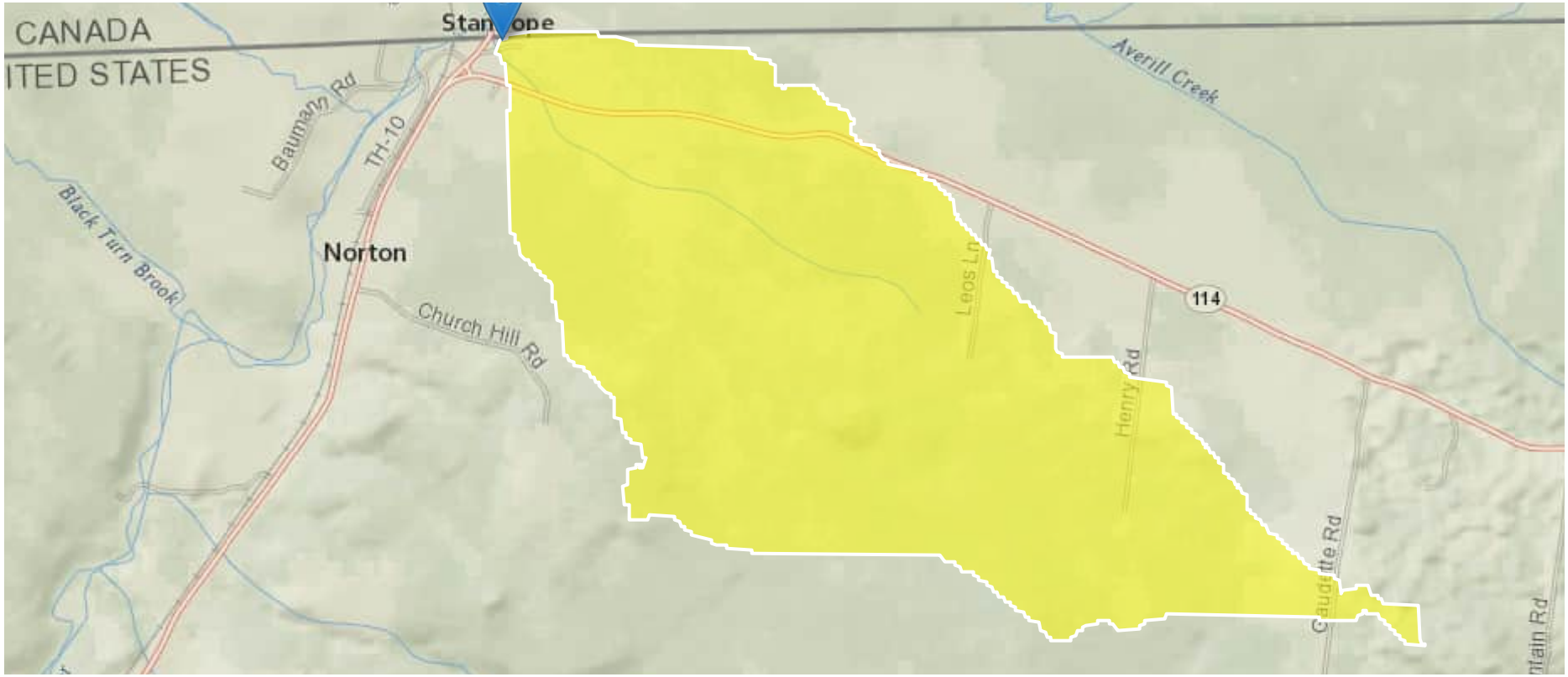
Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 4

Region ID: VT
Workspace ID: VT20240613200628876000
Clicked Point (Latitude, Longitude): 45.01072, -71.79261
Time: 2024-06-13 16:06:51 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	1.67	square miles
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	1.57	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	46.9	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.67	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	1.57	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	46.9	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	74.4	ft^3/s	42.4	131	34.8
20-percent AEP flood	120	ft^3/s	67.2	214	36.1
10-percent AEP flood	157	ft^3/s	84.4	292	38.6
4-percent AEP flood	211	ft^3/s	107	415	42.5

Statistic	Value	Unit	PIL	PIU	ASEp
2-percent AEP flood	258	ft^3/s	126	527	44.9
1-percent AEP flood	310	ft^3/s	147	655	47.3
0.5-percent AEP flood	368	ft^3/s	166	816	50.8
0.2-percent AEP flood	454	ft^3/s	193	1070	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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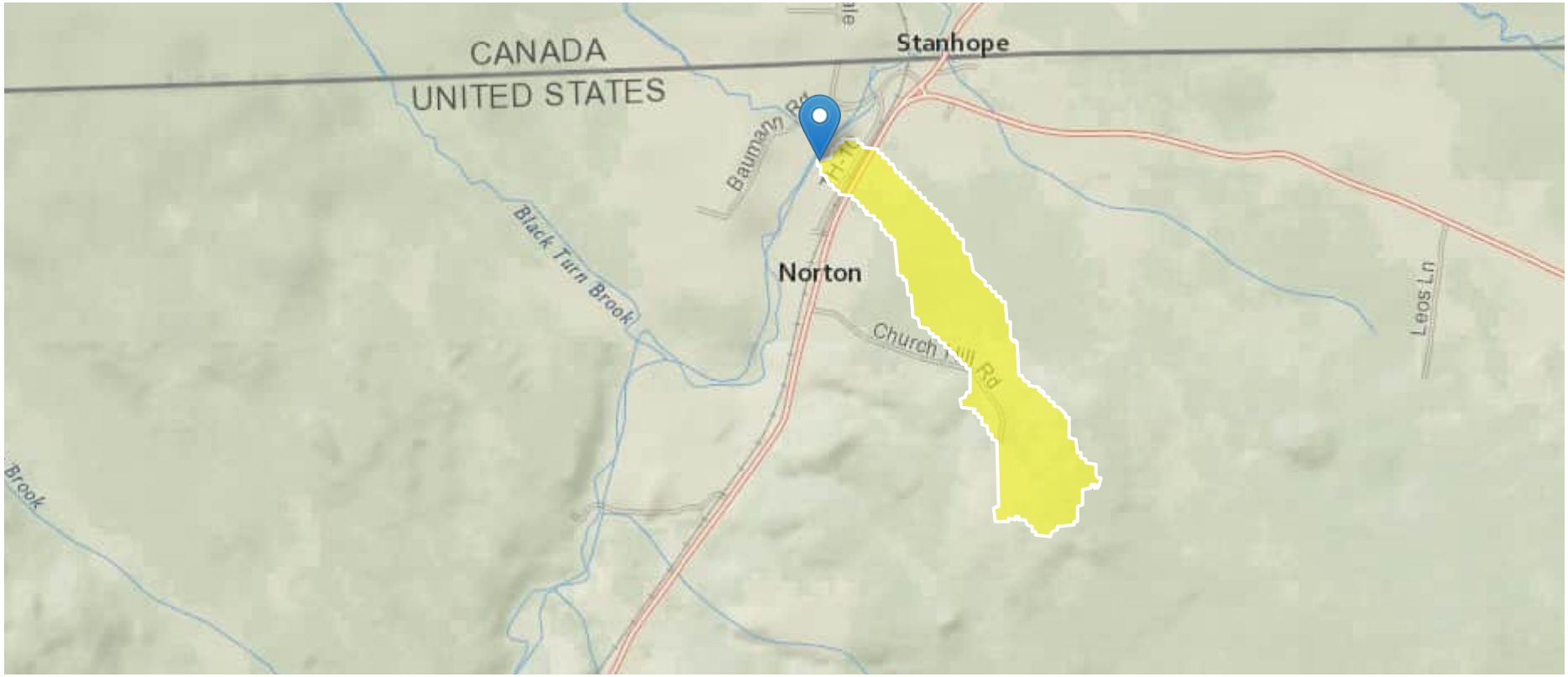
Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 5

Region ID: VT
Workspace ID: VT20240613200815474000
Clicked Point (Latitude, Longitude): 45.00702, -71.79960
Time: 2024-06-13 16:08:35 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.19	square miles
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	46.2	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.19	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	0	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	46.2	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	13.3	ft^3/s	7.47	23.7	34.8
20-percent AEP flood	22.3	ft^3/s	12.3	40.6	36.1
10-percent AEP flood	29.7	ft^3/s	15.6	56.4	38.6
4-percent AEP flood	41	ft^3/s	20.4	82.6	42.5

Statistic	Value	Unit	PIL	PIU	ASEp
2-percent AEP flood	51	ft^3/s	24.3	107	44.9
1-percent AEP flood	62.4	ft^3/s	28.7	136	47.3
0.5-percent AEP flood	75.1	ft^3/s	32.8	172	50.8
0.2-percent AEP flood	94.4	ft^3/s	38.7	230	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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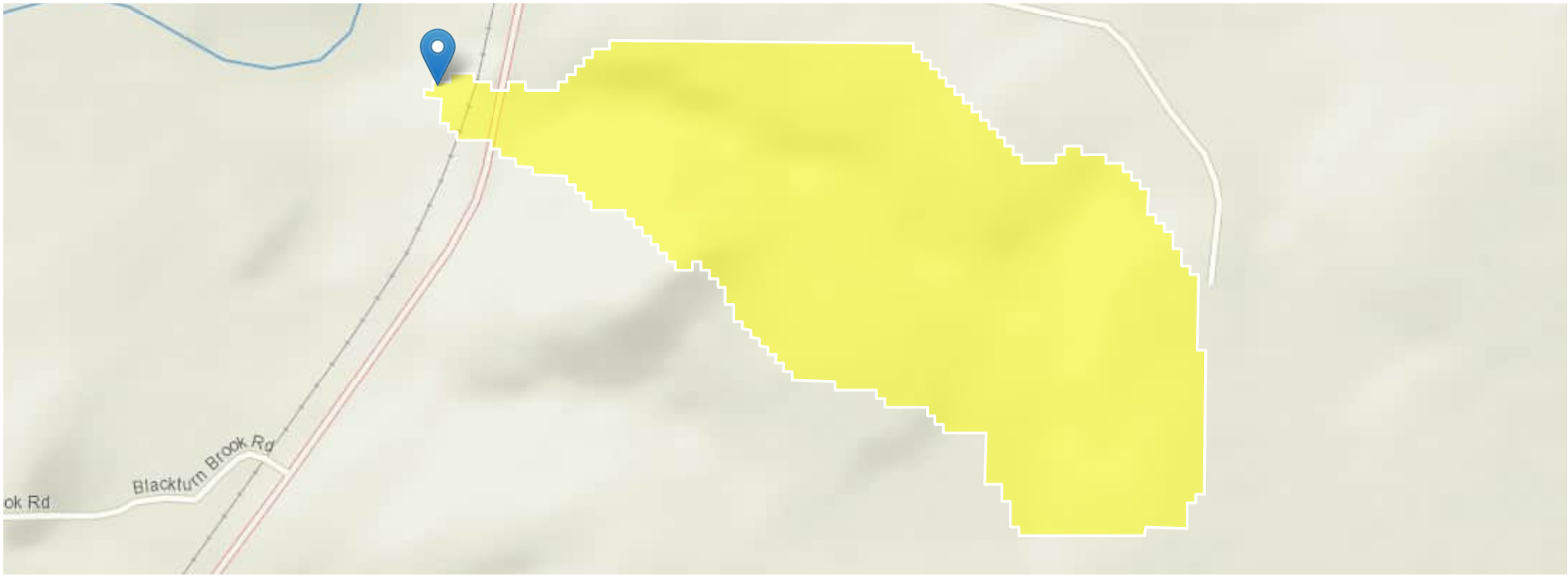
Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 6

Region ID: VT
Workspace ID: VT20240613201051794000
Clicked Point (Latitude, Longitude): 44.99895, -71.80218
Time: 2024-06-13 16:11:13 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.11	square miles
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0	percent

Parameter Code	Parameter Description	Value	Unit
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	46.2	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.11	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	0	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	46.2	inches	33.5	70.4

Peak-Flow Statistics Disclaimers [Statewide Peak Flow]

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

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

Statistic	Value	Unit
50-percent AEP flood	8.14	ft^3/s
20-percent AEP flood	13.8	ft^3/s
10-percent AEP flood	18.4	ft^3/s
4-percent AEP flood	25.5	ft^3/s
2-percent AEP flood	31.9	ft^3/s
1-percent AEP flood	39.1	ft^3/s
0.5-percent AEP flood	47.2	ft^3/s
0.2-percent AEP flood	59.5	ft^3/s

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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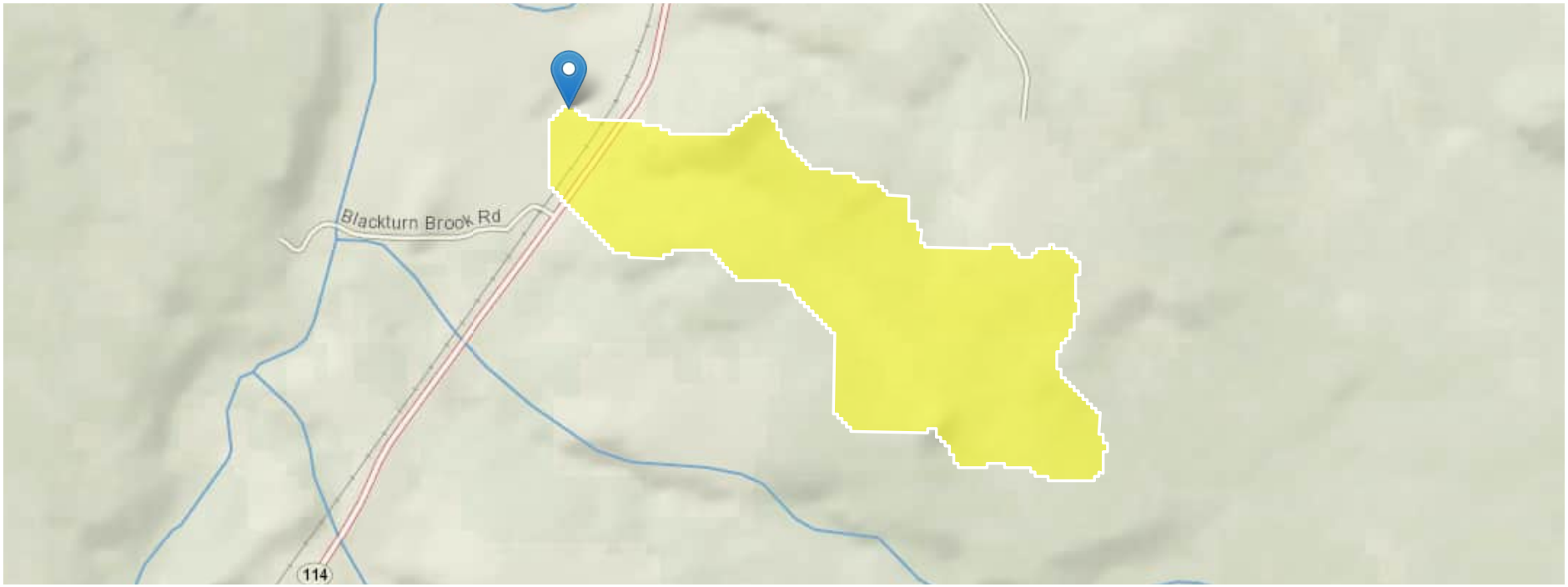
Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report 7

Region ID: VT
Workspace ID: VT20240613201552628000
Clicked Point (Latitude, Longitude): 44.99710, -71.80381
Time: 2024-06-13 16:16:12 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.19	square miles
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	2.02	percent

Parameter Code	Parameter Description	Value	Unit
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	46.3	inches

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Statewide Peak Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.19	square miles	0.18	689
LC06STOR	Percent Storage from NLCD2006	2.02	percent	0	18.5
PRECPRIS10	Mean Annual Precip PRISM 1981 2010	46.3	inches	33.5	70.4

Peak-Flow Statistics Flow Report [Statewide Peak Flow]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	9.86	ft^3/s	5.53	17.6	34.8
20-percent AEP flood	16.5	ft^3/s	9.07	30	36.1
10-percent AEP flood	21.9	ft^3/s	11.5	41.6	38.6
4-percent AEP flood	30	ft^3/s	14.9	60.4	42.5
2-percent AEP flood	37.1	ft^3/s	17.7	77.7	44.9
1-percent AEP flood	45.1	ft^3/s	20.8	97.9	47.3
0.5-percent AEP flood	54	ft^3/s	23.6	123	50.8
0.2-percent AEP flood	67.4	ft^3/s	27.7	164	55.2

Peak-Flow Statistics Citations

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078,

27 p. plus appendixes. (http://pubs.usgs.gov/sir/2014/5078/)

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Application Version: 4.20.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Estimate Wetland and Water Body

Norton, VT calculated : T.Y 6/12/2024

Estimate the wetland and waterbody checked : M.H. 6/19/2024

Streamstats No.	drainage area (mi^2)	LC06STOR	PRECIPRIS (in)	WETLAND AREA (mi^2) (DA*LC06STOR)
1	31.25	6.89	48.3	2.15
2	4.04	0.52	49.1	0.02
3	6.47	0.93	49	0.06
4	1.67	1.57	46.9	0.03
5	0.19	0	46.2	0.00
6	0.11	0	46.2	0.00
7	0.30	1.32	46.3	0.00
Total	**44.03**	5.14%		***2.26***

	Streamstats 1 only			Streamstats combined
streamstats_subwatershed drainage area (mi^2)	31.251			44.03
nhd waterbody in streamstats subwatershed (ft^2)	30025839.5			30184881.6
nhd waterbody(mi2)	1.077			1.083
nhd waterbody percentage	3.446%			2.46%
Streamstats provided LC06STOR	6.89%			5.14%
Ratio of LC06STOR/nhd waterbody	1.999			2.092

Project Drainage Area	57.93	mi^2		
nhd waterbody in DA	30393899.759	ft^2		
nhd waterbody in DA (mi2)	1.090	mi^2		
nhd waterbody percentage	1.882%			
estimated LC06STOR by multiply the Ratio	**3.76%**			**3.94%**

Note:

LC06STOR was estimated using the known streams with the main stream and the tributaries that are available for the LC06STOR.

The estimated LC06STOR result is between 3.94% and 3.76%.

The smaller LC06STOR would result in higher peak in regression method, therefore the 3.76% was used.

Estimate Annual Mean Precipitation 1981-2010

Norton, VT	calculated :	T.Y	6/18/2024
Estimate the annual precipitation	checked :	M.H.	6/19/2024

the Streamstats provide the precipitation of 1981-2010 from PRISM for Drainage area 1.	48.3	in
PRISM calculated for that streamstats watershed using PRISM 1991-2020	50.104	in
PRISM calculated for the project drainage area 1991-2020	50.098	in

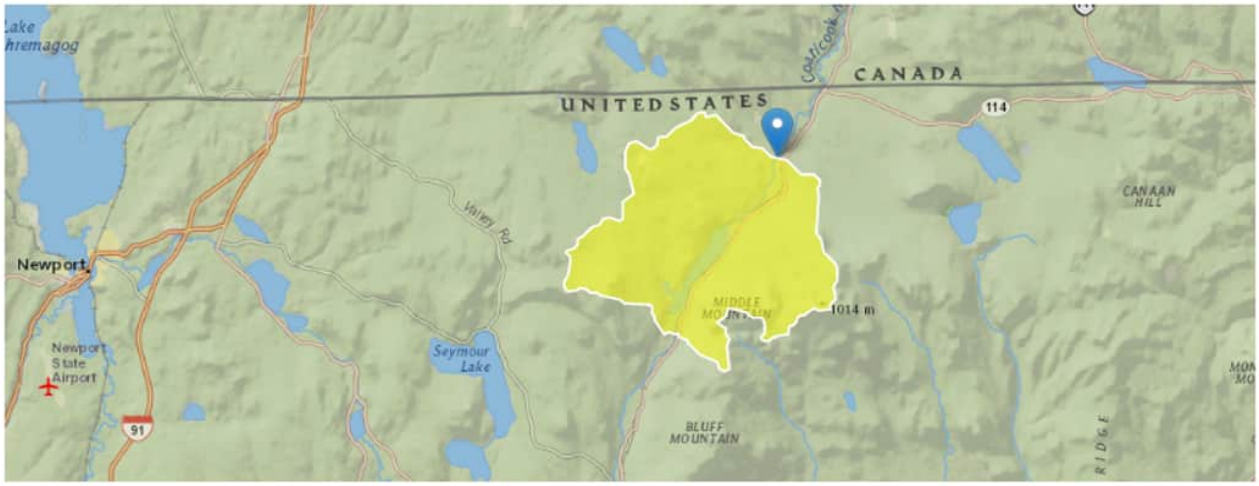
Estimated PRISM for Project drainag area 1981-2010 **48.3** in

the PRISM database: PRISM Climate Group at Oregon State University

30 years normal downloaded, currently 1991-2020 is available.
While the streamstats uses the 1981-2010 PRSIM normals.

StreamStats Report 1

Region ID: VT
Workspace ID: VT20240613195855695000
Clicked Point (Latitude, Longitude): 44.98215, -71.82134
Time: 2024-06-13 15:59:17 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	31.3	square miles

Parameter Code	Parameter Description	Value	Unit
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	6.89	percent
PRECPRIS10	Basin average mean annual precipitation for 1981 to 2010 from PRISM	48.3	inches

Regression Method

Norton, VT
Hydrologic Analysis
Vermont Regression analysis and Final Equations

Calculated by:	T.Y.	8/2/2024
Checked by:	M.H.	8/15/2024

The final Regression equations for estimating flood dicharge on ungaged, unregulated streams in rural drainage basins in Vermont:

$$Q_{50} = 0.145A^{0.900}W^{-0.274}P^{1.569}, \quad (3)$$

$$Q_{1} = 0.251A^{0.854}W^{-0.297}P^{1.809}, \quad (8)$$

$$Q_{0.2} = 0.289A^{0.844}W^{-0.309}P^{1.876}, \quad (10)$$

Where

Q_p	is the estimated flood discharge, in cubic feet per second, at the P-percent annual exceedance probability;
A	is the drainage area of the basin, in square miles;
W	is the percentage of the basin with land cover categorized as wetlands or open water, plus 1.0, from the National Land Cover Data (Fry and others, 2011) using a GIS; and
P	is the basin-wide mean of the average annual precipitation, in inches, determined with the PRISM 1981–2010 annual precipitation dataset (PRISM Group, Oregon State University, 2012a) resampled to a 800-meter-cell resolution by using bilinear interpolation.

Basin characteristics:

DA (mile^2)	A=	57.93
percentage of the basin as wetlands or openwater + 1	W=	4.76
basin-wide mean annual precipitation (in)	P=	48.3

Calculation

return period (yr)	DA Coefficient	B Coefficient	W coefficent	P coefficient	Q (cfs)	Q (rounded)
2	0.145	0.900	-0.274	1.569	1601	**1600**
100	0.251	0.854	-0.297	1.809	5626	**5630**
500	0.289	0.844	-0.309	1.876	7916	**7920**

Citation:

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes.

Simplified Regression Method

Norton, VT
Hydrologic Analysis
Vermont Simplified Regression analysis

Calculated by:	T.Y.	8/2/2024
Checked by:	M.H.	8/15/2024

Drainage-Area-Only Regression Equations, VT

The simplified regression equations for estimating flood discharges on ungaged, unregulated streams in rural drainage basins in Vermont, when basin characteristics beyond drainage area are not available, are as follows:

$$Q_{50} = 48.2A^{0.869}, \quad (21)$$

$$Q_{1} = 197A^{0.827}, \quad (26)$$

$$Q_{0.2} = 289A^{0.816}, \quad (28)$$

Where

Q_p	is the estimated flood discharge, in cubic feet per second, at the P-percent annual exceedance probability;
A	is the drainage area of the basin, in square miles;

Basin characteristics:

DA (mile^2) A= 57.93

Calculation

return period (yr)	DA Coefficient	B Coefficient	Q (cfs)	Q (rounded)
2	48.2	0.869	1641	**1640**
100	197	0.827	5654	**5650**
500	289	0.816	7933	**7930**

citation:

Olson, S.A.,2014, Estimation of flood discharges at selected annual exceedance probabilities for unregulated, rural streams in Vermont, with a section on Vermont regional skew regression, by Veilleux, A.G.: U.S. Geological Survey Scientific Investigations Report 2014–5078, 27 p. plus appendixes.

Gage Analysis

Coaticook River 1.3 km downstream of HWY143

PROJECT LOCATION

LPOE

N

0 3.25 6.5 13 Miles

Sources: Esri, HERE, Garmin, Intermap, increment P Corp, GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong K

Figure A-2

Gage Analysis with Canadian Gage

LPOE

NORTON, ESSEX COUNTY, VT

Gage Recorded Data Summary

Government of Canada | Gouvernement du Canada

Historical Hydrometric Data Search Results

Found 5 stations that matched your search in 0.008 seconds.

Save List | What's This? | Download? | View Report

Check All	Station Name	Years	Province	Station Number	Data Availability	Latitude	Longitude	Gross Drainage Area (km^2)
☑	COATICOOK (RIVIERE) À 1,3 KM EN AVAL DU PONT-ROUTE 143 À WATERVILLE	1959-2023	QC	02OE022	Flow	45°17'06" N	71°53'58" W	521
☐	COATICOOK (RIVIERE) EN AMONT DE LA CENTRALE DE COATICOOK	1930-1982	QC	02OE009	Flow and Level	45°08'41" N	71°48'45" W	334
☐	COATICOOK (RIVIERE) EN AMONT DU PONT A WATERVILLE	1978-2023	QC	02OE040	Level	45°16'42" N	71°53'25" W	515
☐	COATICOOK (RIVIERE) PRES DE NORTH-COATICOOK	1930-1972	QC	02OE010	Flow and Level	45°10'25" N	71°48'09" W	381
☐	LYSTER (LAC) AU BARRAGE À COATICOOK	2008-2023	QC	02OE073	Level	45°02'11" N	71°54'42" W	12.0

Daily Discharge Data Availability for COATICOOK (RIVIERE) À 1,3 KM EN AVAL DU PONT-ROUTE 143 À WATERVILLE (02OE022)

Download? | View Report

Flow Data Availability

This table provides a summary of daily data availability for a station.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

2023	C	C	C	C	C	C	C	C	P	-	-	-
2022	C	C	C	C	C	C	C	C	C	C	C	C
2021	C	C	C	C	C	C	C	C	C	C	C	C
2020	C	C	C	C	C	C	C	C	C	C	C	C
2019	C	C	C	C	C	C	C	C	C	C	C	C
2018	C	C	C	C	C	C	C	C	C	C	C	C
2017	C	C	C	C	C	C	C	C	C	C	C	C
2016	C	C	C	C	C	C	C	C	C	C	C	C
2015	C	C	C	C	C	C	C	C	C	C	C	C
2014	C	C	C	C	C	C	C	C	C	C	C	C
2013	C	C	C	C	C	C	C	C	C	C	C	C
2012	C	C	C	C	C	C	C	C	C	C	C	C
2011	C	C	C	C	C	C	C	C	C	C	C	C
2010	C	C	C	C	C	C	C	C	C	C	C	C
2009	C	C	C	C	C	C	C	C	C	C	C	C
2008	C	C	C	C	C	C	C	C	C	C	C	C
2007	C	C	C	C	C	C	C	C	C	C	C	C
2006	C	C	C	C	C	C	C	C	C	C	C	C
2005	-	-	P	C	C	C	C	C	C	C	C	C
2004	C	C	C	C	C	C	C	C	C	C	C	P

2003	C	C	C	C	C	C	C	C	C	C	C	C
2002	C	C	C	C	C	C	C	C	C	C	C	C
2001	C	C	C	C	C	C	C	C	C	C	C	C
2000	C	C	C	C	C	C	C	C	C	C	C	C
1999	C	C	C	C	C	C	C	C	C	C	C	C
1998	P	-	-	-	P	C	C	C	C	C	C	C
1997	C	C	C	C	C	C	C	C	C	C	C	C
1996	C	C	C	C	C	C	C	C	C	C	C	C
1995	C	C	C	C	C	C	C	C	C	C	C	C
1994	C	C	C	C	C	C	P	P	C	P	C	C
1993	C	C	C	C	C	P	-	-	P	C	C	C
1992	C	C	C	C	C	C	C	C	C	C	C	C
1991	C	C	C	C	C	C	C	C	C	C	C	C
1990	C	C	C	C	C	C	C	C	C	C	C	C
1989	C	C	C	C	C	C	C	C	C	C	C	C
1988	C	C	C	C	C	C	C	C	C	C	C	C
1987	C	C	C	C	C	C	C	C	C	C	C	C
1986	C	C	C	C	C	C	C	C	C	C	C	C
1985	C	C	C	C	C	C	C	C	C	C	C	C
1984	C	C	C	C	C	C	C	C	C	C	C	C

1983	C	C	C	C	C	C	C	C	C	C	C	C
1982	C	C	C	C	C	C	C	C	C	C	C	C
1981	C	C	C	C	C	C	P	P	P	C	C	C
1980	C	C	C	C	C	C	C	C	C	C	C	C
1979	C	C	C	C	C	C	C	C	C	C	C	C
1978	C	C	C	C	C	C	C	C	C	C	C	C
1977	C	C	C	C	C	C	C	C	C	C	C	C
1976	C	C	C	C	C	C	C	C	C	C	C	C
1975	C	C	C	C	C	C	C	C	C	C	C	C
1974	C	C	C	C	C	C	C	C	C	C	C	C
1973	C	C	C	C	C	C	C	C	C	C	C	C
1972	C	C	C	C	C	C	C	C	C	C	C	C
1971	C	C	C	C	C	P	P	P	C	P	-	P
1970	C	C	C	C	C	C	C	C	C	C	C	C
1969	C	C	C	C	C	C	C	C	C	C	C	C
1968	C	C	C	C	C	C	C	C	C	C	C	C
1967	C	C	C	C	C	C	C	C	C	C	C	C
1966	C	C	C	C	C	C	C	C	C	C	C	C
1965	C	C	C	C	C	C	C	C	C	C	C	C
1964	C	C	C	C	C	C	C	C	C	C	C	C

1963	C	C	C	C	C	C	C	C	C	C	C	C
1962	C	C	C	C	C	C	C	C	C	C	C	C
1961	C	C	C	C	C	C	C	C	C	C	C	C
1960	C	C	C	C	C	C	C	C	C	C	C	C
1959	-	-	-	-	-	-	P	C	C	C	C	C

- C = Complete Month
- P = Partial Month
- - = No Data Available

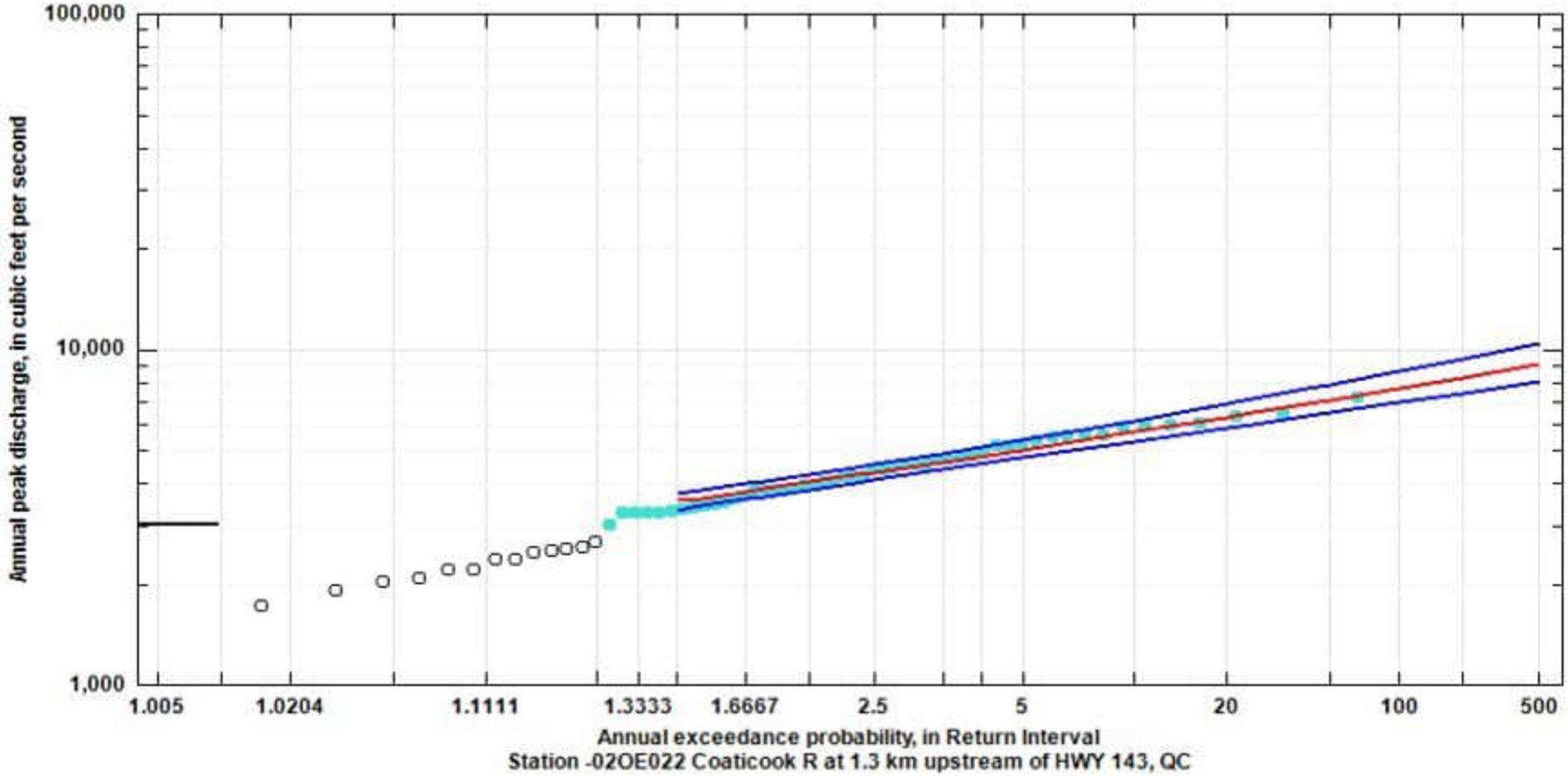
Annual Peak Flows monitored at the Gage

Annual Maximum and Minimum Daily Discharge (m3/s) (PARAM = 1)

ID	PARAM	Year	MM--DD	MAX	SYM	MM--DD	MIN	SYM
02OE022	1	1959						
02OE022	1	1960	04--01	128	E	01--03	1.84	E
02OE022	1	1961	02--27	71.1	E	02--04	1.22	E
02OE022	1	1962	04--08	98.8	E	06--17	1.84	
02OE022	1	1963	04--22	92.6	E	02--17	1.36	E
02OE022	1	1964	04--15	139		08--01	1.43	
02OE022	1	1965	09--25	58.6		09--12	1.78	
02OE022	1	1966	03--25	92.9	E	08--07	1.59	E
02OE022	1	1967	04--03	157	E	08--27	2.08	E
02OE022	1	1968	03--24	97.7	E	09--25	1.73	E
02OE022	1	1969	04--11	168		07--25	1.38	
02OE022	1	1970	04--19	147	E	07--31	1.15	
02OE022	1	1971	04--21	70.5				
02OE022	1	1972	05--05	146		10--05	1.44	E
02OE022	1	1973	12--22	92.9		08--26	1.26	
02OE022	1	1974	04--05	133		01--18	0.85	
02OE022	1	1975	04--20	111		08--25	1.08	
02OE022	1	1976	08--11	114		07--23	2.69	
02OE022	1	1977	03--15	96.3		07--26	0.37	
02OE022	1	1978	04--14	72.8		02--04	0.851	
02OE022	1	1979	03--07	118		08--07	0.935	
02OE022	1	1980	11--25	67.2		07--18	0.657	
02OE022	1	1981						
02OE022	1	1982	04--18	184		10--24	1.06	
02OE022	1	1983	12--14	124		07--18	0.842	
02OE022	1	1984	05--31	136		11--04	0.787	
02OE022	1	1985	03--29	75.2		11--01	1.05	
02OE022	1	1986	03--31	92.9		07--16	0.303	
02OE022	1	1987	04--01	114		09--05	0.727	
02OE022	1	1988	11--21	54.3		07--06	1.05	
02OE022	1	1989	03--29	126		07--21	0.456	
02OE022	1	1990	03--17	93.6		08--04	1.1	
02OE022	1	1991	04--10	62.8		08--02	0.75	
02OE022	1	1992	03--12	104		05--25	0.392	
02OE022	1	1993	04--11	108				
02OE022	1	1994	04--17	152				
02OE022	1	1995	11--13	67.5		06--22	0.526	
02OE022	1	1996	01--20	170		09--22	0.744	
02OE022	1	1997	03--30	62.8		08--10	0.654	
02OE022	1	1998				09--20	0.832	
02OE022	1	1999	09--18	108		09--03	0.37	
02OE022	1	2000	12--18	134				

02OE022	1	2001						
02OE022	1	2002	04--16	165.8		10--13	0.645	
02OE022	1	2003	03--30	112		09--22	0.785	
02OE022	1	2004						
02OE022	1	2005						
02OE022	1	2006	06--11	135.3		09--17	1.619	
02OE022	1	2007	05--17	72.34		08--02	1.387	
02OE022	1	2008	04--13	83.53		09--21	1.771	
02OE022	1	2009	12--04	96.05		09--26	1.159	
02OE022	1	2010	10--02	128		09--06	1.086	
02OE022	1	2011	04--27	179.5		08--14	0.608	
02OE022	1	2012	09--05	48.5		08--27	0.25	
02OE022	1	2013	05--26	119		08--27	0.934	
02OE022	1	2014	04--16	157		10--04	0.916	
02OE022	1	2015	06--10	155		09--26	1.49	
02OE022	1	2016	02--25	108		09--08	0.823	
02OE022	1	2017	02--26	94.1		09--22	0.648	
02OE022	1	2018	12--22	109	B	09--02	0.9	
02OE022	1	2019	11--01	149		09--16	0.388	
02OE022	1	2020	01--12	101	B	08--22	0.419	
02OE022	1	2021	05--01	84.7		08--28	0.487	
02OE022	1	2022	03--20	57.6	B	09--10	0.922	
02OE022	1	2023						

Flow Frequency Analysis



EXPLANATION
- Fitted frequency curve
- PILF (LO) threshold
- Confidence limits: 5 percent lower, 95 percent upper
- Gaged peak discharge
- PILF (LO)

ANALYSIS INFO:
Peakfq v 7.4 run 5/31/2024 3:30:07 PM
B17B using Weighted Skew option
0.189 = Skew (G); Multiple Grubbs-Beck
13 Gaged peaks below PILF (LO) Threshold

1

```
  Program PeakFq           U. S. GEOLOGICAL SURVEY             Seq.002.000
  Version 7.4         Annual peak flow frequency analysis      Run Date / Time
  5/ 4/2022                                                     05/31/2024 12:01

                         --- PROCESSING OPTIONS ---

                      Plot option         = Graphics device
                      Basin char output   = None
                      Print option        = Yes
                      Debug print         = No
                      Input peaks listing = Long
                      Input peaks format  = WATSTORE peak file

                      Input files used:
                         peaks (ascii)  -
C:\Users\USTY709043\Documents\projects\North VT Bil\hydrology\USGS\PEAKFQ.TXT

                         specifications -
C:\Users\USTY709043\Documents\projects\North VT Bil\hydrology\USGS\PKFQWPSF.TMP

                      Output file(s):
                         main - C:\Users\USTY709043\Documents\projects\North VT
Bil\hydrology\USGS\PEAKFQ.PRT


  ***  User responsible for assessment and interpretation of the following analysis
***

1


  Program PeakFq           U. S. GEOLOGICAL SURVEY             Seq.001.001
  Version 7.4         Annual peak flow frequency analysis      Run Date / Time
  5/ 4/2022                                                     05/31/2024 12:01

              Station - 02OE022 CANADA  Coaticook River Highway 143 QC


                    TABLE 1 - INPUT DATA SUMMARY

                Number of peaks in record           =       64
                Peaks not used in analysis          =        0
                Gaged peaks in analysis             =       64
                Historic peaks in analysis          =        0
                Beginning Year                      =     1959
                Ending Year                         =     2022
                Historical Period Length            =       64
                Skew option                         =   WEIGHTED
                Regional skew                       =    0.700
```

```
                Standard error                  =    0.550
                Mean Square error               =    0.303
             Gage base discharge                =      0.0
             User supplied high outlier threshold =   --
             User supplied PILF (LO) criterion  =   --
             Plotting position parameter        =     0.00
             Type of analysis                     BULL.17B
             PILF (LO) Test Method                    MGBT
             Perceptible Ranges              =   Not Applicable
             Interval Data                   =   Not Applicable


   TABLE 2 - DIAGNOSTIC MESSAGE AND PILF RESULTS


   WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.                    0.0
   EMA003I-LOW OUTLIERS WERE DETECTED USING MULTIPLE GRUBBS-BECK TEST      13
2991.0
     THE FOLLOWING PEAKS (WITH CORRESPONDING P-VALUES) WERE DROPPED:
         1713.0    (0.3999)
         1917.0    (0.3284)
         2034.0    (0.2431)
         2069.0    (0.0995)
         2217.0    (0.1325)
         2217.0    (0.0367)
         2373.0    (0.0742)
         2383.0    (0.0233)
         2489.0    (0.0290)
         2511.0    (0.0099)
         2553.0    (0.0042)
         2571.0    (0.0010)
         2655.0    (0.0008)
   WCF163I-NO HIGH OUTLIERS OR HISTORIC PEAKS EXCEEDED HHBASE.      8021.9
 **WCF164W-HISTORIC PERIOD IGNORED.    64.0
   WCF002J-CALCS COMPLETED.  RETURN CODE =  2


                    Kendall's Tau Parameters

                                    MEDIAN   No. of
                    TAU    P-VALUE    SLOPE   PEAKS
              ----------------------------------------
   GAGED PEAKS      0.038      0.664      2.906    64


1


  Program PeakFq           U. S. GEOLOGICAL SURVEY            Seq.001.002
```

Station - 01377000 Hackensack River at Rivervale NJ

TABLE 3 - ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	3.5834	0.1455	-0.439
BULL.17B ESTIMATE	0.0	0.7969	3.6078	0.1113	0.189

BULL.17B ESTIMATE OF MSE OF AT-SITE SKEW 0.0843

TABLE 4 - ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	<-- FOR BULLETIN 17B ESTIMATES --> LOG VARIANCE OF EST.	CONFIDENCE INTERVALS 5.0% LOWER	95.0% UPPER
0.9950		1409.	--	--	--
0.9900		1580.	--	--	--
0.9500		2124.	--	--	--
0.9000		2462.	--	--	--
0.8000		2917.	--	--	--
0.6667	3606.	3388.	----	3401.0	3804.0
0.5000	4020.	3926.	----	3811.0	4240.0
0.4292	4209.	4163.	----	3993.0	4445.0
0.2000	5015.	5104.	----	4735.0	5362.0
0.1000	5656.	5777.	----	5296.0	6129.0
0.0400	6452.	6530.	----	5971.0	7116.0
0.0200	7039.	7031.	----	6457.0	7862.0
0.0100	7623.	7490.	----	6934.0	8616.0
0.0050	8208.	7914.	----	7405.0	9384.0
0.0020	8991.	8432.	----	8028.0	10430.0

1

Station - 01377000 Hackensack River at Rivervale NJ

TABLE 5 - INPUT DATA LISTING

WATER YEAR	PEAK VALUE	PEAKFQ CODES	REMARKS
1942	4167.0		
1943	4520.0		
1944	2511.0		
1945	3489.0		
1946	3270.0		
1947	4908.0		
1948	2069.0		
1949	3280.0		
1950	5544.0		
1951	3450.0		
1952	5932.0		
1953	5191.0		
1954	2489.0		
1955	5155.0		
1956	3280.0		
1957	4696.0		
1958	3919.0		
1959	4025.0		
1960	3400.0		
1961	2571.0		
1962	4167.0		
1963	2373.0		
1964	4378.0		
1965	6497.0		
1966	4378.0		
1967	4802.0		
1968	2655.0		
1969	3280.0		
1970	4025.0		
1971	1917.0		
1972	4449.0		
1973	3305.0		
1974	2217.0		
1975	3672.0		
1976	3813.0		
1977	5367.0		
1978	2383.0		
1979	6003.0		
1980	2217.0		
1981	7203.0		
1982	3813.0		
1983	4732.0		
1984	5861.0		
1985	5861.0		

1986	3955.0
1987	3813.0
1988	5544.0
1989	4767.0
1990	2553.0
1991	4520.0
1992	3393.0
1993	4520.0
1994	6356.0
1995	1713.0
1996	4202.0
1997	5544.0
1998	5473.0
1999	3813.0
2000	3323.0
2001	3849.0
2002	5261.0
2003	3566.0
2004	2991.0
2005	2034.0

Explanation of peak discharge qualification codes

PeakFQ CODE	NWIS CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
O	O	Opportunistic peak
H	7	Historic peak

- Minus-flagged discharge -- Not used in computation
  -8888.0 -- No discharge value given
- Minus-flagged water year -- Historic peak used in computation

Station - 01377000 Hackensack River at Rivervale NJ

TABLE 6 - EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	B17B ESTIMATE
1981	7203.0	0.0154	0.0154
1965	6497.0	0.0308	0.0308
1994	6356.0	0.0462	0.0462
1979	6003.0	0.0615	0.0615
1952	5932.0	0.0769	0.0769
1984	5861.0	0.0923	0.0923
1985	5861.0	0.1077	0.1077
1950	5544.0	0.1231	0.1231
1988	5544.0	0.1385	0.1385
1997	5544.0	0.1538	0.1538
1998	5473.0	0.1692	0.1692
1977	5367.0	0.1846	0.1846
2002	5261.0	0.2000	0.2000
1953	5191.0	0.2154	0.2154
1955	5155.0	0.2308	0.2308
1947	4908.0	0.2462	0.2462
1967	4802.0	0.2615	0.2615
1989	4767.0	0.2769	0.2769
1983	4732.0	0.2923	0.2923
1957	4696.0	0.3077	0.3077
1943	4520.0	0.3231	0.3231
1991	4520.0	0.3385	0.3385
1993	4520.0	0.3538	0.3538
1972	4449.0	0.3692	0.3692
1964	4378.0	0.3846	0.3846
1966	4378.0	0.4000	0.4000
1996	4202.0	0.4154	0.4154
1942	4167.0	0.4308	0.4308
1962	4167.0	0.4462	0.4462
1959	4025.0	0.4615	0.4615
1970	4025.0	0.4769	0.4769
1986	3955.0	0.4923	0.4923
1958	3919.0	0.5077	0.5077
2001	3849.0	0.5231	0.5231
1976	3813.0	0.5385	0.5385
1982	3813.0	0.5538	0.5538
1987	3813.0	0.5692	0.5692
1999	3813.0	0.5846	0.5846
1975	3672.0	0.6000	0.6000
2003	3566.0	0.6154	0.6154
1945	3489.0	0.6308	0.6308
1951	3450.0	0.6462	0.6462
1960	3400.0	0.6615	0.6615
1992	3393.0	0.6769	0.6769
2000	3323.0	0.6923	0.6923

1973	3305.0	0.7077	0.7077
1949	3280.0	0.7231	0.7231
1956	3280.0	0.7385	0.7385
1969	3280.0	0.7538	0.7538
1946	3270.0	0.7692	0.7692
2004	2991.0	0.7846	0.7846
1968	2655.0	0.8000	0.8000
1961	2571.0	0.8154	0.8154
1990	2553.0	0.8308	0.8308
1944	2511.0	0.8462	0.8462
1954	2489.0	0.8615	0.8615
1978	2383.0	0.8769	0.8769
1963	2373.0	0.8923	0.8923
1974	2217.0	0.9077	0.9077
1980	2217.0	0.9231	0.9231
1948	2069.0	0.9385	0.9385
2005	2034.0	0.9538	0.9538
1971	1917.0	0.9692	0.9692
1995	1713.0	0.9846	0.9846

1

End PeakFQ analysis.
Stations processed : 1
Number of errors : 0
Stations skipped : 0
Station years : 64

Data records may have been ignored for the stations listed below.
(Card type must be Y, Z, N, H, I, 2, 3, 4, or *.)
(2, 4, and * records are ignored.)

For the station below, the following records were ignored:

FINISHED PROCESSING STATION: 01377000 USGS Hackensack River at Rivervale

For the station below, the following records were ignored:

FINISHED PROCESSING STATION:

Gage Transpose Method

Norton, VT
Hydrologic Analysis
Gage Transpose Method

Calculated by:	T.Y.	7/31/2024
Checked by:	M.H.	8/10/2024

Gage Transpose Method

The frequency-discharge data of a stream can be estimated using the following discharge -drainage ratio formula, as an alternative method to verify the result (U.S. Department of the Interrior)

$$Q_1/Q_2 = (A_1/A_2)^x$$

Where

Q_1, Q_2	are the discharges at specific locations,
A_1, A_2	is the drainage area of these locations,
x	an exponent that varies from 0.75 to 1.0*

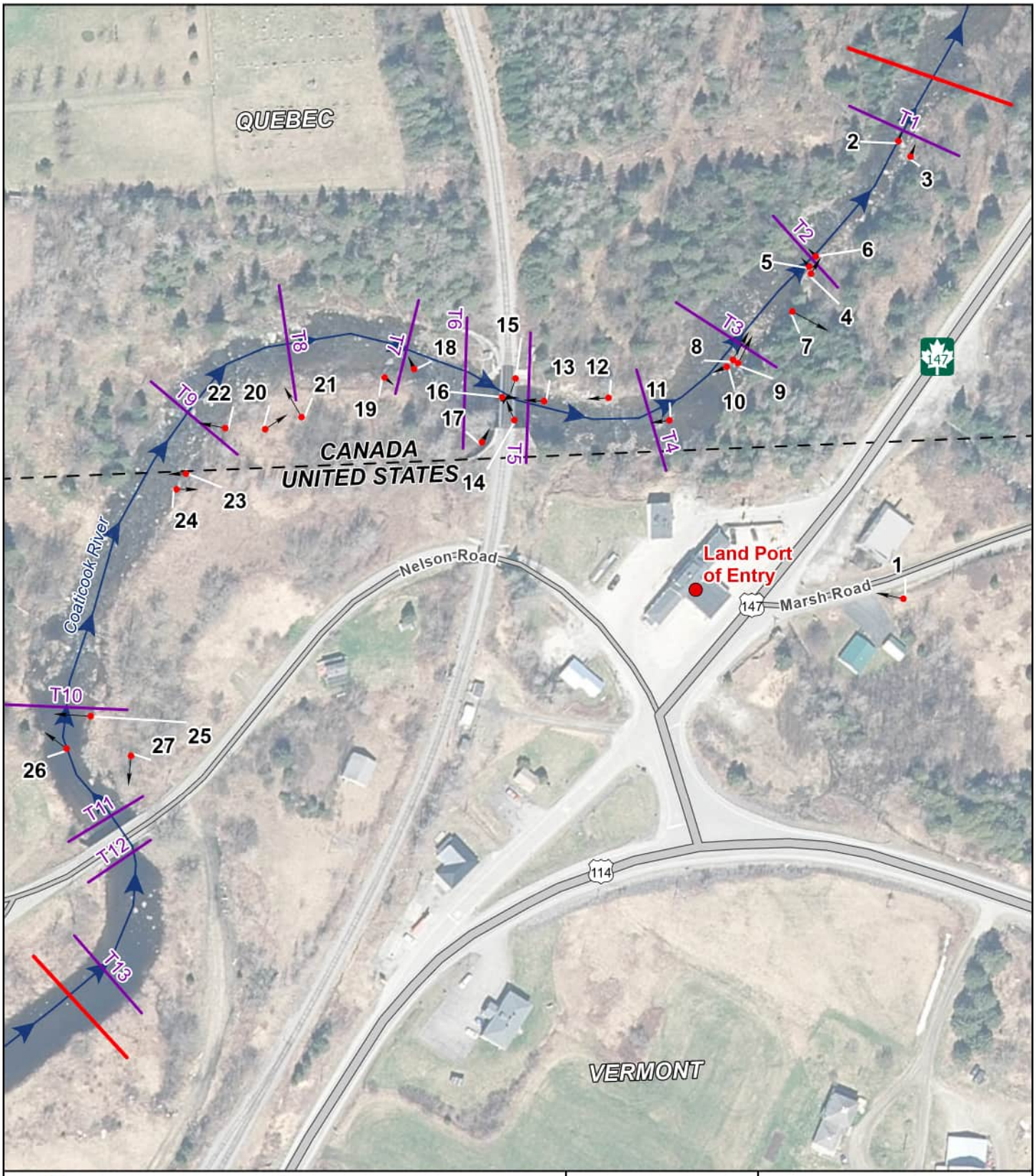
Calculation

return period (yr)	A_1 (mi^2)	A_2 (mi^2)	Q_1 (cfs)	Q_2 (cfs) when x=0.75	Q_2 (cfs) when x=1
2	201	57.93	3926	**1544**	1132
100	201	57.93	7490	**2946**	2159
500	201	57.93	8432	**3317**	2430

note:

*Currently no FEMA Flood Insurance Study (FIS) available for project area, the Washington County FIS(50023CV001A) nearby that has used the transpose method where the exponent x is available is referenced.

APPENDIX B PHOTOS AND FIELD NOTES



Norton Land Port of Entry
Survey Cross Sections
Photo Direction
Limit of Study
Coaticook River
Roads
Highway
United States / Canada Border

Figure B1
Photo Location Map
GSA LPOE Norton
Essex County, VT

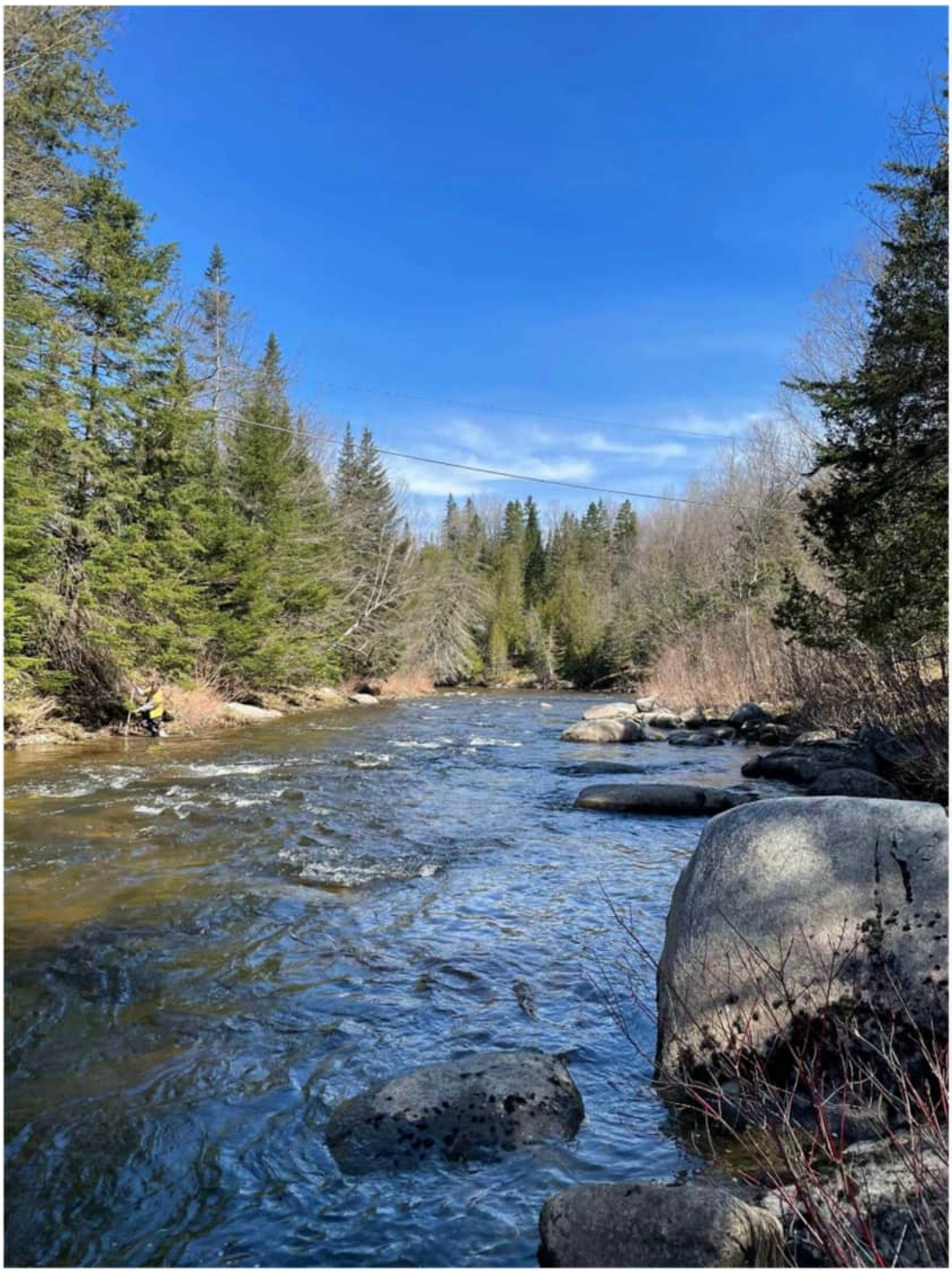
0 100 200 Feet

N

Notes : Data Sources: ESRI Aerial Imagery, Date Exported: 8/29/2024 10:12 AM, Vertical Datum: NAVD88

1.The Norton Vermont LPOE with the CN Railway bridge over the Coaticook River in the background.

2. A view of the Coaticook River looking north in the vicinity of transect T1 at the northern end of the study area.

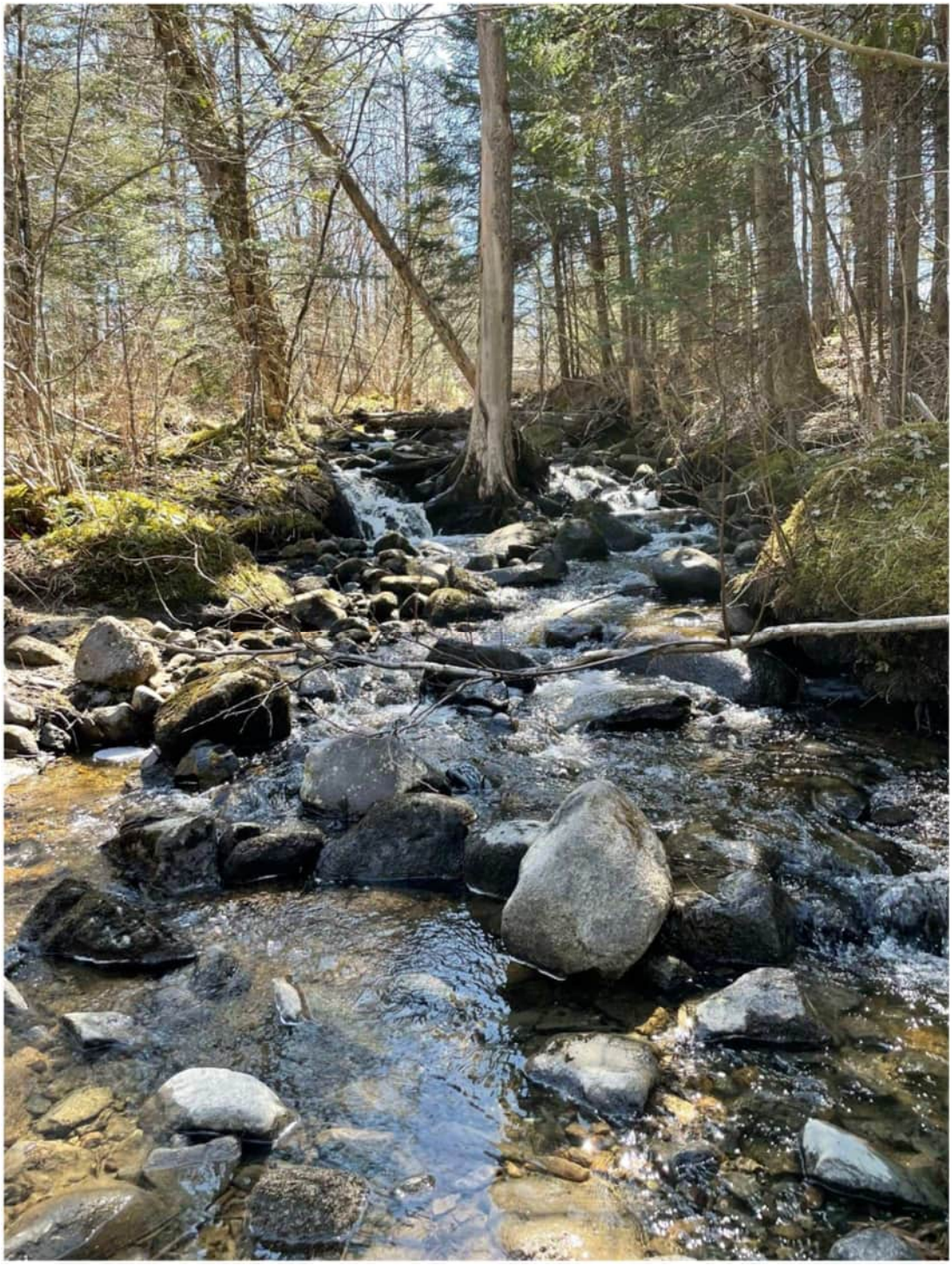


3. Field staff collecting bank height and depth measurements in the Coaticook River at transect T1.

4.A view of the Coaticook River looking north in the vicinity of transect T2.

5. Field staff collecting depth measurements at Transect T2.

6.Field staff collecting depth measurements at Transect T2.



7.A stream flowing into the Coaticook River from the east near transect T3.

8. A view of the Coaticook River looking north in the vicinity of transect T3.

9. A view of the Coaticook River looking north in the vicinity of transect T3.

10.A view of the Coaticook River in the vicinity of transect T3 looking south toward the CN Railway bridge.

11. A view of the Coaticook River in the vicinity of transect T4 looking south toward the CN Railway bridge.

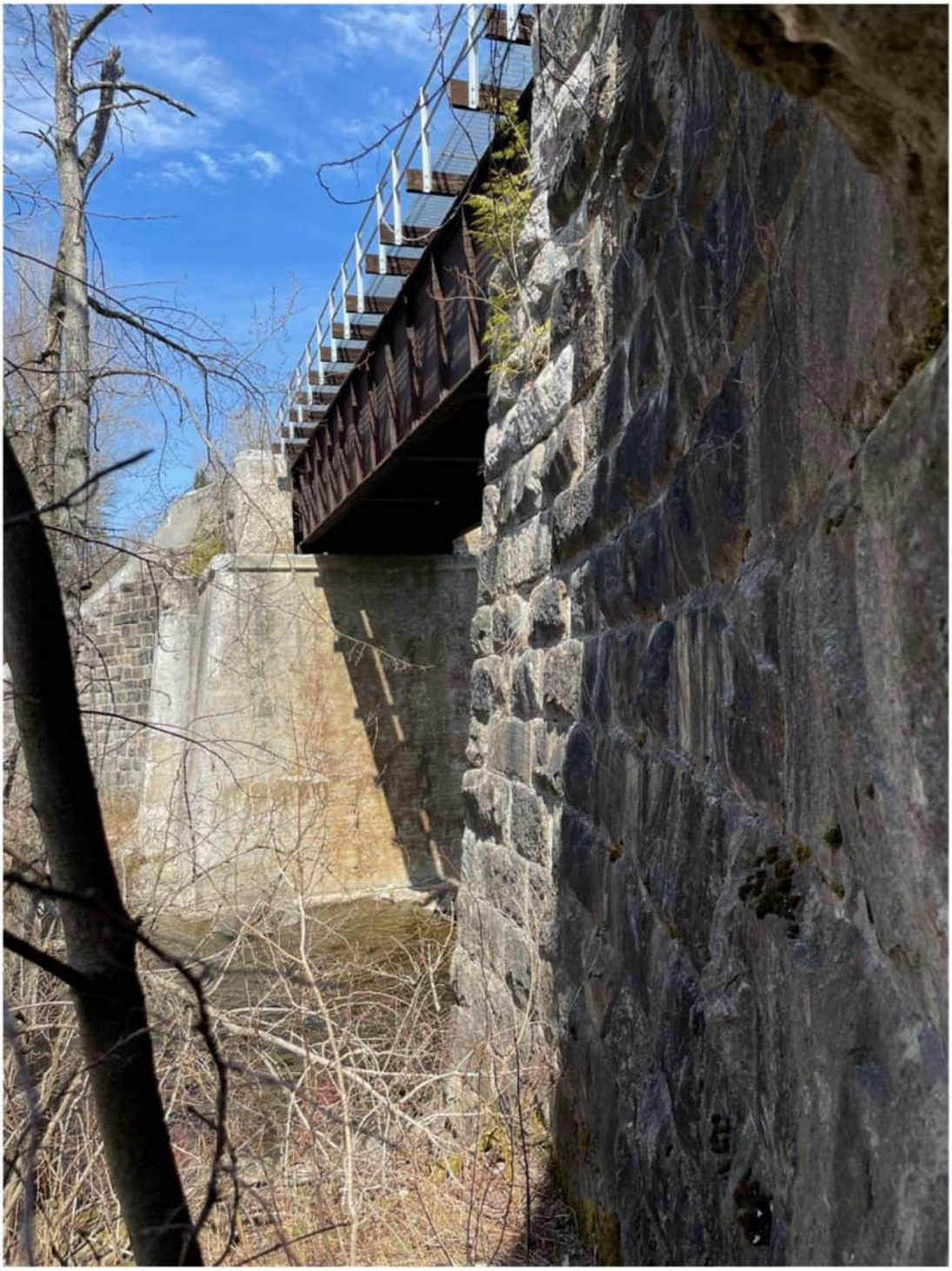
12. A view of the CN Railway bridge from the Coaticook River looking south in the vicinity of transect T4.

13.A view of the CN Railway bridge from the Coaticook River looking south, approaching transect T5.

14. A view of the CN Railway bridge from below at transect T5.

15. Field staff preparing to collect bank height and depth measurements near the CN Railway bridge at transects T5 and T6.

16. A view of the CN Railway bridge from below at transect T5.



17. A view of the CN Railway bridge and its abutments looking west near transect T6.

18. A view from the eastern bank of the Coaticook River in the vicinity of transect T7.

19.The eastern bank of the Coaticook River near transect T7.

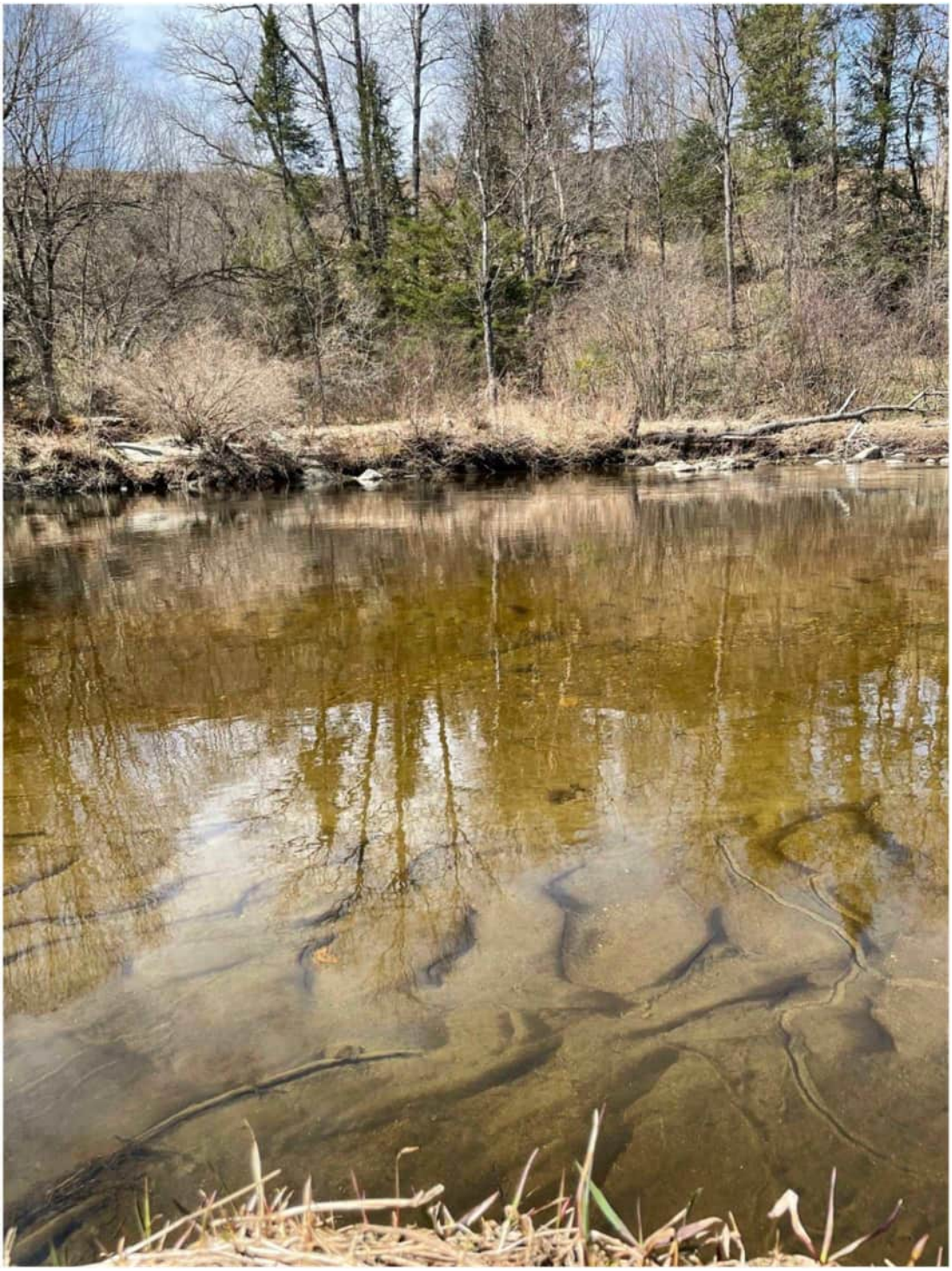
20. A view of the Coaticook River from the eastern bank in the vicinity of transect T8.

21. Field staff collecting bank height measurements on the western bank of the Coaticook River at transect T8.

22. A view of the Coaticook River facing west in the vicinity of transect T9.

23. A view of the Coaticook River facing west from the U.S.–Canada border.

24. A U.S.–Canada border marker on the eastern bank of the Coaticook River.



25. A view of the Coaticook River facing west in the vicinity of transect T10.

26. Field staff collecting bank height measurements on the western bank of the Coaticook River at transect T10.

27. A view of the automobile bridge spanning the Coaticook River along Nelson Road approaching transect T11 from the north.

Norton, Vermont LPOE - H&H study data collection

Field visit date: 4/17/2024
visit by: JD

Transect	TOB east	TOB west	depth 1	depth 2 (max)	depth 3
T1	1'	1'	2'3"	3'4"	2'9"
T2	10"	11'6"	1'3"	2'1"	1'10"
T3	8"	1'6"	1'8"	2'	1'6"
T4	1'	1'	1'7"	2'10"	2'
T5	9"	2'10"	1'2"	3'8"	2'
T6	2'	1'8"	2'2"	2'1"	1'6"
T7	1'5"	2'4"	2'10"	3'	1'10"
T8	8"	2'2"	1'4"	2'8"	2'6"
T9	6'6"	3'	1'5"	2'10"	1'6"
T10	1'8"	3'	2'4"	5'2"	3'2"
T11	1'8"	3'	3'	4'	2'2"
T12	2'6"	3'	3'6"	5'1"	2'2"
T13	3'	4'6"	3'5"	6'	3'

Notes
All data were collected on April 17, 2024
Transects are numbered from north to south
Depths are numbered from east to west
Maximum depth at T13 was estimated for safety reasons TOB - Distance from top of bank to water surface

Bridge Measurements	Span	Deck Thickness	Bottom of deck to water surface
Railroad bridge	see notes	4-5'	30'
Nelson Rd Bridge	67'6"	1'6"	18'6"

Notes
Railroad bridge span could not be safely measured. Will need to measure from aerial imagery.
Railroad bridge deck thickness was estimated from below for safety reasons and lack of entry rights for railroad property.

APPENDIX C HYDRAULICS AND MODEL OUTPUT

USGS one meter x27y499 VT Connecticut River 2016 Source of Terrain data

View

Dates

Publication Date :
2020-03-30
Start Date :
2016-11-01
End Date :
2016-11-19
File Modification Date :
2020-11-17 20:57:43

Citation

U.S. Geological Survey, 20200330, USGS one meter x27y499 VT Connecticut River 2016: U.S. Geological Survey.

Summary

This is a tile of the standard one-meter resolution digital elevation model (DEM) produced through the 3D Elevation Program (3DEP). The elevations in this DEM represent the topographic bare-earth surface. USGS standard one-meter DEMs are produced exclusively from high resolution light detection and ranging (lidar) source data of one-meter or higher resolution. One-meter DEM surfaces are seamless within collection projects, but, not necessarily seamless across projects. The spatial reference used for tiles of the one-meter DEM within the conterminous United States (CONUS) is Universal Transverse Mercator (UTM) in units of meters, and in conformance with the North American Datum of 1983 (NAD83). All bare earth elevation values are in [...]

Contacts

Originator :
U.S. Geological Survey (/catalog/catalogParty/show?partyId=U.S.+Geological+Survey)
Publisher :
U.S. Geological Survey (/catalog/catalogParty/show?partyId=U.S.+Geological+Survey)
Metadata Contact :
U.S. Geological Survey (/catalog/catalogParty/show?partyId=U.S.+Geological+Survey)
Distributor :
U.S. Geological Survey (/catalog/catalogParty/show?partyId=U.S.+Geological+Survey)

Attached Files

Related External Resources

Type: Online Link

Web Link	http://nationalmap.gov/elevation.html (http://nationalmap.gov/elevation.html)
Web Link	http://nationalmap.gov/viewer.html (http://nationalmap.gov/viewer.html)

Type: webLink

3D Elevation Program (3DEP) Metadata	http://nationalmap.gov/3DEP/3dep_prodmetadata.html (http://nationalmap.gov/3DEP/3dep_prodmetadata.html)

Type: browseImage

Thumbnail JPG image	https://prd-tnm.s3.amazonaws.com/StagedProducts/Elevation/1m/Projects/VT_Connecticut_River_2016/browse/USGS_one_meter_x27y499_VT_Connecticut_River_2016_thumb.jpg (https://prd-tnm.s3.amazonaws.com/StagedProducts/Elevation/1m/Projects/VT_Connecticut_River_2016/browse/USGS_one_meter_x27y499_VT_Connecticut_River_2016_thumb.jpg)

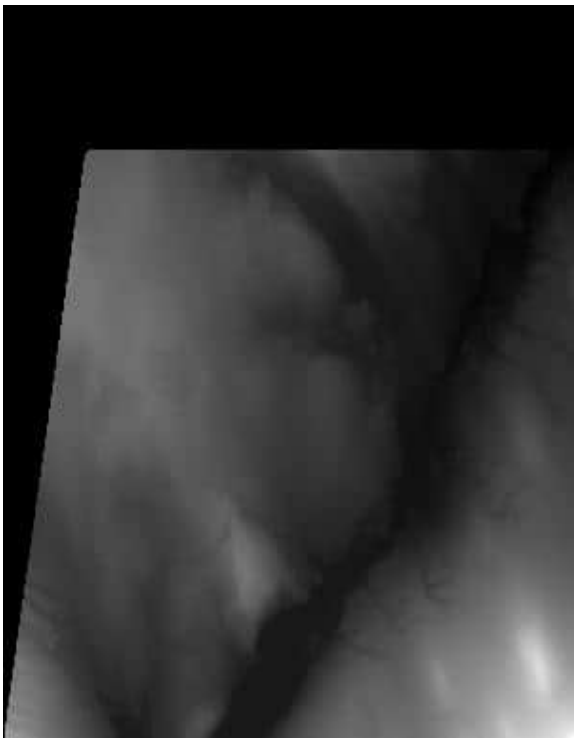
Type: download

TIFF	https://prd-tnm.s3.amazonaws.com/StagedProducts/Elevation/1m/Projects/VT_Connecticut_River_2016/TIFF/USGS_one_meter_x27y499_VT_Connecticut_River_2016.tif (https://prd-tnm.s3.amazonaws.com/StagedProducts/Elevation/1m/Projects/VT_Connecticut_River_2016/TIFF/USGS_one_meter_x27y499_VT_Connecticut_River_2016.tif)

Purpose

The 3DEP data serves as the elevation layer of The National Map, and provides basic elevation information for earth science studies and mapping applications in the United States. The data are utilized by the scientific and resource management communities for global change research, hydrologic modeling, resource monitoring, mapping and visualization, and many other applications.

Preview Image



Thumbnail JPG image

Map » (/catalog/item/imap/5eace84482cefae35a248ff8)

(/catalog/item/imap/5eace84482cefae35a248ff8)

Communities

- National Geospatial Program
- The National Map ❋

Tags

Theme : 1 meter DEM (/catalog/items?q=&filter=tags%3D1+meter+DEM), 1 meter DEM (/catalog/items?q=&filter=tags%3D1+meter+DEM), 10,000 meter DEM (/catalog/items?q=&filter=tags%3D10%2C000+meter+DEM), 10,000 meter DEM (/catalog/items?q=&filter=tags%3D10%2C000+meter+DEM), 10000 x 10000 meter (/catalog/items?q=&filter=tags%3D10000+x+10000+meter), 3D Elevation Program (/catalog/items?

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Place : US (/catalog/items?q=&filter=tags%3DUS), United States (/catalog/items?q=&filter=tags%3DUnited+States)

Provenance

Data source : NGP Product Inventory System

Additional Information

Identifiers

Type	Scheme	Key
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Item Actions

View Item as ...

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ATOM (/catalog/item/5eace84482cefae35a248ff8?format=atom)

ISO XML (/catalog/item/5eace84482cefae35a248ff8?format=isohtml)

Save Item as ...

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ISO XML (/catalog/item/download/5eace84482cefae35a248ff8?format=iso)

View Item...

Metrics (/catalog/item/metrics/5eace84482cefae35a248ff8)

FIG C-1

HEC-RAS Model Setup with Cross section, bridge and field visit labels

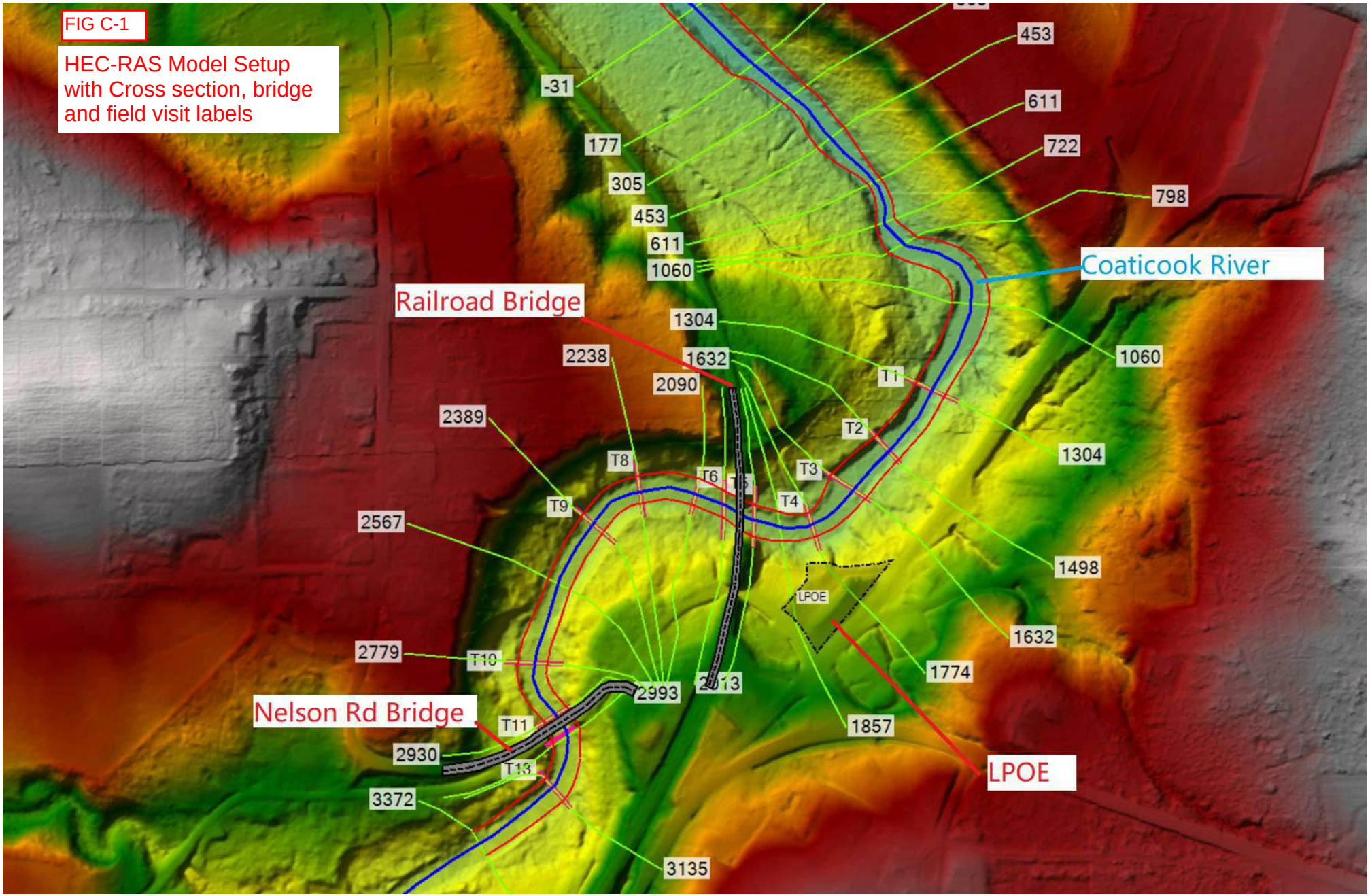
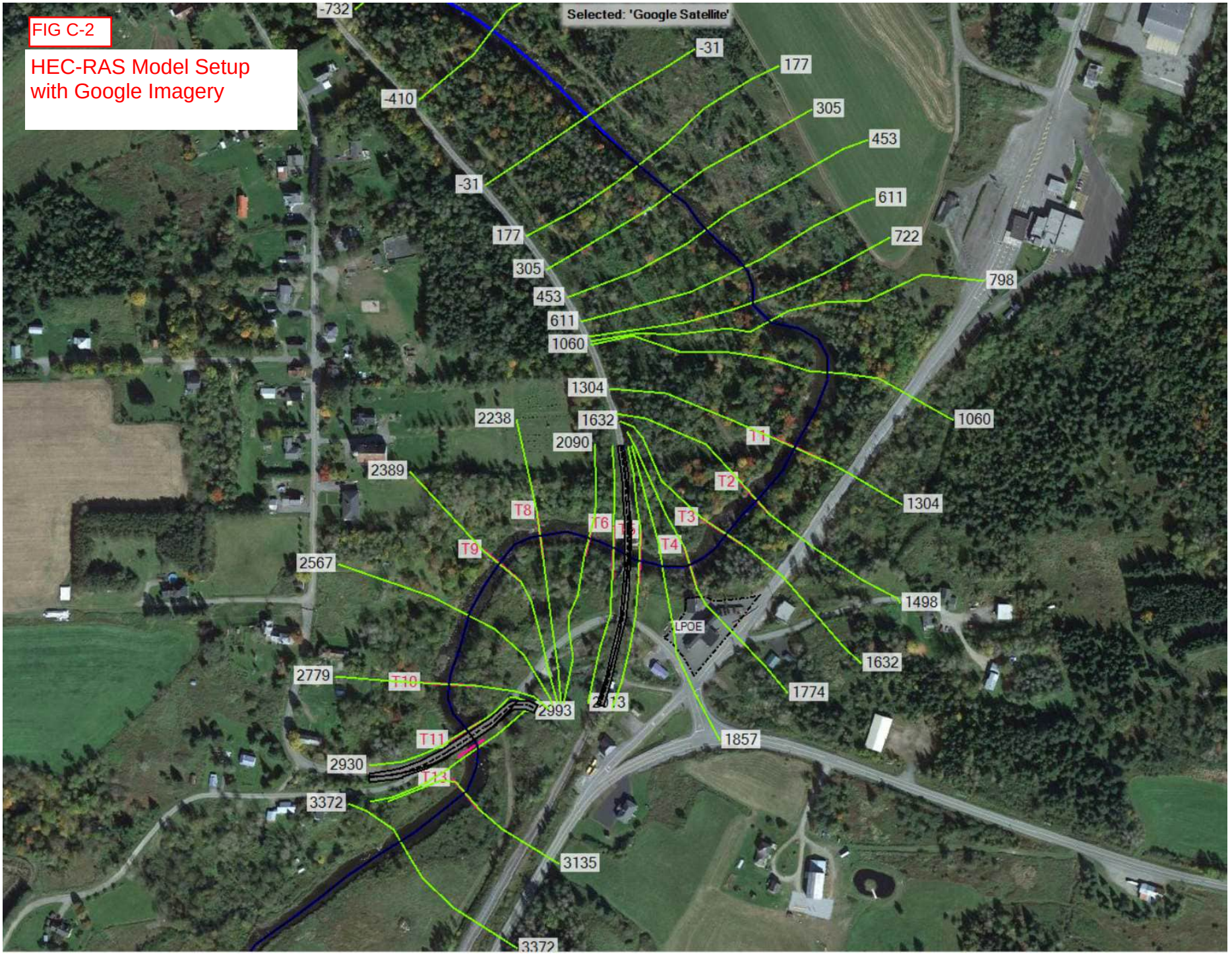
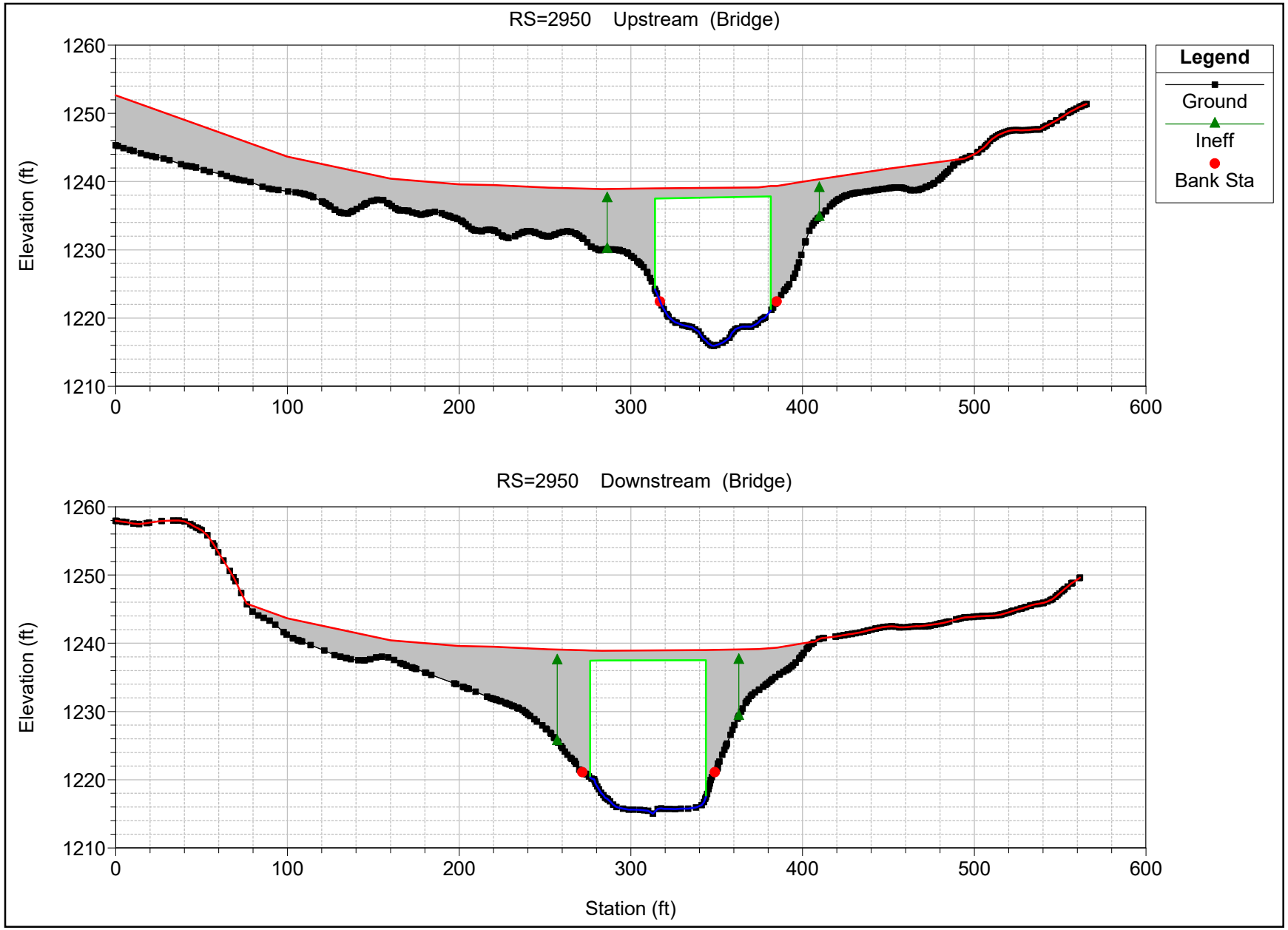


FIG C-2

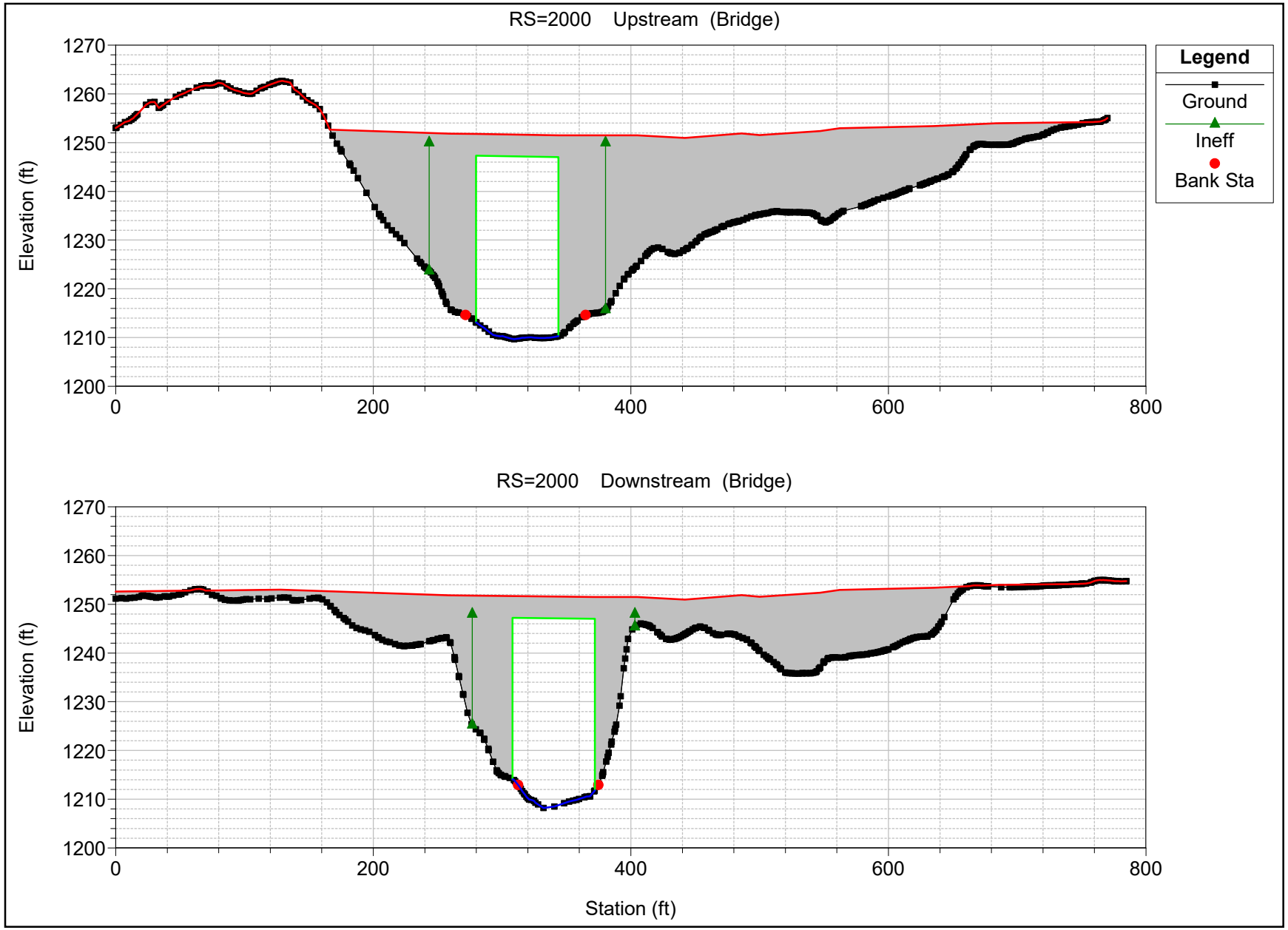
HEC-RAS Model Setup with Google Imagery



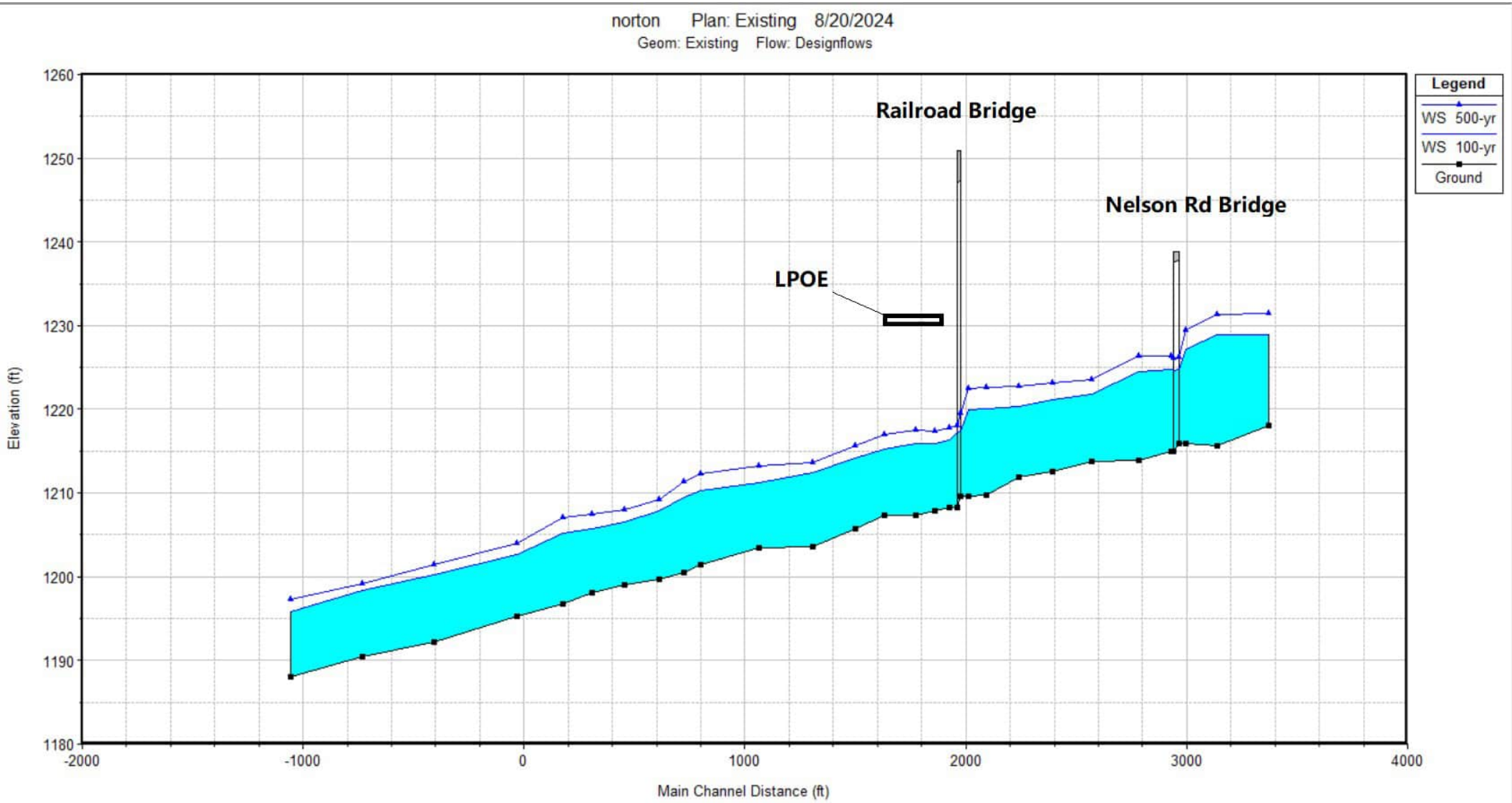
Nelson Rd Bridge Setup

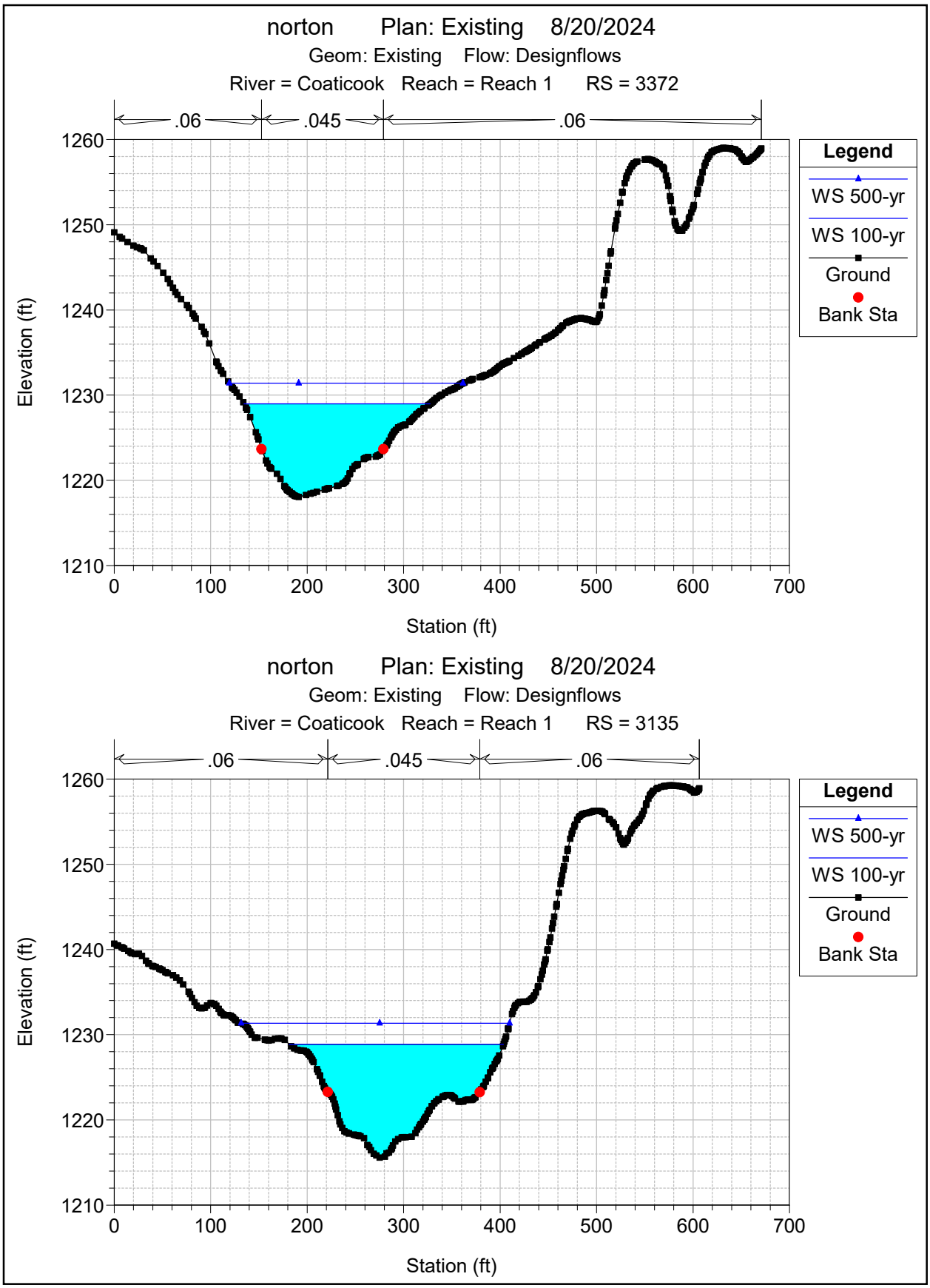


Railroad Bridge Setup



Water Surface Elevations Longitudinal Profile

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Legend
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WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
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1250
1240
1230
1220
1210
0
100
200
300
400
500
600
700
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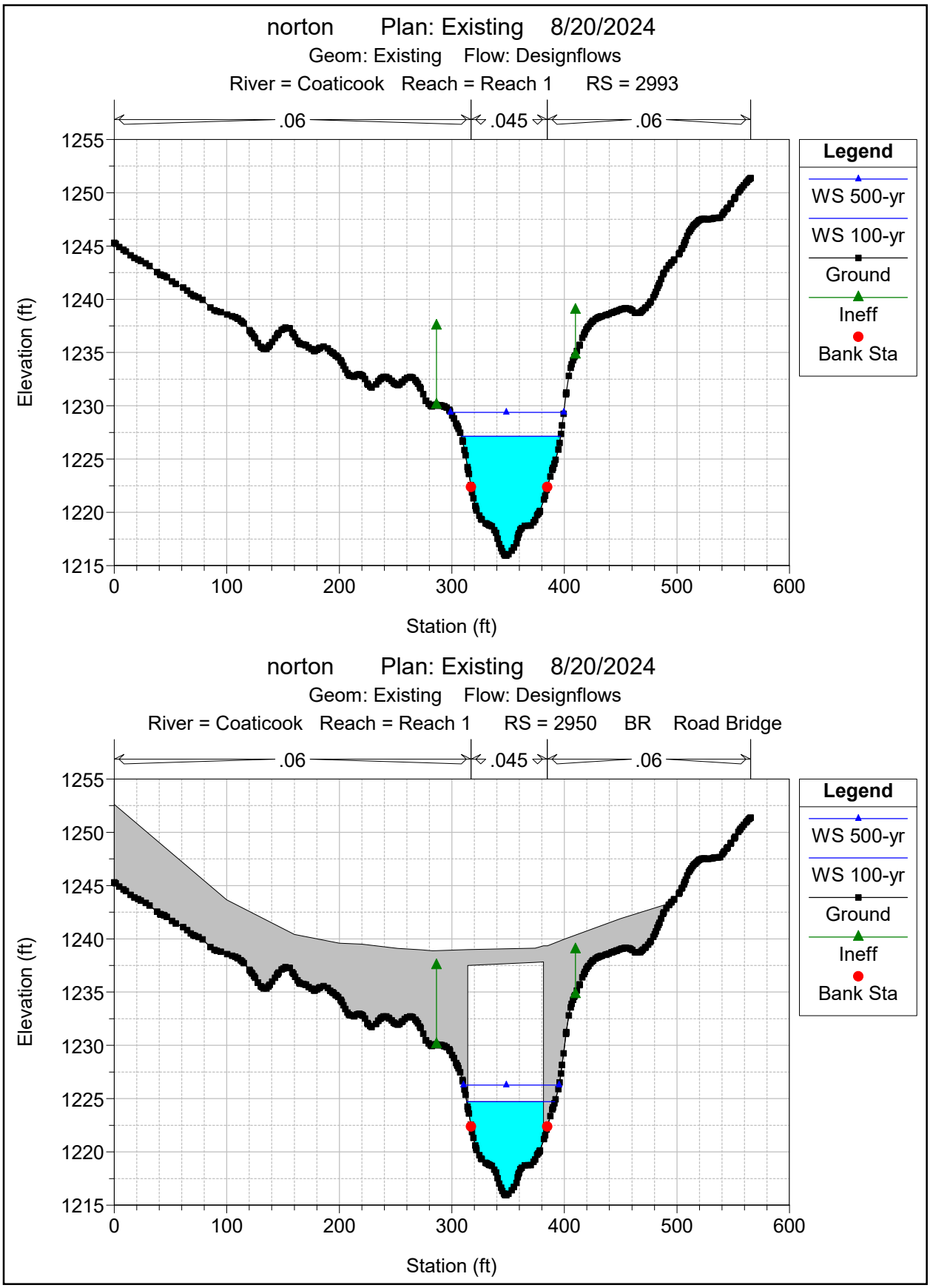
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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Geom: Existing Flow: Designflows
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Legend
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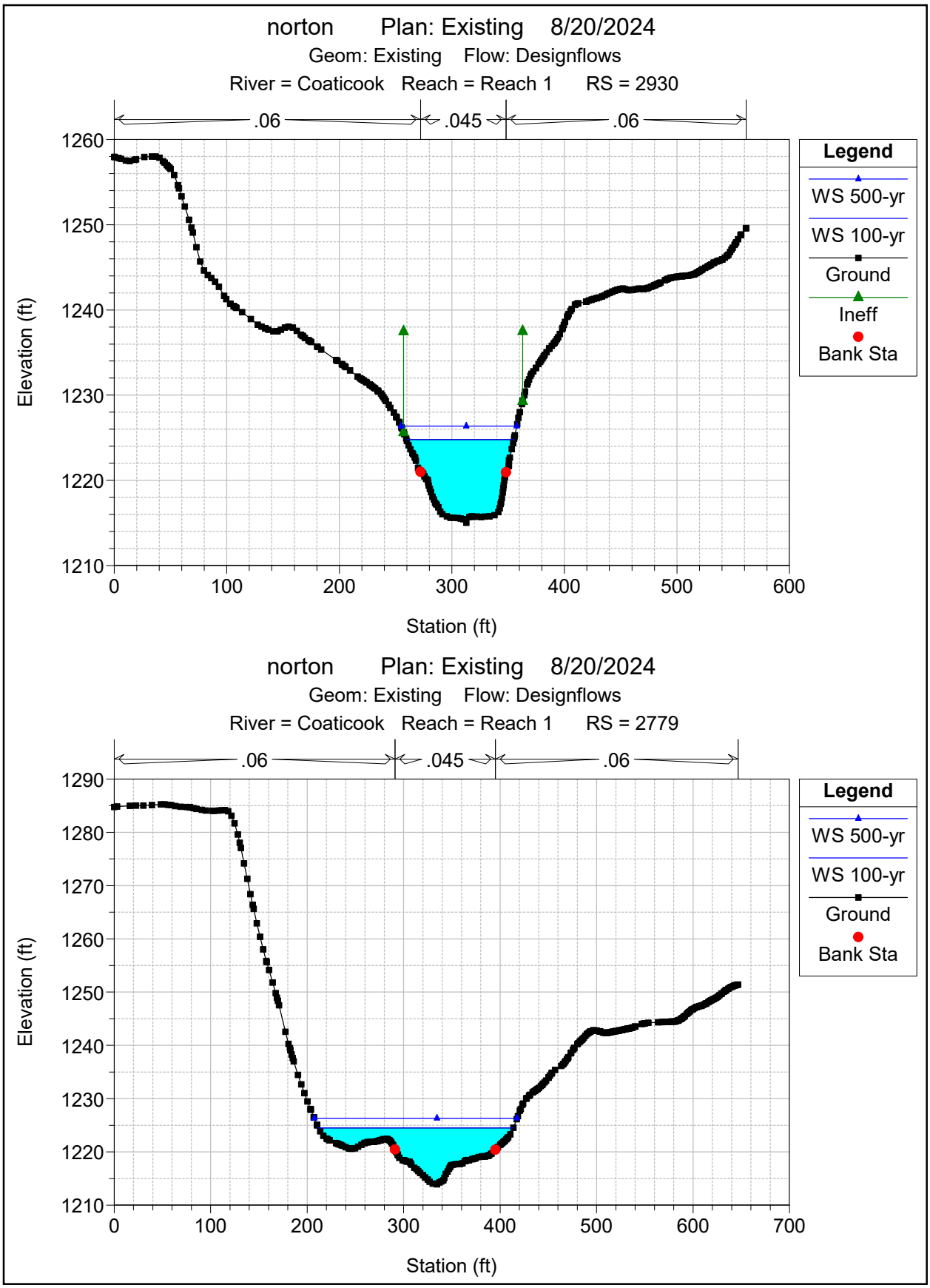
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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1250
1240
1230
1220
1210
0
100
200
300
400
500
600
Station (ft)
Legend
WS 500-yr
WS 100-yr
Ground
Ineff
Bank Sta
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Geom: Existing Flow: Designflows
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Elevation (ft)
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1280
1270
1260
1250
1240
1230
1220
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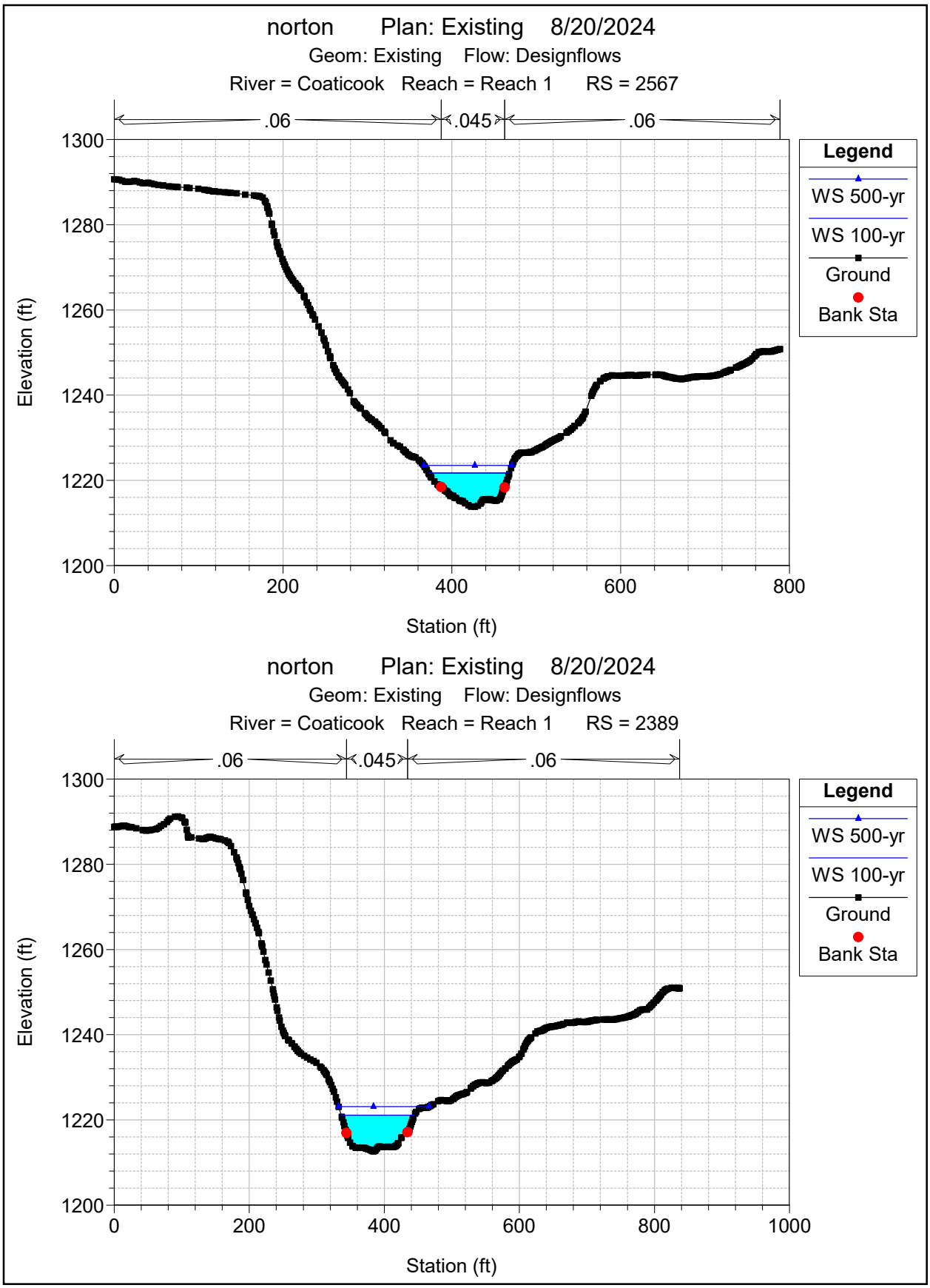
500
600
700
Station (ft)
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta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WS 100-yr
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Bank Sta
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1240
1220
1200
0
200
400
600
800
Station (ft)
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Geom: Existing Flow: Designflows
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Legend
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WS 100-yr
Ground
Bank Sta
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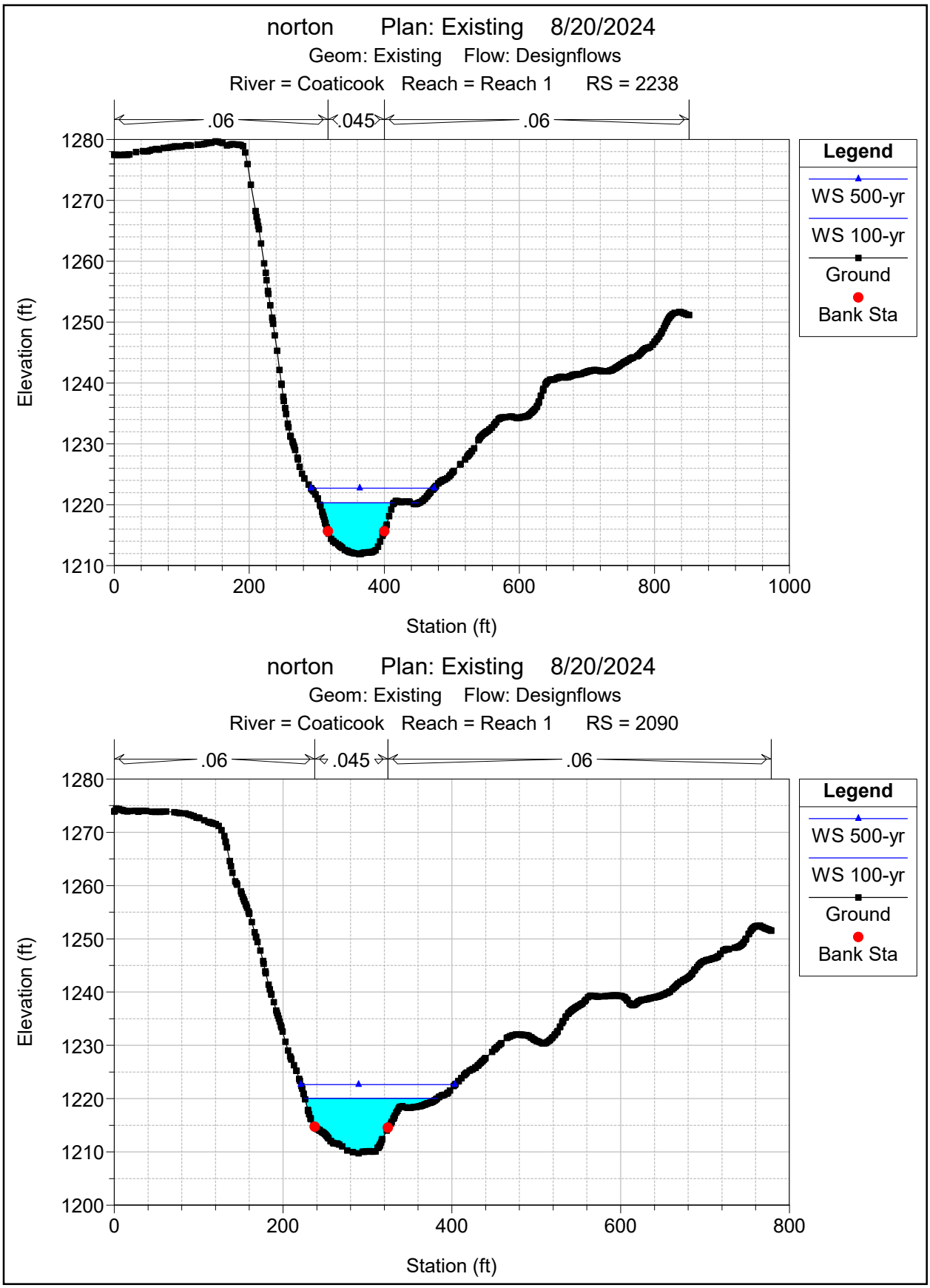
Station (ft)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Ground
Bank Sta
Elevation (ft)
Station (ft)
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1250
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1220
1210
0
200
400
600
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Ground
Bank Sta
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600
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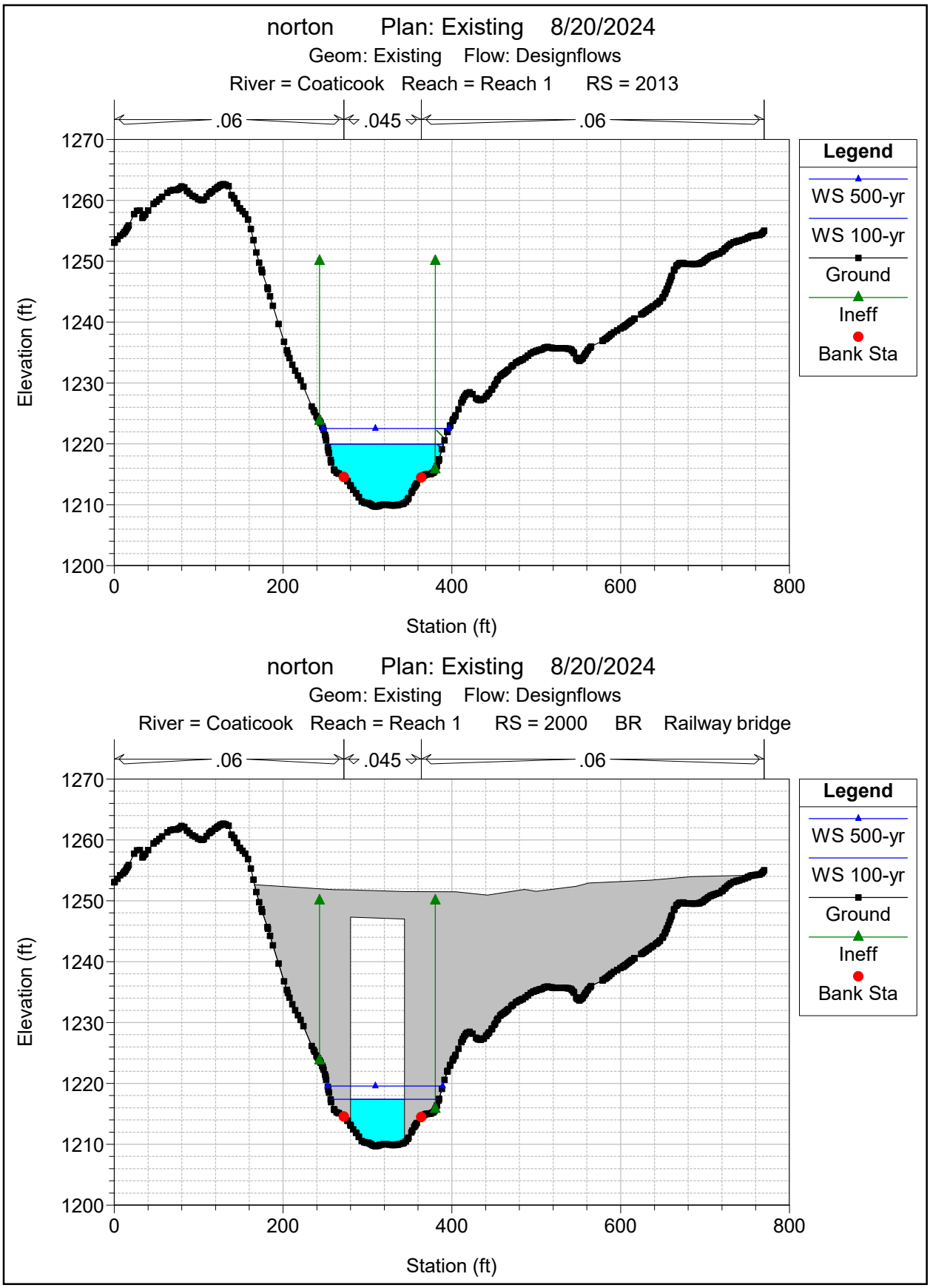
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.06
Legend
WS 500-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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1250
1240
1230
1220
1210
1200
0
200
400
600
800
norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
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.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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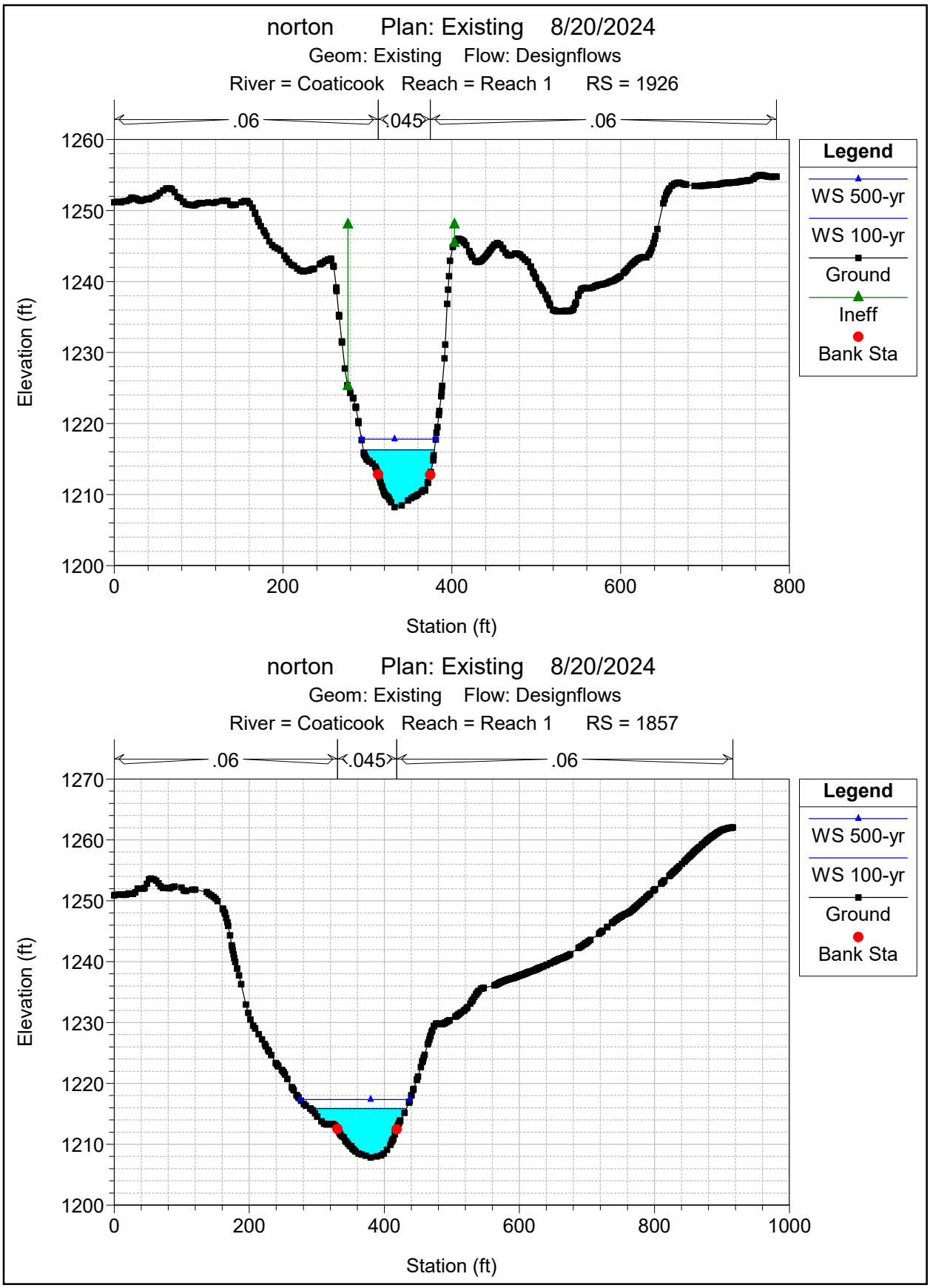
1240
1230
1220
1210
1200
0
200
400
600
800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WS 500-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
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Geom: Existing Flow: Designflows
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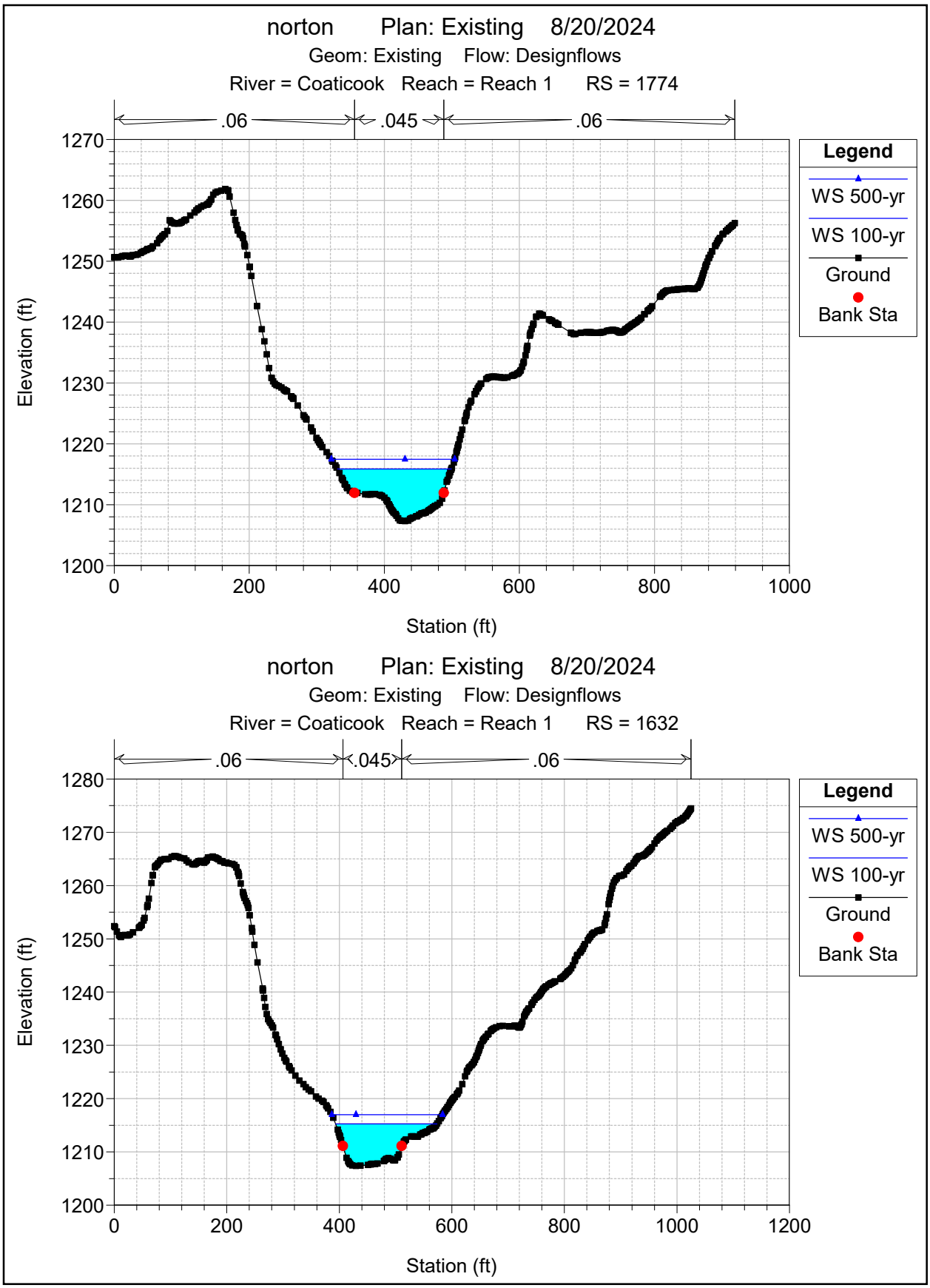
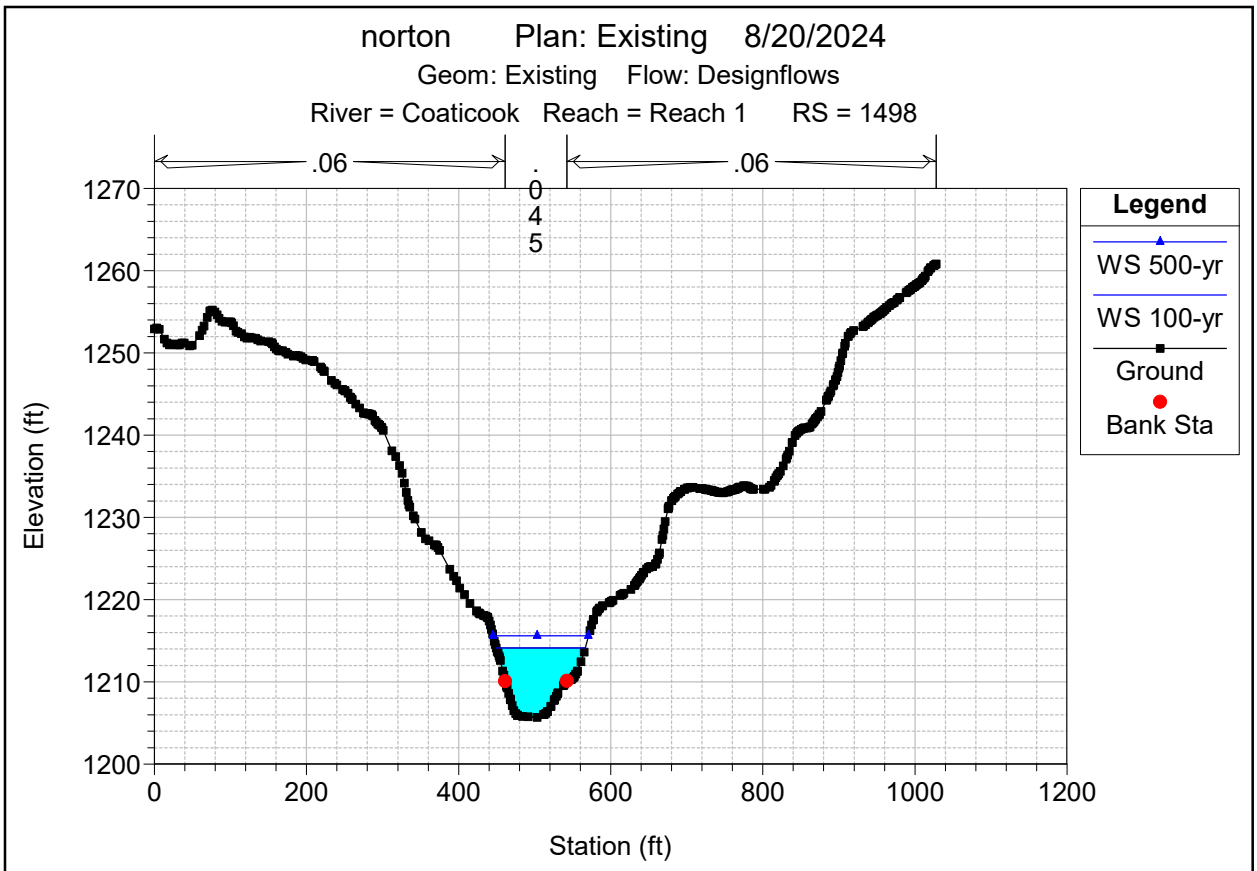
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 1774
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1270
1260
1250
1240
1230
1220
1210
1200
0
200
400
600
800
1000
norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 1632
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1280
1270
1260
1250
1240
1230
1220
1210
1200
0
200
400
600
800
1000
1200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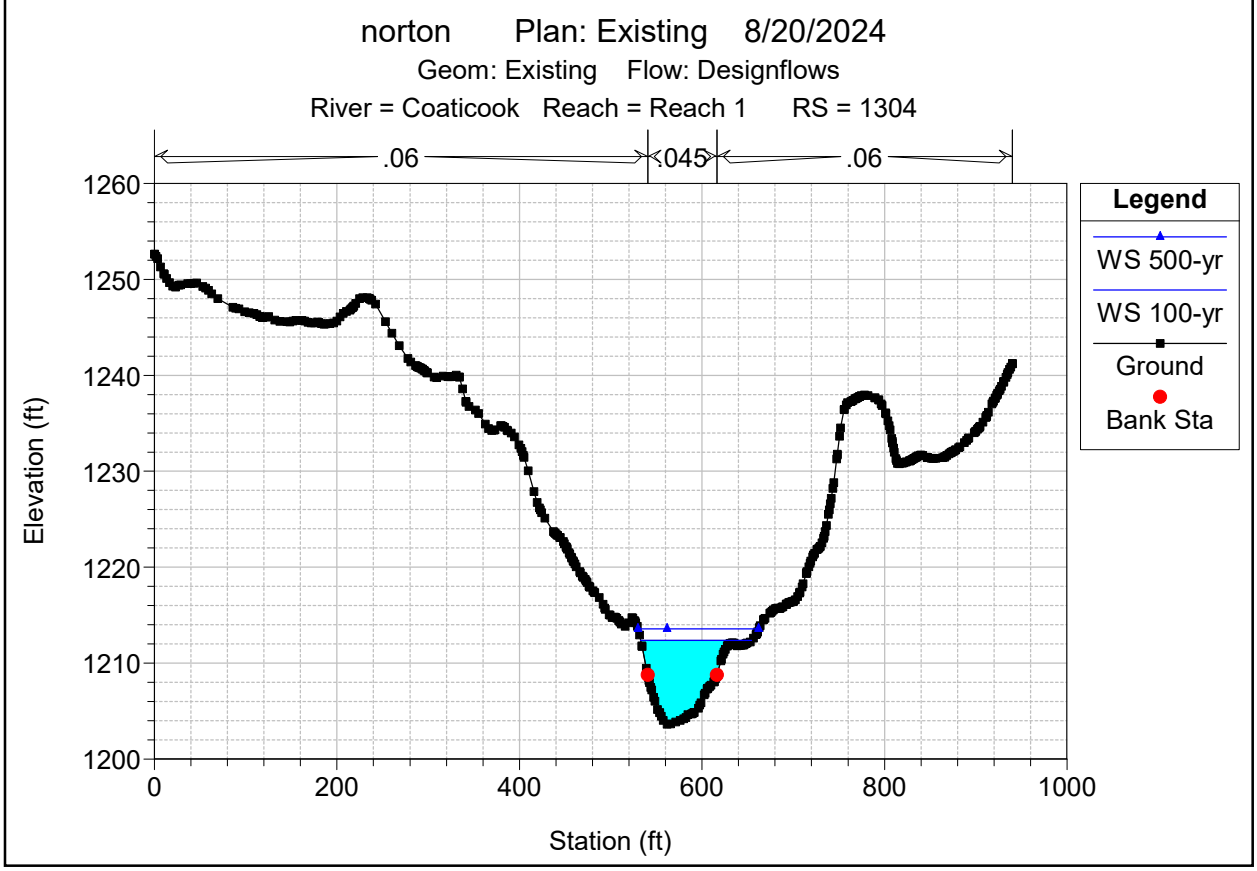
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 1498
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1270
1260
1250
1240
1230
1220
1210
1200
0
200
400
600
800
1000
1200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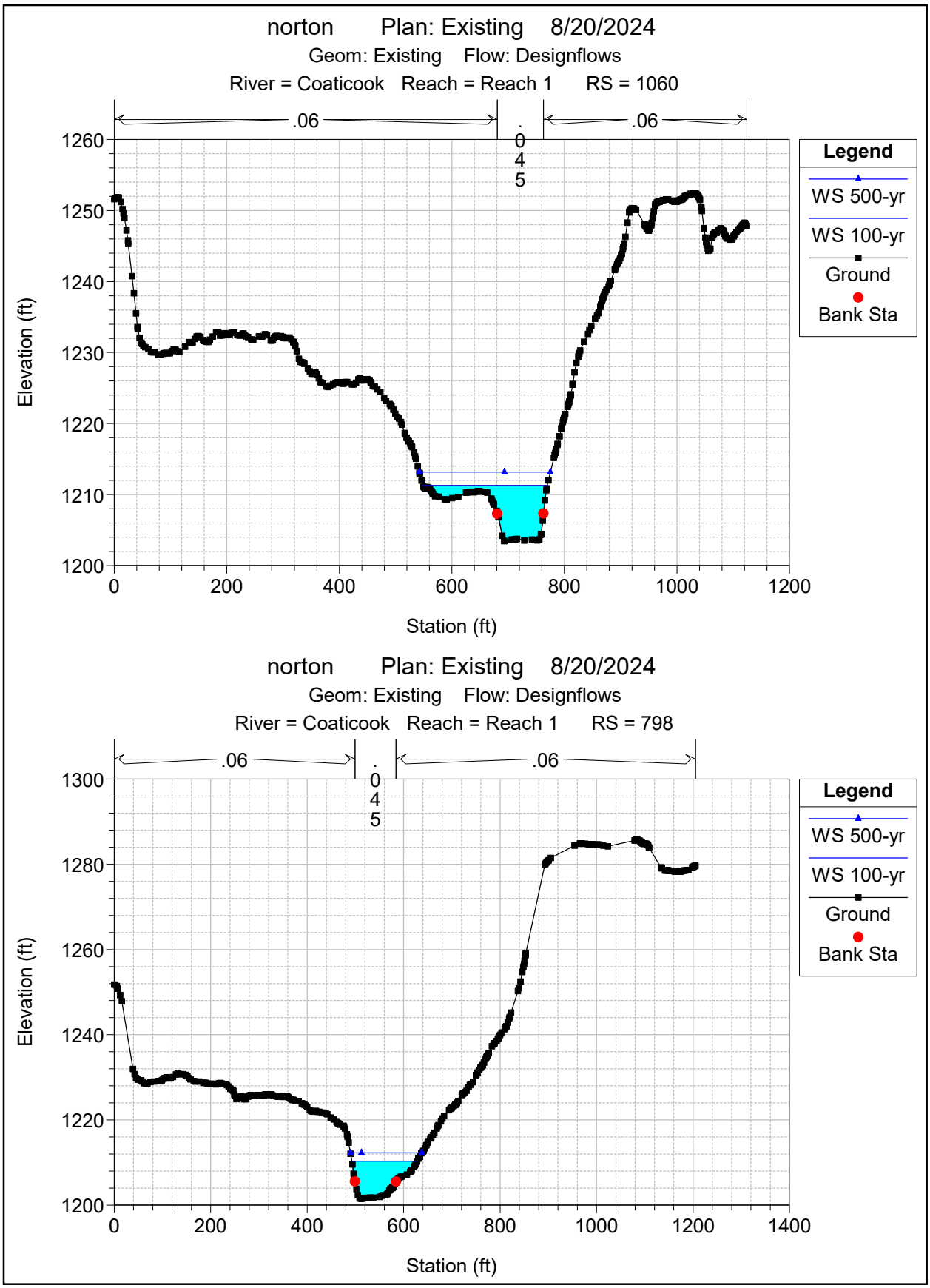
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 1304
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1260
1250
1240
1230
1220
1210
1200
0
200
400
600
800
1000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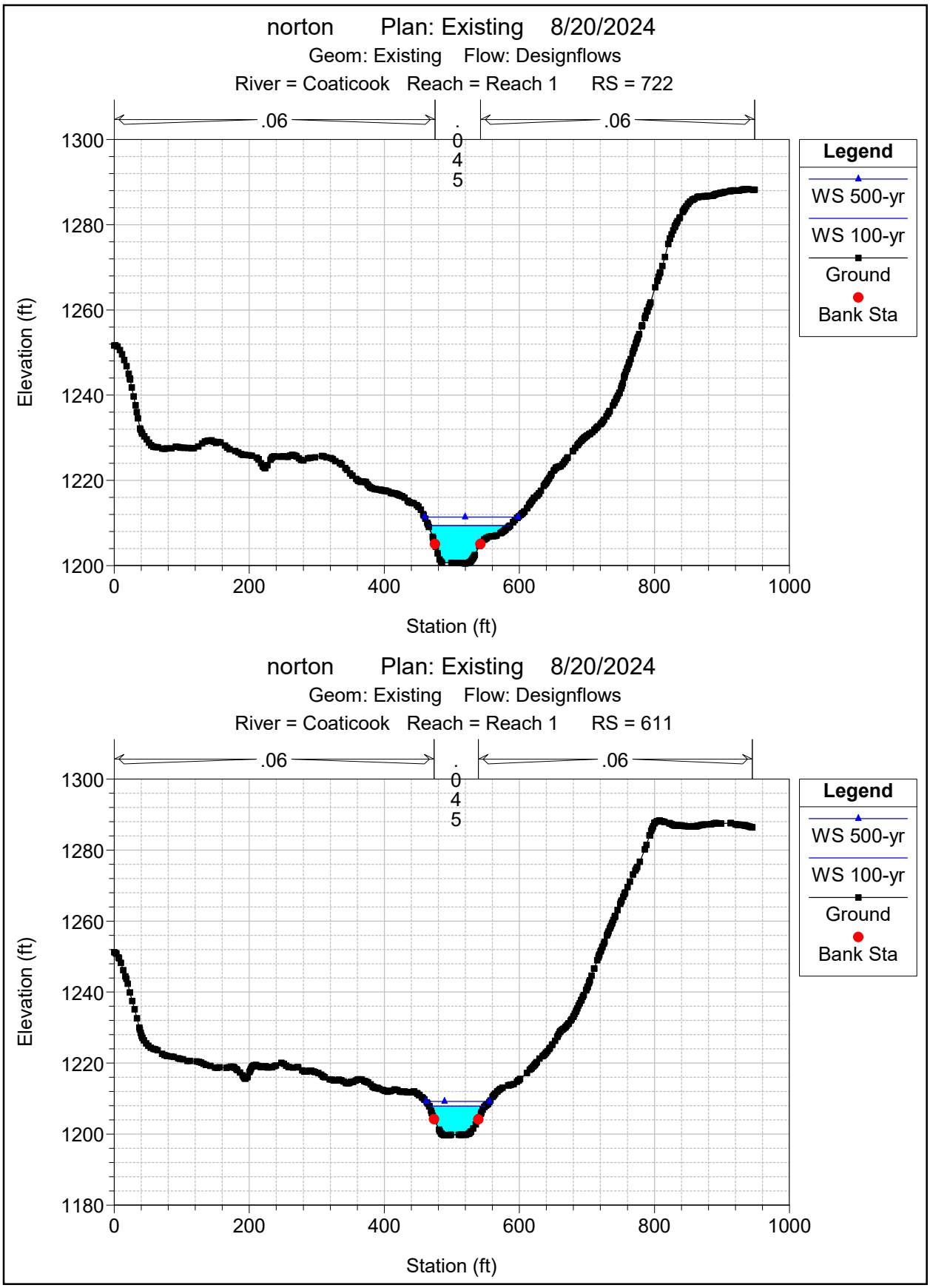
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 1060
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1260
1250
1240
1230
1220
1210
1200
0
200
400
600
800
1000
1200
norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 798
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
0
200
400
600
800
1000
1200
1400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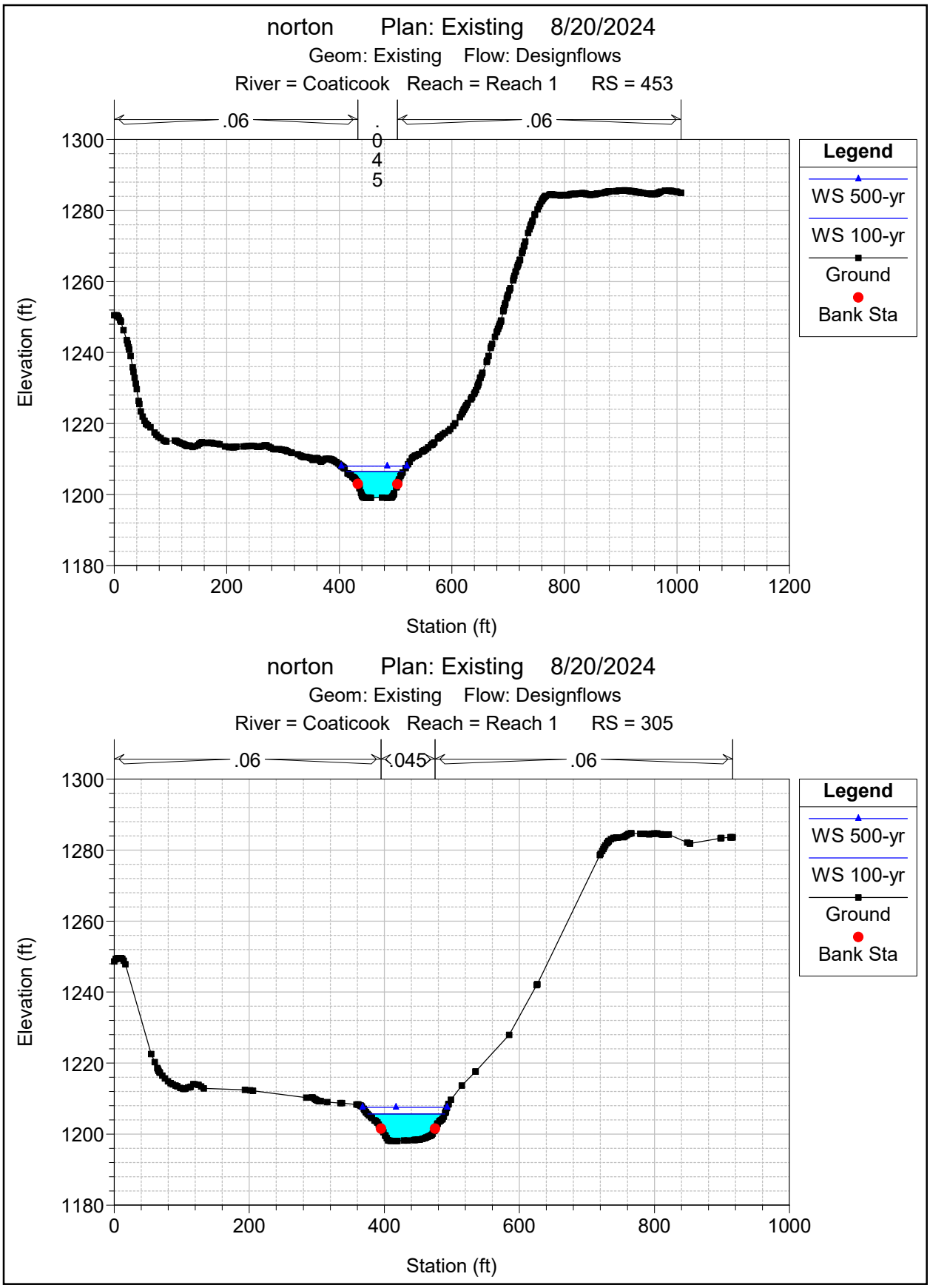
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 722
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
0
200
400
600
800
1000
norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 611
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
1180
0
200
400
600
800
1000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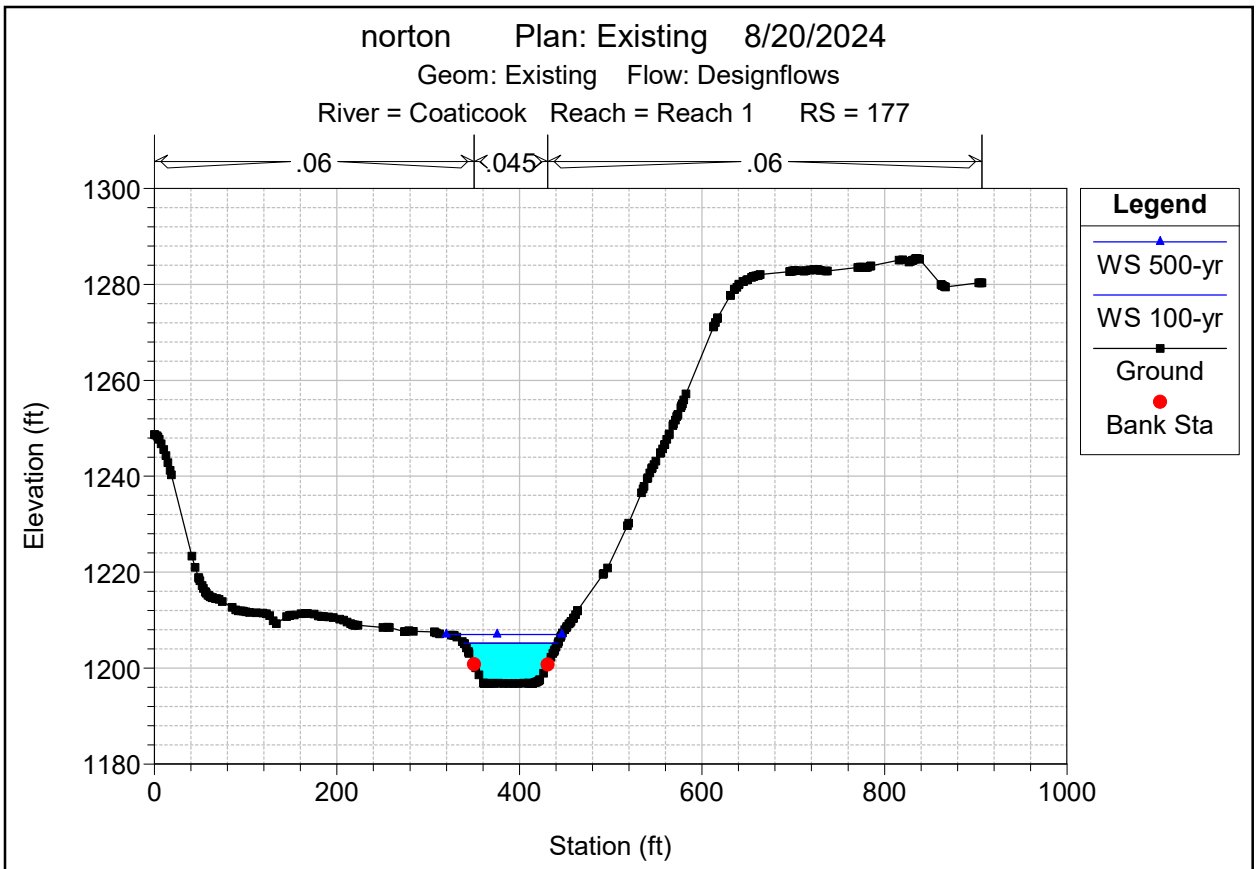
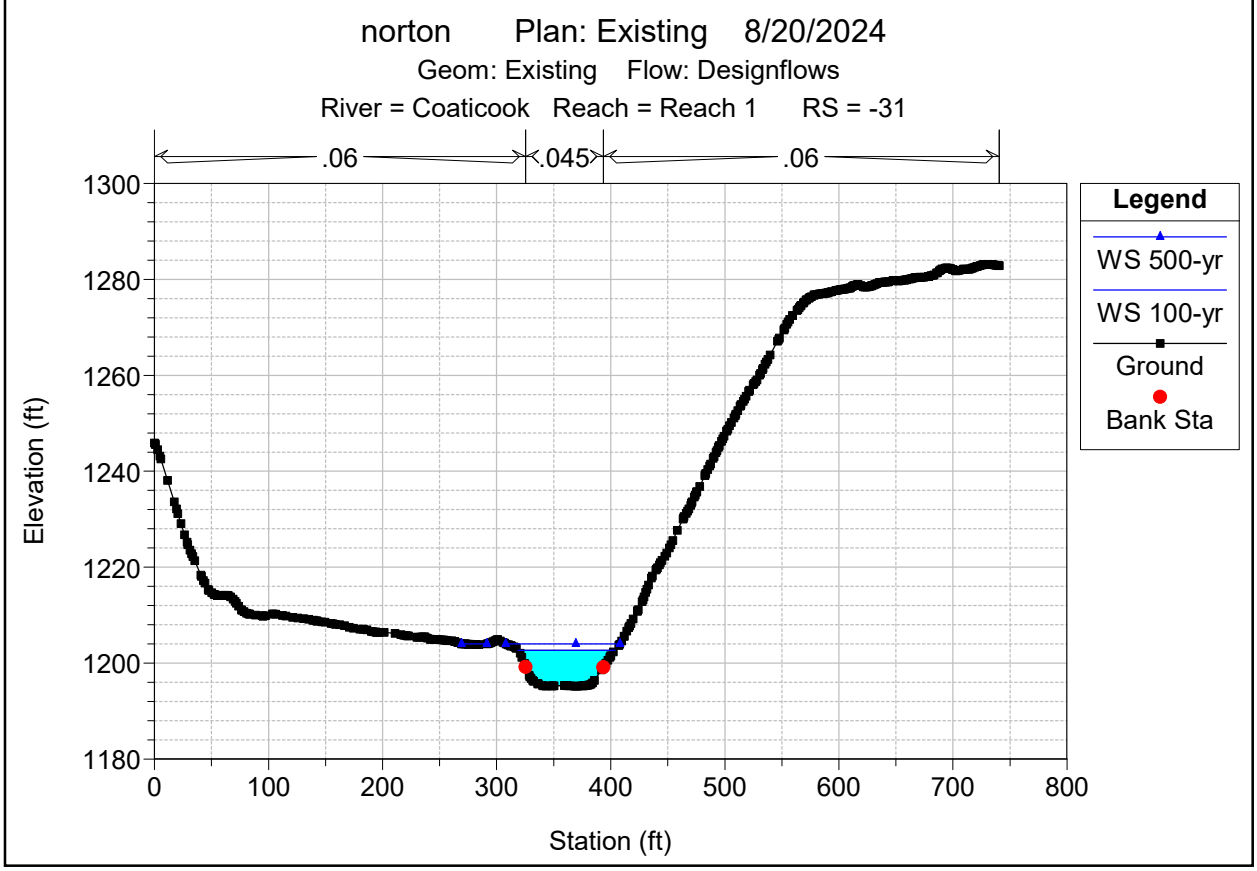
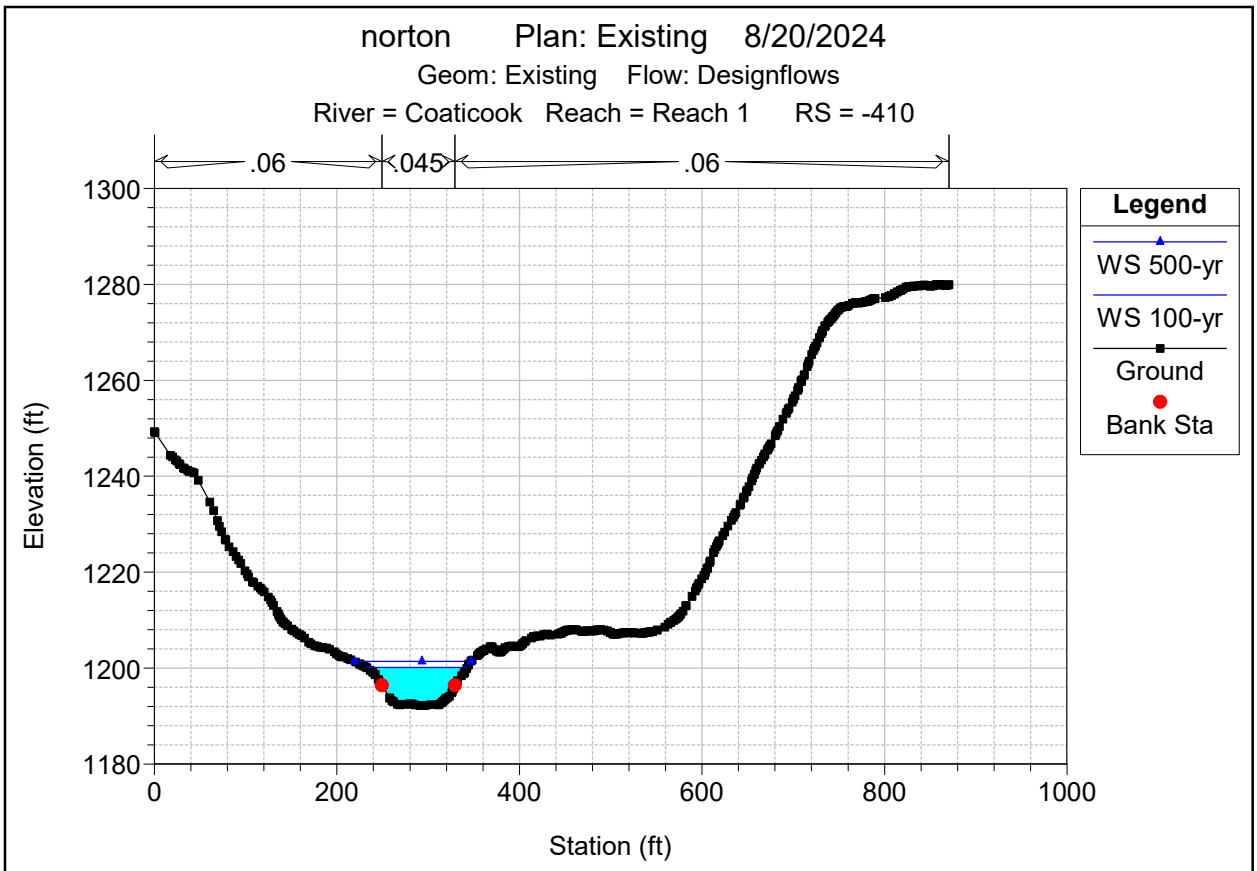
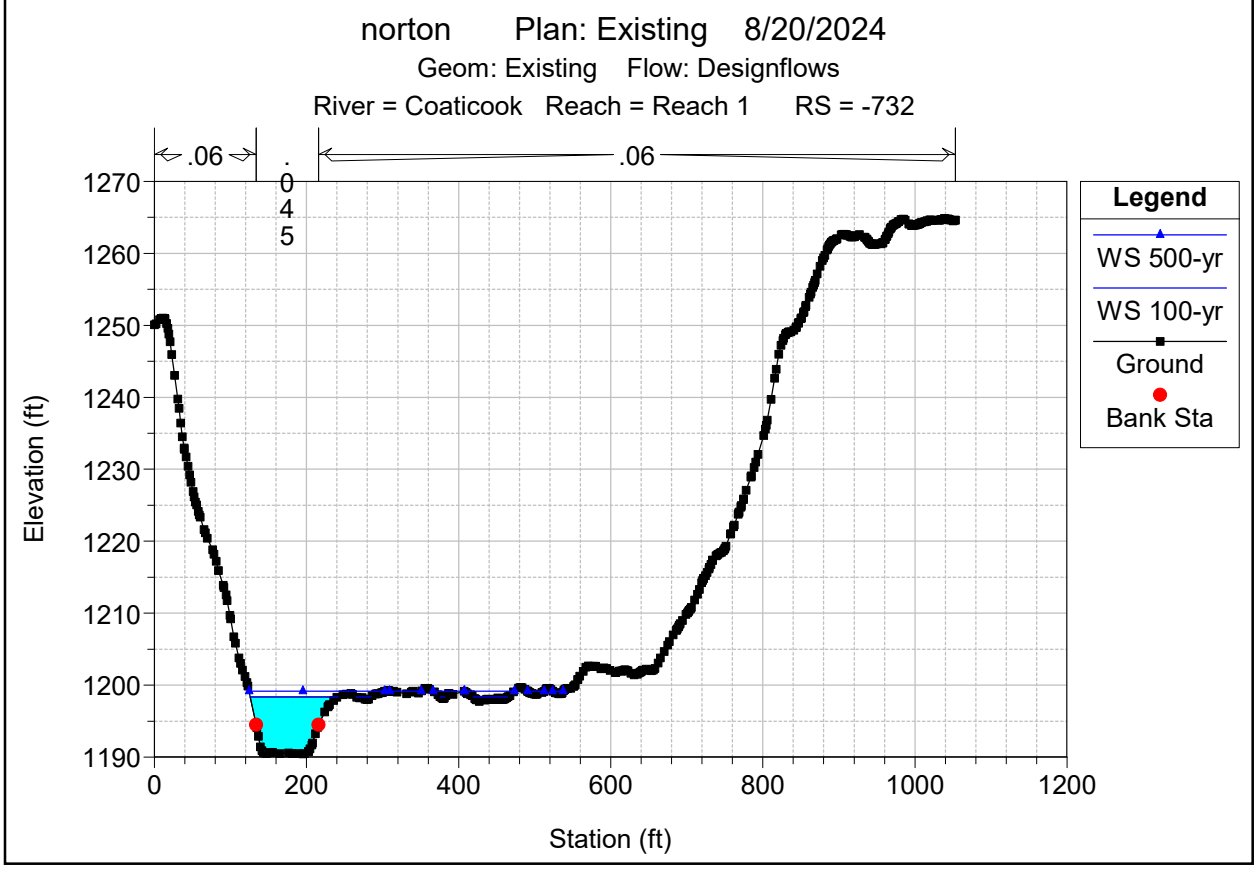
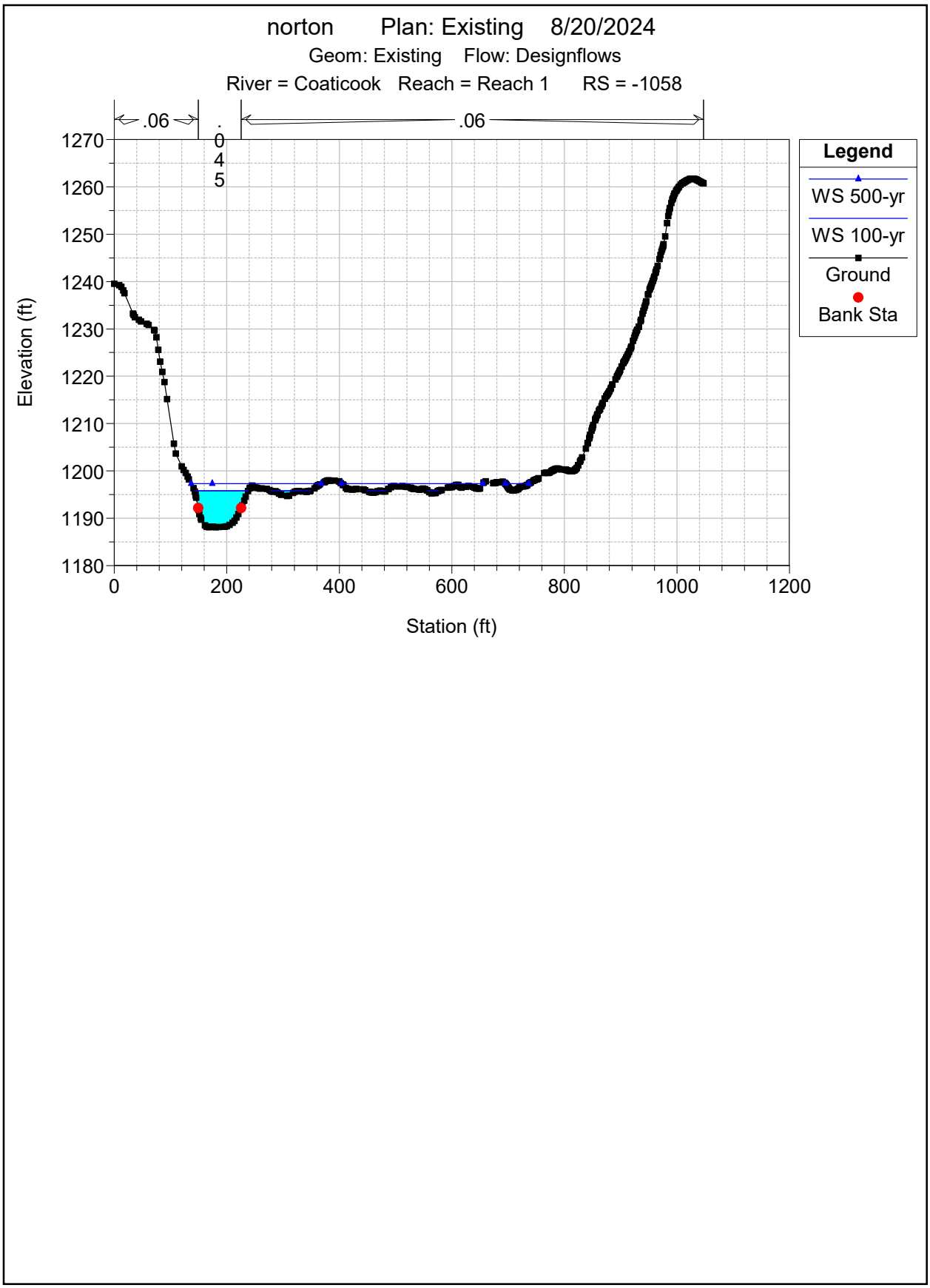
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 453
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
1180
0
200
400
600
800
1000
1200
norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 305
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
1180
0
200
400
600
800
1000


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = 177
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
1300
1280
1260
1240
1220
1200
1180
0
200
400
600
800
1000
Station (ft)


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = -31
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
1300
1280
1260
1240
1220
1200
1180
0
100
200
300
400
500
600
700
800
Station (ft)


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = -410
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1300
1280
1260
1240
1220
1200
1180
0
200
400
600
800
1000


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = -732
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1270
1260
1250
1240
1230
1220
1210
1200
1190
0
200
400
600
800
1000
1200


norton Plan: Existing 8/20/2024
Geom: Existing Flow: Designflows
River = Coaticook Reach = Reach 1 RS = -1058
.06
.045
.06
Legend
WS 500-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1270
1260
1250
1240
1230
1220
1210
1200
1190
1180
0
200
400
600
800
1000
1200

HEC-RAS Plan: Ex River: Coaticook Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3372	100-yr	5630.00	1218.06	1228.97		1229.33	0.001260	4.92	1250.33	192.90	0.29
Reach 1	3372	500-yr	7920.00	1218.06	1231.41		1231.80	0.001006	5.19	1776.26	242.22	0.27
Reach 1	3135	100-yr	5630.00	1215.59	1228.86		1229.07	0.000685	3.77	1600.34	222.13	0.22
Reach 1	3135	500-yr	7920.00	1215.59	1231.34		1231.58	0.000567	4.02	2237.43	278.36	0.21
Reach 1	2993	100-yr	5630.00	1215.94	1227.13	1224.73	1228.51	0.005030	9.55	623.38	88.19	0.58
Reach 1	2993	500-yr	7920.00	1215.94	1229.39	1226.29	1230.99	0.004319	10.37	836.30	100.68	0.56
Reach 1	2950		Bridge									
Reach 1	2930	100-yr	5630.00	1215.03	1224.78	1222.28	1226.02	0.004763	8.99	653.64	95.39	0.56
Reach 1	2930	500-yr	7920.00	1215.03	1226.36	1223.71	1228.00	0.005047	10.43	809.24	102.86	0.59
Reach 1	2779	100-yr	5630.00	1213.92	1224.51		1225.13	0.003043	6.68	1001.35	202.04	0.44
Reach 1	2779	500-yr	7920.00	1213.92	1226.32		1226.97	0.002468	7.00	1375.08	210.30	0.41
Reach 1	2567	100-yr	5630.00	1213.77	1221.76	1221.19	1223.85	0.011375	11.74	506.23	96.25	0.83
Reach 1	2567	500-yr	7920.00	1213.77	1223.50	1222.56	1225.87	0.009421	12.61	681.16	104.37	0.79
Reach 1	2389	100-yr	5630.00	1212.62	1221.10		1222.25	0.005158	8.66	675.73	108.37	0.57
Reach 1	2389	500-yr	7920.00	1212.62	1223.15		1224.46	0.004267	9.33	913.88	134.24	0.55
Reach 1	2238	100-yr	5630.00	1211.89	1220.30		1221.48	0.005029	8.83	679.40	120.71	0.57
Reach 1	2238	500-yr	7920.00	1211.89	1222.72		1223.83	0.003445	8.83	1073.76	182.37	0.50
Reach 1	2090	100-yr	5630.00	1209.76	1220.08		1220.82	0.002648	7.10	896.14	157.41	0.43
Reach 1	2090	500-yr	7920.00	1209.76	1222.63		1223.35	0.001918	7.18	1335.30	182.61	0.38
Reach 1	2013	100-yr	5630.00	1209.67	1219.98	1216.18	1220.56	0.002047	6.35	971.20	138.02	0.38
Reach 1	2013	500-yr	7920.00	1209.67	1222.53	1217.36	1223.18	0.001643	6.74	1303.91	149.04	0.35
Reach 1	2000		Bridge									
Reach 1	1926	100-yr	5630.00	1208.23	1216.30	1216.30	1219.09	0.014308	13.59	442.50	84.22	0.94
Reach 1	1926	500-yr	7920.00	1208.23	1217.82	1217.82	1221.20	0.013389	15.12	573.11	88.17	0.94
Reach 1	1857	100-yr	5630.00	1207.82	1215.87		1217.14	0.006446	9.24	677.93	142.17	0.64
Reach 1	1857	500-yr	7920.00	1207.82	1217.37		1218.84	0.005928	10.16	908.43	162.91	0.63
Reach 1	1774	100-yr	5630.00	1207.32	1215.88		1216.56	0.003796	6.75	885.68	168.77	0.48
Reach 1	1774	500-yr	7920.00	1207.32	1217.48		1218.28	0.003309	7.37	1167.73	182.73	0.47
Reach 1	1632	100-yr	5630.00	1207.38	1215.27		1216.03	0.003542	7.18	885.90	180.16	0.48
Reach 1	1632	500-yr	7920.00	1207.38	1216.98		1217.82	0.003055	7.71	1208.78	196.92	0.46
Reach 1	1498	100-yr	5630.00	1205.69	1214.12		1215.38	0.005764	9.23	665.67	116.91	0.61
Reach 1	1498	500-yr	7920.00	1205.69	1215.61		1217.20	0.005757	10.46	846.30	125.40	0.63
Reach 1	1304	100-yr	5630.00	1203.64	1212.39		1214.05	0.007689	10.45	574.18	121.69	0.70
Reach 1	1304	500-yr	7920.00	1203.64	1213.57	1212.73	1215.79	0.008500	12.21	725.38	132.42	0.75
Reach 1	1060	100-yr	5630.00	1203.47	1211.29		1212.39	0.005067	8.72	788.69	220.72	0.57
Reach 1	1060	500-yr	7920.00	1203.47	1213.18		1214.14	0.003606	8.58	1218.01	233.16	0.50
Reach 1	798	100-yr	5630.00	1201.48	1210.33		1211.23	0.003662	7.82	807.77	135.30	0.49
Reach 1	798	500-yr	7920.00	1201.48	1212.27		1213.28	0.003218	8.49	1080.91	147.92	0.48
Reach 1	722	100-yr	5630.00	1200.56	1209.42		1210.82	0.005627	9.76	656.82	121.27	0.61
Reach 1	722	500-yr	7920.00	1200.56	1211.41		1212.92	0.004752	10.40	914.25	138.73	0.58
Reach 1	611	100-yr	5630.00	1199.76	1207.85		1209.95	0.009305	11.73	501.62	82.38	0.77
Reach 1	611	500-yr	7920.00	1199.76	1209.20	1208.43	1212.04	0.010128	13.72	621.04	94.20	0.83
Reach 1	453	100-yr	5630.00	1199.06	1206.51	1205.51	1208.45	0.009189	11.32	531.13	101.00	0.76
Reach 1	453	500-yr	7920.00	1199.06	1208.04	1207.12	1210.42	0.008842	12.69	696.05	116.53	0.77
Reach 1	305	100-yr	5630.00	1198.05	1205.70		1207.14	0.006747	9.79	620.48	114.31	0.66
Reach 1	305	500-yr	7920.00	1198.05	1207.52		1209.15	0.005737	10.54	839.40	125.39	0.63
Reach 1	177	100-yr	5630.00	1196.78	1205.20		1206.35	0.004541	8.69	681.18	102.86	0.55
Reach 1	177	500-yr	7920.00	1196.78	1207.01		1208.45	0.004367	9.79	882.03	126.58	0.56
Reach 1	-31	100-yr	5630.00	1195.22	1202.68	1201.88	1204.87	0.010460	11.97	490.38	84.94	0.81
Reach 1	-31	500-yr	7920.00	1195.22	1204.04	1203.40	1206.94	0.010979	13.85	616.61	122.33	0.85

HEC-RAS Plan: Ex River: Coaticook Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	-410	100-yr	5630.00	1192.22	1200.17		1201.59	0.006376	9.65	620.27	110.87	0.64
Reach 1	-410	500-yr	7920.00	1192.22	1201.43		1203.34	0.007055	11.32	769.90	127.62	0.69
Reach 1	-732	100-yr	5630.00	1190.46	1198.38		1199.64	0.005478	9.12	676.35	186.59	0.59
Reach 1	-732	500-yr	7920.00	1190.46	1199.17	1197.76	1201.02	0.007245	11.22	879.71	362.79	0.69
Reach 1	-1058	100-yr	5630.00	1188.10	1195.83	1194.52	1197.48	0.007804	10.45	602.93	222.44	0.70
Reach 1	-1058	500-yr	7920.00	1188.10	1197.30	1197.30	1198.75	0.006036	10.46	1190.91	523.76	0.64

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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****

PROJECT DATA
Project Title: norton
Project File : norton.prj
Run Date and Time: 8/20/2024 4:21:08 PM

Project in English units

****

PLAN DATA

Plan Title: Existing
Plan File : C:\Users\USTY709043\Documents\projects\North VT Bil\hecras\norton.p01

Geometry Title: Existing
Geometry File : C:\Users\USTY709043\Documents\projects\North VT Bil\hecras\norton.g02

Flow Title : Designflows
Flow File : C:\Users\USTY709043\Documents\projects\North VT Bil\hecras\norton.f01

Plan Summary Information:
Number of: Cross Sections = 27 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 2 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20

```
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Mixed Flow


**************************************************************************

FLOW DATA

Flow Title: Designflows
Flow File : C:\Users\USTY709043\Documents\projects\North VT Bil\hecras\norton.f01

Flow Data (cfs)
**************************************************************************
*********
* River           Reach           RS      *          100-yr          500-yr   2-yr
bankline *
* Coaticook       Reach 1         3372    *            5630            7920
  1600 *
**************************************************************************
*********

Boundary Conditions
**************************************************************************
*******************
* River           Reach           Profile          *            Upstream
    Downstream    *
**************************************************************************
*******************
* Coaticook       Reach 1         100-yr           *         Normal S = 0.007
Normal S = 0.0078 *
* Coaticook       Reach 1         500-yr           *         Normal S = 0.007
Normal S = 0.0078 *
* Coaticook       Reach 1         2-yr bankline    *         Normal S = 0.007
Normal S = 0.0078 *
**************************************************************************
*******************

**************************************************************************

GEOMETRY DATA

Geometry Title: Existing
Geometry File : C:\Users\USTY709043\Documents\projects\North VT
Bil\hecras\norton.g02
```

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 3372

INPUT
Description:
Station Elevation Data num= 398

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1249.11	5.6	1248.59	8.1	1248.39	13.8	1247.97	19.9	1247.55
23.5	1247.36	27	1247.23	28.2	1247.16	30.6	1246.99	37.7	1246.04
40.8	1245.68	44.8	1245.17	50.9	1244.36	55.4	1243.64	58	1243.14
60.8	1242.59	63.3	1242.11	65.5	1241.78	69.3	1241.27	75.3	1240.57
77.3	1240.24	81.2	1239.57	82.6	1239.29	84.4	1238.98	90.5	1238.01
93.1	1237.46	94.4	1237.18	98.3	1236.08	105.7	1233.93	106.2	1233.81
108.1	1233.39	110.5	1232.93	111	1232.84	112.8	1232.52	118	1231.61
121.9	1230.96	122.3	1230.9	122.9	1230.81	124.7	1230.61	127	1230.28
129.8	1229.85	133.7	1229.17	136.5	1228.55	137.6	1228.28	140.8	1227.42
146.8	1225.66	148.4	1225.15	149.4	1224.8	152.69	1223.67	153.3	1223.46
157.3	1222.33	158.9	1221.98	161.1	1221.57	162.11	221.445	162.7	1221.37
168.6	1220.77	172.3	1220.16	176.2	1219.33	177.1	1219.2	178.6	1218.96
179.5	1218.86	180	1218.81	181.8	1218.66	181.9	1218.66	183.8	1218.49
184.3	1218.43	185.2	1218.34	186.7	1218.23	187.6	1218.17	189.1	1218.12
191.3	1218.06	198.7	1218.28	203.5	1218.45	206.5	1218.54	210.2	1218.68
218.2	1218.92	220.3	1219.01	221.6	1219.05	222.7	1219.09	230.91	219.352
232.4	1219.4	236.7	1219.58	237.9	1219.66	239.6	1219.82	240.5	1219.94
242	1220.23	244	1220.73	244.3	1220.8	244.5	1220.84	246.8	1221.33
249.2	1221.68	251.1	1221.79	251.6	1221.83	251.9	1221.85	252.5	1221.9
258.7	1222.5	259.6	1222.58	261.1	1222.66	263.1	1222.73	263.4	1222.74
271.1	1222.79	273	1222.91	273.3	1222.93	275	1223.02	275.4	1223.07
277.8	1223.44	278.9	1223.6	279.14	1223.67	280.2	1223.79	282.2	1224.1
282.5	1224.14	282.7	1224.17	283.6	1224.35	284.9	1224.64	286.6	1225.03
287.3	1225.16	288.4	1225.38	289.7	1225.61	290.5	1225.77	292.1	1225.93
294.3	1226.2	294.5	1226.21	296.8	1226.33	299.2	1226.44	300.9	1226.5
301.6	1226.52	302	1226.54	305.9	1226.86	306.4	1226.91	307.1	1226.99
308.7	1227.19	309.8	1227.31	311.1	1227.49	313.3	1227.73	313.5	1227.75
313.6	1227.76	314.2	1227.81	315.9	1227.99	317.5	1228.14	320.6	1228.42
320.7	1228.43	321.5	1228.49	325.3	1228.8	326.1	1228.86	327.6	1228.98
329.1	1229.12	329.9	1229.2	330.8	1229.29	332.2	1229.45	333.7	1229.61
334.6	1229.69	336.9	1229.87	338.4	1229.97	340	1230.07	343	1230.29
346.2	1230.47	348.5	1230.59	349.3	1230.62	350.8	1230.68	352.3	1230.76
353.1	1230.82	355.4	1230.98	356.9	1231.09	357.8	1231.17	358.6	1231.24
360.1	1231.34	361.6	1231.42	362.4	1231.47	363.2	1231.51	367.9	1231.71
369.4	1231.77	370.8	1231.85	371.7	1231.89	378.6	1232.09	380.1	1232.13
381	1232.17	381.8	1232.21	383.3	1232.29	384.8	1232.35	385.6	1232.38
389.4	1232.53	391.1	1232.64	392.6	1232.74	394	1232.86	394.9	1232.94
395.7	1233.02	397.2	1233.17	398.7	1233.32	399.5	1233.39	401.8	1233.58

403.3	1233.68	404.1	1233.73	405	1233.77	406.5	1233.84	408	1233.91
408.8	1233.96	409.6	1234.01	414.3	1234.36	418.9	1234.63	421.9	1234.83
422.7	1234.88	425	1235.04	426.5	1235.12	427.3	1235.18	428.2	1235.23
429.7	1235.33	431.1	1235.43	432	1235.49	432.8	1235.56	435.8	1235.8
436.6	1235.86	437.5	1235.93	440.4	1236.15	441.3	1236.21	445.9	1236.55
447	1236.62	448.2	1236.7	449.3	1236.77	450.6	1236.85	452.8	1236.99
453	1237	453.1	1237.01	455.4	1237.19	457	1237.32	457.8	1237.38
460.1	1237.62	460.9	1237.7	462.5	1237.88	464.1	1238.06	464.7	1238.14
465.1	1238.18	468.6	1238.5	469.7	1238.56	471.3	1238.64	472	1238.67
472.5	1238.69	474.4	1238.77	474.5	1238.77	476.4	1238.84	476.8	1238.86
477.5	1238.88	479.2	1238.95	480.2	1238.98	481.6	1239	483.9	1239.04
484.1	1239.04	486.3	1239	488	1238.96	488.7	1238.94	489.8	1238.91
491.1	1238.88	491.9	1238.85	493.4	1238.82	495.3	1238.71	495.7	1238.69
495.8	1238.69	496	1238.68	498.2	1238.61	499.6	1238.59	500.6	1238.73
502.1	1239.05	503	1239.29	503.5	1239.5	505.3	1240.53	507.4	1241.72
507.7	1241.95	508.3	1242.33	510.1	1243.53	511.2	1244.31	512.5	1245.19
514.5	1246.62	514.9	1246.89	519	1249.54	519.6	1249.92	520.6	1250.52
522	1251.26	524.4	1252.58	526.6	1253.75	526.7	1253.83	526.8	1253.85
526.8	1253.87	529.1	1254.88	530.6	1255.44	531.5	1255.74	533	1256.16
534.5	1256.52	536.3	1256.84	537	1256.95	538.3	1257.16	538.6	1257.19
539.1	1257.23	541	1257.37	542.2	1257.42	550	1257.65	550.5	1257.66
551.5	1257.67	552.9	1257.68	553.8	1257.68	555.3	1257.65	557.6	1257.59
557.7	1257.59	557.8	1257.59	560.1	1257.44	561.6	1257.32	562.4	1257.25
563.8	1257.16	564.8	1257.11	565.5	1257.07	568.2	1256.8	569.3	1256.68
569.6	1256.62	570	1256.49	572	1255.77	573.2	1255.21	574.3	1254.54
576.1	1253.36	576.7	1253	577.1	1252.77	578.6	1251.78	579.1	1251.5
580.9	1250.42	581.5	1250.19	582.3	1249.91	583.9	1249.5	584.8	1249.35
586.2	1249.3	588.6	1249.33	588.7	1249.33	591	1249.65	592.6	1249.89
593.4	1250.08	595.7	1250.72	596.4	1250.92	598.1	1251.43	599.5	1251.86
600.3	1252.12	600.8	1252.31	604.2	1253.64	605.3	1254.14	607	1254.92
607.6	1255.21	608.1	1255.39	609.9	1256.13	610	1256.18	611.9	1256.92
613.1	1257.29	614.8	1257.72	615.8	1257.96	617.2	1258.19	619.3	1258.5
619.5	1258.53	619.7	1258.54	620.3	1258.58	621.9	1258.68	624.3	1258.79
625.5	1258.83	627.4	1258.88	629.1	1258.93	630.7	1258.98	631.3	1258.99
631.4	1258.99	631.6	1258.99	633.8	1258.99	635.2	1258.97	636.2	1258.96
637.8	1258.94	638.6	1258.93	639	1258.92	640.9	1258.88	641.1	1258.87
642.9	1258.83	643.3	1258.82	644	1258.78	645.7	1258.65	646.8	1258.55
648.1	1258.36	650.1	1258.01	650.5	1257.96	650.7	1257.92	651.6	1257.79
652.8	1257.59	654.5	1257.4	655.2	1257.38	656.3	1257.42	657.6	1257.49
658.4	1257.57	660	1257.72	662	1257.9	662.3	1257.93	662.4	1257.93
662.5	1257.94	664.7	1258.15	666.2	1258.31	667.1	1258.43	668.6	1258.63
669.5	1258.75	670	1258.82	670.9	1258.93				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	152.69	.045	279.14	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
152.69	279.14	190.5	237.2	272.2	.1	.3

CROSS SECTION OUTPUT Profile #100-yr
****
* E.G. Elev (ft) * 1229.33 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.36 * Wt. n-Val. * 0.060 * 0.045 *
 0.060 *
* W.S. Elev (ft) * 1228.97 * Reach Len. (ft) * 190.50 * 237.20 *
 272.20 *
* Crit W.S. (ft) * 1224.27 * Flow Area (sq ft) * 44.49 * 1095.82 *
 110.04 *
* E.G. Slope (ft/ft) *0.001260 * Area (sq ft) * 44.49 * 1095.82 *
 110.04 *
* Q Total (cfs) * 5630.00 * Flow (cfs) * 69.26 * 5394.22 *
 166.52 *
* Top Width (ft) * 192.91 * Top Width (ft) * 18.10 * 126.45 *
 48.36 *
* Vel Total (ft/s) * 4.50 * Avg. Vel. (ft/s) * 1.56 * 4.92 *
  1.51 *
* Max Chl Dpth (ft) * 10.91 * Hydr. Depth (ft) * 2.46 * 8.67 *
  2.28 *
* Conv. Total (cfs) *158635.5 * Conv. (cfs) * 1951.6 *151992.0 *
 4691.9 *
* Length Wtd. (ft) * 237.41 * Wetted Per. (ft) * 18.87 * 127.29 *
 48.71 *
* Min Ch El (ft) * 1218.06 * Shear (lb/sq ft) * 0.19 * 0.68 *
  0.18 *
* Alpha * 1.15 * Stream Power (lb/ft s) * 0.29 * 3.33 *
  0.27 *
* Frctn Loss (ft) * 0.22 * Cum Volume (acre-ft) * 4.10 * 64.66 *
  4.99 *
* C & E Loss (ft) * 0.04 * Cum SA (acres) * 2.05 * 8.73 *
  3.29 *
****

CROSS SECTION OUTPUT Profile #500-yr
****
* E.G. Elev (ft) * 1231.80 * Element * Left OB * Channel *
Right OB *
* Vel Head (ft) * 0.39 * Wt. n-Val. * 0.060 * 0.045 *
 0.060 *
* W.S. Elev (ft) * 1231.41 * Reach Len. (ft) * 190.50 * 237.20 *
 272.20 *
* Crit W.S. (ft) * 1225.30 * Flow Area (sq ft) * 106.49 * 1404.12 *
 265.66 *
* E.G. Slope (ft/ft) *0.001006 * Area (sq ft) * 106.49 * 1404.12 *
 265.66 *

* Q Total (cfs)	* 7920.00	* Flow (cfs)	* 177.48	* 7288.23	* 454.29	*	
* Top Width (ft)	* 242.22	* Top Width (ft)	* 33.49	* 126.45	* 82.27	*	
* Vel Total (ft/s)	* 4.46	* Avg. Vel. (ft/s)	* 1.67	* 5.19	* 1.71	*	
* Max Chl Dpth (ft)	* 13.35	* Hydr. Depth (ft)	* 3.18	* 11.10	* 3.23	*	
* Conv. Total (cfs)	*249669.2	* Conv. (cfs)	* 5595.0	*229753.2	* 14321.0	*	
* Length Wtd. (ft)	* 237.30	* Wetted Per. (ft)	* 34.46	* 127.29	* 82.72	*	
* Min Ch El (ft)	* 1218.06	* Shear (lb/sq ft)	* 0.19	* 0.69	* 0.20	*	
* Alpha	* 1.26	* Stream Power (lb/ft s)	* 0.32	* 3.60	* 0.35	*	
* Frctn Loss (ft)	* 0.18	* Cum Volume (acre-ft)	* 8.33	* 79.28	* 12.10	*	
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 2.95	* 8.73	* 6.40	*	

****

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 3135

INPUT
Description:
Station Elevation Data num= 387

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1240.68	2.8	1240.49	3.9	1240.45	7.5	1240.26	8.5	1240.22
10.3	1240.09	14.6	1239.83	17	1239.65	18.1	1239.55	21.7	1239.46
25.2	1239.51	25.6	1239.49	28.8	1239.24	32.9	1238.68	35.4	1238.37
35.9	1238.31	39.5	1238.08	40.4	1238.03	42.9	1237.95	46.6	1237.76
47.9	1237.67	50.1	1237.56	53	1237.35	53.7	1237.32	55.5	1237.22
60.8	1236.99	64.3	1236.7	67.9	1236.37	71.4	1235.91	77	1235.04
78.5	1234.76	80.6	1234.33	83.1	1233.82	85.5	1233.39	88.1	1233.16
90.6	1233.11	91.7	1233.14	92.7	1233.16	93.1	1233.16	94.1	1233.18
96.3	1233.42	99.8	1233.71	100.7	1233.72	103.4	1233.62	103.9	1233.57
105.7	1233.39	108.2	1233.05	109.9	1232.71	110.5	1232.62	111.2	1232.53
113.2	1232.36	114	1232.26	115.7	1232.29	117.6	1232.25	118.2	1232.28
120.7	1232.23	122.1	1232.1	123.2	1232.01	124.7	1231.82	125.8	1231.71
128.1	1231.44	128.3	1231.43	133.3	1231.29	134.2	1231.23	135.8	1231.12
136.9	1230.96	138.3	1230.8	138.9	1230.68	140.2	1230.44	140.8	1230.35
142.4	1230	145.9	1229.66	146	1229.66	148.4	1229.66	156.1	1229.42
156.5	1229.4	158.6	1229.36	160	1229.32	163.2	1229.38	166.7	1229.53

170.1	1229.58	172.7	1229.56	173.4	1229.55	176.7	1229.39	183.3	1228.65
186.6	1228.41	189.9	1228.22	193.3	1228.15	193.5	1228.15	194.5	1228.14
196.3	1228.13	196.6	1228.11	199.1	1228	200	1227.92	201.3	1227.74
201.8	1227.68	203.3	1227.46	204.6	1227.2	205.5	1227.02	206.6	1226.79
210.2	1225.95	211.3	1225.66	213	1225.23	213.2	1225.18	215.4	1224.47
217.1	1223.98	217.7	1223.84	218.4	1223.71	220	1223.46	221.4	1223.29
222.3	1223.22	223.61	1223.074	224.7	1222.95	225.8	1222.73	227	1222.42
228.4	1221.93	229.3	1221.57	230.1	1221.22	231.6	1220.57	233.4	1219.85
234.5	1219.47	236.3	1219.07	238.6	1218.68	240.9	1218.54	243.2	1218.41
243.3	1218.41	248.3	1218.27	250.2	1218.24	252.1	1218.16	253.03	1218.19
253.43	1218.11	255.15	1218.08	258.86	1217.87	262.3	1217.07	264.42	1216.83
266.15	1216.45	269.06	1216.02	271.71	1215.84	275.02	1215.59	280.45	1215.7
282.31	1216.08	284.83	1216.18	286.81	1216.5	287.87	1216.66	288.8	1217.01
291.45	1217.47	294.37	1217.76	297.94	1217.95	299.67	1217.98	302.05	1217.98
308.28	1218.03	312.25	1218.46	313.97	1218.86	315.83	1219.15	317.2	1219.4
317.6	1219.46	318.2	1219.53	320	1219.81	321.3	1220.02	321.5	1220.06
322.3	1220.22	323	1220.36	324.6	1220.72	326.3	1221.04	326.9	1221.18
329.2	1221.61	329.3	1221.61	331.6	1221.95	331.9	1221.99	333.9	1222.21
336.2	1222.4	336.2	1222.41	336.3	1222.41	340.5	1222.71	340.9	1222.74
341.4	1222.77	343.2	1222.87	344.8	1222.93	345.6	1222.93	346.5	1222.93
347.9	1222.93	349	1222.89	350.2	1222.79	351.6	1222.64	352.5	1222.58
353.3	1222.52	356.8	1222.17	357.6	1222.14	359.5	1222.18	361.6	1222.18
361.8	1222.18	361.9	1222.19	364.2	1222.34	366.1	1222.36	366.5	1222.38
367	1222.38	368.8	1222.39	370.2	1222.35	371.2	1222.4	372.1	1222.46
373.5	1222.61	374.6	1222.67	378.2	1223.21	378.9	1223.27	380.5	1223.59
382.4	1223.88	382.8	1223.96	383.2	1224	385.1	1224.47	387.2	1224.89
387.4	1224.94	387.5	1224.95	389.8	1225.59	391.7	1226	392.1	1226.08
392.6	1226.16	394.5	1226.56	396	1226.86	396.8	1227.01	397.7	1227.19
399.1	1227.56	402.9	1228.64	403.8	1228.94	404.5	1229.2	405.4	1229.51
406.1	1229.79	408.3	1230.66	408.5	1230.71	408.5	1230.72	408.5	1230.75
412.3	1232.44	413.3	1232.74	414.7	1233.14	415.6	1233.37	416.2	1233.49
418.6	1233.71	420.1	1233.83	420.4	1233.84	421	1233.86	422.8	1233.87
423.9	1233.88	425.2	1233.87	427.2	1233.87	427.5	1233.87	429.9	1233.99
431.7	1234.1	432.3	1234.17	433.4	1234.3	434.7	1234.49	435.5	1234.63
437.1	1234.99	439.1	1235.56	439.4	1235.64	439.6	1235.7	441.8	1236.52
443.2	1237.08	444.2	1237.52	445.8	1238.23	446.6	1238.6	447.1	1238.84
449	1239.84	449.3	1240.01	451	1240.87	452	1241.42	453.7	1242.46
454.8	1243.09	456.1	1243.84	458.2	1245.02	458.5	1245.22	458.7	1245.34
460.9	1246.67	462.6	1247.68	463.3	1248.08	464.4	1248.69	465.6	1249.36
466.4	1249.78	468	1250.63	469.8	1251.55	470.3	1251.8	472.8	1253
474.2	1253.58	475.2	1253.94	476.8	1254.43	477.6	1254.65	479.9	1255.19
480.1	1255.21	481.9	1255.55	483	1255.67	484.7	1255.84	485.8	1255.9
487.1	1255.94	489.2	1255.99	489.5	1256	489.6	1256	491.8	1256.04
493.5	1256.1	495.4	1256.17	496.6	1256.22	497.3	1256.24	499	1256.26
500.5	1256.27	501.2	1256.28	501.4	1256.28	503.7	1256.26	505.1	1256.23
506.1	1256.17	507.8	1256.02	508.5	1255.95	508.9	1255.89	512.8	1255.33
513.3	1255.27	514	1255.19	516.7	1254.95	518	1254.76	520.2	1254.36
520.4	1254.32	522.8	1253.6	524.4	1253.05	525.2	1252.85	526.4	1252.61
527.6	1252.38	528.3	1252.29	529.9	1252.49	531.3	1252.77	532.1	1252.93
532.3	1252.99	532.6	1253.09	534.7	1253.6	536	1253.94	537.1	1254.15

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   538.8 1254.49   539.5 1254.59   539.8 1254.66   541.5 1254.83   541.8 1254.86
   543.7  1255.1   544.2 1255.17     545 1255.32   546.6 1255.63   547.6 1255.89
     549 1256.27   551.2 1256.98   551.4 1257.02   551.8 1257.13   553.7 1257.68
   555.3 1258.07   556.1 1258.21   557.5  1258.4   558.5 1258.56   559.2 1258.63
     562 1258.84     563 1258.91   563.3 1258.92   563.7 1258.94   566.9 1259.09
   569.9 1259.16   570.4 1259.17   570.8 1259.17   572.3 1259.19   575.2 1259.24
   576.1 1259.24   577.6 1259.24   578.5 1259.24   579.9 1259.25   582.3 1259.22
   582.4 1259.22   582.5 1259.22   584.7  1259.2   586.2 1259.18   588.5 1259.14
   589.5 1259.13   590.1 1259.12   591.8 1259.06   592.7 1259.04   593.9 1259.01
   594.2    1259   596.6 1258.84   597.8 1258.73     599 1258.63   600.9 1258.47
   601.4 1258.43   601.7 1258.42     603 1258.49   603.8 1258.53   605.5 1258.68
   606.1  1258.8   606.6 1258.91

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   221.4    .045   378.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         221.4   378.9             14.2   141.5   311.4             .3       .5

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1229.07  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.21  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1228.86  * Reach Len. (ft)        *   14.20  *  141.50  *
 311.40  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   78.41  * 1448.14  *
  73.82  *
* E.G. Slope (ft/ft)     *0.000685  * Area (sq ft)           *   78.41  * 1448.14  *
  73.82  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   78.88  * 5453.48  *
  97.63  *
* Top Width (ft)         *  222.13  * Top Width (ft)         *   39.97  *  157.50  *
  24.66  *
* Vel Total (ft/s)       *    3.52  * Avg. Vel. (ft/s)       *    1.01  *    3.77  *
   1.32  *
* Max Chl Dpth (ft)      *   13.27  * Hydr. Depth (ft)       *    1.96  *    9.19  *
   2.99  *
* Conv. Total (cfs)      *215174.1  * Conv. (cfs)            *  3014.8  *208427.8  *
 3731.5  *
* Length Wtd. (ft)       *  142.95  * Wetted Per. (ft)       *   40.54  *  159.13  *
  25.31  *
* Min Ch El (ft)         * 1215.59  * Shear (lb/sq ft)       *    0.08  *    0.39  *
   0.12  *
* Alpha                  *    1.11  * Stream Power (lb/ft s) *    0.08  *    1.46  *
   0.16  *
```

```
* Frctn Loss (ft)        *    0.21  * Cum Volume (acre-ft)   *    3.83  *   57.74  *
   4.42  *
* C & E Loss (ft)        *    0.35  * Cum SA (acres)         *    1.92  *    7.96  *
   3.06  *
**********************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
**********************************************************************************
***********
* E.G. Elev (ft)         * 1231.58  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.24  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1231.34  * Reach Len. (ft)       *   14.20  *  141.50  *
 311.40  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *  255.37  * 1838.92  *
 143.13  *
* E.G. Slope (ft/ft)     *0.000567  * Area (sq ft)          *  255.37  * 1838.92  *
 143.13  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *  300.39  * 7390.87  *
 228.74  *
* Top Width (ft)         *  278.36  * Top Width (ft)        *   89.93  *  157.50  *
  30.93  *
* Vel Total (ft/s)       *    3.54  * Avg. Vel. (ft/s)      *    1.18  *    4.02  *
   1.60  *
* Max Chl Dpth (ft)      *   15.75  * Hydr. Depth (ft)      *    2.84  *   11.68  *
   4.63  *
* Conv. Total (cfs)      *332590.5  * Conv. (cfs)           * 12614.5  *310370.3  *
 9605.8  *
* Length Wtd. (ft)       *  142.89  * Wetted Per. (ft)      *   90.66  *  159.13  *
  32.08  *
* Min Ch El (ft)         * 1215.59  * Shear (lb/sq ft)      *    0.10  *    0.41  *
   0.16  *
* Alpha                  *    1.21  * Stream Power (lb/ft s) *    0.12  *    1.64  *
   0.25  *
* Frctn Loss (ft)        *    0.17  * Cum Volume (acre-ft)   *    7.54  *   70.45  *
  10.82  *
* C & E Loss (ft)        *    0.41  * Cum SA (acres)         *    2.68  *    7.96  *
   6.04  *
**********************************************************************************
***********
```

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 2993

INPUT
Description:
Station Elevation Data num= 389

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1245.31	1.2	1245.22	4.5	1244.91	8.3	1244.63	10.4	1244.49
14.6	1244.13	17.9	1243.88	21.3	1243.72	23.5	1243.59	27.9	1243.38
31.3	1243.12	38	1242.54	40.8	1242.32	41.3	1242.29	41.4	1242.29
44	1242.23	44.6	1242.19	46.8	1242.05	51.3	1241.68	54.7	1241.44
61.3	1241.11	64.7	1240.82	68	1240.5	70.2	1240.35	71.8	1240.27
74.9	1240.16	78.5	1239.95	85.5	1239.24	89	1238.97	91.1	1238.88
94.7	1238.78	100.3	1238.56	104.8	1238.42	107.4	1238.32	109.5	1238.21
109.9	1238.19	110.1	1238.18	112.4	1237.99	113.6	1237.88	115	1237.72
120.1	1237.1	120.6	1237.02	121.9	1236.84	122.6	1236.74	124.1	1236.51
125.1	1236.34	127.6	1235.9	127.7	1235.9	127.8	1235.88	130.2	1235.54
131.2	1235.45	132.8	1235.35	135.3	1235.34	136.9	1235.53	137.8	1235.66
138.2	1235.71	140.4	1236	142.9	1236.35	144.7	1236.63	145.2	1236.71
145.5	1236.74	146.1	1236.84	148.7	1237.13	150.4	1237.22	152.2	1237.35
155.2	1237.29	155.6	1237.27	155.8	1237.26	158.1	1236.85	159.3	1236.72
160.7	1236.44	162.8	1236.11	164.4	1235.89	164.8	1235.82	165.7	1235.79
168.1	1235.77	169.8	1235.71	170.3	1235.7	170.5	1235.7	172.8	1235.48
175.2	1235.33	177.6	1235.15	178.1	1235.15	180	1235.26	180.6	1235.29
182	1235.38	182.3	1235.42	182.8	1235.45	185.9	1235.57	189.8	1235.38
191.8	1235.12	193.7	1235	194.2	1234.96	195	1234.89	196.6	1234.72
197.6	1234.67	199	1234.54	201.1	1234.28	201.3	1234.24	201.5	1234.22
202.2	1234.08	203.7	1233.76	205.4	1233.41	207.2	1233.07	208.5	1232.9
209.3	1232.83	210.8	1232.8	212.9	1232.75	213.2	1232.74	213.2	1232.75
213.3	1232.75	215.6	1232.89	217	1232.95	218	1232.97	219.4	1232.9
220.3	1232.83	220.9	1232.78	222.7	1232.51	224.8	1232.1	225.1	1232.06
225.5	1231.98	227.5	1231.81	228.7	1231.73	232.6	1232.01	234.5	1232.3
234.6	1232.31	236.5	1232.5	237	1232.56	237.6	1232.61	239.3	1232.71
240.4	1232.7	241.7	1232.71	243.7	1232.59	244.1	1232.56	244.3	1232.53
246.5	1232.34	248.2	1232.15	248.8	1232.1	249.8	1232.03	251.2	1231.98
252.1	1231.95	253.6	1232.02	255.5	1232.2	255.9	1232.23	256.2	1232.26
258.2	1232.47	260.3	1232.64	262.9	1232.71	264.5	1232.67	265.3	1232.64
267.6	1232.42	268.6	1232.26	269.9	1232.08	271.6	1231.76	272.3	1231.63
274.6	1231.09	276.9	1230.48	276.9	1230.47	277	1230.47	279.3	1230.19

281.1	1230	281.6	1229.98	282.3	1229.94	284	1230.05	285.2	1230.09
286.3	1230.09	287.7	1230	288.6	1230.04	289.4	1230.05	291	1230.03
293	1229.95	293.3	1229.95	293.5	1229.95	295.3	1229.82	297.7	1229.62
298	1229.56	298.4	1229.47	300.3	1229.09	301.8	1228.81	303.7	1228.33
304.7	1228.15	305	1228.07	305.9	1227.85	307.4	1227.47	309.4	1226.77
309.7	1226.62	311.2	1225.84	312.1	1225.36	313.9	1224.26	314.4	1224.01
315.1	1223.61	316.8	1222.55	316.91	1222.487	317.05	1222.38	317.9	1221.86
319.1	1221.31	320.9	1220.6	321.5	1220.35	321.9	1220.19	324.3	1219.69
325.9	1219.37	326.2	1219.35	326.6	1219.32	329.9	1218.99	330.9	1218.93
332.4	1218.84	333.3	1218.78	333.9	1218.75	335.6	1218.68	337.56	1218.34
339.37	1218.06	340.63	1217.53	342.04	1217.02	343.78	1216.65	344.88	1216.33
346.3	1216.09	347.08	1215.96	348.34	1215.94	350.31	1216.07	353.3	1216.39
355.11	1216.71	357.47	1217.1	358.42	1217.62	359.21	1217.91	359.84	1218.04
360.78	1218.37	362.04	1218.51	364.88	1218.73	367.71	1218.75	369.99	1218.75
372.59	1219.07	374.01	1219.29	375.7	1219.74	376.8	1219.88	377.9	1220.02
378	1220.07	378.3	1220.14	381.9	1221.21	382.8	1221.56	384.1	1222.09
384.87	1222.39	387.5	1223.36	389.26	1223.99	389.8	1224.16	389.9	1224.19
391.1	1224.57	392.2	1224.94	394.6	1225.9	395.7	1226.51	396.9	1227.37
397.91	1228.157	399.3	1229.26	401.5	1231.08	401.6	1231.19	401.7	1231.22
401.7	1231.25	404	1232.8	405.6	1233.56	406.4	1233.89	407.7	1234.27
408.8	1234.56	409.5	1234.71	411.1	1235.15	413.4	1235.66	413.5	1235.69
413.7	1235.73	415.9	1236.38	417.3	1236.7	418.2	1236.91	419.6	1237.18
420.6	1237.37	421.3	1237.46	423	1237.7	424.3	1237.85	425.2	1237.95
425.4	1237.96	425.6	1237.98	427.7	1238.15	429.1	1238.24	430.1	1238.28
430.4	1238.3	431.4	1238.34	432.4	1238.38	433.3	1238.41	436.5	1238.51
437.5	1238.54	439.4	1238.62	441.7	1238.72	442.6	1238.75	444.1	1238.81
446.1	1238.89	446.4	1238.9	446.8	1238.91	448.7	1238.99	450.4	1239.05
451.1	1239.07	451.9	1239.09	453.4	1239.14	454.6	1239.16	457	1239.13
458	1239.1	458.9	1239.04	460.4	1238.95	462.7	1238.75	463.2	1238.72
465	1238.73	467.2	1238.75	467.5	1238.76	468.7	1238.89	469.7	1238.99
471.7	1239.17	472	1239.2	472.3	1239.24	474.3	1239.46	476	1239.67
476.7	1239.79	479	1240.2	480.3	1240.43	481.3	1240.71	482.6	1241.05
483.7	1241.3	484.6	1241.51	486	1241.9	487.7	1242.35	488.3	1242.49
490.6	1242.86	492.8	1243.17	493	1243.2	493.1	1243.21	494.8	1243.41
495.3	1243.47	497.4	1243.69	497.6	1243.72	501.7	1244.23	502.3	1244.34
504.1	1244.72	504.6	1244.8	506.1	1245.11	506.9	1245.32	507.8	1245.56
509.2	1245.94	510.6	1246.28	511.6	1246.45	512.6	1246.62	513.9	1246.81
515.1	1246.97	516.2	1247.07	517.3	1247.18	518.5	1247.3	519.7	1247.41
520.8	1247.47	522.1	1247.52	523.2	1247.54	524.2	1247.55	525.5	1247.53
526.8	1247.51	527.8	1247.51	530.1	1247.54	531.5	1247.56	532.4	1247.59
533.3	1247.63	534.8	1247.64	536.3	1247.65	537.1	1247.66	538.3	1247.66
540.2	1247.93	541.3	1248.1	542.1	1248.22	544.1	1248.46	544.6	1248.53
545	1248.59	547.6	1248.93	547.9	1248.97	547.9	1248.98	548	1248.99
550.8	1249.41	551.3	1249.49	551.9	1249.6	554.6	1250.04	555.8	1250.22
556.5	1250.32	557.9	1250.51	559.4	1250.7	561.2	1250.94	562.3	1251.05
563.7	1251.21	564.5	1251.29	565.1	1251.35	565.4	1251.37		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

****

```
       0     .06  317.05    .045  384.87     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        317.05  384.87             79.1    63.1    64.5             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  286.25  1237.5       F
  409.75   565.4    1239       F

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
**********
* E.G. Elev (ft)         * 1228.51  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.38  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1227.13  * Reach Len. (ft)       *   28.00  *   28.00  *
  28.00  *
* Crit W.S. (ft)         * 1224.73  * Flow Area (sq ft)     *   19.08  *  573.79  *
  30.51  *
* E.G. Slope (ft/ft)     *0.005030  * Area (sq ft)          *   19.08  *  573.79  *
  30.51  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)           *   51.87  * 5481.85  *
  96.29  *
* Top Width (ft)         *   88.19  * Top Width (ft)       *    8.68  *   67.82  *
  11.69  *
* Vel Total (ft/s)       *    9.03  * Avg. Vel. (ft/s)     *    2.72  *    9.55  *
   3.16  *
* Max Chl Dpth (ft)      *   11.19  * Hydr. Depth (ft)     *    2.20  *    8.46  *
   2.61  *
* Conv. Total (cfs)      * 79378.8  * Conv. (cfs)          *   731.3  * 77289.9  *
 1357.5  *
* Length Wtd. (ft)       *   28.00  * Wetted Per. (ft)     *    9.91  *   69.64  *
  12.67  *
* Min Ch El (ft)         * 1215.94  * Shear (lb/sq ft)     *    0.60  *    2.59  *
   0.76  *
* Alpha                  *    1.09  * Stream Power (lb/ft s) *  1.64  *   24.72  *
   2.39  *
* Frctn Loss (ft)        *    0.24  * Cum Volume (acre-ft)  *    3.82  *   54.45  *
   4.04  *
* C & E Loss (ft)        *    0.50  * Cum SA (acres)        *    1.91  *    7.59  *
   2.93  *
************************************************************************************
**********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
```

1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500-yr

E.G. Elev (ft)	1230.99	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.60	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	1229.39	Reach Len. (ft)	28.00	28.00	28.00
Crit W.S. (ft)	1226.29	Flow Area (sq ft)	48.65	727.34	60.31
E.G. Slope (ft/ft)	*0.004319	Area (sq ft)	48.65	727.34	60.31
Q Total (cfs)	7920.00	Flow (cfs)	144.30	7541.35	234.35
Top Width (ft)	100.68	Top Width (ft)	18.27	67.82	14.59
Vel Total (ft/s)	9.47	Avg. Vel. (ft/s)	2.97	10.37	3.89
Max Chl Dpth (ft)	13.45	Hydr. Depth (ft)	2.66	10.72	4.13
Conv. Total (cfs)	*120516.2	Conv. (cfs)	2195.8	*114754.5	3566.0
Length Wtd. (ft)	28.00	Wetted Per. (ft)	19.78	69.64	16.35
Min Ch El (ft)	1215.94	Shear (lb/sq ft)	0.66	2.82	0.99
Alpha	1.15	Stream Power (lb/ft s)	1.97	29.20	3.87
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	7.49	66.28	10.10
C & E Loss (ft)	0.67	Cum SA (acres)	2.66	7.59	5.88

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Coaticook
REACH: Reach 1 RS: 2950

INPUT
Description: Road Bridge
Distance from Upstream XS = 28
Deck/Roadway Width = 26
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 18

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1252.63		100	1243.66		160	1240.42	
200	1239.59		220	1239.51		252	1239.1	
273	1238.97		283	1238.89		314	1239	
314	1239	1237.5	374	1239.13	1237.8	381.5	1239.34	1237.84
381.5	1239.34		385	1239.34		400	1239.97	
450	1241.9		500	1243.56		515	1243.89	

Upstream Bridge Cross Section Data
Station Elevation Data num= 389

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1245.31	1.2	1245.22	4.5	1244.91	8.3	1244.63	10.4	1244.49
14.6	1244.13	17.9	1243.88	21.3	1243.72	23.5	1243.59	27.9	1243.38
31.3	1243.12	38	1242.54	40.8	1242.32	41.3	1242.29	41.4	1242.29
44	1242.23	44.6	1242.19	46.8	1242.05	51.3	1241.68	54.7	1241.44
61.3	1241.11	64.7	1240.82	68	1240.5	70.2	1240.35	71.8	1240.27
74.9	1240.16	78.5	1239.95	85.5	1239.24	89	1238.97	91.1	1238.88
94.7	1238.78	100.3	1238.56	104.8	1238.42	107.4	1238.32	109.5	1238.21
109.9	1238.19	110.1	1238.18	112.4	1237.99	113.6	1237.88	115	1237.72
120.1	1237.1	120.6	1237.02	121.9	1236.84	122.6	1236.74	124.1	1236.51
125.1	1236.34	127.6	1235.9	127.7	1235.9	127.8	1235.88	130.2	1235.54
131.2	1235.45	132.8	1235.35	135.3	1235.34	136.9	1235.53	137.8	1235.66
138.2	1235.71	140.4	1236	142.9	1236.35	144.7	1236.63	145.2	1236.71
145.5	1236.74	146.1	1236.84	148.7	1237.13	150.4	1237.22	152.2	1237.35
155.2	1237.29	155.6	1237.27	155.8	1237.26	158.1	1236.85	159.3	1236.72
160.7	1236.44	162.8	1236.11	164.4	1235.89	164.8	1235.82	165.7	1235.79
168.1	1235.77	169.8	1235.71	170.3	1235.7	170.5	1235.7	172.8	1235.48
175.2	1235.33	177.6	1235.15	178.1	1235.15	180	1235.26	180.6	1235.29
182	1235.38	182.3	1235.42	182.8	1235.45	185.9	1235.57	189.8	1235.38
191.8	1235.12	193.7	1235	194.2	1234.96	195	1234.89	196.6	1234.72
197.6	1234.67	199	1234.54	201.1	1234.28	201.3	1234.24	201.5	1234.22
202.2	1234.08	203.7	1233.76	205.4	1233.41	207.2	1233.07	208.5	1232.9
209.3	1232.83	210.8	1232.8	212.9	1232.75	213.2	1232.74	213.2	1232.75
213.3	1232.75	215.6	1232.89	217	1232.95	218	1232.97	219.4	1232.9
220.3	1232.83	220.9	1232.78	222.7	1232.51	224.8	1232.1	225.1	1232.06
225.5	1231.98	227.5	1231.81	228.7	1231.73	232.6	1232.01	234.5	1232.3

234.6	1232.31	236.5	1232.5	237	1232.56	237.6	1232.61	239.3	1232.71
240.4	1232.7	241.7	1232.71	243.7	1232.59	244.1	1232.56	244.3	1232.53
246.5	1232.34	248.2	1232.15	248.8	1232.1	249.8	1232.03	251.2	1231.98
252.1	1231.95	253.6	1232.02	255.5	1232.2	255.9	1232.23	256.2	1232.26
258.2	1232.47	260.3	1232.64	262.9	1232.71	264.5	1232.67	265.3	1232.64
267.6	1232.42	268.6	1232.26	269.9	1232.08	271.6	1231.76	272.3	1231.63
274.6	1231.09	276.9	1230.48	276.9	1230.47	277	1230.47	279.3	1230.19
281.1	1230	281.6	1229.98	282.3	1229.94	284	1230.05	285.2	1230.09
286.3	1230.09	287.7	1230	288.6	1230.04	289.4	1230.05	291	1230.03
293	1229.95	293.3	1229.95	293.5	1229.95	295.3	1229.82	297.7	1229.62
298	1229.56	298.4	1229.47	300.3	1229.09	301.8	1228.81	303.7	1228.33
304.7	1228.15	305	1228.07	305.9	1227.85	307.4	1227.47	309.4	1226.77
309.7	1226.62	311.2	1225.84	312.1	1225.36	313.9	1224.26	314.4	1224.01
315.1	1223.61	316.8	1222.55	316.91	1222.487	317.05	1222.38	317.9	1221.86
319.1	1221.31	320.9	1220.6	321.5	1220.35	321.9	1220.19	324.3	1219.69
325.9	1219.37	326.2	1219.35	326.6	1219.32	329.9	1218.99	330.9	1218.93
332.4	1218.84	333.3	1218.78	333.9	1218.75	335.6	1218.68	337.56	1218.34
339.37	1218.06	340.63	1217.53	342.04	1217.02	343.78	1216.65	344.88	1216.33
346.3	1216.09	347.08	1215.96	348.34	1215.94	350.31	1216.07	353.3	1216.39
355.11	1216.71	357.47	1217.1	358.42	1217.62	359.21	1217.91	359.84	1218.04
360.78	1218.37	362.04	1218.51	364.88	1218.73	367.71	1218.75	369.99	1218.75
372.59	1219.07	374.01	1219.29	375.7	1219.74	376.8	1219.88	377.9	1220.02
378	1220.07	378.3	1220.14	381.9	1221.21	382.8	1221.56	384.1	1222.09
384.87	1222.39	387.5	1223.36	389.26	1223.99	389.8	1224.16	389.9	1224.19
391.1	1224.57	392.2	1224.94	394.6	1225.9	395.7	1226.51	396.9	1227.37
397.91	1228.157	399.3	1229.26	401.5	1231.08	401.6	1231.19	401.7	1231.22
401.7	1231.25	404	1232.8	405.6	1233.56	406.4	1233.89	407.7	1234.27
408.8	1234.56	409.5	1234.71	411.1	1235.15	413.4	1235.66	413.5	1235.69
413.7	1235.73	415.9	1236.38	417.3	1236.7	418.2	1236.91	419.6	1237.18
420.6	1237.37	421.3	1237.46	423	1237.7	424.3	1237.85	425.2	1237.95
425.4	1237.96	425.6	1237.98	427.7	1238.15	429.1	1238.24	430.1	1238.28
430.4	1238.3	431.4	1238.34	432.4	1238.38	433.3	1238.41	436.5	1238.51
437.5	1238.54	439.4	1238.62	441.7	1238.72	442.6	1238.75	444.1	1238.81
446.1	1238.89	446.4	1238.9	446.8	1238.91	448.7	1238.99	450.4	1239.05
451.1	1239.07	451.9	1239.09	453.4	1239.14	454.6	1239.16	457	1239.13
458	1239.1	458.9	1239.04	460.4	1238.95	462.7	1238.75	463.2	1238.72
465	1238.73	467.2	1238.75	467.5	1238.76	468.7	1238.89	469.7	1238.99
471.7	1239.17	472	1239.2	472.3	1239.24	474.3	1239.46	476	1239.67
476.7	1239.79	479	1240.2	480.3	1240.43	481.3	1240.71	482.6	1241.05
483.7	1241.3	484.6	1241.51	486	1241.9	487.7	1242.35	488.3	1242.49
490.6	1242.86	492.8	1243.17	493	1243.2	493.1	1243.21	494.8	1243.41
495.3	1243.47	497.4	1243.69	497.6	1243.72	501.7	1244.23	502.3	1244.34
504.1	1244.72	504.6	1244.8	506.1	1245.11	506.9	1245.32	507.8	1245.56
509.2	1245.94	510.6	1246.28	511.6	1246.45	512.6	1246.62	513.9	1246.81
515.1	1246.97	516.2	1247.07	517.3	1247.18	518.5	1247.3	519.7	1247.41
520.8	1247.47	522.1	1247.52	523.2	1247.54	524.2	1247.55	525.5	1247.53
526.8	1247.51	527.8	1247.51	530.1	1247.54	531.5	1247.56	532.4	1247.59
533.3	1247.63	534.8	1247.64	536.3	1247.65	537.1	1247.66	538.3	1247.66
540.2	1247.93	541.3	1248.1	542.1	1248.22	544.1	1248.46	544.6	1248.53
545	1248.59	547.6	1248.93	547.9	1248.97	547.9	1248.98	548	1248.99

```
   550.8 1249.41   551.3 1249.49   551.9  1249.6   554.6 1250.04   555.8 1250.22
   556.5 1250.32   557.9 1250.51   559.4  1250.7   561.2 1250.94   562.3 1251.05
   563.7 1251.21   564.5 1251.29   565.1 1251.35   565.4 1251.37

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06  317.05    .045  384.87     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        317.05  384.87             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  286.25  1237.5       F
  409.75   565.4    1239       F

Downstream  Deck/Roadway Coordinates
    num=      18
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**********************************************************************
       0 1252.63             100 1243.66             160 1240.42
     200 1239.59             220 1239.51             252  1239.1
     273 1238.97          276.25 1238.95          276.25 1238.95 1237.45
     283 1238.89 1237.47  343.75    1239  1237.5  343.75    1239
     374 1239.13             385 1239.34             400 1239.97
     450  1241.9             500 1243.56             515 1243.89

Downstream Bridge Cross Section Data
Station Elevation Data    num=     337
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0 1257.94      .5 1257.93     3.8 1257.83     6.2 1257.73    10.4 1257.52
    13.7 1257.46    18.1  1257.6    19.4 1257.67    26.8 1257.93    33.5 1257.99
    36.8 1257.99    40.1 1257.86    43.4 1257.45    44.8 1257.27    46.7 1256.99
    47.8 1256.87    49.1 1256.68      50 1256.56    53.3 1255.82    56.6 1254.63
    57.5 1254.28    59.7 1253.34    62.7 1252.13    66.5 1250.58    68.6 1249.66
    69.8 1249.09    73.1 1247.36    76.4 1245.69    79.7 1244.62      83 1244.09
    86.2 1243.73    89.6  1243.3    92.9 1242.71    97.7 1241.66    99.6 1241.28
   103.1 1240.73   103.4 1240.71     106 1240.47   106.6  1240.4   107.9 1240.29
   108.5 1240.24   113.5 1239.74   121.4 1238.93   127.4 1238.27   130.9 1238.03
   134.1 1237.85   134.3 1237.84   134.4 1237.84   136.9 1237.67   141.3  1237.5
   144.8 1237.49   145.1 1237.51   148.2 1237.67   151.7 1237.92   154.9 1238.05
   158.7 1237.92   162.1 1237.55   165.7 1237.11   167.3 1236.95   167.6 1236.92
   169.3 1236.72   172.5 1236.46   172.9 1236.41     174 1236.32     175 1236.23
   180.2 1235.72   180.8 1235.66   183.8 1235.36   197.2 1234.13   198.3 1234.02
   202.2 1233.64   202.8 1233.57   204.6 1233.39   205.5  1233.3   209.6 1232.91
   216.3 1232.17   218.4 1231.98   219.5 1231.89     220 1231.84   221.3 1231.74
   221.9  1231.7   223.6 1231.55   224.4 1231.48   226.9 1231.26   227.2 1231.22
   228.1 1231.14   229.3 1231.02   230.8 1230.87   231.8 1230.79     234 1230.54
   234.3  1230.5   234.4 1230.49   234.8 1230.44     237 1230.18   238.2 1229.95
```

239.1	1229.77	240.2	1229.54	241.4	1229.32	243.8	1228.88	245.3	1228.52
248.4	1227.96	250.5	1227.48	250.7	1227.43	251	1227.38	253.1	1226.87
253.5	1226.75	255.2	1226.22	255.4	1226.16	255.6	1226.09	257.2	1225.61
257.7	1225.43	259.3	1224.92	260.1	1224.63	261.6	1224.13	263.1	1223.66
264.9	1223.21	265.5	1223.06	267	1222.72	267.3	1222.65	267.98	1222.31
269.97	1221.48	272.32	1221.01	273.71	1220.86	274.15	1220.8	274.53	1220.78
275.62	1220.48	277.09	1220.18	278.62	1220.05	279	1219.75	279.46	1219.4
280.48	1219.01	281.39	1218.62	282.68	1218.1	284.06	1217.75	284.98	1217.37
285.99	1217.24	286.64	1217.13	287.92	1216.84	289.71	1216.35	291.62	1216.02
295.51	1215.77	298.74	1215.61	301.53	1215.61	305.2	1215.6	307.69	1215.53
310.11	1215.44	312.84	1215.03	315.55	1215.71	317.6	1215.79	319.29	1215.72
322.45	1215.74	325.82	1215.69	329.05	1215.75	333.38	1215.77	337.93	1215.93
341.16	1216.28	342.56	1216.73	343.28	1217.23	343.67	1217.46	344.43	1217.92
345.19	1218.6	345.57	1219.09	346.05	1219.46	346.43	1219.97	347.19	1220.38
348.24	1220.94	349.18	1221.17	350.52	1221.66	350.61	1221.79	350.8	1222.37
351.5	1222.66	353.2	1223.68	354.4	1224.37	355.3	1224.91	355.6	1225.08
356	1225.3	358	1226.6	359.2	1227.33	360.3	1228	362.2	1228.95
362.7	1229.22	363	1229.37	364.3	1229.99	365.1	1230.42	366.9	1231.26
367.5	1231.51	368.5	1231.84	369.9	1232.26	370.7	1232.5	372.3	1232.8
374.6	1233.19	374.7	1233.21	377	1233.64	378.5	1233.91	379.4	1234.09
380.6	1234.33	381.7	1234.57	382.5	1234.74	384.1	1235.05	386.4	1235.45
386.5	1235.46	386.5	1235.47	386.7	1235.5	388.8	1235.8	390.5	1236.03
391.2	1236.15	392.2	1236.32	393.5	1236.58	394.5	1236.8	395.9	1237.17
398	1237.74	398.3	1237.84	398.4	1237.91	399.5	1238.25	400.6	1238.6
402.4	1239.17	403	1239.31	403.7	1239.52	405.3	1239.88	406.4	1240.09
409.5	1240.61	410	1240.66	411.8	1240.76	412.4	1240.78	419.3	1240.97
419.4	1240.97	421.7	1241.09	424	1241.19	424.4	1241.21	426.3	1241.29
428.6	1241.37	428.7	1241.38	430.9	1241.47	433.3	1241.56	435.6	1241.71
437.9	1241.87	438	1241.88	440.2	1242	442.4	1242.14	442.7	1242.16
444.9	1242.26	447	1242.36	447.2	1242.37	447.4	1242.38	449.5	1242.46
451.6	1242.49	451.8	1242.49	452	1242.48	454.1	1242.43	456.2	1242.34
456.7	1242.33	458.8	1242.33	461.1	1242.37	461.4	1242.38	463.4	1242.43
465.7	1242.49	466.1	1242.5	468.1	1242.49	470	1242.47	470.4	1242.47
471.2	1242.49	473	1242.52	473.5	1242.53	474.6	1242.59	477	1242.7
478.2	1242.78	479.7	1242.87	480.4	1242.92	480.8	1242.94	482.1	1243.01
483.4	1243.08	483.9	1243.1	484.3	1243.13	485.4	1243.21	489.4	1243.49
490.9	1243.58	492	1243.65	494	1243.76	494.5	1243.78	495	1243.79
497.1	1243.83	499.5	1243.88	499.6	1243.88	501.3	1243.92	502.2	1243.93
504.5	1243.96	504.7	1243.97	504.8	1243.97	505	1243.97	507.3	1244
508.3	1244.01	509.9	1244.03	510.5	1244.04	512.4	1244.09	514.1	1244.15
515	1244.17	515.3	1244.18	516	1244.23	517.5	1244.34	518.8	1244.44
520.1	1244.54	521.5	1244.67	522.3	1244.74	522.6	1244.77	525.2	1244.95
527	1245.08	527.8	1245.13	529.3	1245.25	530.3	1245.33	532.5	1245.51
532.7	1245.53	532.9	1245.54	533.2	1245.56	535.4	1245.7	536.2	1245.74
537	1245.77	537.9	1245.8	540	1245.9	540.2	1245.91	540.3	1245.91
542.6	1246.12	544.3	1246.32	544.9	1246.38	545.7	1246.49	547.3	1246.81
548.5	1247.07	549.6	1247.3	551.1	1247.63	552	1247.81	552.6	1247.95
554.3	1248.31	556.6	1248.78	556.6	1248.79	556.7	1248.8	557.1	1248.86
561.3	1249.57	561.5	1249.61						

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0     .06  272.32    .045  348.24     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        272.32  348.24             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  257.15 1237.45       F
  362.85   561.5  1237.5       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT  Profile #100-yr
*********************************************************************************
*********
* E.G. US. (ft)          *    1228.51  * Element               *Inside BR US
*Inside BR DS *
* W.S. US. (ft)          *    1227.13  * E.G. Elev (ft)        *    1227.77  *
1226.21  *
* Q Total (cfs)          *    5630.00  * W.S. Elev (ft)        *    1224.71  *
1224.69  *
* Q Bridge (cfs)         *    5630.00  * Crit W.S. (ft)        *    1224.71  *
1222.27  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *       8.77  *
 9.66  *
* Weir Sta Lft (ft)      *             * Vel Total (ft/s)      *      13.93  *
```

```
 9.90  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)      *     404.10  *
568.55  *
* Weir Submerg           *             * Froude # Chl           *       0.83  *
 0.56  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)   *    3769.02  *
4174.17  *
* Min El Weir Flow (ft)  *    1238.90  * Hydr Depth (ft)        *       5.99  *
 8.42  *
* Min El Prs (ft)        *    1237.84  * W.P. Total (ft)        *      73.71  *
80.23  *
* Delta EG (ft)          *       2.50  * Conv. Total (cfs)      *    42444.4  *
69264.2  *
* Delta WS (ft)          *       2.35  * Top Width (ft)         *      67.50  *
67.50  *
* BR Open Area (sq ft)   *    1278.58  * Frctn Loss (ft)        *       0.26  *
 0.72  *
* BR Open Vel (ft/s)     *      13.93  * C & E Loss (ft)        *       0.77  *
 0.77  *
* BR Sluice Coef         *             * Shear Total (lb/sq ft) *       6.02  *
 2.92  *
* BR Sel Method          *Energy only  * Power Total (lb/ft s)  *      83.89  *
28.94  *
********************************************************************************
*********

Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set
equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is
not a valid subcritical answer.  The
         program defaulted to critical depth.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
```

1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE OUTPUT Profile #500-yr

* E.G. US. (ft)	* 1230.99	* Element	*Inside BR US	*Inside BR DS *	
* W.S. US. (ft)	* 1229.39	* E.G. Elev (ft)	* 1230.11	* 1228.33	*
* Q Total (cfs)	* 7920.00	* W.S. Elev (ft)	* 1226.28	* 1226.14	*
* Q Bridge (cfs)	* 7920.00	* Crit W.S. (ft)	* 1226.28	* 1223.82	*
* Q Weir (cfs)	*	* Max Chl Dpth (ft)	* 10.34	* 11.11	*
* Weir Sta Lft (ft)	*	* Vel Total (ft/s)	* 15.54	* 11.88	*
* Weir Sta Rgt (ft)	*	* Flow Area (sq ft)	* 509.77	* 666.57	*
* Weir Submerg	*	* Froude # Chl	* 0.86	* 0.63	*
* Weir Max Depth (ft)	*	* Specif Force (cu ft)	* 5891.41	* 6263.00	*
* Min El Weir Flow (ft)	* 1238.90	* Hydr Depth (ft)	* 7.55	* 9.88	*
* Min El Prs (ft)	* 1237.84	* W.P. Total (ft)	* 76.84	* 83.13	*
* Delta EG (ft)	* 3.00	* Conv. Total (cfs)	* 60997.1	* 88174.1	*
* Delta WS (ft)	* 3.04	* Top Width (ft)	* 67.50	* 67.50	*
* BR Open Area (sq ft)	* 1278.58	* Frctn Loss (ft)	* 0.29	* 0.67	*
* BR Open Vel (ft/s)	* 15.54	* C & E Loss (ft)	* 0.82	* 0.85	*
* BR Sluice Coef	*	* Shear Total (lb/sq ft)	* 6.98	* 4.04	*
* BR Sel Method	*Energy only	* Power Total (lb/ft s)	* 108.48	* 47.98	*

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 2930

INPUT
Description:
Station Elevation Data num= 337

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1257.94	.5	1257.93	3.8	1257.83	6.2	1257.73	10.4	1257.52
13.7	1257.46	18.1	1257.6	19.4	1257.67	26.8	1257.93	33.5	1257.99
36.8	1257.99	40.1	1257.86	43.4	1257.45	44.8	1257.27	46.7	1256.99
47.8	1256.87	49.1	1256.68	50	1256.56	53.3	1255.82	56.6	1254.63
57.5	1254.28	59.7	1253.34	62.7	1252.13	66.5	1250.58	68.6	1249.66
69.8	1249.09	73.1	1247.36	76.4	1245.69	79.7	1244.62	83	1244.09
86.2	1243.73	89.6	1243.3	92.9	1242.71	97.7	1241.66	99.6	1241.28
103.1	1240.73	103.4	1240.71	106	1240.47	106.6	1240.4	107.9	1240.29
108.5	1240.24	113.5	1239.74	121.4	1238.93	127.4	1238.27	130.9	1238.03
134.1	1237.85	134.3	1237.84	134.4	1237.84	136.9	1237.67	141.3	1237.5
144.8	1237.49	145.1	1237.51	148.2	1237.67	151.7	1237.92	154.9	1238.05

158.7	1237.92	162.1	1237.55	165.7	1237.11	167.3	1236.95	167.6	1236.92
169.3	1236.72	172.5	1236.46	172.9	1236.41	174	1236.32	175	1236.23
180.2	1235.72	180.8	1235.66	183.8	1235.36	197.2	1234.13	198.3	1234.02
202.2	1233.64	202.8	1233.57	204.6	1233.39	205.5	1233.3	209.6	1232.91
216.3	1232.17	218.4	1231.98	219.5	1231.89	220	1231.84	221.3	1231.74
221.9	1231.7	223.6	1231.55	224.4	1231.48	226.9	1231.26	227.2	1231.22
228.1	1231.14	229.3	1231.02	230.8	1230.87	231.8	1230.79	234	1230.54
234.3	1230.5	234.4	1230.49	234.8	1230.44	237	1230.18	238.2	1229.95
239.1	1229.77	240.2	1229.54	241.4	1229.32	243.8	1228.88	245.3	1228.52
248.4	1227.96	250.5	1227.48	250.7	1227.43	251	1227.38	253.1	1226.87
253.5	1226.75	255.2	1226.22	255.4	1226.16	255.6	1226.09	257.2	1225.61
257.7	1225.43	259.3	1224.92	260.1	1224.63	261.6	1224.13	263.1	1223.66
264.9	1223.21	265.5	1223.06	267	1222.72	267.3	1222.65	267.98	1222.31
269.97	1221.48	272.32	1221.01	273.71	1220.86	274.15	1220.8	274.53	1220.78
275.62	1220.48	277.09	1220.18	278.62	1220.05	279	1219.75	279.46	1219.4
280.48	1219.01	281.39	1218.62	282.68	1218.1	284.06	1217.75	284.98	1217.37
285.99	1217.24	286.64	1217.13	287.92	1216.84	289.71	1216.35	291.62	1216.02
295.51	1215.77	298.74	1215.61	301.53	1215.61	305.2	1215.6	307.69	1215.53
310.11	1215.44	312.84	1215.03	315.55	1215.71	317.6	1215.79	319.29	1215.72
322.45	1215.74	325.82	1215.69	329.05	1215.75	333.38	1215.77	337.93	1215.93
341.16	1216.28	342.56	1216.73	343.28	1217.23	343.67	1217.46	344.43	1217.92
345.19	1218.6	345.57	1219.09	346.05	1219.46	346.43	1219.97	347.19	1220.38
348.24	1220.94	349.18	1221.17	350.52	1221.66	350.61	1221.79	350.8	1222.37
351.5	1222.66	353.2	1223.68	354.4	1224.37	355.3	1224.91	355.6	1225.08
356	1225.3	358	1226.6	359.2	1227.33	360.3	1228	362.2	1228.95
362.7	1229.22	363	1229.37	364.3	1229.99	365.1	1230.42	366.9	1231.26
367.5	1231.51	368.5	1231.84	369.9	1232.26	370.7	1232.5	372.3	1232.8
374.6	1233.19	374.7	1233.21	377	1233.64	378.5	1233.91	379.4	1234.09
380.6	1234.33	381.7	1234.57	382.5	1234.74	384.1	1235.05	386.4	1235.45
386.5	1235.46	386.5	1235.47	386.7	1235.5	388.8	1235.8	390.5	1236.03
391.2	1236.15	392.2	1236.32	393.5	1236.58	394.5	1236.8	395.9	1237.17
398	1237.74	398.3	1237.84	398.4	1237.91	399.5	1238.25	400.6	1238.6
402.4	1239.17	403	1239.31	403.7	1239.52	405.3	1239.88	406.4	1240.09
409.5	1240.61	410	1240.66	411.8	1240.76	412.4	1240.78	419.3	1240.97
419.4	1240.97	421.7	1241.09	424	1241.19	424.4	1241.21	426.3	1241.29
428.6	1241.37	428.7	1241.38	430.9	1241.47	433.3	1241.56	435.6	1241.71
437.9	1241.87	438	1241.88	440.2	1242	442.4	1242.14	442.7	1242.16
444.9	1242.26	447	1242.36	447.2	1242.37	447.4	1242.38	449.5	1242.46
451.6	1242.49	451.8	1242.49	452	1242.48	454.1	1242.43	456.2	1242.34
456.7	1242.33	458.8	1242.33	461.1	1242.37	461.4	1242.38	463.4	1242.43
465.7	1242.49	466.1	1242.5	468.1	1242.49	470	1242.47	470.4	1242.47
471.2	1242.49	473	1242.52	473.5	1242.53	474.6	1242.59	477	1242.7
478.2	1242.78	479.7	1242.87	480.4	1242.92	480.8	1242.94	482.1	1243.01
483.4	1243.08	483.9	1243.1	484.3	1243.13	485.4	1243.21	489.4	1243.49
490.9	1243.58	492	1243.65	494	1243.76	494.5	1243.78	495	1243.79
497.1	1243.83	499.5	1243.88	499.6	1243.88	501.3	1243.92	502.2	1243.93
504.5	1243.96	504.7	1243.97	504.8	1243.97	505	1243.97	507.3	1244
508.3	1244.01	509.9	1244.03	510.5	1244.04	512.4	1244.09	514.1	1244.15
515	1244.17	515.3	1244.18	516	1244.23	517.5	1244.34	518.8	1244.44
520.1	1244.54	521.5	1244.67	522.3	1244.74	522.6	1244.77	525.2	1244.95

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     527 1245.08   527.8 1245.13   529.3 1245.25   530.3 1245.33   532.5 1245.51
   532.7 1245.53   532.9 1245.54   533.2 1245.56   535.4  1245.7   536.2 1245.74
     537 1245.77   537.9  1245.8     540  1245.9   540.2 1245.91   540.3 1245.91
   542.6 1246.12   544.3 1246.32   544.9 1246.38   545.7 1246.49   547.3 1246.81
   548.5 1247.07   549.6  1247.3   551.1 1247.63     552 1247.81   552.6 1247.95
   554.3 1248.31   556.6 1248.78   556.6 1248.79   556.7  1248.8   557.1 1248.86
   561.3 1249.57   561.5 1249.61

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  272.32    .045  348.24     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        272.32  348.24            227.3   150.9    55.5             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  257.15 1237.45       F
  362.85   561.5  1237.5       F

CROSS SECTION OUTPUT  Profile #100-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1226.02  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.24  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1224.78  * Reach Len. (ft)        *  227.30  *  150.90  *
  55.50  *
* Crit W.S. (ft)         * 1222.28  * Flow Area (sq ft)      *   24.41  *  615.07  *
  14.15  *
* E.G. Slope (ft/ft)     *0.004763  * Area (sq ft)           *   24.41  *  615.07  *
  14.15  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   62.82  * 5532.04  *
  35.15  *
* Top Width (ft)         *   95.39  * Top Width (ft)         *   12.63  *   75.92  *
   6.84  *
* Vel Total (ft/s)       *    8.61  * Avg. Vel. (ft/s)       *    2.57  *    8.99  *
   2.48  *
* Max Chl Dpth (ft)      *    9.75  * Hydr. Depth (ft)       *    1.93  *    8.10  *
   2.07  *
* Conv. Total (cfs)      * 81576.6  * Conv. (cfs)            *   910.2  * 80157.1  *
  509.3  *
* Length Wtd. (ft)       *  154.05  * Wetted Per. (ft)       *   13.22  *   78.45  *
   8.08  *
* Min Ch El (ft)         * 1215.03  * Shear (lb/sq ft)       *    0.55  *    2.33  *
   0.52  *
* Alpha                  *    1.07  * Stream Power (lb/ft s) *    1.41  *   20.97  *
   1.29  *
* Frctn Loss (ft)        *    0.58  * Cum Volume (acre-ft)   *    3.81  *   53.73  *
```

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   4.03  *
* C & E Loss (ft)        *    0.31  * Cum SA (acres)         *    1.91  *    7.49  *
   2.93  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1228.00  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.64  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1226.36  * Reach Len. (ft)        *  227.30  *  150.90  *
  55.50  *
* Crit W.S. (ft)         * 1223.71  * Flow Area (sq ft)      *   47.29  *  734.94  *
  27.02  *
* E.G. Slope (ft/ft)     *0.005047  * Area (sq ft)           *   48.17  *  734.94  *
  27.02  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  172.07  * 7661.80  *
  86.13  *
* Top Width (ft)         *  102.86  * Top Width (ft)         *   17.56  *   75.92  *
   9.39  *
* Vel Total (ft/s)       *    9.79  * Avg. Vel. (ft/s)       *    3.64  *   10.43  *
   3.19  *
* Max Chl Dpth (ft)      *   11.33  * Hydr. Depth (ft)       *    3.12  *    9.68  *
   2.88  *
* Conv. Total (cfs)      *111484.0  * Conv. (cfs)            *  2422.1  *107849.4  *
 1212.4  *
* Length Wtd. (ft)       *  155.56  * Wetted Per. (ft)       *   15.90  *   78.45  *
  11.08  *
* Min Ch El (ft)         * 1215.03  * Shear (lb/sq ft)       *    0.94  *    2.95  *
   0.77  *
* Alpha                  *    1.10  * Stream Power (lb/ft s) *    3.41  *   30.77  *
   2.45  *
* Frctn Loss (ft)        *    0.53  * Cum Volume (acre-ft)   *    7.46  *   65.39  *
  10.07  *
* C & E Loss (ft)        *    0.49  * Cum SA (acres)         *    2.65  *    7.49  *
   5.87  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
```

sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 2779

INPUT
Description:
Station Elevation Data num= 365

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1284.77	2.9	1284.84	16.1	1284.98	22.7	1285.02	30.1	1285.02
39	1285.1	48.3	1285.25	52.3	1285.24	55.6	1285.15	58.9	1285.1
63.4	1284.95	68.7	1284.81	75.1	1284.76	78.1	1284.7	78.6	1284.69
78.6	1284.68	82.3	1284.53	85.2	1284.38	90.7	1284.2	95.1	1284.08
101.7	1284.04	103.9	1284.06	108.3	1284.08	111.1	1284.15	114.8	1284.19
118.1	1283.94	121.4	1283.12	124.7	1281.67	128	1279.61	130.1	1278.03
131.3	1277.05	134.6	1274.19	137.9	1271.26	141.2	1268.41	143.6	1266.38
144.5	1265.64	147.8	1262.93	151.1	1260.39	154.4	1258.02	157.6	1255.86
158	1255.63	160.4	1254.15	164.2	1251.81	167.5	1249.78	168.7	1248.94
169.5	1248.38	170.8	1247.51	177.4	1242.54	180.7	1240.3	182	1239.48
182.6	1239.08	183.9	1238.29	185.1	1237.6	186.1	1236.99	190.5	1234.44
193.8	1232.66	197.1	1231.02	200.4	1229.46	203.5	1228.05	203.7	1227.98
203.8	1227.91	206.9	1226.48	206.9	1226.46	207	1226.45	210	1225.12
210.2	1225.04	210.4	1224.97	213.5	1223.88	216.8	1223.03	220.1	1222.5
220.9	1222.42	222.5	1222.25	223.4	1222.17	229.9	1221.66	231.3	1221.55
231.8	1221.52	233.2	1221.41	234.8	1221.28	236.5	1221.14	239.8	1220.9
243.1	1220.69	244.3	1220.65	245.2	1220.62	246.4	1220.58	249.6	1220.66
252.9	1220.97	256.2	1221.35	259.5	1221.67	259.8	1221.69	262.6	1221.83
262.8	1221.84	263	1221.84	266	1221.91	266.1	1221.91	269.2	1221.94
269.4	1221.94	269.5	1221.94	272.3	1221.99	272.6	1222	273	1222.02
275.4	1222.18	275.9	1222.2	276.5	1222.23	278.6	1222.37	279.2	1222.4
282.5	1222.44	283.4	1222.37	284.8	1222.22	285.8	1222.14	286.9	1221.87
287.9	1221.58	289.1	1221.29	291.11	220.471	292.3	1219.98	293.8	1219.5
294.1	1219.4	295.6	1218.9	298.9	1218.45	300.4	1218.4	300.8	1218.38
302.2	1218.32	303.54	1218.2	304.67	1218.2	306.38	1218.13	307.06	1217.85
308.13	1217.6	311.07	1217.02	313.39	1216.76	315.24	1216.42	316.99	1216.04
320	1215.64	322.34	1215.2	325.06	1214.79	326.91	1214.39	330.12	1214.04
334.5	1213.92	336.93	1214.28	338.87	1214.46	341.11	1214.68	342.18	1215.11
343.74	1215.86	345.49	1216.31	347.14	1216.87	348.11	1217.16	348.4	1217.27

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  349.2 1217.52  351.51 1217.62  353.95 1217.68  356.85 1217.73  358.57 1217.72
 361.08 1217.86  363.32 1218.26  364.18 1218.33  365.04 1218.43   365.8 1218.46
  366.7 1218.46   367.21218.464   367.9 1218.47   371.2 1218.62   372.1 1218.66
  373.7 1218.77   374.5 1218.81   377.7 1219.03     381 1219.14   381.4 1219.14
  384.1 1219.17   384.3 1219.18   384.5 1219.18   387.5 1219.28   387.6 1219.28
  387.7 1219.28   388.8  1219.4   390.8 1219.63   390.9 1219.64  395.18  1220.4
  397.5 1220.86   397.9 1220.95   400.1 1221.34   400.7 1221.45  402.02 1221.64
  403.2 1221.83     404 1221.96   404.9 1222.11   406.4 1222.36   407.3 1222.52
  408.4 1222.77   410.6  1223.3   413.9 1224.56   417.2 1226.13   418.5 1226.74
  420.5 1227.74   421.4 1228.07   423.2 1228.85   423.8 1229.09   427.1 1230.02
  427.2 1230.03   427.6 1230.11   430.1 1230.56   430.4 1230.63   430.9 1230.71
  433.8 1231.18   434.7 1231.31   435.9 1231.45   437.1  1231.6   438.6 1231.79
  438.8 1231.82   440.4 1232.01   442.4 1232.37   443.7  1232.6   444.6 1232.81
  446.3 1233.09   447.6 1233.39   450.1 1233.94   450.3 1233.99   450.5 1234.03
  451.6 1234.31   453.4 1234.73   453.6 1234.79   453.9 1234.84   456.9 1235.39
  463.5 1236.17     465 1236.43   465.5 1236.51   466.9 1236.76   467.9 1237.02
  469.3 1237.39   470.2  1237.6   470.8 1237.78   473.1  1238.5   473.4 1238.56
  473.5 1238.59   473.7 1238.65   475.6 1239.17   476.7 1239.45   476.8 1239.49
    477 1239.53   480.1 1240.26   480.8 1240.38   482.5 1240.67   483.4 1240.84
  484.7 1241.06   485.4 1241.19   486.7 1241.42   488.5 1241.79     490  1242.1
  491.2 1242.28   492.3 1242.43   493.3 1242.58   494.1 1242.63   496.2 1242.77
  496.7  1242.8     497  1242.8   499.6 1242.78   499.9 1242.78     500 1242.78
  502.8 1242.64   503.3 1242.62   503.9 1242.58   506.6 1242.41   507.7 1242.39
  508.7 1242.37   509.9 1242.34   511.5 1242.38   511.6 1242.38   513.2 1242.42
  514.5 1242.47   515.4  1242.5   516.5 1242.55   517.4 1242.58   519.2 1242.64
  519.8 1242.67   520.3 1242.68   523.1 1242.78   523.2 1242.78   523.6  1242.8
  526.1  1242.9   526.5 1242.91   526.9 1242.92     529 1243.02   529.8 1243.05
  530.8 1243.08   531.9 1243.11   533.1 1243.16   533.6 1243.17   534.7 1243.22
  536.5 1243.29   537.4 1243.35   539.8 1243.52   540.2 1243.55   546.8 1244.02
  547.9 1244.07   549.6 1244.13   550.2 1244.15   553.6 1244.22   563.7 1244.31
  567.3 1244.36   568.9 1244.38   570.8 1244.41   571.6 1244.41   574.1 1244.44
  574.2 1244.44   574.3 1244.44   576.8 1244.46   577.6 1244.48   579.1 1244.47
  579.5 1244.47     581 1244.47   582.1 1244.52     584 1244.62   584.5 1244.65
  584.7 1244.67   585.6 1244.76   587.4 1244.95   587.9 1245.01   588.9 1245.14
    590  1245.3   590.5 1245.37   591.5 1245.55   593.4 1245.88   594.7 1246.09
  595.8 1246.25     597 1246.44   598.5 1246.68   599.4 1246.76   600.1 1246.83
  601.7    1247   603.6 1247.19     604 1247.22   604.3 1247.23   606.3 1247.34
  607.7  1247.4   608.6 1247.44   608.7 1247.45   608.8 1247.45     611 1247.63
  612.9 1247.79   613.3 1247.83   613.9 1247.87   615.7 1248.11   617.1 1248.29
    618 1248.38     619 1248.46   620.3 1248.61   621.4 1248.71   622.6 1248.84
  624.1 1248.95   625.7 1249.15   627.3 1249.42   629.3 1249.66   629.6 1249.72
  629.9 1249.76     632 1250.08   633.4 1250.25   634.2 1250.36   634.3 1250.37
  634.4 1250.38   636.6 1250.66   638.5 1250.86   639.5 1250.96   641.3 1251.11
  642.8 1251.21   643.6 1251.27   644.6 1251.33   645.9  1251.4   646.7 1251.42

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06   291.1    .045  395.18     .06
```

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Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         291.1  395.18            272.9   212.2   132.1            .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
********************************************************************************
***********
* E.G. Elev (ft)         * 1225.13  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.62  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1224.51  * Reach Len. (ft)       *  272.90  *  212.20  *
 132.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *  216.55  *  741.16  *
  43.63  *
* E.G. Slope (ft/ft)     *0.003043  * Area (sq ft)          *  216.55  *  741.16  *
  43.63  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  574.28  * 4952.27  *
 103.46  *
* Top Width (ft)         *  202.04  * Top Width (ft)        *   79.38  *  104.08  *
  18.58  *
* Vel Total (ft/s)       *    5.62  * Avg. Vel. (ft/s)      *    2.65  *    6.68  *
   2.37  *
* Max Chl Dpth (ft)      *   10.59  * Hydr. Depth (ft)      *    2.73  *    7.12  *
   2.35  *
* Conv. Total (cfs)      *102065.1  * Conv. (cfs)           * 10410.9  * 89778.6  *
 1875.6  *
* Length Wtd. (ft)       *  214.95  * Wetted Per. (ft)      *   80.07  *  105.49  *
  19.08  *
* Min Ch El (ft)         * 1213.92  * Shear (lb/sq ft)      *    0.51  *    1.33  *
   0.43  *
* Alpha                  *    1.27  * Stream Power (lb/ft s) *    1.36  *    8.92  *
   1.03  *
* Frctn Loss (ft)        *    1.14  * Cum Volume (acre-ft)  *    3.18  *   51.38  *
   3.99  *
* C & E Loss (ft)        *    0.15  * Cum SA (acres)        *    1.67  *    7.18  *
   2.91  *
********************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
```

```
**********************************************************************************
***********
* E.G. Elev (ft)         * 1226.97  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.65  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1226.32  * Reach Len. (ft)        *  272.90  *  212.20  *
 132.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *  364.57  *  929.72  *
  80.78  *
* E.G. Slope (ft/ft)     *0.002468  * Area (sq ft)           *  364.57  *  929.72  *
  80.78  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             * 1185.43  * 6507.06  *
 227.51  *
* Top Width (ft)         *  210.30  * Top Width (ft)         *   83.80  *  104.08  *
  22.42  *
* Vel Total (ft/s)       *    5.76  * Avg. Vel. (ft/s)       *    3.25  *    7.00  *
   2.82  *
* Max Chl Dpth (ft)      *   12.40  * Hydr. Depth (ft)       *    4.35  *    8.93  *
   3.60  *
* Conv. Total (cfs)      *159432.5  * Conv. (cfs)            * 23863.2  *130989.5  *
 4579.8  *
* Length Wtd. (ft)       *  216.23  * Wetted Per. (ft)       *   84.85  *  105.49  *
  23.32  *
* Min Ch El (ft)         * 1213.92  * Shear (lb/sq ft)       *    0.66  *    1.36  *
   0.53  *
* Alpha                  *    1.27  * Stream Power (lb/ft s) *    2.15  *    9.50  *
   1.50  *
* Frctn Loss (ft)        *    0.93  * Cum Volume (acre-ft)   *    6.38  *   62.51  *
  10.00  *
* C & E Loss (ft)        *    0.17  * Cum SA (acres)         *    2.38  *    7.18  *
   5.85  *
**********************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 2567
```

INPUT
Description:
Station Elevation Data num= 451

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1290.64	2.4	1290.63	5.9	1290.57	9.3	1290.35	12.8	1290.11
13.6	1290.09	16.3	1290.06	18.8	1290.1	23.2	1290.22	23.9	1290.22
26.7	1290.15	30.2	1289.92	33.6	1289.78	35.9	1289.77	39.4	1289.81
40.6	1289.81	44.1	1289.66	47.5	1289.48	52.3	1289.35	58	1289.24
64.9	1289	68.4	1288.94	72.9	1288.91	75.3	1288.85	85.8	1288.69
89.2	1288.6	99.6	1288.46	107	1288.23	110.1	1288.12	112.3	1288.02
117	1287.84	117.7	1287.83	119.3	1287.81	123.9	1287.7	130.9	1287.58
134.4	1287.56	137.8	1287.49	145	1287.4	155.2	1287.07	165.6	1286.88
168.2	1286.79	170.8	1286.71	171	1286.71	172.6	1286.67	176	1286.37
178.5	1285.61	179.5	1285.26	181.1	1284.31	181.6	1283.96	183	1283.08
183.7	1282.59	186.5	1280.29	186.9	1279.91	188.8	1278.44	189.9	1277.5
192.3	1275.86	193.4	1275.06	194	1274.72	195.6	1273.81	196.5	1273.26
196.9	1273.07	199.1	1271.91	200.4	1271.3	201.7	1270.65	202.9	1270.1
204.3	1269.49	205.5	1269.01	206.8	1268.5	207.3	1268.34	208.2	1268.03
209.4	1267.62	210.8	1267.2	212	1266.87	214.2	1266.3	215.5	1266.03
217.1	1265.63	217.7	1265.49	218.9	1265.17	219.7	1264.95	221.2	1264.54
224.7	1263.3	224.9	1263.22	225.5	1262.97	228.1	1261.78	229.6	1261.16
231.6	1260.27	232.6	1259.86	234.9	1258.95	235.2	1258.83	235.5	1258.72
237.8	1257.78	242	1256.12	245.4	1254.71	245.5	1254.69	248.1	1253.33
249	1252.8	250.6	1251.82	250.9	1251.68	253.2	1250.31	255.4	1249.11
255.8	1248.9	256.2	1248.68	259.4	1247.02	260.9	1246.33	261.5	1246.09
262.9	1245.51	263.5	1245.27	265.4	1244.62	266.1	1244.38	266.3	1244.31
266.9	1244.17	268.7	1243.65	269.8	1243.34	271.2	1242.97	272.2	1242.73
273.3	1242.45	273.8	1242.28	276.8	1241.37	279	1240.44	283.7	1238.6
284.1	1238.49	285.3	1238.17	286.7	1237.79	287.2	1237.68	288.2	1237.51
290.7	1237.07	291.9	1236.84	296.8	1235.79	297.8	1235.55	299.3	1235.24
301	1234.81	301.5	1234.68	302	1234.61	304.1	1234.33	305.2	1234.16
308.7	1233.76	308.9	1233.73	309.1	1233.69	311.4	1233.22	312.6	1233
313.9	1232.73	316.3	1232.26	316.3	1232.25	320	1231.46	321.2	1231.15
327.4	1229.38	330.5	1228.76	330.9	1228.69	335.8	1228.21	338.5	1227.89
342.2	1227.23	343.1	1227.05	344.7	1226.71	345.5	1226.55	347.9	1226.15
349.6	1225.89	351.8	1225.68	352.8	1225.62	353.3	1225.59	354.8	1225.47
355.2	1225.44	357	1225.32	360.7	1224.85	362.5	1224.52	362.5	1224.51
364.4	1224.13	364.9	1224	366.1	1223.71	367.4	1223.35	368.1	1223.14
369.8	1222.56	370.2	1222.42	372.2	1221.74	373.2	1221.43	374.7	1220.94
375.5	1220.69	379.2	1219.74	382.8	1219.06	384.4	1218.86	385.6	1218.69
386.5	1218.57	386.8	1218.53	387.4	1218.45	389.3	1218.22	390.2	1218.1
391.83	1217.6	393.4	1217.45	394.09	1217.39	394.87	1217.3	396.26	1216.84
397.74	1216.63	398.35	1216.36	400.35	1216.33	401.3	1216.38	401.4	1216.37
401.7	1216.35	403.22	1215.93	404.96	1215.84	408.78	1215.32	410	1215.17
411.21	1215.17	412.52	1215.14	413.21	1215.14	415.64	1214.62	419.73	1214.19
422.68	1213.86	427.2	1213.77	430.85	1214.04	433.81	1214.56	435.11	1214.92
436.07	1215.32	437.2	1215.5	439.37	1215.59	440.24	1215.47	440.85	1215.5
441.98	1215.53	442.41	1215.53	443.98	1215.44	445.11	1215.62	445.54	1215.47

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  447.54 1215.32   449.8 1215.26  452.06 1215.23  453.36 1215.35  453.36 1215.41
  456.58 1215.56  457.71 1216.02  458.49 1216.33   459.1 1216.69   459.8 1217.15
   460.5 1217.39   462.3 1218.23   462.5 1218.35   464.2 1219.19   464.7 1219.48
   465.7  1220.1   467.1 1220.97   467.9 1221.44   470.2 1222.88   471.6 1223.73
     472 1223.96   472.8 1224.34   474.4 1224.99   475.2 1225.27   476.8  1225.7
   477.9 1225.92   478.9 1226.16   479.3 1226.21   479.9 1226.29   481.7 1226.46
   482.6 1226.53   485.6 1226.54   486.3 1226.54   487.1 1226.53     489 1226.54
     490 1226.56   491.4 1226.58   493.2 1226.61   493.7 1226.62   493.9 1226.63
   494.2 1226.65   497.4  1226.9   498.7 1227.04   500.9 1227.29   501.1 1227.31
   503.5 1227.51   503.6 1227.52   505.9 1227.74   506.9 1227.84   508.2 1227.97
   510.6 1228.25   511.7  1228.4   512.9 1228.55     514 1228.68   515.2 1228.83
   516.6    1229   517.5 1229.11   518.4 1229.22   519.9 1229.36   521.4 1229.52
   522.2 1229.61   522.9 1229.68   524.5 1229.82   526.3 1229.97   526.8 1230.03
   527.3 1230.09   529.1 1230.34     536 1231.24   536.1 1231.25     538 1231.53
   538.4 1231.59   540.7 1231.93   540.9 1231.95   543.1 1232.32   545.4 1232.72
   545.7 1232.78   549.5  1233.4   550.6 1233.61   552.4    1234     554 1234.41
   554.7 1234.63   555.5 1234.93     557  1235.5   558.4 1236.12   565.2 1239.84
   566.3 1240.39   567.3 1240.86   568.6 1241.37     570 1241.88   570.9 1242.17
   571.7  1242.4   575.6 1243.23   576.2 1243.36   579.8 1243.91   580.2 1243.98
   580.6 1244.03   582.5 1244.21   584.6 1244.38   584.9  1244.4   585.1 1244.42
   589.5 1244.62   589.5 1244.63   596.5 1244.59   601.1 1244.59   602.9 1244.59
   603.4  1244.6   604.1 1244.62   607.3 1244.66   608.1 1244.67   608.9 1244.69
   610.4  1244.7   611.8 1244.71   612.7  1244.7   613.8 1244.69   617.8  1244.6
   618.4  1244.6   619.7  1244.6   621.9 1244.62   622.1 1244.62   622.3 1244.62
   622.8 1244.64   624.5 1244.69   626.1 1244.73   626.9 1244.76   631.7 1244.83
   641.3 1244.81   641.4 1244.81   641.9 1244.81   643.7 1244.82   645.2 1244.83
     646 1244.82   647.5 1244.79     649 1244.74   650.8 1244.62   651.4 1244.58
   652.8 1244.48   653.2 1244.45   653.8 1244.42   655.6 1244.33   656.7  1244.3
     658 1244.24   660.4 1244.13   660.9 1244.11   662.8 1244.03   664.3 1243.96
   665.2 1243.93   666.6  1243.9   670.4 1243.82     672  1243.8   672.4 1243.79
     673  1243.8   674.7 1243.83   677.1 1243.89   679.4 1243.99   679.5    1244
   679.9 1244.02   681.9 1244.12   683.4 1244.18   685.8 1244.26   686.7 1244.28
   687.3 1244.29   689.1 1244.33   689.4 1244.33   691.1 1244.37   691.5 1244.38
   692.2 1244.38   693.9  1244.4   694.9 1244.41   696.3 1244.42   698.6 1244.44
   698.7 1244.44     699 1244.44   701.1 1244.43   703.4 1244.44   704.9 1244.46
   705.8 1244.46   708.2 1244.53   710.2 1244.59   710.6  1244.6     713 1244.66
     714 1244.71   715.4 1244.78   717.7 1244.93   717.8 1244.94     718 1244.95
   721.7 1245.23   724.1 1245.43     725  1245.5   725.5 1245.55   727.5  1245.7
   729.3 1245.83   729.7 1245.87   730.5 1245.92   736.9 1246.47     737 1246.48
   739.3  1246.7   740.8 1246.83   741.7 1246.91   743.3 1247.06   744.1 1247.14
   744.6 1247.18   746.5 1247.37   748.4 1247.54   749.7 1247.68   751.3 1247.85
   752.2 1247.96   753.7 1248.18   756.1 1248.59   758.4 1249.13   759.9 1249.44
   760.8 1249.62   763.2    1250   763.7 1250.06   763.9 1250.07   765.1 1250.14
   767.3 1250.27   768.2 1250.26     770 1250.24   770.6 1250.24   770.9 1250.24
   774.5 1250.17   777.9 1250.25   778.1 1250.25   778.3 1250.26   780.5 1250.36
   781.7 1250.42     783  1250.5   785.5 1250.66   785.9 1250.67     788 1250.75
   788.7 1250.78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

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*********************************************
       0     .06   387.4    .045   462.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         387.4   462.5             233.4     178   107.4             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1223.85  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.09  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1221.76  * Reach Len. (ft)       *  233.40  *  178.00  *
 107.40  *
* Crit W.S. (ft)         * 1221.19  * Flow Area (sq ft)     *   29.74  *  466.01  *
  10.48  *
* E.G. Slope (ft/ft)     *0.011375  * Area (sq ft)          *   29.74  *  466.01  *
  10.48  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  120.62  * 5472.52  *
  36.86  *
* Top Width (ft)         *   96.25  * Top Width (ft)        *   15.25  *   75.10  *
   5.90  *
* Vel Total (ft/s)       *   11.12  * Avg. Vel. (ft/s)      *    4.06  *   11.74  *
   3.52  *
* Max Chl Dpth (ft)      *    7.99  * Hydr. Depth (ft)      *    1.95  *    6.21  *
   1.78  *
* Conv. Total (cfs)      * 52787.0  * Conv. (cfs)           *  1130.9  * 51310.5  *
  345.6  *
* Length Wtd. (ft)       *  178.20  * Wetted Per. (ft)      *   15.64  *   76.53  *
   6.82  *
* Min Ch El (ft)         * 1213.77  * Shear (lb/sq ft)      *    1.35  *    4.32  *
   1.09  *
* Alpha                  *    1.09  * Stream Power (lb/ft s) *    5.48  *   50.78  *
   3.84  *
* Frctn Loss (ft)        *    1.31  * Cum Volume (acre-ft)  *    2.40  *   48.44  *
   3.91  *
* C & E Loss (ft)        *    0.28  * Cum SA (acres)        *    1.37  *    6.75  *
   2.87  *
************************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
```

the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500-yr

E.G. Elev (ft)	1225.87	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.36	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	1223.50	Reach Len. (ft)	233.40	178.00	107.40
Crit W.S. (ft)	1222.56	Flow Area (sq ft)	60.85	597.09	23.23
E.G. Slope (ft/ft)	0.009421	Area (sq ft)	60.85	597.09	23.23
Q Total (cfs)	7920.00	Flow (cfs)	295.24	7527.72	97.04
Top Width (ft)	104.37	Top Width (ft)	20.55	75.10	8.72
Vel Total (ft/s)	11.63	Avg. Vel. (ft/s)	4.85	12.61	4.18
Max Chl Dpth (ft)	9.73	Hydr. Depth (ft)	2.96	7.95	2.66
Conv. Total (cfs)	81596.5	Conv. (cfs)	3041.7	77555.0	999.8
Length Wtd. (ft)	178.44	Wetted Per. (ft)	21.22	76.53	10.14
Min Ch El (ft)	1213.77	Shear (lb/sq ft)	1.69	4.59	1.35
Alpha	1.13	Stream Power (lb/ft s)	8.18	57.85	5.63
Frctn Loss (ft)	1.09	Cum Volume (acre-ft)	5.05	58.79	9.85
C & E Loss (ft)	0.31	Cum SA (acres)	2.06	6.75	5.81

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 2389

INPUT
Description:
Station Elevation Data num= 457

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1288.79	1.6	1288.8	2.7	1288.77	5.1	1288.77	6.1	1288.83
9.7	1288.92	12	1289.02	13.5	1289.05	15.1	1289.04	18.3	1288.96
21.3	1288.75	23.6	1288.68	24.1	1288.69	25.9	1288.65	32.7	1288.45
42.2	1288.07	44.5	1288	47	1287.88	51.8	1287.95	53.8	1288.05
55.7	1288.11	61.3	1288.22	63.1	1288.34	66.1	1288.6	69.2	1288.97
73.7	1289.38	78.2	1289.94	80.4	1290.37	82.7	1290.7	90	1291.14
94.8	1291.23	99.6	1290.98	100.8	1290.83	104.3	1290.02	104.8	1289.87
105.3	1289.75	107.2	1288.11	109.1	1286.7	109.5	1286.43	109.8	1286.26
114.1	1286.31	125.7	1286.03	130.4	1285.94	133	1285.96	135	1286.06
136.9	1286.2	139.6	1286.31	141.4	1286.42	142.6	1286.41	146.6	1286.27
150.4	1286.05	153.6	1285.99	154.9	1285.93	155.9	1285.91	158.2	1285.84
163.9	1285.58	167.5	1285.32	168.5	1285.22	169.8	1284.97	173	1284.27
177.5	1282.83	180.8	1281.59	182	1281.12	183.7	1280.28	185.6	1279.31
186	1279.07	186.5	1278.83	188.4	1277.76	190.7	1276.34	195.1	1273.35
195.3	1273.19	195.5	1273.04	197.6	1271.63	200	1270.19	202.3	1269.1
204.5	1268.17	204.6	1268.15	206.9	1267.11	209.1	1266.23	209.2	1266.15
211.6	1265.1	213.6	1264.17	214.2	1263.82	218.1	1261.42	218.5	1261.1
219	1260.78	220.8	1259.5	223.8	1257.53	225.5	1256.46	228.6	1254.6
231.6	1252.72	234.8	1250.65	236.1	1249.74	237.1	1249.04	238.1	1248.27
240.6	1246.44	241.7	1245.66	244	1244.04	245.1	1243.32	247.7	1241.87
249.6	1240.96	251	1240.43	252.5	1239.92	253.3	1239.69	257.2	1238.85
258	1238.72	258.7	1238.61	262.6	1238.01	263.2	1237.91	266.8	1237.24
267.3	1237.14	269.6	1236.67	271.6	1236.29	271.9	1236.23	272.2	1236.18
274.2	1235.87	276.7	1235.51	281.2	1235.06	285.9	1234.62	290.2	1234.18
295.1	1233.87	299.3	1233.43	305	1232.54	306.7	1232.23	309.8	1231.71
311.3	1231.36	312.8	1231.04	313.7	1230.81	314.6	1230.57	317.3	1229.58
318.3	1229.25	319.3	1228.93	321.5	1228.17	323.8	1227.27	325.3	1226.62
328.1	1225.3	329.9	1224.31	332.3	1223.05	336.9	1220.74	337.3	1220.5
339.3	1219.47	340.8	1218.59	342.5	1217.66	343.9	1216.94	345.1	1216.35
346.2	1215.88	346.51	1215.766	349.3	1214.7	352.8	1213.91	353.2	1213.84
353.6	1213.78	357.8	1213.53	357.9	1213.53	358	1213.53	360.2	1213.5
362.1	1213.46	363.2	1213.45	364.9	1213.46	366.3	1213.46	368.3	1213.47
370.6	1213.46	372.61	1213.27	375.73	1213.1	378.57	1213.03	380.63	1212.88
381.69	1212.71	383.81	1212.62	386.55	1212.77	387.6	1213	389.24	1213.34
390.58	1213.6	392.17	1213.73	393.52	1213.8	397.5	1213.7	399.3	1213.67
405	1213.75	408.8	1213.7	409.6	1213.67	411.5	1213.66	413	1213.68
413.8	1213.69	415.31	1213.759	416.2	1213.8	417.3	1213.93	418.5	1214.1
419.9	1214.39	420.8	1214.57	425.1	1215.81	425.5	1215.89	432.5	1216.84
434.3	1217.12	435.4	1217.38	437.1	1217.96	438.5	1218.49	439.5	1218.94
440.6	1219.49	441.8	1220.05	442.8	1220.48	445.7	1221.51	447	1221.88
451.3	1222.59	453.1	1222.71	455.8	1222.85	456.1	1222.85	458.1	1222.84

459.8 1222.85 460.4 1222.85 461.2 1222.86 462.8 1222.9 464.2 1222.96
465.1 1223.03 467.6 1223.26 469.4 1223.44 470 1223.49 472.5 1223.68
479.8 1224.43 482.2 1224.58 484.1 1224.66 487.7 1224.64 489.6 1224.59
491.4 1224.51 492 1224.49 493.2 1224.45 494.5 1224.44 495.1 1224.43
496.9 1224.52 498.7 1224.6 501.8 1224.91 502.4 1224.98 504.2 1225.23
506.1 1225.48 506.7 1225.55 507.9 1225.67 509.1 1225.76 509.7 1225.8
511.6 1225.91 514 1226.03 515.2 1226.06 516.5 1226.1 517.1 1226.12
520.7 1226.35 521.4 1226.43 522.6 1226.59 527.9 1227.42 528.1 1227.45
528.8 1227.56 531.4 1227.96 531.5 1227.97 531.6 1227.98 534.1 1228.23
534.9 1228.31 536.3 1228.41 538.3 1228.56 539.4 1228.61 541.7 1228.76
542 1228.77 543.2 1228.8 545.1 1228.83 547.3 1228.78 548.5 1228.73
550 1228.71 550.6 1228.7 552.7 1228.7 555.2 1228.81 555.3 1228.81
558.8 1229.11 560.6 1229.29 563.3 1229.57 565.6 1229.85 565.9 1229.9
567.2 1230.08 568.6 1230.29 569 1230.35 569.7 1230.49 571.2 1230.79
572.4 1231.01 574.5 1231.38 575.8 1231.61 579.2 1232.09 579.2 1232.1
582.6 1232.69 584 1232.89 584.5 1232.97 586 1233.19 587.2 1233.34
588.8 1233.55 589.5 1233.64 589.8 1233.67 591.1 1233.79 592.5 1233.91
592.9 1233.94 593.6 1234 595.1 1234.15 596.3 1234.25 599.7 1234.74
600.4 1234.92 603.1 1235.56 603.1 1235.57 605.8 1236.5 606.5 1236.78
607.9 1237.23 608.4 1237.43 609.9 1237.91 611.1 1238.22 612.6 1238.58
613.3 1238.75 615.1 1239.02 616.4 1239.23 616.7 1239.28 617.4 1239.38
623.6 1240.32 626.9 1240.71 627 1240.72 627.1 1240.73 629.6 1240.86
630.4 1240.88 631.7 1240.93 632.3 1240.94 633.8 1241.01 635 1241.13
636.3 1241.26 637.2 1241.35 637.7 1241.4 640.4 1241.61 640.5 1241.62
643.2 1241.76 644.8 1241.82 646 1241.86 647.2 1241.9 648.8 1241.93
649.1 1241.93 650.6 1241.95 651.5 1241.98 653.9 1242.03 656 1242.11
657.1 1242.16 657.3 1242.17 657.6 1242.18 659.8 1242.26 660.6 1242.29
661.9 1242.35 662.6 1242.37 665.3 1242.51 670.7 1242.79 670.9 1242.79
671.6 1242.79 677.4 1242.78 679 1242.82 679.1 1242.82 680.8 1242.88
681.9 1242.91 683.3 1242.98 684.1 1243.01 684.7 1243.02 687.2 1243.08
687.4 1243.09 687.5 1243.09 687.6 1243.09 691.8 1243.04 694.2 1243
695.7 1242.99 696.1 1242.99 697.5 1242.99 698.5 1243 700.9 1243.05
701.2 1243.06 702.8 1243.13 704 1243.2 704.3 1243.21 704.7 1243.23
706.7 1243.3 707.6 1243.32 708.9 1243.36 709.5 1243.38 711 1243.42
712.3 1243.44 713.2 1243.46 714.3 1243.48 715 1243.49 724.4 1243.58
726.1 1243.58 728.8 1243.58 730.3 1243.58 731.1 1243.58 731.6 1243.58
734.4 1243.56 734.5 1243.56 734.6 1243.56 737.1 1243.54 737.8 1243.54
739.9 1243.57 742.6 1243.64 743.1 1243.66 745.4 1243.72 747.4 1243.8
749.5 1243.86 751.2 1243.91 753.7 1243.97 755.7 1244.04 756.4 1244.07
758 1244.12 760.7 1244.25 761.4 1244.28 761.8 1244.3 763.2 1244.38
765.4 1244.5 767.1 1244.58 768.2 1244.64 769.8 1244.76 770 1244.78
771.6 1244.91 772.4 1244.99 774.7 1245.25 775.1 1245.29 775.6 1245.35
778.4 1245.68 779.4 1245.76 781.8 1245.94 785.2 1245.92 788.5 1245.94
788.6 1245.94 788.8 1245.97 792 1246.34 793.8 1246.64 795.4 1246.91
796.5 1247.09 798.8 1247.47 799.1 1247.53 801.8 1247.97 802.2 1248.03
802.8 1248.15 804.5 1248.42 805.6 1248.62 807.1 1248.93 807.5 1249
809 1249.3 809.8 1249.46 812.4 1249.96 812.5 1249.97 812.9 1250.03
815.2 1250.37 815.8 1250.46 817.8 1250.64 819.2 1250.75 820.5 1250.8
825.3 1250.99 825.8 1251.01 826 1251.01 826.2 1251.02 829.4 1251.05
830.9 1251 832.8 1250.95 833.8 1250.94 835.6 1250.89 836.2 1250.88

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   836.5 1250.89   837.4 1250.89

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0     .06   343.9    .045   434.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         343.9   434.3              245   151.3    52.6             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1222.25  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.15  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1221.10  * Reach Len. (ft)        *  245.00  *  151.30  *
  52.60  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   16.04  *  638.15  *
  21.53  *
* E.G. Slope (ft/ft)     *0.005158  * Area (sq ft)           *   16.04  *  638.15  *
  21.53  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   42.67  * 5527.47  *
  59.86  *
* Top Width (ft)         *  108.37  * Top Width (ft)         *    7.72  *   90.40  *
  10.25  *
* Vel Total (ft/s)       *    8.33  * Avg. Vel. (ft/s)       *    2.66  *    8.66  *
   2.78  *
* Max Chl Dpth (ft)      *    8.48  * Hydr. Depth (ft)       *    2.08  *    7.06  *
   2.10  *
* Conv. Total (cfs)      * 78387.8  * Conv. (cfs)            *   594.1  * 76960.2  *
  833.5  *
* Length Wtd. (ft)       *  151.08  * Wetted Per. (ft)       *    8.77  *   91.43  *
  11.02  *
* Min Ch El (ft)         * 1212.62  * Shear (lb/sq ft)       *    0.59  *    2.25  *
   0.63  *
* Alpha                  *    1.06  * Stream Power (lb/ft s) *    1.57  *   19.47  *
   1.75  *
* Frctn Loss (ft)        *    0.77  * Cum Volume (acre-ft)   *    2.28  *   46.18  *
   3.87  *
* C & E Loss (ft)        *    0.00  * Cum SA (acres)         *    1.31  *    6.41  *
   2.85  *
************************************************************************************
***********

CROSS SECTION OUTPUT  Profile #500-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1224.46  * Element                *  Left OB *  Channel *
```

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Right OB *
* Vel Head (ft)          *    1.32  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1223.15  * Reach Len. (ft)        *  245.00  *  151.30  *
  52.60  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   35.99  *  823.04  *
  54.85  *
* E.G. Slope (ft/ft)     *0.004267  * Area (sq ft)           *   35.99  *  823.04  *
  54.85  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  112.95  * 7682.62  *
 124.43  *
* Top Width (ft)         *  134.24  * Top Width (ft)         *   11.78  *   90.40  *
  32.06  *
* Vel Total (ft/s)       *    8.67  * Avg. Vel. (ft/s)       *    3.14  *    9.33  *
   2.27  *
* Max Chl Dpth (ft)      *   10.53  * Hydr. Depth (ft)       *    3.05  *    9.10  *
   1.71  *
* Conv. Total (cfs)      *121237.9  * Conv. (cfs)            *  1729.0  *117604.1  *
 1904.8  *
* Length Wtd. (ft)       *  149.52  * Wetted Per. (ft)       *   13.32  *   91.43  *
  33.03  *
* Min Ch El (ft)         * 1212.62  * Shear (lb/sq ft)       *    0.72  *    2.40  *
   0.44  *
* Alpha                  *    1.13  * Stream Power (lb/ft s) *    2.26  *   22.39  *
   1.00  *
* Frctn Loss (ft)        *    0.57  * Cum Volume (acre-ft)   *    4.79  *   55.89  *
   9.75  *
* C & E Loss (ft)        *    0.06  * Cum SA (acres)         *    1.97  *    6.41  *
   5.76  *
*******************************************************************************
***********

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 2238

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1277.47     2.1  1277.5     5.5 1277.43     8.9 1277.49    12.2 1277.47
    15.6 1277.52      19 1277.49    20.4 1277.51    22.3 1277.54    32.4 1277.92
    42.5 1278.08      45 1278.06    49.3 1278.06    52.6 1278.16      56 1278.31
    61.5 1278.42    62.7 1278.43    66.1 1278.31    72.8 1278.58    79.5 1278.65
    82.9 1278.72    86.3 1278.74    89.6 1278.86      93 1278.84    99.7 1278.88
   106.5 1279.03   109.8 1279.07   113.2 1278.99   123.3 1279.14   124.4 1279.13
   129.9 1279.18   133.4 1279.25   136.8 1279.39   140.1 1279.44   143.6 1279.44
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150.2	1279.7	153.6	1279.65	157.2	1279.54	160.3	1279.42	167	1279.04
170.9	1279.12	173.7	1279.21	176.4	1279.22	181.9	1279.18	183.9	1279.15
184.6	1279.12	187.1	1279.1	190.6	1278.91	194	1277.87	197.3	1275.95
202.4	1272.55	209.2	1268.23	210.8	1267.29	212	1266.55	213.3	1265.79
214.2	1265.27	217.5	1262.93	222	1259.65	224.3	1258.11	225.6	1256.89
227.6	1255.13	228.4	1254.64	231.1	1252.77	233.9	1250.73	234.4	1250.33
235.2	1249.73	237.7	1247.81	241.1	1245.31	244.8	1242.15	247.5	1239.9
247.8	1239.68	250.3	1237.74	251.2	1237.05	253	1235.87	254.5	1234.9
257	1233.32	257.9	1232.73	261	1231.31	261.2	1231.19	261.3	1231.16
264	1230.37	264.6	1230.14	265.7	1229.77	266.7	1229.45	268	1229
271.4	1227.75	272.2	1227.42	274.7	1226.23	278.1	1225.09	281.4	1224.32
288	1223.29	291.4	1222.72	292.2	1222.59	294	1222.36	295.2	1222.18
297.8	1221.7	298	1221.67	301.1	1221.05	301.3	1221.01	301.5	1220.93
304.6	1220.01	305.3	1219.76	307.9	1218.83	309	1218.38	309.9	1218.05
311.2	1217.56	312.41	1217.095	312.8	1216.94	312.9	1216.92	314.5	1216.3
315.8	1215.89	316.6	1215.65	317.8	1215.27	321.1	1214.38	324.1	1214.04
324.4	1214	324.6	1213.97	327.6	1213.72	327.8	1213.71	331.6	1213.45
333.5	1213.28	334.3	1213.22	335.3	1213.12	336.4	1213.04	337.6	1212.93
341.67	1212.57	345.14	1212.45	346.5	1212.32	348.09	1212.2	350.6	1212.18
352.87	1212.12	355.3	1212.01	358.66	1211.97	362.44	1211.89	364.93	1211.89
367.83	1212.06	369.42	1212.11	369.99	1212.15	370.9	1212.14	374.8	1212.18
376.7	1212.16	377.3	1212.16	377.7	1212.16	380.6	1212.16	381.91	1212.223
383.9	1212.32	387.2	1212.54	390.5	1213.11	393.8	1213.96	397.1	1214.89
398.3	1215.21	399.2	1215.44	400.13	1215.66	400.4	1215.73	401.3	1216
403	1216.53	403.7	1216.74	407	1218.13	410.1	1219.24	413.1	1220.11
413.6	1220.26	414.3	1220.33	416.9	1220.61	418	1220.59	419	1220.58
420.2	1220.57	423.5	1220.45	424.8	1220.47	425.6	1220.45	426.8	1220.46
430.1	1220.5	433.2	1220.54	433.4	1220.54	433.6	1220.54	434.8	1220.52
436.5	1220.49	436.7	1220.48	437.1	1220.46	443.4	1220.14	445.3	1220.12
446.7	1220.11	448.2	1220.17	448.5	1220.19	450	1220.26	451.1	1220.32
452.3	1220.39	453.3	1220.44	456.2	1220.63	456.6	1220.66	456.9	1220.69
459.4	1220.95	459.9	1221	460	1221.01	462.8	1221.34	463.2	1221.4
463.8	1221.48	465.7	1221.74	466.5	1221.85	467.6	1221.98	468.6	1222.11
471.5	1222.45	473.2	1222.63	474.4	1222.8	475.3	1222.91	476.5	1223.06
479.8	1223.51	480.3	1223.56	482.9	1223.79	483.1	1223.81	483.2	1223.82
484.1	1223.87	486.1	1224	486.4	1224.02	486.7	1224.03	489	1224.14
489.7	1224.17	493	1224.34	496.3	1224.67	497.8	1224.89	498.2	1224.95
500.7	1225.29	502	1225.46	502.9	1225.58	512.4	1226.63	512.9	1226.68
519.5	1227.45	522.8	1227.9	524	1228.06	525	1228.18	526.1	1228.32
527	1228.43	529.4	1228.75	529.9	1228.82	532.8	1229.26	539.3	1230.61
540.3	1230.77	541.5	1230.98	542.6	1231.16	544.1	1231.34	546	1231.56
547.9	1231.71	549.3	1231.81	550.3	1231.89	551.7	1232.01	553.2	1232.12
555.6	1232.33	555.9	1232.36	556.1	1232.38	559.1	1232.68	559.2	1232.7
562.5	1233.11	563.2	1233.22	564.9	1233.49	565.8	1233.62	569.1	1234.06
570.7	1234.17	570.9	1234.18	572.4	1234.28	573.6	1234.32	574.7	1234.33
575.7	1234.36	579.1	1234.35	585.7	1234.48	588.2	1234.46	589	1234.47
592.3	1234.36	595.6	1234.24	597	1234.26	598.9	1234.26	599.9	1234.3
601.4	1234.33	602.8	1234.37	605.3	1234.42	605.5	1234.43	608.6	1234.47
608.8	1234.48	609.1	1234.49	611.6	1234.55	612.1	1234.58	612.9	1234.64
614.5	1234.78	615.5	1234.86	617.4	1235.08	618.8	1235.23	620.3	1235.39

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   620.6 1235.41   622.1 1235.57   623.2 1235.72   625.4 1236.03   626.2 1236.21
   628.2 1236.72   628.7 1236.84   629.1 1236.95     632 1237.87     632 1237.88
   634.9  1238.8   635.2 1238.88   635.3 1238.93   635.8 1239.07   638.6 1239.78
   639.7 1239.95   640.7 1240.13   641.9 1240.32   645.2 1240.55   647.3 1240.55
   648.6 1240.55   649.5 1240.56   651.2  1240.6   651.9  1240.6   655.2 1240.77
   655.3 1240.78   656.4 1240.83   658.2  1240.9   658.5 1240.91   658.8 1240.92
   661.1    1241   662.6 1241.01   664.1 1240.99   665.1 1240.98   666.5 1240.94
   668.4 1240.89   671.7 1240.95   672.8    1241     675  1241.1   675.7 1241.14
   677.9 1241.24   678.3 1241.26   678.6 1241.27   680.9 1241.35   681.6 1241.37
   681.7 1241.37   681.8 1241.37   684.5  1241.4     685 1241.41   685.6 1241.41
   687.4 1241.42   688.3 1241.43   691.6 1241.49   694.9 1241.62   696.1 1241.68
   698.2 1241.77   699.1  1241.8   700.9 1241.87   701.5 1241.89     702 1241.91
   704.7    1242   704.8    1242   705.4 1242.02   708.1 1242.08   708.6 1242.08
   710.7 1242.13   713.6 1242.12   714.7 1242.11   716.2 1242.07   719.5    1242
     720 1241.99   721.4 1241.97   722.4 1241.96   723.9 1241.96   724.7 1241.95
   725.3 1241.95   727.7 1241.95     728 1241.95   728.2 1241.95   729.9 1241.96
   731.3 1241.96   731.5 1241.96     734 1242.02   734.6 1242.03   735.3 1242.06
     737 1242.12   737.9 1242.16   739.2 1242.24   741.2 1242.38   742.8 1242.48
     743  1242.5   744.5 1242.61   745.7 1242.69   746.8 1242.78   747.8 1242.85
   748.6 1242.91   750.7 1243.06   751.5 1243.12   754.3 1243.33   754.5 1243.34
   754.6 1243.35   755.9 1243.44   757.6 1243.55   757.7 1243.56   757.9 1243.57
   760.7 1243.73     761 1243.75   761.5 1243.79   763.7 1243.96   764.3    1244
   765.1 1244.04   766.8 1244.12   767.6 1244.17   768.6  1244.2   774.2  1244.4
   775.8 1244.52   775.9 1244.53   777.5 1244.66   778.9 1244.84   779.3 1244.89
   780.8 1245.06     782 1245.21   782.9 1245.32   784.1 1245.46     785 1245.53
   786.5 1245.63   787.4  1245.7   788.1 1245.71   790.1 1245.75   790.6 1245.77
   791.1 1245.78   793.9 1245.92   797.2 1246.31   797.4 1246.33   800.3 1246.74
   800.5 1246.77   800.8  1246.8   803.3 1247.17   803.8 1247.23   804.4  1247.3
   806.4 1247.59   807.1 1247.67   809.4 1248.09   810.4 1248.25   811.5 1248.51
   813.7 1248.98   815.5 1249.41     817 1249.75   818.6 1250.08   818.7  1250.1
   820.3 1250.43   821.6 1250.65   822.2 1250.76   823.5 1250.97   824.7 1251.09
   826.8 1251.32   830.1  1251.5   836.5 1251.65   836.7 1251.65   836.9 1251.65
   838.8 1251.62   839.9  1251.6     843 1251.49   843.3 1251.48   843.7 1251.45
   846.6 1251.29   849.9 1251.17   851.2 1251.15

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   316.6    .045  400.13     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         316.6  400.13             195.2     148    72.4             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1221.48  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.18  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
```

```
* W.S. Elev (ft)         * 1220.30  * Reach Len. (ft)        *  195.20  *  148.00  *
  72.40  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   30.20  *  616.97  *
  32.23  *
* E.G. Slope (ft/ft)     *0.005029  * Area (sq ft)           *   30.20  *  616.97  *
  32.23  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   89.49  * 5450.06  *
  90.45  *
* Top Width (ft)         *  120.71  * Top Width (ft)         *   12.97  *   83.53  *
  24.21  *
* Vel Total (ft/s)       *    8.29  * Avg. Vel. (ft/s)       *    2.96  *    8.83  *
   2.81  *
* Max Chl Dpth (ft)      *    8.41  * Hydr. Depth (ft)       *    2.33  *    7.39  *
   1.33  *
* Conv. Total (cfs)      * 79389.6  * Conv. (cfs)            *  1261.9  * 76852.2  *
 1275.5  *
* Length Wtd. (ft)       *  146.79  * Wetted Per. (ft)       *   13.78  *   84.21  *
  25.00  *
* Min Ch El (ft)         * 1211.89  * Shear (lb/sq ft)       *    0.69  *    2.30  *
   0.40  *
* Alpha                  *    1.10  * Stream Power (lb/ft s) *    2.04  *   20.32  *
   1.14  *
* Frctn Loss (ft)        *    0.52  * Cum Volume (acre-ft)   *    2.15  *   44.00  *
   3.84  *
* C & E Loss (ft)        *    0.13  * Cum SA (acres)         *    1.25  *    6.11  *
   2.83  *
*******************************************************************************
***********

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1223.83  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.12  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1222.72  * Reach Len. (ft)       *  195.20  *  148.00  *
  72.40  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   74.16  *  818.93  *
 180.67  *
* E.G. Slope (ft/ft)     *0.003445  * Area (sq ft)           *   74.16  *  818.93  *
 180.67  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  215.45  * 7231.03  *
 473.52  *
* Top Width (ft)         *  182.37  * Top Width (ft)         *   25.17  *   83.53  *
  73.67  *
* Vel Total (ft/s)       *    7.38  * Avg. Vel. (ft/s)       *    2.91  *    8.83  *
   2.62  *
```

* Max Chl Dpth (ft)	* 10.82	* Hydr. Depth (ft)	* 2.95	* 9.80	* 2.45	*	
* Conv. Total (cfs)	*134944.7	* Conv. (cfs)	* 3670.9	*123205.6	* 8068.1	*	
* Length Wtd. (ft)	* 143.47	* Wetted Per. (ft)	* 26.24	* 84.21	* 74.62	*	
* Min Ch El (ft)	* 1211.89	* Shear (lb/sq ft)	* 0.61	* 2.09	* 0.52	*	
* Alpha	* 1.32	* Stream Power (lb/ft s)	* 1.77	* 18.47	* 1.36	*	
* Frctn Loss (ft)	* 0.36	* Cum Volume (acre-ft)	* 4.48	* 53.04	* 9.61	*	
* C & E Loss (ft)	* 0.12	* Cum SA (acres)	* 1.87	* 6.11	* 5.69	*	

****

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 2090

INPUT
Description:
Station Elevation Data num= 500

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1273.9	.2	1273.95	.8	1274.06	2.2	1274.48	5.5	1274.41
8.7	1274.24	10.1	1274.15	10.8	1274.08	12	1273.99	15.3	1273.91
18.6	1273.98	25.2	1274.05	28.5	1273.87	31.8	1274.04	34.7	1274.04
37.8	1274	44.9	1273.85	48.2	1273.81	51.5	1273.86	54.8	1273.83
58.1	1273.9	61.4	1273.9	71.2	1273.76	74.5	1273.67	77.5	1273.61
84.3	1273.53	87.7	1273.37	90.7	1273.25	93.9	1273.06	97.5	1272.75
97.9	1272.76	100.3	1272.71	100.7	1272.71	106.6	1272.26	111.5	1271.94
112.9	1271.9	113.9	1271.83	114.9	1271.77	116.1	1271.71	117.2	1271.66
120.4	1271.53	123.7	1271.21	127	1270.4	130.3	1269.27	131.9	1268.26
132	1268.18	133.6	1267.17	136.8	1264.62	138.3	1263.62	140.1	1262.39
143.4	1260.78	144.7	1260.44	145.5	1260.18	150	1258.91	151	1258.46
152.3	1257.84	153.3	1257.4	154.2	1257.07	155.7	1256.51	156.5	1256.2
157.4	1255.86	159.1	1255.13	159.8	1254.81	160	1254.71	163.1	1253.13
166.4	1251.24	168	1250.37	168.1	1250.28	169.7	1249.39	173	1247.82
176.3	1245.86	177.1	1245.33	179	1243.91	179.6	1243.52	182.9	1241.38
184.4	1240.53	186	1239.65	186.2	1239.55	189	1238.11	192	1236.54
192.8	1236.11	193.8	1235.61	195	1235.03	196.1	1234.46	197.5	1233.69
198	1233.41	199.4	1232.61	202.7	1230.7	206	1229.04	208.5	1227.94
209.3	1227.6	209.9	1227.36	212.9	1226.28	215.8	1225.26	215.9	1225.22
219.2	1223.71	219.9	1223.34	221.6	1222.39	222.6	1221.88	224.1	1220.94
224.3	1220.84	226	1219.86	229.4	1217.88	229.7	1217.72	230.9	1217.08
232.4	1216.34	232.7	1216.15	236.1	1214.99	237.7	1214.71	239.5	1214.42

240.4	1214.34	2411214.277		242.7	1214.1	242.9	1214.08	243.1	1214.07
243.6	1214.01	245.8	1213.79	246.3	1213.72	247.3	1213.61	248.4	1213.51
249.7	1213.35	251.1	1213.11	252	1212.95	253.1	1212.73	253.8	1212.56
256.3	1212.04	256.5	1212	256.6	1211.99	259.1	1211.68	259.9	1211.62
263.3	1211.55	264.5	1211.55	266.61	1211.4	270.19	1211.03	276	1210.28
282.64	1209.95	289.52	1209.76	294.14	1210.04	296.08	1210	298.26	1210.08
300.06	1210.11	302.22	1210.13	302.91	1210.1	304.42	1210.03	305.34	1210.08
305.65	1210.08	307.22	1210.04	309.6	1210.11	311.82	1210.74	313.03	1210.79
313.99	1211.01	314.65	1211.2	315.05	1211.44	316.11	1211.73	316.9	1212.22
317.6	1212.39	322.83	1214.01	324.4	1214.52	326.1	1214.93	327.8	1215.33
328.8	1215.64	330.8	1216.24	331.2	1216.37	331.5	1216.47	332.4	1216.79
334.1	1217.37	335.4	1217.69	336.9	1218.14	337.9	1218.4	339.4	1218.49
341.3	1218.61	345.5	1218.36	347.4	1218.3	347.9	1218.27	348.3	1218.27
350.5	1218.27	351.1	1218.28	354	1218.37	354.6	1218.39	357.9	1218.47
359.4	1218.51	361.2	1218.56	362.5	1218.6	363.5	1218.65	364.6	1218.7
365.3	1218.74	367.5	1218.88	367.9	1218.9	368.2	1218.92	369.9	1219.02
371	1219.09	371.2	1219.1	371.5	1219.11	373.9	1219.22	374.6	1219.24
375.5	1219.3	376.7	1219.38	377.9	1219.46	379.5	1219.64	379.6	1219.64
381.2	1219.82	382.4	1219.99	384.5	1220.28	385.2	1220.35	387.9	1220.59
388.1	1220.6	389.4	1220.65	390.9	1220.71	394.5	1220.95	395.6	1221.13
397.8	1221.51	402.3	1222.36	403.6	1222.6	404.5	1222.76	407.6	1223.24
407.8	1223.27	408	1223.3	411.2	1223.82	411.6	1223.9	414.5	1224.4
415.6	1224.58	416.5	1224.72	417.8	1224.92	421.1	1225.26	423.7	1225.44
425	1225.55	427.7	1225.8	427.8	1225.81	427.9	1225.82	428.3	1225.87
430.7	1226.18	431.1	1226.24	431.7	1226.33	433.5	1226.63	434.4	1226.77
435.7	1226.98	436.4	1227.09	437.8	1227.31	439.2	1227.53	439.7	1227.61
447.8	1228.78	450.6	1229.25	451.1	1229.32	451.8	1229.42	453.4	1229.67
455.8	1230.02	457.9	1230.28	458.7	1230.4	465.1	1231.39	466.2	1231.49
468.6	1231.68	468.6	1231.69	471.2	1231.82	472.2	1231.89	475.8	1232.02
476.1	1232.02	478.6	1232.03	479.4	1232.02	481.1	1232.01	481.4	1232
483	1231.97	483.6	1231.97	485	1231.96	486.1	1231.95	486.6	1231.94
487.8	1231.91	488.6	1231.89	490.2	1231.84	491.1	1231.77	493.5	1231.55
493.7	1231.53	494.3	1231.47	496	1231.26	497.3	1231.1	498.5	1230.99
500.7	1230.82	500.9	1230.8	501	1230.79	501.2	1230.78	503.5	1230.64
506	1230.48	507.1	1230.42	508.1	1230.36	508.5	1230.36	509.3	1230.38
511	1230.45	511.7	1230.47	513.4	1230.67	515.2	1230.87	516.3	1231.06
518.4	1231.36	519.4	1231.54	521.7	1231.94	522.4	1232.08	524.5	1232.48
525	1232.59	525.5	1232.7	528.1	1233.46	528.3	1233.51	530.6	1234.2
531.5	1234.49	531.6	1234.52	531.7	1234.54	534.6	1235.23	534.9	1235.32
535.3	1235.42	537.6	1235.92	538.2	1236.06	538.9	1236.16	540.6	1236.39
541.5	1236.52	542.5	1236.64	543.7	1236.78	544.8	1236.91	546.1	1237.06
546.7	1237.13	548.1	1237.28	549.7	1237.41	549.8	1237.41	551.8	1237.58
553	1237.7	553.1	1237.71	554.7	1237.87	557	1238.24	558	1238.39
558.7	1238.54	561.3	1239.05	563.3	1239.23	564.4	1239.32	564.6	1239.33
564.9	1239.33	567.3	1239.28	568	1239.27	568.8	1239.25	570.2	1239.2
571.3	1239.18	572.7	1239.18	573.1	1239.17	574.6	1239.17	581.2	1239.23
581.7	1239.24	584.5	1239.25	584.7	1239.25	587.4	1239.3	587.9	1239.3
588.5	1239.31	590.3	1239.36	591.2	1239.37	592.4	1239.37	594.5	1239.37
596.1	1239.34	596.3	1239.34	597.8	1239.31	598.9	1239.3	600.2	1239.27
601.8	1239.23	604.2	1239.07	604.7	1239.02	606.1	1238.79	607.6	1238.53

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   607.8 1238.49   608.1 1238.43   610.4 1237.94   611.1 1237.81     612 1237.74
   613.3  1237.6   614.4 1237.53     616 1237.64   616.2 1237.65   617.7 1237.77
     619 1237.95   619.9 1238.07   621.1 1238.23   621.9 1238.31   623.8 1238.45
   624.4  1238.5   624.8 1238.51   627.5 1238.56   627.7 1238.56   630.5 1238.66
     631 1238.68   631.7 1238.71   633.4 1238.79   634.3 1238.83   635.6 1238.88
   636.3  1238.9   639.2    1239   639.5 1239.01     641 1239.05     642 1239.09
   643.8 1239.15   644.3 1239.17   645.5 1239.23   646.3 1239.27   647.7 1239.34
   649.7 1239.47     651 1239.55   651.8 1239.62     654 1239.78   654.4 1239.81
   654.6 1239.83   655.7 1239.91   657.4 1240.04   657.7 1240.07   658.3 1240.13
   661.1 1240.49   662.9 1240.77   664.4 1241.01   665.6  1241.2   666.8  1241.4
   667.8 1241.55   668.4 1241.62   671.1 1241.93   671.1 1241.94   671.2 1241.94
   671.3 1241.95   673.9 1242.19   674.5 1242.24   675.3 1242.31   676.7 1242.42
   677.8 1242.51   679.5 1242.68   679.6  1242.7   681.2 1242.86   682.2 1243.06
   683.9 1243.33   684.6 1243.45     685 1243.56     687 1244.01   687.7 1244.18
   687.9 1244.21   688.2 1244.26   690.5 1244.71   692.4 1245.05   693.3 1245.19
   694.6 1245.41     696 1245.56     698 1245.77   698.8 1245.82   701.3 1245.96
   701.6 1245.97   702.6 1246.01   704.3 1246.08   704.7  1246.1   705.2 1246.12
   707.1 1246.21     708 1246.26   709.5 1246.32   709.8 1246.33   711.4  1246.4
   712.6 1246.47   713.8 1246.55   714.7 1246.61   715.4 1246.72     718 1247.15
   718.1 1247.16   718.3  1247.2   721.5  1247.8   722.3 1247.87   723.7 1247.96
   724.8 1248.06   726.4 1248.07   726.6 1248.07   728.2 1248.07   735.1 1248.33
   737.5 1248.38   738.2 1248.42   739.4 1248.51   740.2 1248.57   741.6 1248.69
     743 1248.88   743.7 1248.98   744.9 1249.15   745.8 1249.35   747.9 1249.86
   748.3 1249.95   748.5 1250.01   751.6 1250.86   752.2 1251.01     754 1251.51
     755 1251.75   756.5 1251.97   756.8 1252.02   758.4 1252.25   759.6 1252.32
   760.7 1252.38   761.7 1252.42   762.3 1252.43     765 1252.44   765.1 1252.44
   765.3 1252.43   767.9 1252.26   768.4 1252.22   770.6 1252.02   771.8 1251.92
   773.4 1251.84   775.1 1251.74   776.1 1251.68   777.8 1251.58   778.3 1251.55

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   237.7    .045   324.4     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         237.7   324.4               62    76.9   111.3             .3       .5

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1220.82  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.75  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1220.08  * Reach Len. (ft)       *   62.00  *   76.90  *
 111.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   37.94  *  750.05  *
 108.15  *
* E.G. Slope (ft/ft)     *0.002648  * Area (sq ft)          *   37.94  *  750.05  *
 108.15  *
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* Q Total (cfs)         * 5630.00  * Flow (cfs)            *   97.16  * 5327.06  *
 205.79  *
* Top Width (ft)        *  157.41  * Top Width (ft)        *   12.08  *   86.70  *
  58.63  *
* Vel Total (ft/s)      *    6.28  * Avg. Vel. (ft/s)      *    2.56  *    7.10  *
   1.90  *
* Max Chl Dpth (ft)     *   10.32  * Hydr. Depth (ft)      *    3.14  *    8.65  *
   1.84  *
* Conv. Total (cfs)     *109412.0  * Conv. (cfs)           *  1888.1  *103524.7  *
 3999.2  *
* Length Wtd. (ft)      *   77.93  * Wetted Per. (ft)      *   13.31  *   87.77  *
  59.27  *
* Min Ch El (ft)        * 1209.76  * Shear (lb/sq ft)      *    0.47  *    1.41  *
   0.30  *
* Alpha                 *    1.22  * Stream Power (lb/ft s) *    1.21  *   10.03  *
   0.57  *
* Frctn Loss (ft)       *    0.18  * Cum Volume (acre-ft)  *    2.00  *   41.68  *
   3.72  *
* C & E Loss (ft)       *    0.08  * Cum SA (acres)        *    1.19  *    5.82  *
   2.76  *
*******************************************************************************
***********

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)        * 1223.35  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)         *    0.72  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)        * 1222.63  * Reach Len. (ft)       *   62.00  *   76.90  *
 111.30  *
* Crit W.S. (ft)        *          * Flow Area (sq ft)     *   74.39  *  971.52  *
 289.39  *
* E.G. Slope (ft/ft)    *0.001918  * Area (sq ft)          *   74.39  *  971.52  *
 289.39  *
* Q Total (cfs)         * 7920.00  * Flow (cfs)            *  204.35  * 6977.39  *
 738.26  *
* Top Width (ft)        *  182.61  * Top Width (ft)        *   16.53  *   86.70  *
  79.38  *
* Vel Total (ft/s)      *    5.93  * Avg. Vel. (ft/s)      *    2.75  *    7.18  *
   2.55  *
* Max Chl Dpth (ft)     *   12.87  * Hydr. Depth (ft)      *    4.50  *   11.21  *
   3.65  *
* Conv. Total (cfs)     *180861.1  * Conv. (cfs)           *  4666.5  *159335.6  *
16859.0  *
* Length Wtd. (ft)      *   78.96  * Wetted Per. (ft)      *   18.45  *   87.77  *
  80.21  *
* Min Ch El (ft)        * 1209.76  * Shear (lb/sq ft)      *    0.48  *    1.33  *
   0.43  *
```

```
* Alpha                  *    1.31  * Stream Power (lb/ft s) *    1.33  *    9.52  *
   1.10  *
* Frctn Loss (ft)        *    0.14  * Cum Volume (acre-ft)   *    4.15  *   50.00  *
   9.22  *
* C & E Loss (ft)        *    0.04  * Cum SA (acres)         *    1.77  *    5.82  *
   5.56  *
*******************************************************************************
***********

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 2013

INPUT
Description:
Station Elevation Data    num=     452
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1253.02      .5 1253.11     3.8 1253.62     7.1  1254.2    10.4 1254.47
    11.9 1254.75    12.3  1254.8    13.7 1255.05    14.9 1255.36      16 1255.61
      17 1255.88    23.6 1257.75    26.9 1258.29    30.2 1258.33    33.5 1257.13
    34.3 1257.26    35.9 1257.58    36.8 1257.72    40.1 1258.34    46.7 1259.43
      50 1259.78    53.3 1260.16    56.6 1260.58    62.9 1261.26    66.5  1261.6
    69.8 1261.72      73 1261.67    74.9 1261.76    76.3 1261.86    77.9 1262.04
    79.6 1262.29    82.9 1262.14    86.2 1261.57    86.8  1261.5    89.1 1261.11
    92.8 1260.74    95.8 1260.53    99.4 1260.19   102.7 1260.02   104.4 1259.99
     106  1260.1   109.3 1260.64   112.6 1261.14   113.5 1261.21     115  1261.4
   115.8 1261.46   119.1 1261.83   119.9 1261.87   121.7 1262.06   122.4 1262.11
   123.1 1262.21     125 1262.38   125.7 1262.46   126.3 1262.52   128.4  1262.6
     129 1262.65   129.5 1262.65   131.8 1262.51   132.2 1262.52   135.5 1262.32
   138.8 1260.87   139.1 1260.83   141.8 1260.36   142.1 1260.33   145.2 1259.53
   145.4 1259.49   148.6 1258.69   148.7 1258.67   148.7 1258.66   151.9 1258.22
   155.2 1257.73   158.5 1256.86   161.8 1255.31   164.8 1253.46   168.3 1251.45
   171.6 1249.78   174.4 1248.62   175.4 1248.17   181.5  1245.7   182.1 1245.39
   184.7 1244.25     188 1242.68   194.6 1239.68   201.1 1236.77   204.4 1235.37
   205.7 1234.88   207.7 1234.08     211 1232.98   214.3 1232.03   217.6  1231.2
   220.8 1230.43   224.1 1229.41     234 1226.16   236.2 1225.51   237.2 1225.21
   239.6 1224.58   240.5 1224.35   241.5 1224.16   242.9 1223.81   243.8 1223.63
   244.7 1223.38   246.2  1222.9   247.1 1222.66   247.9 1222.25   249.6 1221.49
   250.4 1221.09   251.1 1220.57   252.9 1219.45   253.6 1218.95   254.3  1218.5
   256.3 1217.35   256.9 1216.92   260.2 1215.74   260.8 1215.65   263.5 1215.27
   265.61215.142   266.3  1215.1     270 1214.83  272.13 1214.55   273.7 1214.36
   276.3 1213.91   276.6 1213.85   279.6 1213.18   280.1 1213.07     283 1212.47
   286.5  1211.9   286.6 1211.87   289.7 1211.23   289.7 1211.22     293 1210.56
   296.2 1210.35   296.3 1210.34  298.78 1210.23  300.36 1210.28  301.42 1210.22
  302.61  1210.1  304.01 1210.02  305.35 1209.89  307.22 1209.76  309.35 1209.67
  311.83 1209.74  313.58 1209.82  314.74 1209.91  315.87 1209.97  317.45 1209.95
  319.01 1210.02   322.5 1210.04   325.3 1209.96   325.8 1209.95   329.1  1209.9
```

329.7 1209.9	331.7 1209.9	332.4 1209.9	333.1 1209.92	334.9 1209.95
3351209.953	335.7 1209.97	336.4 1209.98	338.1 1210.02	341.4 1210.13
342.2 1210.18	343.1 1210.25	345.5 1210.45	347.8 1210.9	348.8 1211.1
352.1 1211.95	353.1 1212.24	355.3 1212.83	356.5 1213.07	357.5 1213.27
358.6 1213.51	361.9 1214.17	363.9 1214.49	365.2 1214.67	366.5 1214.77
367.2 1214.82	368.5 1214.93	370 1214.97	370.2 1214.98	371.8 1215.02
373.3 1215.04	373.6 1215.05	375 1215.07	377.1 1215.22	378.3 1215.3
379.4 1215.53	380.7 1215.83	381.6 1216.04	382.4 1216.4	384.3 1217.2
384.9 1217.49	388.2 1219.1	391.4 1220.6	394.6 1221.95	394.8 1222.01
394.9 1222.06	397.7 1222.93	398.1 1223.03	400.8 1223.76	401.4 1223.92
402 1224.08	403.9 1224.53	404.6 1224.72	407.9 1225.7	411.2 1226.78
412.5 1227.15	413.1 1227.36	414.5 1227.73	416.2 1228.06	417.8 1228.34
421.1 1228.48	424.4 1228.16	428.6 1227.52	430.1 1227.39	430.9 1227.28
431.7 1227.23	433.6 1227.2	434.2 1227.16	437.5 1227.34	437.8 1227.39
440.7 1227.81	440.8 1227.84	440.9 1227.86	443 1228.19	444 1228.36
444.1 1228.37	447.1 1228.91	447.4 1228.96	447.7 1229.03	450.2 1229.6
451.2 1229.83	453.3 1230.4	454 1230.56	454.7 1230.68	457.2 1231.13
458.2 1231.23	459.5 1231.39	460.5 1231.49	461.7 1231.6	462.5 1231.69
463.8 1231.79	465.2 1231.98	465.6 1232.04	467.1 1232.23	470.4 1232.68
471.8 1232.85	472.3 1232.9	475.8 1233.29	477 1233.42	479.3 1233.58
480.2 1233.65	481.1 1233.69	482.8 1233.82	483.5 1233.86	484.2 1233.91
487.3 1234.16	490.1 1234.47	490.3 1234.49	493.4 1234.85	496.5 1235.06
496.7 1235.08	496.9 1235.1	499.6 1235.23	500 1235.26	500.4 1235.28
503.3 1235.4	503.4 1235.4	505.4 1235.49	506.7 1235.54	509.1 1235.73
510.1 1235.81	510.7 1235.83	512.5 1235.87	513.3 1235.88	513.5 1235.88
514 1235.87	517 1235.78	518.5 1235.75	519 1235.74	520.4 1235.71
521.2 1235.71	523.5 1235.69	523.8 1235.69	524 1235.69	527.3 1235.72
529 1235.71	530.7 1235.71	531.6 1235.7	534.1 1235.68	534.6 1235.68
536.9 1235.66	537.6 1235.66	538.9 1235.61	541 1235.53	542.1 1235.34
543.9 1235.07	544.4 1234.98	544.8 1234.89	547.4 1234.14	547.9 1234
548.8 1233.89	550 1233.79	551.3 1233.61	552.6 1233.82	553.8 1233.94
554.7 1234.06	555.2 1234.17	556.8 1234.49	557.9 1234.72	558.2 1234.78
558.8 1234.91	560.5 1235.26	561.6 1235.49	563.8 1235.81	565 1236
578.8 1236.94	578.8 1236.95	579 1236.96	581.5 1237.18	582.2 1237.25
583.7 1237.41	585.6 1237.61	586.7 1237.74	588.6 1237.96	589.1 1238.02
591.9 1238.32	595.9 1238.65	599.8 1238.93	602.4 1239.15	602.8 1239.18
603.5 1239.24	603.9 1239.27	605.1 1239.4	606.2 1239.49	607.8 1239.68
609.5 1239.86	610.7 1239.99	612.1 1240.13	612.9 1240.22	613.4 1240.27
616 1240.53	616.2 1240.55	616.2 1240.56	624.5 1241.24	624.8 1241.27
626.3 1241.41	627.3 1241.51	629.1 1241.68	629.7 1241.74	630 1241.78
631.9 1241.97	632.8 1242.07	633.3 1242.11	635.6 1242.35	637.6 1242.53
638.4 1242.6	641.8 1242.92	643.1 1243.04	643.9 1243.15	646 1243.39
646.4 1243.44	646.7 1243.48	649.4 1243.94	649.8 1244	650.3 1244.13
652.2 1244.64	653.1 1244.86	654.5 1245.35	655 1245.5	656.5 1246.01
657.7 1246.52	658.8 1246.94	659.8 1247.36	660.5 1247.59	663.2 1248.51
663.3 1248.54	663.7 1248.64	666 1249.18	666.5 1249.3	667.3 1249.39
668.8 1249.55	669.9 1249.68	671.5 1249.69	673.2 1249.71	674.3 1249.67
675.8 1249.62	676.6 1249.59	679.9 1249.56	680 1249.56	683.3 1249.55
684.3 1249.54	685.4 1249.53	686.6 1249.53	688.2 1249.54	688.5 1249.54
690 1249.55	691 1249.58	692.6 1249.61	692.8 1249.61	693.3 1249.62

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   695.2 1249.71   696.4 1249.79   696.7 1249.81   697.2 1249.86   699.1 1250.09
   700.1 1250.19   701.7 1250.36   703.5 1250.54   706.1 1250.76   706.8 1250.82
   707.3 1250.84   709.1 1250.95   710.2 1251.02   710.6 1251.03   712.7 1251.12
   715.4 1251.24     717  1251.3   719.5 1251.54   720.3 1251.62   720.9 1251.69
     723 1251.97   723.7 1252.06   723.9 1252.09   726.3 1252.41   728.4 1252.65
   730.5 1252.87   733.8 1253.11   734.5 1253.12     737 1253.24   737.2 1253.25
   737.3 1253.26   739.9 1253.35   740.6 1253.38     744 1253.49   747.3 1253.66
   750.7  1253.9   750.8 1253.91   750.9 1253.91   754.1 1254.11   755.1 1254.14
   756.2 1254.16   757.5 1254.21   758.9 1254.23   760.8 1254.26   761.6 1254.27
     764  1254.3   764.2  1254.3   764.8 1254.34   767.1 1254.53   767.6 1254.58
   768.5 1254.74   770.1 1255.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  272.13    .045   363.9     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        272.13   363.9             64.4    86.2    75.1             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  243.33    1250       F
  380.33   770.1    1250       F

CROSS SECTION OUTPUT  Profile #100-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1220.56  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.59  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1219.98  * Reach Len. (ft)        *   36.50  *   36.50  *
  36.50  *
* Crit W.S. (ft)         * 1216.18  * Flow Area (sq ft)      *   77.47  *  812.48  *
  81.25  *
* E.G. Slope (ft/ft)     *0.002047  * Area (sq ft)           *   77.47  *  812.48  *
 103.43  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *  205.69  * 5160.91  *
 263.39  *
* Top Width (ft)         *  138.02  * Top Width (ft)         *   20.08  *   91.77  *
  26.17  *
* Vel Total (ft/s)       *    5.80  * Avg. Vel. (ft/s)       *    2.66  *    6.35  *
   3.24  *
* Max Chl Dpth (ft)      *   10.31  * Hydr. Depth (ft)       *    3.86  *    8.85  *
   4.95  *
* Conv. Total (cfs)      *124436.4  * Conv. (cfs)            *  4546.3  *114068.5  *
 5821.6  *
* Length Wtd. (ft)       *   36.50  * Wetted Per. (ft)       *   21.24  *   92.68  *
  16.51  *
* Min Ch El (ft)         * 1209.67  * Shear (lb/sq ft)       *    0.47  *    1.12  *
```

```
   0.63  *
* Alpha                 *    1.12  * Stream Power (lb/ft s) *    1.24  *    7.12  *
   2.04  *
* Frctn Loss (ft)       *    0.15  * Cum Volume (acre-ft)   *    1.92  *   40.30  *
   3.45  *
* C & E Loss (ft)       *    0.56  * Cum SA (acres)         *    1.17  *    5.66  *
   2.66  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)        * 1223.18  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)         *    0.65  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)        * 1222.53  * Reach Len. (ft)       *   36.50  *   36.50  *
  36.50  *
* Crit W.S. (ft)        * 1217.36  * Flow Area (sq ft)     *  134.19  * 1046.56  *
 123.16  *
* E.G. Slope (ft/ft)    *0.001643  * Area (sq ft)          *  134.19  * 1046.56  *
 177.67  *
* Q Total (cfs)         * 7920.00  * Flow (cfs)            *  396.34  * 7051.62  *
 472.04  *
* Top Width (ft)        *  149.04  * Top Width (ft)        *   24.77  *   91.77  *
  32.50  *
* Vel Total (ft/s)      *    6.07  * Avg. Vel. (ft/s)      *    2.95  *    6.74  *
   3.83  *
* Max Chl Dpth (ft)     *   12.86  * Hydr. Depth (ft)      *    5.42  *   11.40  *
   7.50  *
* Conv. Total (cfs)     *195366.2  * Conv. (cfs)           *  9776.7  *173945.4  *
11644.1  *
* Length Wtd. (ft)      *   36.50  * Wetted Per. (ft)      *   26.59  *   92.68  *
  16.51  *
* Min Ch El (ft)        * 1209.67  * Shear (lb/sq ft)      *    0.52  *    1.16  *
   0.77  *
* Alpha                 *    1.13  * Stream Power (lb/ft s) *    1.53  *    7.81  *
   2.93  *
* Frctn Loss (ft)       *    0.13  * Cum Volume (acre-ft)   *    4.00  *   48.21  *
   8.62  *
```

```
* C & E Loss (ft)        *    0.65  * Cum SA (acres)         *    1.74  *    5.66  *
   5.42  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

BRIDGE


RIVER: Coaticook
REACH: Reach 1            RS: 2000

INPUT
Description: Railway bridge
Distance from Upstream XS =    36.5
Deck/Roadway Width        =    18.5
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      16
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*******************************************************************************
       0 1252.62             128 1252.99             260 1251.84
  279.83  1251.8          279.83  1251.8  1247.3  343.83  1251.5    1247
  343.83  1251.5           404.9 1251.47             442 1250.95
     486 1251.87             500 1251.55           546.9 1252.39
   562.1 1252.93             635  1253.4             684 1253.96
  779.79 1254.28

Upstream Bridge Cross Section Data
Station Elevation Data    num=     452
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1253.02      .5 1253.11     3.8 1253.62     7.1  1254.2    10.4 1254.47
    11.9 1254.75    12.3  1254.8    13.7 1255.05    14.9 1255.36      16 1255.61
      17 1255.88    23.6 1257.75    26.9 1258.29    30.2 1258.33    33.5 1257.13
    34.3 1257.26    35.9 1257.58    36.8 1257.72    40.1 1258.34    46.7 1259.43
      50 1259.78    53.3 1260.16    56.6 1260.58    62.9 1261.26    66.5  1261.6
    69.8 1261.72      73 1261.67    74.9 1261.76    76.3 1261.86    77.9 1262.04
    79.6 1262.29    82.9 1262.14    86.2 1261.57    86.8  1261.5    89.1 1261.11
    92.8 1260.74    95.8 1260.53    99.4 1260.19   102.7 1260.02   104.4 1259.99
     106  1260.1   109.3 1260.64   112.6 1261.14   113.5 1261.21     115  1261.4
   115.8 1261.46   119.1 1261.83   119.9 1261.87   121.7 1262.06   122.4 1262.11
```

123.1	1262.21	125	1262.38	125.7	1262.46	126.3	1262.52	128.4	1262.6
129	1262.65	129.5	1262.65	131.8	1262.51	132.2	1262.52	135.5	1262.32
138.8	1260.87	139.1	1260.83	141.8	1260.36	142.1	1260.33	145.2	1259.53
145.4	1259.49	148.6	1258.69	148.7	1258.67	148.7	1258.66	151.9	1258.22
155.2	1257.73	158.5	1256.86	161.8	1255.31	164.8	1253.46	168.3	1251.45
171.6	1249.78	174.4	1248.62	175.4	1248.17	181.5	1245.7	182.1	1245.39
184.7	1244.25	188	1242.68	194.6	1239.68	201.1	1236.77	204.4	1235.37
205.7	1234.88	207.7	1234.08	211	1232.98	214.3	1232.03	217.6	1231.2
220.8	1230.43	224.1	1229.41	234	1226.16	236.2	1225.51	237.2	1225.21
239.6	1224.58	240.5	1224.35	241.5	1224.16	242.9	1223.81	243.8	1223.63
244.7	1223.38	246.2	1222.9	247.1	1222.66	247.9	1222.25	249.6	1221.49
250.4	1221.09	251.1	1220.57	252.9	1219.45	253.6	1218.95	254.3	1218.5
256.3	1217.35	256.9	1216.92	260.2	1215.74	260.8	1215.65	263.5	1215.27
265.61	1215.142	266.3	1215.1	270	1214.83	272.13	1214.55	273.7	1214.36
276.3	1213.91	276.6	1213.85	279.6	1213.18	280.1	1213.07	283	1212.47
286.5	1211.9	286.6	1211.87	289.7	1211.23	289.7	1211.22	293	1210.56
296.2	1210.35	296.3	1210.34	298.78	1210.23	300.36	1210.28	301.42	1210.22
302.61	1210.1	304.01	1210.02	305.35	1209.89	307.22	1209.76	309.35	1209.67
311.83	1209.74	313.58	1209.82	314.74	1209.91	315.87	1209.97	317.45	1209.95
319.01	1210.02	322.5	1210.04	325.3	1209.96	325.8	1209.95	329.1	1209.9
329.7	1209.9	331.7	1209.9	332.4	1209.9	333.1	1209.92	334.9	1209.95
335	1209.953	335.7	1209.97	336.4	1209.98	338.1	1210.02	341.4	1210.13
342.2	1210.18	343.1	1210.25	345.5	1210.45	347.8	1210.9	348.8	1211.1
352.1	1211.95	353.1	1212.24	355.3	1212.83	356.5	1213.07	357.5	1213.27
358.6	1213.51	361.9	1214.17	363.9	1214.49	365.2	1214.67	366.5	1214.77
367.2	1214.82	368.5	1214.93	370	1214.97	370.2	1214.98	371.8	1215.02
373.3	1215.04	373.6	1215.05	375	1215.07	377.1	1215.22	378.3	1215.3
379.4	1215.53	380.7	1215.83	381.6	1216.04	382.4	1216.4	384.3	1217.2
384.9	1217.49	388.2	1219.1	391.4	1220.6	394.6	1221.95	394.8	1222.01
394.9	1222.06	397.7	1222.93	398.1	1223.03	400.8	1223.76	401.4	1223.92
402	1224.08	403.9	1224.53	404.6	1224.72	407.9	1225.7	411.2	1226.78
412.5	1227.15	413.1	1227.36	414.5	1227.73	416.2	1228.06	417.8	1228.34
421.1	1228.48	424.4	1228.16	428.6	1227.52	430.1	1227.39	430.9	1227.28
431.7	1227.23	433.6	1227.2	434.2	1227.16	437.5	1227.34	437.8	1227.39
440.7	1227.81	440.8	1227.84	440.9	1227.86	443	1228.19	444	1228.36
444.1	1228.37	447.1	1228.91	447.4	1228.96	447.7	1229.03	450.2	1229.6
451.2	1229.83	453.3	1230.4	454	1230.56	454.7	1230.68	457.2	1231.13
458.2	1231.23	459.5	1231.39	460.5	1231.49	461.7	1231.6	462.5	1231.69
463.8	1231.79	465.2	1231.98	465.6	1232.04	467.1	1232.23	470.4	1232.68
471.8	1232.85	472.3	1232.9	475.8	1233.29	477	1233.42	479.3	1233.58
480.2	1233.65	481.1	1233.69	482.8	1233.82	483.5	1233.86	484.2	1233.91
487.3	1234.16	490.1	1234.47	490.3	1234.49	493.4	1234.85	496.5	1235.06
496.7	1235.08	496.9	1235.1	499.6	1235.23	500	1235.26	500.4	1235.28
503.3	1235.4	503.4	1235.4	505.4	1235.49	506.7	1235.54	509.1	1235.73
510.1	1235.81	510.7	1235.83	512.5	1235.87	513.3	1235.88	513.5	1235.88
514	1235.87	517	1235.78	518.5	1235.75	519	1235.74	520.4	1235.71
521.2	1235.71	523.5	1235.69	523.8	1235.69	524	1235.69	527.3	1235.72
529	1235.71	530.7	1235.71	531.6	1235.7	534.1	1235.68	534.6	1235.68
536.9	1235.66	537.6	1235.66	538.9	1235.61	541	1235.53	542.1	1235.34
543.9	1235.07	544.4	1234.98	544.8	1234.89	547.4	1234.14	547.9	1234

```
   548.8 1233.89     550 1233.79   551.3 1233.61   552.6 1233.82   553.8 1233.94
   554.7 1234.06   555.2 1234.17   556.8 1234.49   557.9 1234.72   558.2 1234.78
   558.8 1234.91   560.5 1235.26   561.6 1235.49   563.8 1235.81     565    1236
   578.8 1236.94   578.8 1236.95     579 1236.96   581.5 1237.18   582.2 1237.25
   583.7 1237.41   585.6 1237.61   586.7 1237.74   588.6 1237.96   589.1 1238.02
   591.9 1238.32   595.9 1238.65   599.8 1238.93   602.4 1239.15   602.8 1239.18
   603.5 1239.24   603.9 1239.27   605.1  1239.4   606.2 1239.49   607.8 1239.68
   609.5 1239.86   610.7 1239.99   612.1 1240.13   612.9 1240.22   613.4 1240.27
     616 1240.53   616.2 1240.55   616.2 1240.56   624.5 1241.24   624.8 1241.27
   626.3 1241.41   627.3 1241.51   629.1 1241.68   629.7 1241.74     630 1241.78
   631.9 1241.97   632.8 1242.07   633.3 1242.11   635.6 1242.35   637.6 1242.53
   638.4  1242.6   641.8 1242.92   643.1 1243.04   643.9 1243.15     646 1243.39
   646.4 1243.44   646.7 1243.48   649.4 1243.94   649.8    1244   650.3 1244.13
   652.2 1244.64   653.1 1244.86   654.5 1245.35     655  1245.5   656.5 1246.01
   657.7 1246.52   658.8 1246.94   659.8 1247.36   660.5 1247.59   663.2 1248.51
   663.3 1248.54   663.7 1248.64     666 1249.18   666.5  1249.3   667.3 1249.39
   668.8 1249.55   669.9 1249.68   671.5 1249.69   673.2 1249.71   674.3 1249.67
   675.8 1249.62   676.6 1249.59   679.9 1249.56     680 1249.56   683.3 1249.55
   684.3 1249.54   685.4 1249.53   686.6 1249.53   688.2 1249.54   688.5 1249.54
     690 1249.55     691 1249.58   692.6 1249.61   692.8 1249.61   693.3 1249.62
   695.2 1249.71   696.4 1249.79   696.7 1249.81   697.2 1249.86   699.1 1250.09
   700.1 1250.19   701.7 1250.36   703.5 1250.54   706.1 1250.76   706.8 1250.82
   707.3 1250.84   709.1 1250.95   710.2 1251.02   710.6 1251.03   712.7 1251.12
   715.4 1251.24     717  1251.3   719.5 1251.54   720.3 1251.62   720.9 1251.69
     723 1251.97   723.7 1252.06   723.9 1252.09   726.3 1252.41   728.4 1252.65
   730.5 1252.87   733.8 1253.11   734.5 1253.12     737 1253.24   737.2 1253.25
   737.3 1253.26   739.9 1253.35   740.6 1253.38     744 1253.49   747.3 1253.66
   750.7  1253.9   750.8 1253.91   750.9 1253.91   754.1 1254.11   755.1 1254.14
   756.2 1254.16   757.5 1254.21   758.9 1254.23   760.8 1254.26   761.6 1254.27
     764  1254.3   764.2  1254.3   764.8 1254.34   767.1 1254.53   767.6 1254.58
   768.5 1254.74   770.1 1255.03

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  272.13    .045   363.9     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        272.13   363.9             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  243.33    1250       F
  380.33   770.1    1250       F

Downstream  Deck/Roadway Coordinates
    num=      16
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*****************************************************************************
       0 1252.62             128 1252.99             260 1251.84
     308  1251.7             308  1251.7  1247.2     372  1251.5    1247
```

372	1251.5	404.9	1251.47	442	1250.95				
486	1251.87	500	1251.55	546.9	1252.39				
562.1	1252.93	635	1253.4	684	1253.96				
779.79	1254.28								

Downstream Bridge Cross Section Data

Station Elevation Data num= 453

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1251.16	4.6	1251.24	8	1251.17	11.3	1251.29	14.6	1251.34
18	1251.51	20.2	1251.75	21.3	1251.84	24.7	1251.73	25.8	1251.64
27.1	1251.58	28.6	1251.47	31.4	1251.35	34.2	1251.45	38	1251.62
39.8	1251.61	41.4	1251.59	44.7	1251.79	49.1	1252	51	1252.14
53.8	1252.46	58.1	1252.83	61.4	1253.06	62.2	1253.09	64.8	1253.12
66.4	1253.08	68.1	1253.01	71.4	1252.6	74.8	1251.94	78.1	1251.75
81.5	1251.27	81.8	1251.22	81.9	1251.22	84.8	1250.89	88.2	1250.83
90.9	1250.75	94.6	1250.74	95.4	1250.77	97	1250.87	99	1250.95
101.2	1251.07	104.5	1251.02	111.1	1251.13	117.7	1251.06	121	1251.18
127.5	1251.37	130.8	1251.41	134.1	1251.36	137.4	1250.85	138.5	1250.81
139.6	1250.8	140.7	1250.75	144	1250.84	150.6	1251.15	153.9	1251.32
157.2	1251.33	157.8	1251.27	160.5	1251.01	163.9	1250.38	166.8	1249.66
167	1249.57	169.8	1248.81	171.2	1248.38	173.7	1247.78	177	1247.18
178.4	1246.89	180.3	1246.42	183.6	1245.66	187	1245.13	190.3	1244.83
193.6	1244.63	196.9	1244.35	201.3	1243.66	203.6	1243.23	204.2	1243.15
206.9	1242.72	210.2	1242.37	212.8	1242.23	216.9	1241.83	220.2	1241.54
223.5	1241.42	224.3	1241.43	226.4	1241.49	230.1	1241.54	230.3	1241.54
232.9	1241.68	234.3	1241.72	235.7	1241.77	236.8	1241.82	243.4	1242.41
244.3	1242.47	246.1	1242.59	247.2	1242.65	250	1242.88	252.6	1242.97
253	1243.02	253.4	1243.08	256.6	1243.22	257	1243.07	259.6	1242.22
259.9	1242.09	263	1239.14	263.2	1238.9	263.4	1238.64	266.3	1235.29
266.5	1235.09	269.6	1231.57	269.8	1231.43	273.1	1227.74	276.3	1225.38
276.4	1225.37	279.6	1224.32	282.8	1223.63	282.9	1223.6	283	1223.56
286.1	1222.37	286.2	1222.3	286.3	1222.21	289.3	1220.34	289.6	1220.08
293	1217.68	295.7	1215.92	296	1215.72	296.3	1215.62	297.5	1215.34
298.9	1215.03	299.3	1214.9	301.81	1214.715	302	1214.7	302.6	1214.63
305.9	1214.37	309.1	1213.95	310.1	1213.68	311.4	1213.27	312.4	1212.99
312.76	1212.84	313.6	1212.54	314.5	1212.14	315.7	1211.67	317	1211.2
317.7	1210.98	319	1210.49	320.06	1210.2	321.02	1209.98	322.7	1209.85
324.74	1209.65	326	1209.29	327.89	1208.93	332.21	1208.23	340.65	1208.48
348.21	1209.17	352.09	1209.5	355.1	1209.71	357.81	1209.85	359.75	1210.05
364.02	1210.38	365.47	1210.56	368.1	1210.59	368.2	1210.61	368.4	1210.66
371.5	1211.63	371.8	1211.74	374.5	1212.78	374.8	1212.92	375.1	1213.18
377.7	1214.81	378.1	1215.12	378.5	1215.54	380.9	1217.74	381.9	1218.71
382.81	1219.514	384.7	1221.21	385.2	1221.79	387.3	1223.84	387.9	1224.47
388.6	1225.32	391.2	1229.19	392.1	1231.13	394.5	1236.85	395.6	1238.86
396.6	1240.77	397.8	1242.91	401.1	1244.85	404.4	1245.7	407.7	1246.04
409	1245.97	409.5	1245.94	409.7	1245.93	410.9	1245.88	412	1245.78
413.3	1245.69	414.2	1245.61	415	1245.44	417	1245.11	420.6	1244.29
420.8	1244.24	421	1244.2	422.8	1243.76	424	1243.44	424.1	1243.42
427.4	1242.89	427.9	1242.87	430	1242.77	430.7	1242.75	431.6	1242.79

433 1242.83	434 1242.88	435.2 1243	436 1243.07	437.3 1243.21
439 1243.43	440.6 1243.65	442 1243.88	442.5 1243.95	443.9 1244.17
445 1244.38	446.2 1244.51	448 1244.84	449.9 1245.08	450.5 1245.2
453.5 1245.38	453.8 1245.4	454 1245.39	456.4 1245.23	457 1245.18
457.1 1245.17	457.2 1245.16	460 1244.73	460.4 1244.68	460.8 1244.6
463.7 1244.06	466 1243.8	467 1243.7	468.1 1243.7	469 1243.7
470.3 1243.71	475 1243.92	475.4 1243.92	476.9 1243.94	478 1243.9
480.2 1243.81	481 1243.71	483.5 1243.45	484 1243.38	486.7 1243.1
487 1243.07	490 1242.78	490.1 1242.77	493 1242.14	493.3 1242.09
493.7 1242.01	496 1241.4	496.6 1241.27	497.3 1241.09	499.1 1240.63
499.9 1240.41	503.2 1239.63	505.1 1239.29	506.5 1238.98	507.4 1238.79
508 1238.68	510.8 1238.14	512.6 1237.71	513.2 1237.59	513.6 1237.5
515.6 1236.93	516.5 1236.66	519.9 1236.02	520.9 1235.96	522 1235.92
523.2 1235.84	524.8 1235.83	525.1 1235.83	527.6 1235.82	529.3 1235.82
530.3 1235.82	533.1 1235.84	533.3 1235.84	533.4 1235.84	535.9 1235.86
536.6 1235.86	538.7 1235.84	539.9 1235.84	541.8 1235.94	543.3 1236.03
544.3 1236.25	545.9 1236.75	546.6 1236.92	547.1 1237.06	549.4 1237.99
549.9 1238.18	550 1238.23	550.1 1238.26	552.7 1238.77	553.3 1238.95
555.5 1239.03	556.7 1239.1	558.3 1239.09	558.4 1239.09	560 1239.07
563.3 1239.05	566.3 1239.12	566.6 1239.14	569.4 1239.33	570 1239.36
571 1239.4	572.2 1239.47	573.4 1239.51	575 1239.56	576.7 1239.59
577.8 1239.63	579.3 1239.63	580.1 1239.65	583.2 1239.76	583.4 1239.77
586.2 1239.93	586.8 1239.94	589 1240.05	590.1 1240.06	591.8 1240.16
593.4 1240.25	594.5 1240.34	596 1240.45	596.8 1240.52	597.3 1240.55
598.6 1240.65	600 1240.75	603.5 1241.18	604.5 1241.31	605.6 1241.46
606.9 1241.62	608.8 1241.9	611.1 1242.22	613.1 1242.42	613.6 1242.48
615.1 1242.61	616.6 1242.8	616.9 1242.83	617.5 1242.88	619.3 1243.1
620.3 1243.16	621.8 1243.25	622.1 1243.28	624.8 1243.39	626.1 1243.38
627 1243.39	627.6 1243.41	630.2 1243.41	630.3 1243.42	630.4 1243.42
633.1 1243.75	633.7 1243.82	634.7 1244.09	635.8 1244.39	637.1 1244.72
638.6 1245.29	639 1245.47	640.5 1246	641.3 1246.42	643.4 1247.38
650.5 1250.99	652 1251.54	652.3 1251.69	653.9 1252.24	655.1 1252.55
656.3 1252.79	657.3 1253	657.8 1253.11	660.5 1253.49	660.6 1253.5
663.3 1253.72	664 1253.76	666.1 1253.85	667.3 1253.89	668.8 1253.88
669.3 1253.88	670.7 1253.86	671.6 1253.83	674.3 1253.71	675.7 1253.69
677.1 1253.66	677.4 1253.66	687.5 1253.47	694.2 1253.47	695.2 1253.47
697.6 1253.49	699.1 1253.51	699.5 1253.51	701.8 1253.54	704.3 1253.58
704.6 1253.58	706 1253.59	707.7 1253.62	708.9 1253.62	709.8 1253.62
711.2 1253.62	712.3 1253.63	714.7 1253.65	714.8 1253.65	715 1253.66
717.4 1253.72	718.3 1253.75	719.9 1253.79	720.5 1253.8	721.8 1253.84
722.4 1253.85	723.9 1253.88	725.3 1253.88	726.3 1253.88	727.5 1253.88
728.9 1253.89	730 1253.9	732.1 1253.93	732.4 1253.93	732.5 1253.94
735.1 1253.97	735.9 1253.98	737.6 1253.99	737.9 1253.99	740.1 1254.02
741.9 1254.09	743 1254.11	743.7 1254.12	745.2 1254.14	746.5 1254.17
747.7 1254.17	749.5 1254.21	750 1254.21	750.2 1254.22	750.8 1254.23
753.5 1254.25	757.1 1254.47	757.8 1254.55	759.8 1254.76	760.6 1254.84
762.9 1254.93	764.1 1254.97	765.4 1254.96	766.9 1254.97	767.6 1254.96
768 1254.96	768.8 1254.94	770.5 1254.9	771.2 1254.88	773 1254.83
774.7 1254.78	775.6 1254.77	777.8 1254.75	778.2 1254.75	778.5 1254.74
780.6 1254.72	784.3 1254.76	784.7 1254.76		

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************
       0     .06  312.76    .045   374.5     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        312.76   374.5             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   276.8    1248       F
   403.2   784.7    1248       F

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT  Profile #100-yr
*********************************************************************************
*********
* E.G. US. (ft)          *    1220.56  * Element               *Inside BR US
*Inside BR DS *
* W.S. US. (ft)          *    1219.98  * E.G. Elev (ft)        *    1219.85  *
1219.60  *
* Q Total (cfs)          *    5630.00  * W.S. Elev (ft)        *    1217.40  *
1217.20  *
* Q Bridge (cfs)         *    5630.00  * Crit W.S. (ft)        *    1216.62  *
1216.25  *
* Q Weir (cfs)           *             * Max Chl Dpth (ft)     *       7.73  *
 8.97  *
```

```
* Weir Sta Lft (ft)      *            * Vel Total (ft/s)       *      12.55  *
12.19  *
* Weir Sta Rgt (ft)      *            * Flow Area (sq ft)      *     448.46  *
461.87  *
* Weir Submerg           *            * Froude # Chl           *       0.80  *
 0.73  *
* Weir Max Depth (ft)    *            * Specif Force (cu ft)   *    3790.18  *
3901.37  *
* Min El Weir Flow (ft)  *    1250.96 * Hydr Depth (ft)        *       7.01  *
 7.22  *
* Min El Prs (ft)        *    1247.30 * W.P. Total (ft)        *      75.68  *
73.60  *
* Delta EG (ft)          *       1.47 * Conv. Total (cfs)      *    48493.8  *
53301.9  *
* Delta WS (ft)          *       3.67 * Top Width (ft)         *      64.00  *
64.00  *
* BR Open Area (sq ft)   *    2352.39 * Frctn Loss (ft)        *       0.23  *
 0.39  *
* BR Open Vel (ft/s)     *      12.55 * C & E Loss (ft)        *       0.03  *
 0.12  *
* BR Sluice Coef         *            * Shear Total (lb/sq ft) *       4.99  *
 4.37  *
* BR Sel Method          *Energy only * Power Total (lb/ft s)  *      62.60  *
53.28  *
********************************************************************************
*********

Warning: For the final momentum answer at the bridge, the upstream energy was
computed lower than the downstream
         energy.  This is not physically possible, the momentum answer has been
disregarded.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

BRIDGE OUTPUT  Profile #500-yr
********************************************************************************
*********
* E.G. US. (ft)          *    1223.18 * Element                *Inside BR US
*Inside BR DS *
* W.S. US. (ft)          *    1222.53 * E.G. Elev (ft)         *    1222.40  *
1221.86  *
* Q Total (cfs)          *    7920.00 * W.S. Elev (ft)         *    1219.57  *
1218.06  *
* Q Bridge (cfs)         *    7920.00 * Crit W.S. (ft)         *    1218.21  *
1217.86  *
* Q Weir (cfs)           *            * Max Chl Dpth (ft)      *       9.90  *
 9.83  *
* Weir Sta Lft (ft)      *            * Vel Total (ft/s)       *      13.49  *
```

```
15.32  *
* Weir Sta Rgt (ft)      *             * Flow Area (sq ft)      *     587.07  *
517.12  *
* Weir Submerg           *             * Froude # Chl           *       0.76  *
 0.88  *
* Weir Max Depth (ft)    *             * Specif Force (cu ft)   *    6035.65  *
5993.05  *
* Min El Weir Flow (ft)  *    1250.96  * Hydr Depth (ft)        *       9.17  *
 8.08  *
* Min El Prs (ft)        *    1247.30  * W.P. Total (ft)        *      80.01  *
75.33  *
* Delta EG (ft)          *       1.97  * Conv. Total (cfs)      *    73200.5  *
63456.8  *
* Delta WS (ft)          *       4.71  * Top Width (ft)         *      64.00  *
64.00  *
* BR Open Area (sq ft)   *    2352.39  * Frctn Loss (ft)        *       0.25  *
 0.45  *
* BR Open Vel (ft/s)     *      15.32  * C & E Loss (ft)        *       0.29  *
 0.21  *
* BR Sluice Coef         *             * Shear Total (lb/sq ft) *       5.36  *
 6.68  *
* BR Sel Method          *Energy only  * Power Total (lb/ft s)  *      72.35  *
102.25  *
********************************************************************************
*********

Warning: For the final momentum answer at the bridge, the upstream energy was
computed lower than the downstream
         energy.  This is not physically possible, the momentum answer has been
disregarded.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.
Note:    Multiple critical depths were found at this location.  The critical depth
with the lowest, valid, water surface was used.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 1926

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
       0 1251.16     4.6 1251.24       8 1251.17    11.3 1251.29    14.6 1251.34
```

18	1251.51	20.2	1251.75	21.3	1251.84	24.7	1251.73	25.8	1251.64
27.1	1251.58	28.6	1251.47	31.4	1251.35	34.2	1251.45	38	1251.62
39.8	1251.61	41.4	1251.59	44.7	1251.79	49.1	1252	51	1252.14
53.8	1252.46	58.1	1252.83	61.4	1253.06	62.2	1253.09	64.8	1253.12
66.4	1253.08	68.1	1253.01	71.4	1252.6	74.8	1251.94	78.1	1251.75
81.5	1251.27	81.8	1251.22	81.9	1251.22	84.8	1250.89	88.2	1250.83
90.9	1250.75	94.6	1250.74	95.4	1250.77	97	1250.87	99	1250.95
101.2	1251.07	104.5	1251.02	111.1	1251.13	117.7	1251.06	121	1251.18
127.5	1251.37	130.8	1251.41	134.1	1251.36	137.4	1250.85	138.5	1250.81
139.6	1250.8	140.7	1250.75	144	1250.84	150.6	1251.15	153.9	1251.32
157.2	1251.33	157.8	1251.27	160.5	1251.01	163.9	1250.38	166.8	1249.66
167	1249.57	169.8	1248.81	171.2	1248.38	173.7	1247.78	177	1247.18
178.4	1246.89	180.3	1246.42	183.6	1245.66	187	1245.13	190.3	1244.83
193.6	1244.63	196.9	1244.35	201.3	1243.66	203.6	1243.23	204.2	1243.15
206.9	1242.72	210.2	1242.37	212.8	1242.23	216.9	1241.83	220.2	1241.54
223.5	1241.42	224.3	1241.43	226.4	1241.49	230.1	1241.54	230.3	1241.54
232.9	1241.68	234.3	1241.72	235.7	1241.77	236.8	1241.82	243.4	1242.41
244.3	1242.47	246.1	1242.59	247.2	1242.65	250	1242.88	252.6	1242.97
253	1243.02	253.4	1243.08	256.6	1243.22	257	1243.07	259.6	1242.22
259.9	1242.09	263	1239.14	263.2	1238.9	263.4	1238.64	266.3	1235.29
266.5	1235.09	269.6	1231.57	269.8	1231.43	273.1	1227.74	276.3	1225.38
276.4	1225.37	279.6	1224.32	282.8	1223.63	282.9	1223.6	283	1223.56
286.1	1222.37	286.2	1222.3	286.3	1222.21	289.3	1220.34	289.6	1220.08
293	1217.68	295.7	1215.92	296	1215.72	296.3	1215.62	297.5	1215.34
298.9	1215.03	299.3	1214.9	301.81	1214.715	302	1214.7	302.6	1214.63
305.9	1214.37	309.1	1213.95	310.1	1213.68	311.4	1213.27	312.4	1212.99
312.76	1212.84	313.6	1212.54	314.5	1212.14	315.7	1211.67	317	1211.2
317.7	1210.98	319	1210.49	320.06	1210.2	321.02	1209.98	322.7	1209.85
324.74	1209.65	326	1209.29	327.89	1208.93	332.21	1208.23	340.65	1208.48
348.21	1209.17	352.09	1209.5	355.1	1209.71	357.81	1209.85	359.75	1210.05
364.02	1210.38	365.47	1210.56	368.1	1210.59	368.2	1210.61	368.4	1210.66
371.5	1211.63	371.8	1211.74	374.5	1212.78	374.8	1212.92	375.1	1213.18
377.7	1214.81	378.1	1215.12	378.5	1215.54	380.9	1217.74	381.9	1218.71
382.81	1219.514	384.7	1221.21	385.2	1221.79	387.3	1223.84	387.9	1224.47
388.6	1225.32	391.2	1229.19	392.1	1231.13	394.5	1236.85	395.6	1238.86
396.6	1240.77	397.8	1242.91	401.1	1244.85	404.4	1245.7	407.7	1246.04
409	1245.97	409.5	1245.94	409.7	1245.93	410.9	1245.88	412	1245.78
413.3	1245.69	414.2	1245.61	415	1245.44	417	1245.11	420.6	1244.29
420.8	1244.24	421	1244.2	422.8	1243.76	424	1243.44	424.1	1243.42
427.4	1242.89	427.9	1242.87	430	1242.77	430.7	1242.75	431.6	1242.79
433	1242.83	434	1242.88	435.2	1243	436	1243.07	437.3	1243.21
439	1243.43	440.6	1243.65	442	1243.88	442.5	1243.95	443.9	1244.17
445	1244.38	446.2	1244.51	448	1244.84	449.9	1245.08	450.5	1245.2
453.5	1245.38	453.8	1245.4	454	1245.39	456.4	1245.23	457	1245.18
457.1	1245.17	457.2	1245.16	460	1244.73	460.4	1244.68	460.8	1244.6
463.7	1244.06	466	1243.8	467	1243.7	468.1	1243.7	469	1243.7
470.3	1243.71	475	1243.92	475.4	1243.92	476.9	1243.94	478	1243.9
480.2	1243.81	481	1243.71	483.5	1243.45	484	1243.38	486.7	1243.1
487	1243.07	490	1242.78	490.1	1242.77	493	1242.14	493.3	1242.09
493.7	1242.01	496	1241.4	496.6	1241.27	497.3	1241.09	499.1	1240.63

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   499.9 1240.41   503.2 1239.63   505.1 1239.29   506.5 1238.98   507.4 1238.79
     508 1238.68   510.8 1238.14   512.6 1237.71   513.2 1237.59   513.6  1237.5
   515.6 1236.93   516.5 1236.66   519.9 1236.02   520.9 1235.96     522 1235.92
   523.2 1235.84   524.8 1235.83   525.1 1235.83   527.6 1235.82   529.3 1235.82
   530.3 1235.82   533.1 1235.84   533.3 1235.84   533.4 1235.84   535.9 1235.86
   536.6 1235.86   538.7 1235.84   539.9 1235.84   541.8 1235.94   543.3 1236.03
   544.3 1236.25   545.9 1236.75   546.6 1236.92   547.1 1237.06   549.4 1237.99
   549.9 1238.18     550 1238.23   550.1 1238.26   552.7 1238.77   553.3 1238.95
   555.5 1239.03   556.7  1239.1   558.3 1239.09   558.4 1239.09     560 1239.07
   563.3 1239.05   566.3 1239.12   566.6 1239.14   569.4 1239.33     570 1239.36
     571  1239.4   572.2 1239.47   573.4 1239.51     575 1239.56   576.7 1239.59
   577.8 1239.63   579.3 1239.63   580.1 1239.65   583.2 1239.76   583.4 1239.77
   586.2 1239.93   586.8 1239.94     589 1240.05   590.1 1240.06   591.8 1240.16
   593.4 1240.25   594.5 1240.34     596 1240.45   596.8 1240.52   597.3 1240.55
   598.6 1240.65     600 1240.75   603.5 1241.18   604.5 1241.31   605.6 1241.46
   606.9 1241.62   608.8  1241.9   611.1 1242.22   613.1 1242.42   613.6 1242.48
   615.1 1242.61   616.6  1242.8   616.9 1242.83   617.5 1242.88   619.3  1243.1
   620.3 1243.16   621.8 1243.25   622.1 1243.28   624.8 1243.39   626.1 1243.38
     627 1243.39   627.6 1243.41   630.2 1243.41   630.3 1243.42   630.4 1243.42
   633.1 1243.75   633.7 1243.82   634.7 1244.09   635.8 1244.39   637.1 1244.72
   638.6 1245.29     639 1245.47   640.5    1246   641.3 1246.42   643.4 1247.38
   650.5 1250.99     652 1251.54   652.3 1251.69   653.9 1252.24   655.1 1252.55
   656.3 1252.79   657.3    1253   657.8 1253.11   660.5 1253.49   660.6  1253.5
   663.3 1253.72     664 1253.76   666.1 1253.85   667.3 1253.89   668.8 1253.88
   669.3 1253.88   670.7 1253.86   671.6 1253.83   674.3 1253.71   675.7 1253.69
   677.1 1253.66   677.4 1253.66   687.5 1253.47   694.2 1253.47   695.2 1253.47
   697.6 1253.49   699.1 1253.51   699.5 1253.51   701.8 1253.54   704.3 1253.58
   704.6 1253.58     706 1253.59   707.7 1253.62   708.9 1253.62   709.8 1253.62
   711.2 1253.62   712.3 1253.63   714.7 1253.65   714.8 1253.65     715 1253.66
   717.4 1253.72   718.3 1253.75   719.9 1253.79   720.5  1253.8   721.8 1253.84
   722.4 1253.85   723.9 1253.88   725.3 1253.88   726.3 1253.88   727.5 1253.88
   728.9 1253.89     730  1253.9   732.1 1253.93   732.4 1253.93   732.5 1253.94
   735.1 1253.97   735.9 1253.98   737.6 1253.99   737.9 1253.99   740.1 1254.02
   741.9 1254.09     743 1254.11   743.7 1254.12   745.2 1254.14   746.5 1254.17
   747.7 1254.17   749.5 1254.21     750 1254.21   750.2 1254.22   750.8 1254.23
   753.5 1254.25   757.1 1254.47   757.8 1254.55   759.8 1254.76   760.6 1254.84
   762.9 1254.93   764.1 1254.97   765.4 1254.96   766.9 1254.97   767.6 1254.96
     768 1254.96   768.8 1254.94   770.5  1254.9   771.2 1254.88     773 1254.83
   774.7 1254.78   775.6 1254.77   777.8 1254.75   778.2 1254.75   778.5 1254.74
   780.6 1254.72   784.3 1254.76   784.7 1254.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06  312.76    .045   374.5     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        312.76   374.5              58.3      69   127.4             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

```
       0   276.8    1248       F
   403.2   784.7    1248       F

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1219.09  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.79  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1216.30  * Reach Len. (ft)       *   58.30  *   69.00  *
 127.40  *
* Crit W.S. (ft)         * 1216.30  * Flow Area (sq ft)     *   31.93  *  401.32  *
   9.25  *
* E.G. Slope (ft/ft)     *0.014308  * Area (sq ft)          *   31.93  *  401.32  *
   9.25  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  137.87  * 5455.60  *
  36.53  *
* Top Width (ft)         *   84.22  * Top Width (ft)        *   17.65  *   61.74  *
   4.83  *
* Vel Total (ft/s)       *   12.72  * Avg. Vel. (ft/s)      *    4.32  *   13.59  *
   3.95  *
* Max Chl Dpth (ft)      *    8.07  * Hydr. Depth (ft)      *    1.81  *    6.50  *
   1.91  *
* Conv. Total (cfs)      * 47067.1  * Conv. (cfs)           *  1152.6  * 45609.1  *
  305.4  *
* Length Wtd. (ft)       *   69.15  * Wetted Per. (ft)      *   18.14  *   62.85  *
   6.01  *
* Min Ch El (ft)         * 1208.23  * Shear (lb/sq ft)      *    1.57  *    5.70  *
   1.37  *
* Alpha                  *    1.11  * Stream Power (lb/ft s) *    6.79  *   77.53  *
   5.43  *
* Frctn Loss (ft)        *    0.64  * Cum Volume (acre-ft)  *    1.86  *   39.28  *
   3.41  *
* C & E Loss (ft)        *    0.76  * Cum SA (acres)        *    1.15  *    5.52  *
   2.64  *
************************************************************************************
***********

Warning: The energy equation could not be balanced within the specified number of
iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
```

the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #500-yr

E.G. Elev (ft)	1221.20	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.38	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	1217.82	Reach Len. (ft)	58.30	69.00	127.40
Crit W.S. (ft)	1217.82	Flow Area (sq ft)	60.42	494.87	17.82
E.G. Slope (ft/ft)	0.013389	Area (sq ft)	60.42	494.87	17.82
Q Total (cfs)	7920.00	Flow (cfs)	351.39	7483.25	85.36
Top Width (ft)	88.17	Top Width (ft)	19.95	61.74	6.48
Vel Total (ft/s)	13.82	Avg. Vel. (ft/s)	5.82	15.12	4.79
Max Chl Dpth (ft)	9.59	Hydr. Depth (ft)	3.03	8.02	2.75
Conv. Total (cfs)	68445.3	Conv. (cfs)	3036.7	64670.9	737.7
Length Wtd. (ft)	69.08	Wetted Per. (ft)	20.90	62.85	8.25
Min Ch El (ft)	1208.23	Shear (lb/sq ft)	2.42	6.58	1.81
Alpha	1.14	Stream Power (lb/ft s)	14.05	99.52	8.65
Frctn Loss (ft)	1.82	Cum Volume (acre-ft)	3.91	46.94	8.54
C & E Loss (ft)	0.11	Cum SA (acres)	1.72	5.52	5.41

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical
depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross

sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
program defaulted to critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 1857

INPUT
Description:
Station Elevation Data num= 453

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1250.9	1.1	1250.97	6.4	1251.03	10.9	1251.06	14.3	1250.99
17.1	1251.02	17.7	1251.03	21.1	1251.21	26.8	1251.12	27.7	1251.14
31.3	1251.42	34.8	1251.97	35.7	1252	37.9	1251.98	41.6	1251.99
43.7	1252.04	45	1252.12	48.4	1252.81	51.6	1253.56	54.3	1253.66
58.6	1253.56	62	1253.3	65.4	1252.89	68.8	1252.39	72.2	1252.12
75.6	1252.14	78.2	1252.12	80.9	1252.05	82.5	1252.05	86.2	1252.27
89.3	1252.33	99.5	1252.19	102.9	1251.7	104.8	1251.63	106.3	1251.6
115.5	1251.82	119.9	1251.82	137	1251.43	140.4	1251.12	143.8	1250.91
147.4	1250.63	150	1250.34	152.7	1249.98	160.7	1248.7	160.8	1248.67
161.1	1248.6	163.3	1248.11	164.2	1247.86	166	1247.16	167.6	1246.46
168.6	1245.89	171.3	1244.33	174	1242.69	174.5	1242.4	175.3	1241.92
176.6	1241.22	177.9	1240.58	179.3	1239.97	181.9	1238.89	184.9	1237.73
188.1	1236.31	194.9	1232.96	198.3	1231.59	201.7	1230.51	205.8	1229.51
208.5	1229.01	213.8	1228.08	218.8	1227.25	222.9	1226.45	224.4	1226.12
227.6	1225.51	229	1225.25	232.4	1224.66	239.2	1223.35	240.4	1223.2
241.9	1222.96	242.6	1222.86	243	1222.82	248.4	1222.21	249.4	1222.07
251	1221.81	252.9	1221.48	256.3	1220.73	263.1	1219.36	264.3	1219.13
265.7	1218.86	269.9	1218.1	270.4	1218.02	272.3	1217.78	273.3	1217.61
276.7	1217.17	280.7	1216.61	283.5	1216.33	290.4	1215.89	290.9	1215.84
293.5	1215.57	293.8	1215.55	297.2	1215.09	300.5	1214.56	306.8	1213.79
310.5	1213.4	313.8	1213.27	316.1	1213.26	320.4	1213.34	321.9	1213.35
323.7	1213.34	324.8	1213.26	327.1	1213.09	329.57	1212.7	330.23	1212.61
330.56	1212.53	330.77	1212.42	331.83	1212.24	333.55	1212.04	333.87	1211.83
334.95	1211.59	336.88	1211.31	340.1	1211.13	342.15	1210.6	344.08	1210.38

346.19	1210.07	348.82	1209.72	350.84	1209.68	352.75	1209.28	354.94	1209.11
357.19	1208.85	361.85	1208.5	366.25	1208.32	372.2	1208.14	379.85	1207.82
388.8	1208.01	395.32	1208.19	399.01	1208.48	403.83	1209.11	408.8	1209.92
410.57	1210.34	411.6	1210.61	412.29	1210.7	413.3	1210.9	415.6	1211.64
418.24	1212.44	419.9	1212.99	420.2	1213.07	421.2	1213.33	421.8	1213.5
423	1213.81	423.2	1213.86	423.5	1213.92	429.9	1215.17	436.6	1216.83
437.1	1217.02	439.9	1218.02	439.9	1218.04	442.7	1218.93	443.2	1219.09
448	1220.58	448.4	1220.69	449.9	1221.13	454	1222.67	456.2	1223.51
456.6	1223.66	456.8	1223.75	458.3	1224.25	459.7	1224.69	464.3	1226.41
465.3	1226.75	466.6	1227.19	468.1	1227.75	468.4	1227.86	469.9	1228.4
470.9	1228.7	473.2	1229.38	473.8	1229.45	476.6	1229.84	480.7	1229.83
482.2	1229.76	483.2	1229.73	484.7	1229.74	485	1229.74	486.6	1229.77
487.9	1229.84	488.8	1229.9	489.9	1229.96	490.7	1230.01	492.9	1230.16
493.2	1230.18	493.5	1230.2	494.8	1230.28	496.3	1230.36	496.6	1230.38
505.1	1230.96	506.6	1231.07	507.6	1231.15	509.2	1231.3	509.9	1231.36
510.4	1231.4	513.2	1231.62	513.2	1231.63	517.4	1231.92	518.9	1232.07
521.7	1232.35	523.3	1232.53	527.3	1233.13	529.6	1233.5	529.9	1233.55
530.1	1233.59	531.3	1233.81	533.3	1234.19	535.8	1234.61	536.6	1234.76
537.8	1234.92	538.6	1235.05	539.9	1235.23	543.3	1235.55	544.2	1235.6
545.9	1235.65	546.6	1235.68	547.1	1235.7	563.2	1236.11	565.7	1236.24
566.5	1236.27	567.1	1236.31	569.6	1236.45	569.8	1236.46	570	1236.48
571.5	1236.56	572.9	1236.64	573.1	1236.65	573.4	1236.67	575.8	1236.78
576.5	1236.8	577.3	1236.84	578.8	1236.92	579.8	1236.97	581.7	1237.04
583.1	1237.09	584.6	1237.14	585	1237.15	586.4	1237.19	587.5	1237.22
588.8	1237.25	589.7	1237.27	590.4	1237.29	592.7	1237.37	593.3	1237.39
595.1	1237.49	596.2	1237.55	596.3	1237.56	596.5	1237.57	599.1	1237.68
599.6	1237.71	600.4	1237.74	602	1237.78	603	1237.81	604.2	1237.85
604.9	1237.88	606.3	1237.92	607.8	1238	608.1	1238.02	609.6	1238.09
610.7	1238.15	611.9	1238.22	612.9	1238.27	613.6	1238.29	615.8	1238.36
616.2	1238.37	619.4	1238.5	619.5	1238.5	619.7	1238.51	622.8	1238.64
623.5	1238.67	625.2	1238.75	626.1	1238.79	627.4	1238.86	628.1	1238.9
628.4	1238.91	629.5	1238.97	630.6	1239.02	633.2	1239.13	635.6	1239.25
639.7	1239.41	641.1	1239.48	645.5	1239.74	646.2	1239.77	650.5	1239.98
651.1	1240.01	652.7	1240.1	653	1240.11	654.7	1240.21	655.5	1240.25
657.1	1240.34	657.9	1240.39	659.3	1240.44	660.4	1240.48	661.9	1240.53
662.9	1240.57	665.1	1240.67	665.4	1240.68	665.5	1240.69	665.8	1240.7
667.9	1240.79	669.1	1240.86	670.3	1240.93	672.7	1241.06	672.8	1241.07
673.1	1241.09	675.3	1241.24	687.7	1242.25	689.2	1242.36	691.9	1242.54
694.3	1242.71	697.2	1242.93	697.6	1242.97	697.9	1242.98	698.4	1243.03
700.1	1243.16	702.6	1243.37	705	1243.59	718	1244.61	720	1244.78
721.2	1244.89	722.5	1245	723	1245.05	729.9	1245.7	730.2	1245.73
737.2	1246.36	737.3	1246.37	737.4	1246.38	737.6	1246.39	739.8	1246.59
742.3	1246.8	744.1	1246.93	744.8	1246.99	745.2	1247.02	747.3	1247.18
748.2	1247.26	749.8	1247.36	750.6	1247.42	751.8	1247.51	752.2	1247.54
754.7	1247.69	757.1	1247.81	757.2	1247.81	759.7	1247.94	761.2	1248.03
762.2	1248.09	762.6	1248.11	763.7	1248.2	764.7	1248.28	767.1	1248.49
768.6	1248.64	769.5	1248.73	770	1248.78	771.6	1248.94	771.9	1248.98
773.7	1249.16	774.3	1249.21	776.7	1249.44	777.4	1249.5	779.2	1249.68
781.2	1249.9	781.6	1249.94	784	1250.17	784.9	1250.26	787.9	1250.58
789.2	1250.72	791.3	1250.92	792.4	1251.02	793.7	1251.15	798.5	1251.66

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   799.8  1251.8   800.9  1251.9   809.8 1252.79   810.6 1252.87     811 1252.91
   812.4 1253.07     813 1253.15   814.7 1253.34   822.2 1254.09   822.7 1254.14
   823.6 1254.24   825.1 1254.41   825.9  1254.5   827.5 1254.66   828.7 1254.78
   829.7 1254.88     830  1254.9   830.5 1254.96   832.4 1255.18   833.4 1255.29
   834.8 1255.44   837.1 1255.69   840.9 1256.08   844.2 1256.43   845.1 1256.52
   846.9 1256.72   849.3 1256.99   851.1 1257.18   852.1 1257.29   853.2 1257.42
   854.1 1257.52   855.8 1257.71   856.6  1257.8     858 1257.96     859 1258.07
   859.5 1258.12   861.4  1258.3   861.4 1258.31   863.3 1258.49   863.8 1258.55
   864.8 1258.65   866.2 1258.78     867 1258.85   869.5 1259.11   870.7 1259.22
   871.1 1259.25   871.7 1259.32   874.5 1259.59   875.9 1259.73   877.7 1259.92
   878.2 1259.97   878.3 1259.98   878.6    1260   880.8 1260.19   881.9  1260.3
   883.2  1260.4   885.5 1260.58   885.6 1260.59   885.7 1260.59   885.9 1260.61
     888 1260.78   889.4 1260.88   890.4 1260.96   892.3 1261.12   892.8 1261.17
     894 1261.26   895.3 1261.34   897.7  1261.5   899.2 1261.59   900.1 1261.63
   902.2 1261.71   902.5 1261.72   904.3 1261.78   907.4 1261.87     908 1261.89
   909.8 1261.94   910.4 1261.96   911.8 1261.99   912.2    1262     913 1262.01
   914.6 1262.04   915.5 1262.04   916.3 1262.05

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06  330.56    .045  418.24     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        330.56  418.24             41.4    83.7   149.8             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1217.14  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.26  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1215.87  * Reach Len. (ft)        *   41.40  *   83.70  *
 149.80  *
* Crit W.S. (ft)         * 1214.51  * Flow Area (sq ft)      *   78.40  *  576.13  *
  23.41  *
* E.G. Slope (ft/ft)     *0.006446  * Area (sq ft)           *   78.40  *  576.13  *
  23.41  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *  243.28  * 5323.86  *
  62.86  *
* Top Width (ft)         *  142.17  * Top Width (ft)         *   39.99  *   87.68  *
  14.50  *
* Vel Total (ft/s)       *    8.30  * Avg. Vel. (ft/s)       *    3.10  *    9.24  *
   2.69  *
* Max Chl Dpth (ft)      *    8.05  * Hydr. Depth (ft)       *    1.96  *    6.57  *
   1.61  *
* Conv. Total (cfs)      * 70124.3  * Conv. (cfs)            *  3030.2  * 66311.2  *
  782.9  *
* Length Wtd. (ft)       *   82.77  * Wetted Per. (ft)       *   40.21  *   88.53  *
```

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  14.91  *
* Min Ch El (ft)         * 1207.82  * Shear (lb/sq ft)       *    0.78  *    2.62  *
   0.63  *
* Alpha                  *    1.18  * Stream Power (lb/ft s) *    2.43  *   24.20  *
   1.70  *
* Frctn Loss (ft)        *    0.40  * Cum Volume (acre-ft)   *    1.79  *   38.51  *
   3.36  *
* C & E Loss (ft)        *    0.17  * Cum SA (acres)         *    1.11  *    5.41  *
   2.61  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Note:    Hydraulic jump has occurred between this cross section and the previous
upstream section.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1219.40  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    5.29  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1214.11  * Reach Len. (ft)        *   41.40  *   83.70  *
 149.80  *
* Crit W.S. (ft)         * 1215.70  * Flow Area (sq ft)      *   20.23  *  421.14  *
   4.70  *
* E.G. Slope (ft/ft)     *0.039506  * Area (sq ft)           *   20.23  *  421.14  *
   4.70  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *   83.29  * 7817.96  *
  18.75  *
* Top Width (ft)         *  120.23  * Top Width (ft)         *   26.34  *   87.68  *
   6.21  *
* Vel Total (ft/s)       *   17.76  * Avg. Vel. (ft/s)       *    4.12  *   18.56  *
   3.99  *
* Max Chl Dpth (ft)      *    6.29  * Hydr. Depth (ft)       *    0.77  *    4.80  *
   0.76  *
* Conv. Total (cfs)      * 39846.6  * Conv. (cfs)            *   419.0  * 39333.2  *
   94.4  *
* Length Wtd. (ft)       *   82.46  * Wetted Per. (ft)       *   26.44  *   88.53  *
   6.44  *
* Min Ch El (ft)         * 1207.82  * Shear (lb/sq ft)       *    1.89  *   11.73  *
   1.80  *
* Alpha                  *    1.08  * Stream Power (lb/ft s) *    7.77  *  217.80  *
   7.19  *
* Frctn Loss (ft)        *    0.36  * Cum Volume (acre-ft)   *    3.86  *   46.22  *
   8.51  *
* C & E Loss (ft)        *    0.20  * Cum SA (acres)         *    1.69  *    5.41  *
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   5.39  *
**********************************************************************************
**********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 1774

INPUT
Description:
Station Elevation Data    num=     454
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
       0 1250.65       1 1250.63     3.2 1250.66     5.7 1250.64    10.5 1250.75
    12.2 1250.84      16 1250.94    17.7 1250.94    20.1 1250.89    22.5 1250.76
    23.5 1250.76    24.9 1250.83    27.5 1251.03    32.2 1251.07    34.8 1251.12
    39.4 1251.36    41.8 1251.54    44.2 1251.68    47.7 1251.83    49.1 1251.97
    49.8 1252.01    53.4 1252.06      54 1252.09    55.3 1252.19      57 1252.46
    63.5 1252.94    66.4 1253.51    67.7 1253.64    68.9 1253.86    71.3 1254.11
    71.4 1254.12    71.7 1254.13    73.9 1254.38    74.9 1254.43    78.5 1254.98
    82.1 1256.72    83.9 1256.56    85.6 1256.36    86.4 1256.35    89.2 1256.17
    91.3 1256.25    93.8 1256.19    96.4 1256.22    98.8 1256.36     100 1256.46
   103.6 1256.66   104.3 1256.73   106.3 1256.85   112.5 1257.52   118.7 1258.03
   121.5 1258.36   123.7 1258.52     125 1258.66   128.6 1258.93   132.2 1259.16
     137 1259.29   138.1 1259.35   138.6 1259.38   139.4 1259.45   141.1 1259.74
     143 1260.08   143.6 1260.21   146.6 1260.92   150.2 1261.28   152.9 1261.43
   158.5 1261.59   164.6 1261.86   168.2 1261.69   168.4 1261.64   168.8 1261.54
   170.9 1260.64   176.7 1257.98     179 1256.76   180.9 1255.94   182.6 1255.27
   183.2 1255.07   185.7 1254.47   186.2 1254.42   188.2 1254.34   189.8  1254.2
   190.7 1253.83   192.6 1252.86   193.2 1252.57   193.4 1252.42     197 1251.03
   200.5 1249.09   200.6 1249.06   200.6 1249.05   200.6 1249.03   203.1 1247.59
   211.4 1242.63   218.6 1238.85   222.2 1236.83   225.8  1234.7   229.4 1232.47
   232.8 1230.86     233  1230.8   235.3 1230.26   237.8 1229.87   240.2 1229.65
   243.8  1229.5   247.7 1229.26     251 1228.93   252.6 1228.81   253.4 1228.75
   254.6 1228.66   255.1 1228.63   256.1 1228.59   261.8 1227.84   262.5 1227.76
   264.1  1227.6     265 1227.47   265.4 1227.41   271.9 1226.29   280.3 1224.69
     282 1224.42   284.1 1224.14   284.8 1224.02   291.3 1222.67     294 1222.05
   299.3 1220.99   301.6 1220.61   303.2 1220.36   303.5 1220.29   304.2 1220.16
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305.9	1219.83	308.3	1219.45	314.6	1218.62	318.4	1218.02	322.7	1217.25
323.6	1217.09	327.5	1216.46	329.4	1216.12	333.6	1215.22	337.1	1214.38
337.4	1214.31	338.6	1214.04	341.2	1213.43	341.9	1213.31	344.3	1212.86
345	1212.73	348.8	1212.31	352.6	1212.05	356	1211.96	356.3	1211.96
360.2	1211.93	371.7	1211.72	375.5	1211.69	379.3	1211.69	380.2	1211.7
381.9	1211.74	382.5	1211.76	382.6	1211.76	383	1211.77	386.4	1211.74
393.2	1211.59	393.4	1211.58	395.8	1211.49	396.7	1211.44	400.1	1211.15
402.91	1210.794	403.8	1210.68	404.6	1210.52	406.9	1210.08	407.9	1209.85
409.1	1209.58	410.4	1209.28	411.7	1209.06	412.8	1208.9	413.8	1208.73
416.54	1208.47	417.85	1208.22	420.31	1207.77	422.92	1207.45	425.8	1207.34
430.49	1207.32	435.02	1207.41	437.84	1207.66	439.55	1207.79	442.26	1207.91
447.17	1208.11	448.93	1208.15	451.54	1208.36	454.8	1208.57	456.3	1208.6
456.6	1208.61	458.2	1208.63	459.2	1208.66	461.2	1208.74	461.6	1208.75
465.1	1208.97	466	1209.06	467.21	1209.161	468.5	1209.27	469.8	1209.38
471.9	1209.58	474.4	1209.74	475.3	1209.79	478.7	1209.99	482.2	1210.32
485.6	1211.02	487.94	1211.95	489	1212.33	492.4	1213.76	493.6	1214.09
495.8	1214.78	496.2	1214.9	497.6	1215.33	498.9	1215.74	499.3	1215.87
499.9	1216.08	502.7	1216.91	504.2	1217.5	504.8	1217.77	506.8	1218.6
507.4	1218.88	508.5	1219.37	509.3	1219.71	509.7	1219.91	511.7	1220.72
513.4	1221.49	515.4	1222.32	518.9	1223.75	519.3	1223.9	520.9	1224.56
521.4	1224.75	522.2	1225.11	524.6	1226.03	527.5	1226.79	528.6	1227.09
533.5	1228.17	535.6	1228.61	535.8	1228.65	535.9	1228.66	538.3	1229.12
539.6	1229.33	540.7	1229.53	542.9	1229.85	543.1	1229.89	543.3	1229.91
550.8	1230.68	552.8	1230.81	554.5	1230.92	555.2	1230.94	556.6	1230.99
557.7	1231.02	560.1	1231.04	562.5	1231.04	564.9	1231.03	566.2	1231.02
568.2	1230.98	569.5	1230.97	570.7	1230.95	571.8	1230.93	572.9	1230.91
575.3	1230.88	577.7	1230.86	582.4	1230.95	589	1231.16	590.4	1231.22
591.8	1231.28	592.7	1231.31	596.5	1231.49	597.3	1231.54	598.1	1231.61
599.6	1231.77	601.2	1231.98	602	1232.12	604.3	1232.68	605.9	1233.25
606.6	1233.5	608.9	1234.54	610.7	1235.45	611.2	1235.78	611.8	1236.12
615.4	1237.79	615.9	1238.03	616.4	1238.25	618.2	1238.89	620.1	1239.53
620.9	1239.77	624.8	1240.84	625.2	1240.88	629.5	1241.37	629.8	1241.37
630.1	1241.36	632.1	1241.25	634.2	1241.13	634.4	1241.12	634.6	1241.1
643.8	1240.46	646	1240.33	647	1240.27	648.3	1240.19	648.4	1240.19
652.9	1239.88	653	1239.88	653.1	1239.87	655.3	1239.74	657.5	1239.61
657.6	1239.6	657.8	1239.59	676.2	1238.24	676.7	1238.21	680.3	1238.07
680.8	1238.05	683.2	1238.05	690.8	1238.23	698.6	1238.33	699.4	1238.34
700.2	1238.34	701.7	1238.33	703.1	1238.34	704	1238.34	705	1238.34
706.3	1238.32	707.7	1238.3	709.7	1238.28	711	1238.26	712.3	1238.24
714.4	1238.25	715.6	1238.26	716.8	1238.26	717.9	1238.27	719.1	1238.28
720.3	1238.3	721.4	1238.31	722.6	1238.34	723.8	1238.38	724.9	1238.42
729.5	1238.56	731.9	1238.6	733.3	1238.62	735.1	1238.67	736.5	1238.69
738	1238.71	738.8	1238.71	741.1	1238.67	742.7	1238.6	743.5	1238.58
744.2	1238.56	745.8	1238.43	747.4	1238.34	748.1	1238.33	748.8	1238.34
750.4	1238.28	752.1	1238.38	752.7	1238.4	753.3	1238.45	755.1	1238.56
756.8	1238.8	757.4	1238.83	759.7	1238.98	761.5	1239.19	762.5	1239.24
764.3	1239.36	766.3	1239.55	766.7	1239.57	767	1239.6	769	1239.71
771	1239.89	771.3	1239.91	773.6	1240.05	775.9	1240.28	776.2	1240.3
778.3	1240.46	780.4	1240.7	780.6	1240.72	785.1	1241.27	785.2	1241.28
785.3	1241.29	789.8	1241.81	789.9	1241.81	790.8	1241.91	792.2	1242.05

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   794.4 1242.31   794.5 1242.31   796.8  1242.6   808.1 1244.17   808.4 1244.21
   810.7 1244.51   810.9 1244.53   812.6 1244.73   813.1 1244.78   813.6 1244.84
   815.4 1244.99   816.8  1245.1   818.8  1245.2     820 1245.23   825.4 1245.25
     829 1245.33   829.4 1245.34   831.7 1245.35   833.9 1245.38     834 1245.38
   834.2 1245.38   836.4 1245.39   838.2 1245.41   838.7 1245.41   839.3 1245.41
     841 1245.41   842.4 1245.42   843.3 1245.43   844.4 1245.47   845.7 1245.49
   849.6 1245.53   850.3 1245.54   850.9 1245.55   852.7 1245.51     855  1245.5
   855.2 1245.49   857.3 1245.45   859.5 1245.46   859.6 1245.47   863.7 1245.66
     865 1245.86   866.6 1246.19     868 1246.54     869 1246.84   870.1 1247.23
   871.3 1247.65   872.3 1248.01   873.6 1248.48   875.2 1249.03   875.9 1249.25
   876.5 1249.44   878.3 1249.91   880.4 1250.49   880.6 1250.55   880.8 1250.59
   882.9 1251.07   885.3 1251.58   885.5 1251.63   889.9 1252.48   890.6 1252.61
   892.3 1252.96   893.6 1253.25   894.6 1253.43   895.8 1253.63   896.9 1253.83
   900.9 1254.38   901.6 1254.46   902.1 1254.52   906.1 1254.93   906.2 1254.94
     908 1255.12   908.6 1255.19   910.6 1255.41   910.9 1255.43   913.2 1255.64
   914.9  1255.8   915.5 1255.87   916.3 1255.95     919 1256.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06     356    .045  487.94     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           356  487.94             72.6   141.6   223.1             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1216.56  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.68  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1215.88  * Reach Len. (ft)       *   72.60  *  141.60  *
 223.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   63.37  *  801.28  *
  21.03  *
* E.G. Slope (ft/ft)     *0.003796  * Area (sq ft)          *   63.37  *  801.28  *
  21.03  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  175.88  * 5407.58  *
  46.54  *
* Top Width (ft)         *  168.77  * Top Width (ft)        *   25.45  *  131.94  *
  11.37  *
* Vel Total (ft/s)       *    6.36  * Avg. Vel. (ft/s)      *    2.78  *    6.75  *
   2.21  *
* Max Chl Dpth (ft)      *    8.55  * Hydr. Depth (ft)      *    2.49  *    6.07  *
   1.85  *
* Conv. Total (cfs)      * 91374.7  * Conv. (cfs)           *  2854.6  * 87764.9  *
  755.3  *
* Length Wtd. (ft)       *  142.60  * Wetted Per. (ft)      *   25.83  *  132.63  *
  12.04  *
```

```
* Min Ch El (ft)         * 1207.32  * Shear (lb/sq ft)       *    0.58  *    1.43  *
   0.41  *
* Alpha                  *    1.09  * Stream Power (lb/ft s) *    1.61  *    9.66  *
   0.92  *
* Frctn Loss (ft)        *    0.52  * Cum Volume (acre-ft)   *    1.72  *   37.18  *
   3.28  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)         *    1.08  *    5.20  *
   2.57  *
**********************************************************************************
**********

CROSS SECTION OUTPUT  Profile #500-yr
**********************************************************************************
**********
* E.G. Elev (ft)         * 1218.28  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.80  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1217.48  * Reach Len. (ft)        *   72.60  *  141.60  *
 223.10  *
* Crit W.S. (ft)         * 1214.63  * Flow Area (sq ft)      *  111.35  * 1013.04  *
  43.34  *
* E.G. Slope (ft/ft)     *0.003309  * Area (sq ft)           *  111.35  * 1013.04  *
  43.34  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  342.51  * 7462.92  *
 114.57  *
* Top Width (ft)         *  182.73  * Top Width (ft)         *   34.58  *  131.94  *
  16.21  *
* Vel Total (ft/s)       *    6.78  * Avg. Vel. (ft/s)       *    3.08  *    7.37  *
   2.64  *
* Max Chl Dpth (ft)      *   10.16  * Hydr. Depth (ft)       *    3.22  *    7.68  *
   2.67  *
* Conv. Total (cfs)      *137681.1  * Conv. (cfs)            *  5954.2  *129735.3  *
 1991.6  *
* Length Wtd. (ft)       *  143.86  * Wetted Per. (ft)       *   35.10  *  132.63  *
  17.14  *
* Min Ch El (ft)         * 1207.32  * Shear (lb/sq ft)       *    0.66  *    1.58  *
   0.52  *
* Alpha                  *    1.12  * Stream Power (lb/ft s) *    2.02  *   11.62  *
   1.38  *
* Frctn Loss (ft)        *    0.46  * Cum Volume (acre-ft)   *    3.79  *   44.84  *
   8.42  *
* C & E Loss (ft)        *    0.00  * Cum SA (acres)         *    1.66  *    5.20  *
   5.35  *
**********************************************************************************
**********

Note:    Hydraulic jump has occurred between this cross section and the previous
upstream section.
```

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 1632

INPUT
Description:
Station Elevation Data num= 453

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1252.38	1.1	1252.2	4.7	1251.34	8.3	1250.68	10.1	1250.53
11.8	1250.34	18.9	1250.73	22.5	1250.66	25.1	1250.71	27.6	1250.84
33.2	1251.21	43.8	1252.07	45	1252.22	47.3	1252.42	48.8	1252.61
52	1253.45	53.7	1253.94	58.6	1256	59.3	1256.33	61.3	1257.54
65.9	1260.49	68.2	1261.91	68.4	1262	72.5	1263.45	73.3	1263.7
75.2	1263.83	76.9	1264	78.3	1264.23	81.3	1264.55	83.2	1264.82
89.1	1264.97	92.6	1264.91	96.2	1265.03	102	1265.35	106.9	1265.54
110.4	1265.52	114	1265.39	117.5	1265.2	124.7	1265.09	128.2	1264.71
132.1	1264.34	138.9	1264.02	142.4	1263.96	144.6	1264.07	146	1264.26
147.1	1264.3	149.4	1264.56	152.1	1264.56	153.1	1264.65	154.6	1264.44
155.5	1264.45	157.1	1264.38	158.3	1264.41	159.7	1264.32	162.2	1264.53
163.8	1264.7	164.7	1264.83	166.8	1265.26	170.9	1265.31	175.2	1265.46
178	1265.28	180	1265.22	182.2	1265.12	184.7	1264.96	185.1	1264.94
188.7	1264.6	192.3	1264.56	195.8	1264.31	199.4	1264.32	202.9	1264.19
209.8	1264.08	213.6	1263.85	216.8	1263.47	217.3	1263.38	219.8	1262.58
220.7	1262.27	221.6	1261.8	224.6	1260.39	228.5	1258.77	229.2	1258.46
230	1258.16	231.5	1257.67	233.8	1257.1	236.2	1256.7	237.4	1256.28
238.5	1255.8	240.8	1254.42	244.4	1252.02	245.5	1251.35	249.2	1248.87
254.7	1245.6	263.7	1240.67	264	1240.48	264.3	1240.29	266.3	1238.91
268.5	1237.24	271	1235.88	273.3	1234.9	275.6	1234.5	277.9	1234.19
280.3	1233.77	282.3	1233.36	286.7	1232.02	287.2	1231.87	289.5	1231.13
292.6	1230.24	295.7	1229.26	298.8	1228.47	302.2	1227.68	304.7	1227.18
305.8	1226.96	310.4	1226.09	311.8	1225.84	315.1	1225.31	322	1224.31
329	1223.41	336.1	1222.71	340.5	1222.13	345.5	1221.68	349.5	1221.39
358.5	1220.39	363	1220.01	369.5	1219.61	371.9	1219.39	376.4	1218.77
377.7	1218.56	380.1	1218.19	384	1217.51	389.4	1216.39	397.2	1214.17
398.9	1213.62	400.3	1213.17	401.1	1212.93	401.3	1212.88	401.5	1212.79
403.11	1212.236	406.27	1211.1	412.8	1208.88	415.5	1208.26	416.8	1208.03
417.9	1207.87	419.5	1207.7	422.84	1207.46	429.39	1207.38	437.51	1207.42
450.91	1207.58	455.47	1207.64	456.02	1207.7	456.75	1207.7	458.2	1207.78
463.7	1207.75	467.7	1207.84	479.4	1208.3	479.5	1208.31	481.9	1208.54
483.3	1208.67	484.2	1208.73	487.2	1208.85	491.1	1208.72	495.1	1208.5
496.1	1208.47	497.6	1208.47	498.4	1208.46	499	1208.46	503.2	1208.92
503.7	1209.04	505.6	1209.52	510.51	1211.048	510.7	1211.11	514.6	1211.9
515.7	1212.05	517.4	1212.21	518.5	1212.31	527.7	1212.88	530.3	1212.95
533.7	1212.88	534	1212.88	538.1	1212.84	538.7	1212.88	539.7	1212.91
543.5	1213.23	545.7	1213.31	547.9	1213.5	550	1213.55	550.6	1213.58
551.2	1213.58	552.9	1213.74	554.3	1213.76	556.4	1213.84	559.9	1214.17
561.5	1214.22	562.2	1214.31	562.8	1214.32	564.5	1214.45	566.7	1214.44

567 1214.46	568.5 1214.63	569.2 1214.72	571.9 1214.96	573.9 1215.35
577 1215.8	579.7 1216.33	580.8 1216.5	582.2 1216.71	584 1217.1
585.5 1217.38	587.4 1217.66	588.2 1217.8	590.2 1218.07	592.3 1218.37
592.5 1218.4	592.5 1218.41	594.8 1218.81	596.7 1219.15	597.2 1219.25
597.7 1219.36	599.5 1219.61	601 1219.78	601.8 1219.92	602.9 1220.08
605.2 1220.34	608.8 1220.79	609.5 1220.89	611.1 1221.14	613.2 1221.54
618.4 1222.74	623.5 1224.17	626.4 1225.05	627.5 1225.28	629.8 1225.69
630.7 1225.85	632.1 1226.03	634.9 1226.3	636.8 1226.51	639 1226.83
639.1 1226.84	639.2 1226.85	641.4 1227.32	643.4 1227.8	643.8 1227.91
644.2 1228.04	646.1 1228.55	647.7 1228.97	648.4 1229.22	649.4 1229.52
650.8 1229.92	651.9 1230.22	654.5 1230.82	655.4 1230.99	656.2 1231.1
657.7 1231.3	660.1 1231.57	660.4 1231.61	663.7 1232.03	664.7 1232.15
664.7 1232.16	668.9 1232.7	670 1232.81	671.7 1232.97	673.1 1233.08
675.2 1233.22	678.7 1233.4	685 1233.62	690.4 1233.66	702 1233.56
702.3 1233.56	706.6 1233.56	706.7 1233.56	706.9 1233.57	711 1233.65
711.3 1233.66	711.6 1233.66	713.6 1233.66	715.3 1233.62	715.9 1233.59
716.7 1233.54	718.3 1233.41	719.7 1233.33	720.6 1233.39	721.7 1233.54
722.9 1233.78	724 1234.04	725.2 1234.45	728.3 1235.42	729.9 1235.78
731.7 1236.15	732.2 1236.25	732.6 1236.33	734.5 1236.59	736.7 1236.89
736.9 1236.91	737 1236.93	741.3 1237.64	741.5 1237.68	741.8 1237.72
743.8 1238.08	746.8 1238.56	750 1238.94	751.8 1239.12	754.3 1239.33
755.5 1239.47	756.8 1239.67	757.8 1239.83	758.6 1239.98	760.1 1240.23
761.8 1240.49	762.5 1240.57	763 1240.63	764.8 1240.83	766.9 1241.02
767.1 1241.03	767.3 1241.04	771.6 1241.34	771.9 1241.36	774.1 1241.51
776 1241.62	776.4 1241.65	776.9 1241.67	778.7 1241.77	781.9 1241.94
783.4 1242.03	792.7 1242.49	793.3 1242.54	795 1242.68	797.3 1242.87
799.7 1243.1	802 1243.34	802 1243.35	804.3 1243.61	806.3 1243.84
806.6 1243.87	807 1243.91	809 1244.1	812.1 1244.49	815 1245.03
818.3 1245.83	819.3 1246.11	822.1 1246.76	822.9 1246.89	823.6 1247
827.6 1247.42	828 1247.47	829.9 1247.73	832.1 1248.11	832.2 1248.12
834.5 1248.59	836.6 1248.99	841.5 1249.7	843.8 1250.09	845.3 1250.32
846.2 1250.45	848.5 1250.79	849.6 1250.93	852.2 1251.12	853.1 1251.17
858.3 1251.44	860.1 1251.5	862.3 1251.56	862.5 1251.57	862.6 1251.57
864.9 1251.65	867.1 1251.75	871.3 1252.55	872.3 1252.98	874.1 1253.79
875.6 1254.61	878.7 1256.52	879.9 1257.29	881.1 1257.89	882.3 1258.55
884.3 1259.42	885.7 1259.94	888 1260.59	890.4 1261.03	892.4 1261.33
892.7 1261.37	892.9 1261.41	897.3 1261.82	897.4 1261.82	899.7 1261.85
901.6 1261.85	905.9 1262.06	910.3 1262.74	912.5 1263.1	914.6 1263.41
915.9 1263.53	918.3 1263.7	918.9 1263.74	922.9 1264.16	923.3 1264.21
925.2 1264.53	927.5 1264.92	927.6 1264.94	928.1 1265	929.9 1265.23
931.9 1265.46	932.2 1265.47	932.5 1265.48	934.5 1265.5	936.3 1265.52
937.6 1265.52	939.2 1265.58	940.6 1265.66	942.6 1265.8	944.9 1266.03
947.6 1266.31	948.5 1266.41	949.3 1266.49	950.8 1266.65	952.3 1266.81
953.1 1266.9	955.5 1267.19	960.1 1267.92	963.7 1268.44	965.8 1268.71
968.5 1269.01	969.4 1269.1	970.2 1269.18	971.7 1269.29	973.3 1269.4
974 1269.47	974.7 1269.54	976.3 1269.71	978.1 1269.89	979.2 1270.01
981 1270.16	982.9 1270.29	988 1270.64	990.3 1270.91	992.5 1271.21
992.6 1271.22	992.7 1271.24	997.2 1271.74	997.2 1271.75	999.6 1271.9
1001.7 1272.06	1001.9 1272.07	1002.1 1272.09	1006.2 1272.27	1006.5 1272.28
1006.9 1272.31	1008.8 1272.46	1010.7 1272.6	1011.7 1272.69	1015.1 1272.99

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  1015.8 1273.07  1016.5 1273.17  1018.1 1273.39  1019.6 1273.61  1021.3 1273.87
  1022.8 1274.11  1024.1 1274.36  1025.1  1274.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  406.27    .045   510.7     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        406.27   510.7             165.7   134.5   124.8             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1216.03  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.76  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1215.27  * Reach Len. (ft)       *  165.70  *  134.50  *
 124.80  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   25.66  *  735.68  *
 124.56  *
* E.G. Slope (ft/ft)     *0.003542  * Area (sq ft)          *   25.66  *  735.68  *
 124.56  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   57.74  * 5283.18  *
 289.08  *
* Top Width (ft)         *  180.16  * Top Width (ft)        *   12.94  *  104.43  *
  62.79  *
* Vel Total (ft/s)       *    6.36  * Avg. Vel. (ft/s)      *    2.25  *    7.18  *
   2.32  *
* Max Chl Dpth (ft)      *    7.89  * Hydr. Depth (ft)      *    1.98  *    7.04  *
   1.98  *
* Conv. Total (cfs)      * 94604.4  * Conv. (cfs)           *   970.3  * 88776.5  *
 4857.6  *
* Length Wtd. (ft)       *  134.38  * Wetted Per. (ft)      *   13.60  *  105.31  *
  63.03  *
* Min Ch El (ft)         * 1207.38  * Shear (lb/sq ft)      *    0.42  *    1.54  *
   0.44  *
* Alpha                  *    1.21  * Stream Power (lb/ft s) *    0.94  *   11.09  *
   1.01  *
* Frctn Loss (ft)        *    0.60  * Cum Volume (acre-ft)  *    1.65  *   34.68  *
   2.91  *
* C & E Loss (ft)        *    0.05  * Cum SA (acres)        *    1.05  *    4.81  *
   2.38  *
************************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
```

CROSS SECTION OUTPUT Profile #500-yr

E.G. Elev (ft)	1217.82	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.84	Wt. n-Val.	0.060	0.045	0.060
W.S. Elev (ft)	1216.98	Reach Len. (ft)	165.70	134.50	124.80
Crit W.S. (ft)		Flow Area (sq ft)	53.21	914.59	240.99
E.G. Slope (ft/ft)	0.003055	Area (sq ft)	53.21	914.59	240.99
Q Total (cfs)	7920.00	Flow (cfs)	137.05	7052.64	730.31
Top Width (ft)	196.92	Top Width (ft)	19.73	104.43	72.76
Vel Total (ft/s)	6.55	Avg. Vel. (ft/s)	2.58	7.71	3.03
Max Chl Dpth (ft)	9.60	Hydr. Depth (ft)	2.70	8.76	3.31
Conv. Total (cfs)	143294.0	Conv. (cfs)	2479.6	127601.1	13213.3
Length Wtd. (ft)	134.34	Wetted Per. (ft)	20.61	105.31	73.15
Min Ch El (ft)	1207.38	Shear (lb/sq ft)	0.49	1.66	0.63
Alpha	1.26	Stream Power (lb/ft s)	1.27	12.77	1.90
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	3.66	41.71	7.70
C & E Loss (ft)	0.08	Cum SA (acres)	1.62	4.81	5.12

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross
sections.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 1498

INPUT
Description:
Station Elevation Data num= 447

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1252.93	3.1	1253.02	6.5	1252.86	13.1	1251.68	16.4	1251.19
19.7	1250.96	23	1251.07	26.4	1251.09	29.7	1250.96	33	1250.97
36.3	1251.19	39.2	1251.2	46.3	1250.87	49.6	1250.94	59.3	1252.09
62.9	1252.76	65.1	1253.25	69.5	1254.33	72.8	1255.05	73.7	1255.12
76.1	1255.22	79.4	1254.97	82.4	1254.63	85.2	1254.2	88.7	1253.84
93.1	1253.75	98.1	1253.79	100.2	1253.77	101.5	1253.67	103.8	1253.3
107.4	1252.66	109.7	1252.5	114.6	1252.34	118.1	1251.95	121.7	1251.8
125.3	1251.9	128	1251.83	133	1251.8	136.1	1251.6	139.7	1251.44
150.4	1251.38	154	1251.23	155.4	1251.08	157.8	1250.75	160.3	1250.46
162.8	1250.3	164.7	1250.25	168.3	1250.29	172.8	1250.06	175.5	1249.83
182.7	1249.63	186.2	1249.67	189.8	1249.65	192.7	1249.53	195.3	1249.34
199.1	1249.13	207.3	1249.07	207.6	1249.06	207.8	1249.06	208.1	1249.04
210.1	1248.95	218.5	1248.28	220	1248.09	222.5	1247.84	223.5	1247.76
232.8	1246.64	237.5	1246.31	239.8	1246.11	247.2	1245.55	249.9	1245.43
250.8	1245.37	254.4	1245.1	257.4	1244.64	257.9	1244.57	259.4	1244.38
259.9	1244.32	264.8	1243.76	269.8	1243.29	274.8	1242.74	275.9	1242.65
279.8	1242.63	280.5	1242.61	282	1242.57	283.4	1242.58	285.6	1242.48
286.9	1242.33	290.1	1241.8	291.5	1241.61	293.8	1241.37	294.5	1241.31
296.2	1241.2	298.5	1240.98	299	1240.9	300.8	1240.6	312.4	1238.09
317.3	1237.4	322.1	1236.31	325.8	1235.37	328.7	1234.18	331	1233.05
333.3	1232.06	334.7	1231.51	335.6	1231.26	340.3	1230.19	342.6	1229.79
351.1	1228.16	356.5	1227.41	360.8	1227.16	368.1	1226.66	369.6	1226.64
370.4	1226.62	370.5	1226.62	372.8	1226.33	374.9	1226.01	388.2	1223.71
393.6	1222.83	397.2	1222.3	401.6	1221.42	407.6	1220.64	415	1219.55
423.8	1218.62	423.9	1218.61	426.7	1218.38	427.1	1218.36	428.5	1218.25
432.8	1218.11	433.1	1218.1	435.4	1218.01	437.2	1217.89	437.8	1217.85
438.3	1217.77	440.1	1217.4	441.6	1216.91	443.2	1216.4	444.7	1215.84
447	1214.94	448.1	1214.56	449.4	1214.13	450.5	1213.7	451.7	1213.52
453	1213.17	454	1212.91	454.9	1212.59	457.9	1211.31	459.3	1210.82
461	1210.18	461.36	1210.06	462.8	1209.55	463.3	1209.4	463.7	1209.26
465.6	1208.58	467.7	1207.94	467.9	1207.87	468.2	1207.81	470.3	1207.12
472.6	1206.5	474.9	1206.15	477	1205.96	477.2	1205.94	477.5	1205.93
483.98	1205.78	491.45	1205.74	503.25	1205.69	511.8	1206.02	512.1	1206.03
512.3	1206.04	514.4	1206.17	516.7	1206.37	516.8	1206.38	521.2	1207
521.4	1207.03	525.6	1207.74	526	1207.81	526.5	1207.89	528.3	1208.23
530	1208.57	530.6	1208.67	537.6	1209.54	538.61	1209.682	538.8	1209.71
539.9	1209.86	541.2	1210.02	542.3	1210.11	543.3	1210.19	546.9	1210.26
547.7	1210.27	549.2	1210.36	550.9	1210.52	551.5	1210.6	552.1	1210.67
553.9	1210.94	555.8	1211.26	556.2	1211.32	561	1212.45	564.9	1213.62
572.5	1216.22	574.9	1216.93	577	1217.52	577.2	1217.59	577.2	1217.6
581.3	1218.47	581.9	1218.56	582.7	1218.68	584.3	1218.86	585.4	1219
588.9	1219.24	589.5	1219.28	597.7	1219.62	598.3	1219.66	599.1	1219.7
600.7	1219.79	603	1219.91	612.4	1220.5	614.1	1220.6	614.7	1220.63
615.5	1220.66	617.1	1220.77	626.5	1221.25	631.1	1221.72	631.8	1221.8
633.4	1222.01	634.7	1222.16	635.8	1222.32	637.3	1222.51	638.1	1222.62
638.8	1222.71	640.5	1222.95	642.7	1223.24	642.8	1223.25	642.9	1223.26
643.4	1223.32	647	1223.74	649.8	1223.92	651.1	1223.97	652.2	1223.99
653.6	1224	654.5	1224.02	655.2	1224.04	659.1	1224.33	659.2	1224.34

```
   659.3 1224.36   661.6 1224.91   663.4 1225.48   663.9 1225.67   667.5 1227.31
   668.6 1227.84     670 1228.61   671.6 1229.49   675.4 1231.06   675.6 1231.12
   675.7 1231.15   676.6 1231.35   679.8 1232.01   680.3 1232.07   682.6 1232.32
   683.9 1232.46     685 1232.56     688 1232.85   689.7 1232.97   691.8 1233.14
   692.1 1233.16   696.7 1233.41   697.3 1233.44   700.4 1233.57   701.4 1233.59
   704.5 1233.67   708.2 1233.66   716.8 1233.51   718.7  1233.5   719.1  1233.5
   720.1 1233.49   720.8 1233.49     724 1233.42   724.9 1233.41   725.1  1233.4
   727.2 1233.36   728.6 1233.34     732 1233.29   732.6 1233.27   734.3 1233.22
   735.4 1233.19   736.5 1233.16   736.7 1233.15   740.4 1233.08   741.4 1233.06
     743 1233.04   743.8 1233.04   746.2 1233.02   746.8 1233.01   748.3    1233
   752.2 1233.06   753.3  1233.1     755 1233.16   756.1 1233.22     758 1233.29
   758.3 1233.29     760 1233.33   760.4 1233.34     761 1233.35   762.8 1233.39
     764 1233.41   765.1 1233.46   766.9 1233.56   767.5 1233.59   767.9 1233.61
   769.7  1233.7   774.6 1233.84   775.7 1233.83     777 1233.83   779.3  1233.8
   781.1 1233.71   781.7 1233.68   783.6 1233.56   784.1 1233.52   784.9 1233.47
   786.4 1233.43   787.5 1233.41   800.7 1233.43   802.8 1233.41   808.8 1233.64
     811 1233.88   814.9 1234.41     815 1234.43   815.4  1234.5   817.2 1234.82
   818.9 1235.05   819.6 1235.16   820.7 1235.32   822.8 1235.61   826.7 1236.25
   830.7 1237.08   831.5 1237.28   832.7 1237.57   834.6 1238.07   838.6  1239.1
   838.6 1239.11   842.4 1239.96   844.6 1240.25   845.7 1240.37   846.4 1240.43
     848 1240.56   850.3  1240.7   852.8 1240.83   854.2 1240.86   855.1 1240.88
   858.1 1240.87   859.9 1240.94   861.1 1240.98     862 1241.02   864.6 1241.36
     866 1241.53     867 1241.65   868.5 1241.83   869.4 1241.95   869.9 1242.01
   871.7 1242.22   873.8 1242.47   874.1  1242.5   874.5 1242.55   876.5 1242.89
   883.6 1244.24     884 1244.32   885.6 1244.64   885.9 1244.71   886.4  1244.8
   888.3 1245.15   889.5 1245.37   892.4 1245.98     893 1246.09   893.4 1246.17
   895.4 1246.67   895.8 1246.78   897.3 1247.14   898.7 1247.63   900.2 1248.13
     901  1248.4   902.6 1249.05   904.8  1249.9     905 1249.99   907.5 1250.81
   908.6 1251.15   912.2 1252.02   912.3 1252.03   914.7 1252.34   916.1 1252.48
   919.5 1252.71   931.6 1253.21   932.5 1253.26   934.8 1253.41   937.7 1253.64
   938.8 1253.73   939.3 1253.76   941.2 1253.93   942.3 1254.03   943.6 1254.14
     946 1254.34   946.1 1254.34   948.5 1254.49   949.8 1254.57   950.9 1254.62
   953.6 1254.76   954.6 1254.83   955.7  1254.9   957.3 1255.02   958.1 1255.09
   959.5 1255.21   960.5  1255.3   962.9 1255.51     963 1255.52   966.3 1255.77
   968.6 1255.94   970.2 1256.03   971.5  1256.1   972.6 1256.16   976.1 1256.42
   977.4 1256.53   979.8 1256.74   979.8 1256.75   988.4 1257.33   989.5  1257.4
   991.9 1257.57   993.3 1257.68   994.3 1257.76   996.7 1257.92   996.8 1257.93
   998.6 1258.05   999.1 1258.08    1000 1258.15  1001.5 1258.26  1002.4 1258.31
  1003.9 1258.42  1005.3  1258.5  1006.4 1258.57  1008.8  1258.8  1009.9 1258.91
  1011.2 1259.05  1012.3 1259.16  1013.6 1259.35  1016.8 1259.89  1018.3 1260.07
  1020.5 1260.32  1020.7 1260.34  1020.8 1260.35  1024.5 1260.64  1025.5 1260.68
    1027 1260.77  1027.9 1260.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  461.36    .045   542.3     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        461.36   542.3             103.9   193.4   240.6             .1       .3
```

CROSS SECTION OUTPUT Profile #100-yr
****

* E.G. Elev (ft)	* 1215.38	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 1.26	* Wt. n-Val.	* 0.060	* 0.045	* 0.060 *
* W.S. Elev (ft)	* 1214.12	* Reach Len. (ft)	* 103.90	* 193.40	* 240.60 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 22.49	* 577.87	* 65.32 *
* E.G. Slope (ft/ft)	*0.005764	* Area (sq ft)	* 22.49	* 577.87	* 65.32 *
* Q Total (cfs)	* 5630.00	* Flow (cfs)	* 62.10	* 5331.82	* 236.08 *
* Top Width (ft)	* 116.91	* Top Width (ft)	* 11.92	* 80.94	* 24.05 *
* Vel Total (ft/s)	* 8.46	* Avg. Vel. (ft/s)	* 2.76	* 9.23	* 3.61 *
* Max Chl Dpth (ft)	* 8.43	* Hydr. Depth (ft)	* 1.89	* 7.14	* 2.72 *
* Conv. Total (cfs)	* 74158.9	* Conv. (cfs)	* 818.0	* 70231.3	* 3109.6 *
* Length Wtd. (ft)	* 193.80	* Wetted Per. (ft)	* 12.63	* 81.84	* 24.51 *
* Min Ch El (ft)	* 1205.69	* Shear (lb/sq ft)	* 0.64	* 2.54	* 0.96 *
* Alpha	* 1.14	* Stream Power (lb/ft s)	* 1.77	* 23.44	* 3.47 *
* Frctn Loss (ft)	* 1.28	* Cum Volume (acre-ft)	* 1.56	* 32.66	* 2.64 *
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 1.00	* 4.52	* 2.26 *

****

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500-yr
****

* E.G. Elev (ft)	* 1217.20	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 1.59	* Wt. n-Val.	* 0.060	* 0.045	* 0.060 *
* W.S. Elev (ft)	* 1215.61	* Reach Len. (ft)	* 103.90	* 193.40	* 240.60 *

```
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   43.45  *  698.46  *
 104.39  *
* E.G. Slope (ft/ft)     *0.005757  * Area (sq ft)           *   43.45  *  698.46  *
 104.39  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *  152.44  * 7308.01  *
 459.56  *
* Top Width (ft)         *  125.40  * Top Width (ft)        *   16.06  *   80.94  *
  28.40  *
* Vel Total (ft/s)       *    9.36  * Avg. Vel. (ft/s)      *    3.51  *   10.46  *
   4.40  *
* Max Chl Dpth (ft)      *    9.92  * Hydr. Depth (ft)      *    2.71  *    8.63  *
   3.68  *
* Conv. Total (cfs)      *104386.3  * Conv. (cfs)           *  2009.1  * 96320.2  *
 6057.0  *
* Length Wtd. (ft)       *  194.18  * Wetted Per. (ft)      *   17.03  *   81.84  *
  29.11  *
* Min Ch El (ft)         * 1205.69  * Shear (lb/sq ft)      *    0.92  *    3.07  *
   1.29  *
* Alpha                  *    1.17  * Stream Power (lb/ft s) *    3.22  *   32.09  *
   5.67  *
* Frctn Loss (ft)        *    1.35  * Cum Volume (acre-ft)  *    3.47  *   39.22  *
   7.20  *
* C & E Loss (ft)        *    0.06  * Cum SA (acres)        *    1.55  *    4.52  *
   4.98  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1           RS: 1304

INPUT
Description:
Station Elevation Data    num=     459
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1252.63      .2 1252.63     1.6  1252.4     3.4 1252.15     6.7 1251.28
      10  1250.6    10.7 1250.52    13.3 1250.09    16.6 1249.66    19.9 1249.28
    23.2 1249.19    26.5 1249.39    28.7 1249.44    36.4 1249.56    39.7 1249.55
      43 1249.61    46.3 1249.62    52.9 1249.25    56.2  1249.1    59.4 1248.85
    62.7 1248.48    69.3 1247.99    85.8 1247.08      89 1246.98    92.4 1246.92
```

99	1246.61	103.7	1246.51	108.9	1246.45	112.2	1246.33	115.4	1246.13
116.2	1246.12	118.2	1246.03	118.7	1246.02	122.2	1246.06	125.2	1246.12
131.9	1245.77	137.3	1245.61	145.1	1245.59	148.4	1245.55	151.7	1245.66
155	1245.73	161.6	1245.73	164.4	1245.67	168.2	1245.52	171.7	1245.47
175.3	1245.46	178.8	1245.55	180	1245.53	183.1	1245.39	185.9	1245.31
187.6	1245.36	192	1245.38	196.5	1245.47	200	1245.65	203.5	1246.09
207	1246.45	210.3	1246.65	214.1	1246.8	215.4	1246.92	217	1247.06
217.6	1247.12	218.6	1247.24	220.4	1247.49	224.7	1247.98	228.2	1248.1
233.1	1248.08	235.3	1248.01	235.6	1247.99	236.3	1247.94	238.1	1247.83
242.3	1247.43	253.3	1245.59	260	1244.39	268.4	1243.1	277.6	1241.76
281	1241.39	286.1	1241.02	287.4	1240.95	288.2	1240.89	288.6	1240.88
289.5	1240.83	291.1	1240.78	291.8	1240.75	293.2	1240.66	293.7	1240.64
295.3	1240.52	296.2	1240.46	298.4	1240.29	298.8	1240.26	299.1	1240.24
306.3	1239.82	309.4	1239.76	316.2	1239.91	321.4	1239.87	323.5	1239.86
324	1239.86	325	1239.88	326.5	1239.88	327.1	1239.88	330.6	1240.01
334.1	1239.82	334.1	1239.81	337.7	1238.59	341.2	1237.28	341.6	1237.19
344.7	1236.75	351.8	1236.4	355.3	1236.01	362.4	1234.92	365.9	1234.44
369.4	1234.25	371.9	1234.28	373	1234.31	379.5	1234.75	380	1234.76
382	1234.7	383.6	1234.6	386.5	1234.28	387.2	1234.22	390.8	1233.98
394.3	1233.59	399.5	1232.76	401.5	1232.39	403	1232.04	404.4	1231.65
405.1	1231.46	409.4	1230.05	415.8	1227.87	419.4	1226.75	421.9	1226.17
423	1225.97	424.4	1225.69	427.7	1225.1	437.3	1223.7	438.3	1223.6
439.3	1223.51	440.8	1223.38	441.8	1223.3	444.1	1223.11	444.3	1223.1
444.6	1223.07	448	1222.69	449.3	1222.46	451	1222.16	451.6	1222.05
451.8	1222	452.4	1221.88	454.3	1221.5	455.1	1221.33	456.8	1221.03
457.3	1220.94	458.7	1220.68	459.3	1220.59	460.6	1220.36	462.3	1220.05
465.9	1219.54	466.8	1219.41	468.8	1219.09	469.4	1219	469.9	1218.94
471.8	1218.74	473	1218.58	474.2	1218.41	476.2	1218.04	476.6	1217.99
477.1	1217.92	480.2	1217.55	481.7	1217.4	482.6	1217.33	487.3	1216.84
491.7	1216.13	493.5	1215.74	494.2	1215.61	498.1	1215.05	499.2	1215
501.5	1214.79	501.8	1214.78	504.2	1214.82	505.2	1214.76	506.7	1214.67
508.8	1214.44	509.1	1214.4	510	1214.29	511.6	1214.08	515.9	1213.83
519.5	1214.2	523.1	1214.74	524.1	1214.7	526	1214.44	526.7	1214.38
527.3	1214.22	529	1213.83	531.5	1212.95	534	1211.82	534.21	1211.724
538.9	1209.46	540.5	1208.78	541.2	1208.5	541.9	1208.2	542.41	1207.97
543.9	1207.48	544.8	1207.2	547.1	1206.43	548.4	1206.02	551.3	1205.18
553.7	1204.83	553.8	1204.83	555.23	1204.47	557.62	1204.03	561.59	1203.64
565.57	1203.67	571.33	1203.87	576.2	1204.03	580.08	1204.2	582.56	1204.35
584.4	1204.62	588.5	1204.7	589.5	1204.75	590.9	1204.84	591.6	1204.88
595.9	1205.31	597.5	1205.62	598.8	1205.88	602.4	1206.7	603.3	1206.88
605.4	1207.29	605.8	1207.35	606	1207.37	606.5	1207.42	608.3	1207.57
609.6	1207.71	613.1	1208.05	613.2	1208.06	613.2	1208.07	613.3	1208.08
614.71	1208.372	615.7	1208.58	616.49	1208.78	616.8	1208.86	620.7	1210.24
621.3	1210.41	623.1	1210.93	624	1211.16	625.6	1211.45	627.6	1211.78
628.1	1211.84	629.2	1211.95	630.6	1212.05	631.2	1212.08	632.9	1212.11
633.1	1212.12	634.8	1212.12	635.5	1212.05	637.1	1211.9	638.4	1211.82
639.5	1211.83	640.5	1211.84	642	1211.86	643	1211.87	645.1	1211.89
645.4	1211.91	645.6	1211.92	646.1	1211.94	647.9	1212.04	649.2	1212.1
653	1212.22	656.4	1212.61	659.3	1212.98	660	1213.07	660.3	1213.14
660.9	1213.28	662.8	1213.72	663.6	1213.92	667.2	1214.52	667.7	1214.57

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   668.9 1214.67   674.4 1215.21   675.2 1215.28   676.8 1215.42     678 1215.53
   680.1 1215.67   681.6 1215.72   682.6 1215.74   684.7 1215.71   685.2 1215.71
   685.7 1215.73   687.6 1215.84   688.8 1215.88   692.3 1216.14   692.4 1216.15
   692.5 1216.15   692.7 1216.16     695 1216.31   696.1 1216.34   697.5 1216.38
   698.9  1216.4   699.3 1216.41   699.7 1216.42   699.9 1216.43   700.4 1216.46
   702.4 1216.61   704.8 1216.93   706.9 1217.32   707.2 1217.37   707.3  1217.4
   709.6 1217.96   710.9 1218.29   714.2 1219.33   714.5 1219.39   714.6 1219.43
   715.1 1219.55   716.9 1220.04   718.3  1220.4   719.3 1220.66   721.1 1221.08
   722.1 1221.29   723.2 1221.46   725.8 1221.83   726.5 1221.87     728 1221.98
     729  1222.1   729.5 1222.17   731.4 1222.55   733.2 1223.01   733.8 1223.22
   734.8 1223.71   736.2 1224.34   738.6 1225.52   739.5 1225.99   740.7  1226.6
   741.7 1227.19   743.5 1228.23   744.4 1228.83   747.7 1231.29   748.2 1231.67
   748.3 1231.77   750.7 1233.65   751.9 1234.51   755.6 1236.41   755.8 1236.45
     758 1236.93   759.4 1237.15   763.1 1237.25     764 1237.31   765.3 1237.39
   767.7 1237.54   768.3 1237.57   769.2 1237.62   770.6  1237.7   772.5  1237.8
   772.7  1237.8   774.4 1237.88   778.2 1237.94     782 1237.88   789.2 1237.67
   789.7 1237.66   793.5 1237.47     794 1237.41   796.4 1237.03   797.3 1236.85
   801.1 1236.09   801.2 1236.06   801.4    1236   803.6 1235.26   804.9 1234.74
     806 1234.33   807.9 1233.42   808.4 1233.11   808.7 1232.95   809.9 1232.42
   810.8 1231.98   812.5 1231.32   813.2 1231.11   814.3 1230.81   816.3 1230.79
   819.2 1230.85   820.1 1230.87   820.4 1230.88   820.8 1230.89   822.8 1230.94
   823.9 1230.97   827.2 1231.08   827.6 1231.09   827.7 1231.09   828.5 1231.13
     830 1231.21   831.5 1231.29   832.3 1231.34   833.7 1231.42   834.7 1231.49
   835.4 1231.53   837.1 1231.61   839.5  1231.7   840.1 1231.69   841.9 1231.65
   846.6 1231.44   846.7 1231.44   846.8 1231.43     847 1231.43   851.5 1231.34
   853.1 1231.34   853.9 1231.35   856.3 1231.34   863.5 1231.43   865.8  1231.5
   865.9  1231.5     866 1231.51   868.3 1231.66   870.7 1231.83   872.4 1231.93
   873.1 1231.97   873.4 1231.99   874.9 1232.07   875.5  1232.1   877.3  1232.2
   877.9 1232.24   881.1 1232.44   882.6 1232.56   887.4 1232.97   889.8 1233.22
   891.8 1233.43   892.5  1233.5   898.2 1234.03   899.4 1234.13   900.1  1234.2
   901.8 1234.37   902.8 1234.48   903.9 1234.59   904.2 1234.63   904.7 1234.69
   907.7 1235.13   911.1 1235.62   911.4 1235.66   911.5 1235.69   912.1 1235.82
   913.8 1236.16   917.6 1237.01   918.6  1237.2   919.2 1237.31     921  1237.6
   921.4 1237.67     923 1237.92   923.4 1237.99     924 1238.11   925.8 1238.39
   926.8 1238.57   928.1 1238.84   930.5  1239.3   930.5 1239.31   930.6 1239.32
   930.7 1239.35   932.9 1239.79   934.4 1240.08   935.3 1240.28   936.9 1240.62
   938.2 1240.87     940  1241.2   940.1 1241.22   940.2 1241.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   540.5    .045  616.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         540.5  616.49             190.9   244.2   290.1             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
*************************************************************************************
***********
* E.G. Elev (ft)         * 1214.05  * Element                *  Left OB *  Channel *
```

```
Right OB *
* Vel Head (ft)          *    1.67  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1212.39  * Reach Len. (ft)        *  190.90  *  244.20  *
 290.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   14.13  *  528.88  *
  31.17  *
* E.G. Slope (ft/ft)     *0.007689  * Area (sq ft)           *   14.13  *  528.88  *
  31.17  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   42.88  * 5528.23  *
  58.89  *
* Top Width (ft)         *  121.69  * Top Width (ft)         *    7.75  *   75.99  *
  37.95  *
* Vel Total (ft/s)       *    9.81  * Avg. Vel. (ft/s)       *    3.04  *   10.45  *
   1.89  *
* Max Chl Dpth (ft)      *    8.74  * Hydr. Depth (ft)       *    1.82  *    6.96  *
   0.82  *
* Conv. Total (cfs)      * 64206.4  * Conv. (cfs)            *   489.0  * 63045.8  *
  671.6  *
* Length Wtd. (ft)       *  242.52  * Wetted Per. (ft)       *    8.55  *   77.11  *
  38.42  *
* Min Ch El (ft)         * 1203.64  * Shear (lb/sq ft)       *    0.79  *    3.29  *
   0.39  *
* Alpha                  *    1.12  * Stream Power (lb/ft s) *    2.41  *   34.42  *
   0.74  *
* Frctn Loss (ft)        *    1.50  * Cum Volume (acre-ft)   *    1.51  *   30.20  *
   2.37  *
* C & E Loss (ft)        *    0.17  * Cum SA (acres)         *    0.98  *    4.18  *
   2.08  *
**************************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
**************************************************************************************
***********
* E.G. Elev (ft)         * 1215.79  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.22  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1213.57  * Reach Len. (ft)        *  190.90  *  244.20  *
 290.10  *
* Crit W.S. (ft)         * 1212.73  * Flow Area (sq ft)      *   24.99  *  618.96  *
  81.43  *
```

```
* E.G. Slope (ft/ft)     *0.008500  * Area (sq ft)           *   24.99  *  618.96  *
  81.43  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *   94.15  * 7554.68  *
 271.17  *
* Top Width (ft)         *  132.42  * Top Width (ft)        *   10.76  *   75.99  *
  45.66  *
* Vel Total (ft/s)       *   10.92  * Avg. Vel. (ft/s)      *    3.77  *   12.21  *
   3.33  *
* Max Chl Dpth (ft)      *    9.93  * Hydr. Depth (ft)      *    2.32  *    8.15  *
   1.78  *
* Conv. Total (cfs)      * 85902.9  * Conv. (cfs)           *  1021.2  * 81940.5  *
 2941.2  *
* Length Wtd. (ft)       *  240.23  * Wetted Per. (ft)      *   11.79  *   77.11  *
  46.23  *
* Min Ch El (ft)         * 1203.64  * Shear (lb/sq ft)      *    1.12  *    4.26  *
   0.93  *
* Alpha                  *    1.20  * Stream Power (lb/ft s) *    4.24  *   51.99  *
   3.11  *
* Frctn Loss (ft)        *    1.27  * Cum Volume (acre-ft)  *    3.39  *   36.29  *
   6.69  *
* C & E Loss (ft)        *    0.38  * Cum SA (acres)        *    1.52  *    4.18  *
   4.77  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 1060

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1251.61     1.5 1251.77     5.5 1251.85     8.2 1251.82    11.6 1251.19
    14.9 1250.18    16.6  1249.6    18.3 1248.94    21.7  1247.2    24.2 1245.79
      25 1245.28    31.7 1240.77    35.1 1238.35    38.7 1235.53    41.4 1233.58
    41.8 1233.36    45.1 1232.04    48.5 1231.39    49.7 1231.21    51.9 1230.99
```

55.2	1230.75	60.7	1230.49	65.3	1230.09	69	1230.02	72	1230.04
78.7	1229.65	82.1	1229.76	86.2	1229.81	88.8	1229.93	92.1	1229.96
95.5	1229.89	98.8	1229.9	102.2	1230.21	105.5	1230.42	108.9	1230.4
112.3	1230.18	115.6	1230.07	125.7	1230.83	132.5	1231.45	136	1231.37
139.4	1231.43	142.9	1231.91	146.4	1232.24	149.8	1232.31	151.9	1232.22
153.3	1232.2	157.8	1231.75	159.6	1231.62	163.7	1231.51	167.2	1231.49
169.9	1231.82	175.1	1232.26	181.1	1232.89	184.6	1232.87	188	1232.39
191.5	1232.42	195	1232.69	197.8	1232.71	201.9	1232.55	205.4	1232.58
208.6	1232.78	212.3	1232.88	218.9	1232.49	219.3	1232.47	222.7	1232.4
227.9	1232.66	229.7	1232.68	231.8	1232.43	234.4	1232.28	237.9	1232.18
243.6	1231.86	247	1231.76	257.2	1232.27	262.7	1232.24	264.4	1232.32
268	1232.59	271.3	1232.5	278.2	1231.67	280.8	1231.7	281.8	1231.76
283.5	1232.05	285.1	1232.24	288.4	1232.35	291.7	1232.24	296.3	1232.31
299.5	1232.22	300.3	1232.14	301.5	1232.08	304.8	1232.01	307	1232.1
311.4	1232.12	314.6	1231.87	317.9	1231.52	318.7	1231.43	321.2	1231.04
321.9	1230.89	324.5	1230.17	328.2	1229.11	331.1	1228.67	334	1228.61
337.8	1228.43	344.2	1227.79	347.5	1227.34	350.7	1227.03	354	1227.02
357.3	1227.18	357.6	1227.16	360.2	1226.96	360.6	1226.92	363.4	1226.38
367.1	1225.8	371.1	1225.67	377	1225.21	380.3	1225.15	383.6	1225.36
388.9	1225.51	393.4	1225.76	396.7	1225.82	400	1225.81	403.2	1225.68
406.5	1225.62	407.8	1225.66	411	1225.85	413.9	1225.86	422.5	1225.5
426.4	1225.53	429.8	1225.74	433.9	1226.2	436.4	1226.34	436.8	1226.32
439.8	1226.07	443	1226.09	446.4	1226.23	447.7	1226.23	448.2	1226.23
449.7	1226.24	453	1226.15	454	1226.07	455.7	1225.82	456.8	1225.7
459.6	1225.29	463	1225.22	467.5	1224.82	472.9	1224.46	479.6	1223.57
482.6	1223.21	482.9	1223.17	489.6	1222.74	491.2	1222.57	492.9	1222.4
496.2	1221.95	499.5	1221.37	502.6	1220.93	506.2	1220.7	509.5	1220.21
511.2	1219.84	516.1	1218.69	516.9	1218.54	519.5	1218.02	519.8	1217.97
521.7	1217.69	522.6	1217.55	522.8	1217.53	523	1217.51	526.1	1217.18
528.4	1216.83	529.4	1216.68	532.8	1215.91	534.9	1215.36	536.1	1215.05
539.4	1213.98	542.4	1213.08	542.7	1212.99	542.7	1212.97	546.1	1211.96
549.5	1211.11	550.6	1210.98	553	1210.87	553.3	1210.88	555.9	1211.06
558.5	1210.97	559.9	1210.87	561.1	1210.76	563.3	1210.5	563.7	1210.46
565	1210.29	566.3	1210.09	566.7	1210.04	570.2	1209.78	577.1	1209.72
587.2	1209.34	590.8	1209.3	600.3	1209.51	611.5	1209.66	625.2	1210.26
628.7	1210.29	633	1210.36	634.3	1210.39	635.6	1210.39	638.1	1210.36
639	1210.34	639.5	1210.35	645.9	1210.49	647.3	1210.45	648.1	1210.46
649.3	1210.45	649.9	1210.44	659.6	1210.37	662.7	1210.27	669.8	1209.45
670.9	1209.29	673	1208.98	674.21	1208.758	675	1208.61	679.6	1207.7
680.88	1207.32	682.9	1206.79	689.5	1204.21	692.8	1203.48	693.5	1203.47
705.9	1203.66	709	1203.62	709.2	1203.62	709.4	1203.62	712.1	1203.67
712.5	1203.68	712.9	1203.69	715.8	1203.76	728.9	1203.53	742.1	1203.66
751.5	1203.56	751.9	1203.56	755	1203.63	755.2	1203.64	755.4	1203.69
758.1	1204.34	758.5	1204.43	758.5	1204.45	761.6	1206.34	762.93	1207.33
765.5	1209.18	767.9	1210.62	768.3	1210.86	771.6	1212.01	781.5	1215.18
782.7	1215.56	783.9	1215.87	784.9	1216.18	785.6	1216.43	787.7	1217.01
788.2	1217.15	791.5	1218.21	794.3	1219.23	794.8	1219.42	795.5	1219.63
797.2	1220.22	798.1	1220.51	799.3	1220.81	800.1	1220.99	801.4	1221.33
805.9	1222.34	807.1	1222.68	808.1	1222.93	808.8	1223.14	810.9	1223.84
811.4	1223.97	811.7	1224.12	814.6	1225.47	814.7	1225.51	814.8	1225.57

```
     818 1227.21   821.3 1228.56   824.6 1229.46   826.2 1229.85   826.4  1229.9
   827.9 1230.27   834.9 1231.51   841.9 1232.63   844.5 1233.16   847.8 1233.75
   854.4 1234.75   858.1 1235.19   860.4 1235.55   861.1 1235.66   863.9 1236.42
     865 1236.74   866.8 1237.24   867.7 1237.48   868.9 1237.76   869.7 1237.93
     871 1238.23   872.5  1238.5   874.6 1238.81   875.4  1238.9   878.4 1239.31
   879.7 1239.56   882.1 1240.05   882.2 1240.06   889.3 1241.61   889.7  1241.7
   891.1 1241.98   891.7 1242.11   893.5 1242.43   894.1 1242.54   895.3 1242.72
   896.5  1242.9   897.3    1243     899  1243.3     901 1243.69   901.4 1243.78
   901.9 1243.94   903.8 1244.51   904.8 1244.84   906.2 1245.36   908.6 1246.28
   912.3 1248.29   915.2 1249.74   915.8 1249.89   916.1 1249.95   917.3 1250.08
   918.2 1250.18   919.9 1250.34   921.9 1250.29   923.7 1250.31     926 1250.16
   927.4 1250.08   942.3 1248.06   942.5 1248.03   943.5 1247.89   944.7 1247.73
   946.3 1247.49   947.1 1247.39   949.5 1247.15   950.1 1247.16   951.9 1247.39
   952.2 1247.47   953.8 1247.85   954.3 1247.99   955.1 1248.27   956.7 1248.91
   957.6 1249.24   959.1 1249.91   960.9 1250.62   961.4 1250.81   961.7 1250.88
   963.9 1251.09   965.2 1251.18   966.3 1251.21   968.4 1251.23   968.7 1251.23
   968.9 1251.23     975 1251.46   975.9 1251.47   980.2 1251.55   981.7 1251.56
   983.2 1251.56     984 1251.56   991.6 1251.38   992.8 1251.33   995.2 1251.27
   995.3 1251.26   995.8 1251.26   997.6 1251.23   999.1 1251.22    1000 1251.26
  1001.6 1251.33  1002.4 1251.38  1002.9 1251.41  1004.8 1251.48  1006.6 1251.52
  1007.2 1251.52  1008.2 1251.53  1009.6 1251.58  1010.4 1251.62    1012  1251.8
  1014.2 1252.01  1014.4 1252.03  1014.9 1252.04    1018 1252.15  1019.2 1252.17
  1021.5 1252.21  1021.7 1252.22  1024.1 1252.36  1028.2  1252.4  1028.9  1252.4
  1030.7 1252.39  1031.3 1252.38    1033 1252.37  1033.7 1252.35  1034.8 1252.31
  1036.1 1252.24  1036.8 1252.18  1038.5 1251.96  1039.5 1251.79  1040.6 1251.61
  1040.9  1251.5  1043.3 1250.43  1044.4 1249.92  1048.1 1247.49  1048.1 1247.47
  1050.5 1246.19  1051.9 1245.55  1052.9 1245.12  1054.7 1244.61  1055.7 1244.34
  1057.7  1244.4  1059.4 1244.61  1062.6 1246.11  1063.2 1246.35    1065 1246.67
  1065.6 1246.73    1067 1246.88  1067.4  1246.9  1069.8 1246.86  1070.8 1246.89
  1074.4 1247.27    1077 1247.41  1078.3  1247.5  1079.4 1247.39  1081.3 1247.23
  1081.8 1247.17  1082.1 1247.14  1083.1 1246.95  1084.2 1246.73  1085.8 1246.46
  1086.6 1246.36    1088 1246.18    1089 1246.07  1093.4  1245.9  1093.8 1245.93
  1094.6 1245.97  1097.2 1245.94  1098.6 1246.08  1100.5 1246.37  1101.2 1246.46
  1103.5 1246.67  1105.9 1246.95  1108.3 1247.24  1108.5 1247.27  1109.3 1247.31
  1110.7 1247.35  1112.2  1247.5  1113.1 1247.52  1114.5  1247.7  1115.5  1247.8
    1116  1247.9    1118 1248.08  1119.8 1248.27  1120.3 1248.25  1121.2 1248.16
  1122.7 1247.97  1123.6 1247.88  1124.2 1247.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  680.88    .045  762.93     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        680.88  762.93             129.8     262   254.2             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
*************************************************************************************
***********
* E.G. Elev (ft)         * 1212.39  * Element                *  Left OB *  Channel *
```

```
Right OB *
* Vel Head (ft)          *    1.10  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1211.29  * Reach Len. (ft)        *  129.80  *  262.00  *
 254.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *  178.94  *  598.16  *
  11.59  *
* E.G. Slope (ft/ft)     *0.005067  * Area (sq ft)           *  178.94  *  598.16  *
  11.59  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  385.45  * 5217.78  *
  26.77  *
* Top Width (ft)         *  220.72  * Top Width (ft)        *  132.08  *   82.05  *
   6.59  *
* Vel Total (ft/s)       *    7.14  * Avg. Vel. (ft/s)      *    2.15  *    8.72  *
   2.31  *
* Max Chl Dpth (ft)      *    7.82  * Hydr. Depth (ft)      *    1.35  *    7.29  *
   1.76  *
* Conv. Total (cfs)      * 79094.3  * Conv. (cfs)           *  5415.0  * 73303.1  *
  376.1  *
* Length Wtd. (ft)       *  256.74  * Wetted Per. (ft)      *  132.47  *   83.66  *
   7.72  *
* Min Ch El (ft)         * 1203.47  * Shear (lb/sq ft)      *    0.43  *    2.26  *
   0.47  *
* Alpha                  *    1.39  * Stream Power (lb/ft s) *    0.92  *   19.73  *
   1.10  *
* Frctn Loss (ft)        *    1.10  * Cum Volume (acre-ft)  *    1.09  *   27.04  *
   2.23  *
* C & E Loss (ft)        *    0.06  * Cum SA (acres)        *    0.67  *    3.73  *
   1.94  *
*******************************************************************************
***********

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1214.14  * Element              *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.96  * Wt. n-Val.           *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1213.18  * Reach Len. (ft)      *  129.80  *  262.00  *
 254.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)    *  435.35  *  753.31  *
  29.35  *
* E.G. Slope (ft/ft)     *0.003606  * Area (sq ft)         *  435.35  *  753.31  *
  29.35  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)          * 1382.83  * 6464.80  *
```

```
  72.36  *
* Top Width (ft)         *  233.16  * Top Width (ft)         *  138.80  *   82.05  *
  12.31  *
* Vel Total (ft/s)       *    6.50  * Avg. Vel. (ft/s)       *    3.18  *    8.58  *
   2.47  *
* Max Chl Dpth (ft)      *    9.71  * Hydr. Depth (ft)       *    3.14  *    9.18  *
   2.38  *
* Conv. Total (cfs)      *131891.0  * Conv. (cfs)            * 23028.2  *107657.7  *
 1205.1  *
* Length Wtd. (ft)       *  249.31  * Wetted Per. (ft)       *  139.47  *   83.66  *
  13.75  *
* Min Ch El (ft)         * 1203.47  * Shear (lb/sq ft)       *    0.70  *    2.03  *
   0.48  *
* Alpha                  *    1.46  * Stream Power (lb/ft s) *    2.23  *   17.40  *
   1.18  *
* Frctn Loss (ft)        *    0.85  * Cum Volume (acre-ft)   *    2.38  *   32.45  *
   6.32  *
* C & E Loss (ft)        *    0.01  * Cum SA (acres)         *    1.19  *    3.73  *
   4.58  *
*******************************************************************************
***********

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 798

INPUT
Description:
Station Elevation Data    num=     364
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1251.74     2.2 1251.77     5.5 1251.42     7.8  1250.8    12.2  1249.3
    15.5 1247.88    38.7 1231.96      42 1230.74    45.4 1229.83    48.7 1229.46
    55.3 1229.31    58.6 1229.04      62 1228.63    65.3 1228.44    68.6 1228.52
    75.2 1228.89    82.5 1229.03    91.1 1229.12    95.1 1229.09    98.5 1229.27
   101.8 1229.64   104.6 1229.85   108.4 1230.02   115.1 1229.75     117 1229.82
   121.7 1230.09   128.3 1230.71   131.7 1230.88     135 1230.76   142.9 1230.76
   148.3 1230.55   149.1 1230.45   151.5 1230.28   154.8 1229.82   158.1 1229.54
   164.7 1229.12     168 1229.02     176    1229   184.4 1228.66   187.7 1228.73
     191 1228.68   193.9  1228.5   197.5 1228.39   200.8 1228.41   204.1 1228.53
     207 1228.38   210.7 1228.33   217.3 1228.65   220.5 1228.67   223.8 1228.54
   230.4 1228.39   233.7 1228.21     237 1227.86   240.3 1227.37   241.1  1227.3
   245.2 1227.08   246.8 1226.86   249.1 1225.98   250.1 1225.66   253.4 1224.93
   256.8 1225.04   260.1 1225.36   263.4 1225.54   269.8 1224.86   272.8 1224.89
   276.6 1225.44   277.6 1225.53   278.7 1225.66   279.9 1225.76   283.2 1225.84
   289.8 1225.72   296.3 1225.85   299.7 1225.87   306.3 1225.67   309.6 1225.69
   312.9 1225.95   314.2 1225.98   316.2    1226   319.5 1225.87   322.8 1226.02
   326.1 1225.94   326.2 1225.93   329.4 1225.76     336 1225.59   339.3 1225.45
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345.9	1225.55	349.7	1225.42	355.8	1225.6	358.6	1225.53	362.4	1225.3
365.7	1224.94	369	1224.73	371	1224.7	372.3	1224.67	375.6	1224.47
382.3	1224.47	388.8	1223.91	389.7	1223.86	391.1	1223.78	394	1223.58
397	1223.33	400	1223.02	405.3	1222.28	408.6	1222.04	411.8	1221.97
418.1	1222.1	421.9	1221.9	425.2	1221.91	431.2	1221.72	435.2	1221.69
435.3	1221.68	438.5	1221.53	441.9	1221.34	448.5	1220.55	455.2	1220.12
460.9	1219.49	463	1219.3	463.8	1219.23	465.1	1219.11	468.4	1218.9
475.1	1218.6	475.9	1218.5	476.7	1218.39	478.6	1217.93	482.4	1216.6
483.7	1216.05	486.2	1214.66	490.1	1212.09	493.7	1209.57	496.51	1207.398
497	1207.01	499.26	1205.55	502.1	1203.8	505	1202.33	508.8	1201.54
512.6	1201.48	516.3	1201.62	519	1201.66	521.4	1201.73	527.6	1201.71
531.4	1201.8	537	1201.78	550.3	1201.97	554	1202.24	557	1202.31
561.5	1202.34	565.3	1202.53	567.1	1202.79	570.3	1203.44	571.9	1203.71
572.9	1203.83	574.3	1203.89	576.2	1204.04	576.6	1204.07	576.7	1204.08
576.9	1204.1	579.1	1204.36	580.4	1204.56	581.91	1204.931	584.2	1205.5
587.9	1206.07	588.8	1206.17	590.3	1206.34	593.6	1206.59	595.5	1206.75
606.7	1207.19	613.5	1207.77	613.8	1207.8	616.5	1208.12	621.5	1209.02
623.5	1209.33	624.8	1209.61	627.6	1210.25	630.2	1210.94	630.4	1210.96
630.9	1211.05	633.1	1211.34	633.6	1211.41	636.9	1212.15	640.3	1212.61
641.4	1212.8	644.2	1213.32	647	1214.07	647.1	1214.09	649.7	1214.68
650.3	1214.82	655.2	1215.65	657.1	1215.94	660.8	1216.46	663.8	1216.96
668.4	1218.02	670.5	1218.54	671.8	1218.8	677.2	1219.69	680.5	1220.36
683.9	1220.92	693.9	1222.28	697.3	1222.62	698.2	1222.71	699.5	1222.85
700.6	1222.98	704	1223.31	706.7	1223.49	707.4	1223.55	709.7	1223.88
711	1224.07	713.3	1224.47	720.7	1225.86	722.3	1226.08	722.4	1226.1
724	1226.32	727.3	1226.5	730.5	1226.87	734.7	1227.7	737.1	1228.16
737.8	1228.23	739.8	1228.42	743.7	1228.93	750.2	1230.49	750.3	1230.5
751.1	1230.65	753.4	1231.06	753.5	1231.08	753.7	1231.11	756.5	1231.7
756.8	1231.76	759.6	1232.23	760.1	1232.32	760.6	1232.38	762.8	1232.64
763.4	1232.73	764.1	1232.88	766.7	1233.46	770	1234.37	771	1234.61
772.1	1234.84	773.2	1235.1	774.5	1235.34	775.2	1235.47	776.5	1235.73
783.1	1237.31	786.4	1237.77	787.7	1237.93	788.4	1238.02	792.9	1238.53
795.4	1238.94	796.2	1239.09	797	1239.28	798.8	1239.69	800.1	1239.97
803.2	1240.5	809.5	1241.31	811.4	1241.69	812.6	1241.94	812.7	1241.95
812.7	1241.98	815.7	1242.83	818.8	1243.85	819.7	1244.15	822.5	1245.17
837.1	1250.26	838.9	1250.91	842.2	1252.5	845.8	1254.76	845.9	1254.78
848.4	1255.98	849.5	1256.57	850.8	1257.38	852.6	1258.6	853.1	1258.94
853.3	1259.06	893	1280.01	893.8	1280.12	895.2	1280.33	896.6	1280.53
897.6	1280.64	899.8	1280.86	900.7	1280.96	905	1281.5	954.3	1284.4
965.5	1284.86	966.6	1284.85	969.2	1284.88	969.3	1284.88	976.2	1284.85
983.7	1284.69	983.9	1284.68	984.3	1284.68	986.3	1284.66	987.3	1284.65
988.8	1284.67	989.9	1284.69	991.3	1284.71	992	1284.71	999.7	1284.63
1001.1	1284.63	1003.6	1284.63	1003.7	1284.63	1006.1	1284.61	1013.5	1284.37
1023.4	1284.19	1079.1	1285.62	1079.4	1285.62	1082.3	1285.71	1082.7	1285.72
1082.8	1285.72	1086	1285.71	1088.7	1285.57	1089.3	1285.51	1090.1	1285.43
1091.7	1285.24	1092.6	1285.14	1093.7	1285.06	1094.7	1284.94	1095.9	1284.86
1097.4	1284.84	1097.7	1284.83	1099.2	1284.82	1100.7	1284.82	1102.5	1284.82
1103.7	1284.75	1104.7	1284.66	1105.8	1284.59	1106.7	1284.43	1108.4	1284.01
1109.1	1283.88	1133.6	1279.25	1134	1279.19	1135.5	1279.02	1142	1278.54
1142.6	1278.54	1145	1278.54	1145.3	1278.54	1148.3	1278.53	1148.6	1278.53

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  1148.7 1278.53  1151.6 1278.49  1151.9 1278.49  1154.6 1278.45  1155.2 1278.44
  1161.8 1278.28  1169.6 1278.25  1170.7 1278.25  1171.7 1278.26  1174.3 1278.33
    1175 1278.34  1175.6 1278.36  1178.3 1278.42  1178.6 1278.43  1181.2 1278.52
  1181.6 1278.53  1184.6 1278.55  1187.6 1278.58  1188.2 1278.59    1189 1278.62
  1190.6 1278.67  1198.1 1279.27  1199.5 1279.35    1200 1279.38  1201.4 1279.46
  1202.5 1279.52  1203.6 1279.58  1204.7 1279.63  1205.2 1279.66

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  499.26    .045   584.2     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        499.26   584.2             37.6    76.5   136.1             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1211.23  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    0.89  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1210.33  * Reach Len. (ft)       *   37.60  *   76.50  *
 136.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   16.32  *  667.35  *
 124.10  *
* E.G. Slope (ft/ft)     *0.003662  * Area (sq ft)          *   16.32  *  667.35  *
 124.10  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   38.70  * 5220.34  *
 370.96  *
* Top Width (ft)         *  135.30  * Top Width (ft)        *    6.65  *   84.94  *
  43.71  *
* Vel Total (ft/s)       *    6.97  * Avg. Vel. (ft/s)      *    2.37  *    7.82  *
   2.99  *
* Max Chl Dpth (ft)      *    8.85  * Hydr. Depth (ft)      *    2.45  *    7.86  *
   2.84  *
* Conv. Total (cfs)      * 93034.0  * Conv. (cfs)           *   639.5  * 86264.5  *
 6130.0  *
* Length Wtd. (ft)       *   79.71  * Wetted Per. (ft)      *    8.20  *   86.16  *
  44.06  *
* Min Ch El (ft)         * 1201.48  * Shear (lb/sq ft)      *    0.46  *    1.77  *
   0.64  *
* Alpha                  *    1.18  * Stream Power (lb/ft s) *    1.08  *   13.85  *
   1.92  *
* Frctn Loss (ft)        *    0.36  * Cum Volume (acre-ft)  *    0.80  *   23.23  *
   1.83  *
* C & E Loss (ft)        *    0.05  * Cum SA (acres)        *    0.47  *    3.23  *
   1.79  *
************************************************************************************
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #500-yr

E.G. Elev (ft)	1213.28	Element	Left OB	Channel	Right OB	
Vel Head (ft)	1.02	Wt. n-Val.	0.060	0.045	0.060	
W.S. Elev (ft)	1212.27	Reach Len. (ft)	37.60	76.50	136.10	
Crit W.S. (ft)		Flow Area (sq ft)	31.84	831.45	217.63	
E.G. Slope (ft/ft)	0.003218	Area (sq ft)	31.84	831.45	217.63	
Q Total (cfs)	7920.00	Flow (cfs)	87.76	7058.96	773.27	
Top Width (ft)	147.92	Top Width (ft)	9.43	84.94	53.55	
Vel Total (ft/s)	7.33	Avg. Vel. (ft/s)	2.76	8.49	3.55	
Max Chl Dpth (ft)	10.79	Hydr. Depth (ft)	3.38	9.79	4.06	
Conv. Total (cfs)	139623.6	Conv. (cfs)	1547.2	124444.2	13632.2	
Length Wtd. (ft)	81.68	Wetted Per. (ft)	11.58	86.16	54.10	
Min Ch El (ft)	1201.48	Shear (lb/sq ft)	0.55	1.94	0.81	
Alpha	1.22	Stream Power (lb/ft s)	1.52	16.46	2.87	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	1.69	27.68	5.60	
C & E Loss (ft)	0.05	Cum SA (acres)	0.97	3.23	4.39	

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1 RS: 722

INPUT
Description:
Station Elevation Data num= 453

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1251.63	1.6	1251.67	5	1251.44	8.3	1250.61	11.6	1249.57
14.9	1248.24	18.2	1246.8	21.5	1245.03	23	1243.91	23.4	1243.67
25.9	1241.78	28.8	1239.69	31.5	1237.62	33.4	1236	35	1234.55
38.1	1232.18	38.9	1231.9	40.4	1231.28	41.4	1230.96	44.7	1230.37
48	1229.6	51.4	1228.86	54.7	1228.24	58	1227.88	61.3	1227.78
64.6	1227.79	71.2	1227.46	74.6	1227.41	77.9	1227.51	84.5	1227.52
91.1	1227.92	94.4	1227.85	97.8	1227.66	101.1	1227.7	104	1227.63
109.8	1227.61	114.3	1227.53	117.7	1227.55	124.3	1227.94	130.1	1228.66
134.2	1229.11	137.5	1229.25	138.8	1229.27	139.8	1229.34	144.2	1229.42
147.4	1229.06	150.8	1228.8	154.1	1229.02	157.4	1228.89	164.1	1228.17
167.4	1227.68	170.6	1227.31	179.3	1226.9	183.9	1226.55	187.9	1226.17
190.6	1225.97	193.7	1226.04	199.5	1225.92	203.8	1225.77	211.1	1225.32
213.5	1224.98	213.8	1224.96	214	1224.93	217.4	1224.02	219.8	1223.33
220.4	1223.21	221.3	1223.17	222.6	1222.92	223.7	1222.92	227	1223.59
231.3	1224.83	232.9	1225.19	233.7	1225.38	234.2	1225.47	236.8	1225.62
237	1225.65	243.6	1225.55	246.9	1225.58	250.2	1225.68	253.6	1225.57
256.9	1225.52	260.3	1225.81	263.5	1226.01	266.8	1225.89	268.9	1225.74
270.1	1225.63	273.4	1225.18	276.8	1224.81	280.1	1224.68	286.7	1225.2
290.2	1225.31	297.2	1225.38	307.5	1225.75	310.1	1225.68	314	1225.42
320.8	1225.25	323.5	1225.03	327.6	1224.51	334.1	1224.06	334.4	1224.03
336.8	1223.76	342.1	1222.9	344.6	1222.43	349.2	1221.62	352.7	1221.11
358.3	1220.37	360.7	1220	361.7	1219.86	365.1	1219.61	368.5	1219.72
371.9	1219.68	372.9	1219.51	375.3	1219.09	376.7	1218.8	378.7	1218.45
379.3	1218.37	382	1218.15	385.5	1217.97	387.1	1217.93	388.9	1217.88
392.3	1217.84	392.6	1217.83	393.7	1217.79	395.3	1217.75	395.7	1217.73
396.5	1217.69	399.1	1217.57	400.6	1217.56	401.3	1217.55	402.6	1217.54
405.9	1217.41	409.4	1217.08	410.7	1217.04	411.3	1217.02	412.8	1217.01
413.9	1216.97	415.4	1216.93	416.2	1216.91	418.1	1216.82	419.3	1216.72
419.6	1216.7	421.9	1216.55	423	1216.48	426.4	1216.3	429.9	1215.94
434.5	1215.22	435.2	1215.11	436.7	1214.9	437.7	1214.82	440.3	1214.75
440.7	1214.73	443.6	1214.61	448	1214.18	450.6	1213.81	450.7	1213.79
454.1	1213.1	457.6	1212.05	458.3	1211.8	460.9	1210.98	463.4	1210.07
464.5	1209.65	466	1209.06	471.5	1206.78	472.2	1206.42	475	1205.06
476.11	1204.432	478.8	1202.89	481.9	1201.44	484	1200.93	485.4	1200.67
499.3	1200.69	502.8	1200.61	509.9	1200.59	512.3	1200.63	517.4	1200.57
519.3	1200.56	520	1200.56	520.2	1200.56	520.7	1200.57	522.5	1200.59
523.7	1200.61	525.1	1200.68	526	1200.76	526.31	1200.782	527.1	1200.84
527.7	1200.94	529.2	1201.25	530.6	1201.57	531.4	1201.79	532.8	1202.17
534.1	1202.5	540.5	1204.59	542.45	1205.04	544.5	1205.55	548	1206.09
548.2	1206.11	548.8	1206.19	550.8	1206.42	551.5	1206.5	555	1206.79
558.5	1206.88	558.7	1206.88	561.1	1206.88	563.7	1206.96	565.4	1207.04
566.2	1207.09	572.4	1207.59	573.9	1207.76	574.5	1207.83	576.5	1208.07
578.3	1208.31	579.1	1208.4	579.3	1208.43	582.8	1208.88	584.2	1209.1
585.3	1209.26	586.3	1209.41	590.7	1210.19	590.9	1210.22	593.3	1210.66
596.8	1211.21	596.9	1211.22	597	1211.23	599.4	1211.56	601.9	1211.9
603.3	1212.1	604.1	1212.21	604.3	1212.25	605	1212.35	606.8	1212.61
607.6	1212.73	611.2	1213.45	611.8	1213.59	614.3	1214.21	614.8	1214.33
616	1214.59	616.8	1214.77	618.4	1215.13	619.3	1215.35	621.5	1215.81

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   621.8 1215.87   621.9 1215.89   622.3 1215.94   625.5 1216.36   626.8 1216.52
   628.6 1216.86   629.1 1216.93   629.3 1216.97   631.8 1217.54   636.2 1218.74
   637.9 1219.08   639.2 1219.35   639.8 1219.47   641.3 1219.86   641.7 1219.99
   643.4 1220.36   644.2 1220.59   646.1 1221.08   646.7 1221.25   647.6 1221.49
   650.6 1222.28   651.7 1222.48     654 1222.92   654.1 1222.96   654.2 1222.96
   654.4 1222.98   656.7 1223.11   657.7 1223.18   659.2 1223.27   660.3  1223.3
   661.3 1223.33   664.2 1223.78   666.6 1224.31   666.7 1224.32   668.4 1224.76
   670.8 1225.22   671.6  1225.4     679 1226.88   679.1  1226.9   679.2 1226.91
   682.7 1227.64   686.3 1228.31   686.6 1228.36   687.2 1228.49   689.1 1228.83
   691.6 1229.27     692 1229.35   693.5 1229.64   694.1 1229.72   695.5 1229.96
   696.6 1230.08   697.1 1230.15   699.1 1230.36   700.6 1230.58   703.7 1230.87
     704 1230.91   704.2 1230.92   704.6 1230.96   707.8 1231.28     711 1231.79
   711.4 1231.86   711.5 1231.88     714 1232.31   714.9 1232.46   716.5 1232.68
   720.1  1233.2   721.5 1233.42   722.1 1233.52   723.6 1233.85   725.4 1234.22
   728.9 1235.01   731.3 1235.65   731.4 1235.69   733.2 1236.18   733.7 1236.32
   738.5 1237.59   740.7  1238.2   740.9 1238.27   741.4  1238.4   743.4 1239.01
   744.4 1239.39   745.8 1239.83     748 1240.48   748.1 1240.52   748.3 1240.56
   750.6 1241.59   751.9 1242.18     753 1242.82   755.1 1244.12   755.4 1244.35
   755.6 1244.49   756.3  1244.8   757.8 1245.47   759.4 1246.11   760.3 1246.47
   761.9  1247.2   762.7 1247.56   763.1 1247.77   764.6 1248.48   767.5 1249.82
   768.7 1250.38   769.9 1250.95   770.6 1251.27   772.3 1252.11     773 1252.39
   774.3 1253.05   774.8 1253.23   775.5 1253.56   777.2  1254.3   781.3 1256.15
   781.8  1256.4   785.6 1258.11   786.8 1258.67   789.1 1259.64   789.2  1259.7
   789.3 1259.73   789.6 1259.84   791.7  1260.7   793.1 1261.31   794.1 1261.77
   801.3 1265.29   804.3 1266.83   806.1 1267.74   806.2 1267.76     808 1268.57
   808.6 1268.82   811.8 1270.31   815.5 1272.45   820.6  1275.5     823  1276.7
   823.1 1276.72   823.1 1276.76   825.5 1277.72   827.9 1278.68     830 1279.45
   830.5 1279.65   831.1 1279.86   832.7 1280.36   834.2 1280.82   836.8 1281.49
   837.5 1281.71   841.7    1283   842.4 1283.18   843.6 1283.47   844.8 1283.74
   845.5 1283.89   847.2 1284.32   849.6 1284.86   850.4 1285.01   852.9 1285.42
   856.1 1285.81   856.7 1285.89   856.9  1285.9   857.2 1285.93   859.3  1286.1
     864 1286.49   864.1  1286.5   864.2  1286.5   864.4 1286.51   866.5 1286.59
   867.9 1286.62   868.9 1286.61   870.8 1286.57   871.4 1286.59   873.8 1286.69
   875.4 1286.67   876.2 1286.68   877.6 1286.71   878.6 1286.72   879.1 1286.73
     881 1286.76   883.4 1286.76   884.4 1286.78   885.9 1286.82   886.6 1286.84
   888.3 1286.98   889.3 1287.06   890.4 1287.15   891.2 1287.19   894.1 1287.33
   895.5 1287.34   897.6 1287.43   897.9 1287.43   897.9 1287.44     898 1287.44
   900.3 1287.51   901.6 1287.55   902.8 1287.62   904.9 1287.71   911.7 1287.87
   912.4 1287.88   912.8 1287.91   914.3 1287.96   916.6 1288.05   917.2 1288.06
   918.5 1288.05   919.7 1288.01   920.3 1287.99   922.1 1288.01   924.5 1287.99
   925.3 1288.02   929.3 1288.18   931.5 1288.25   931.7 1288.25   932.1 1288.25
   934.2 1288.27   935.3 1288.28   936.6  1288.3     939 1288.31   945.7  1288.2
   946.2  1288.2   946.5 1288.19   948.3 1288.22

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06     475    .045  542.45     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
```

```
          475  542.45             83.9   110.7   130.3             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1210.82  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.40  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1209.42  * Reach Len. (ft)       *   83.90  *  110.70  *
 130.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   20.69  *  539.98  *
  96.15  *
* E.G. Slope (ft/ft)     *0.005627  * Area (sq ft)          *   20.69  *  539.98  *
  96.15  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   59.15  * 5270.92  *
 299.94  *
* Top Width (ft)         *  121.27  * Top Width (ft)        *    9.91  *   67.45  *
  43.90  *
* Vel Total (ft/s)       *    8.57  * Avg. Vel. (ft/s)      *    2.86  *    9.76  *
   3.12  *
* Max Chl Dpth (ft)      *    8.86  * Hydr. Depth (ft)      *    2.09  *    8.01  *
   2.19  *
* Conv. Total (cfs)      * 75052.0  * Conv. (cfs)           *   788.5  * 70265.1  *
 3998.4  *
* Length Wtd. (ft)       *  111.07  * Wetted Per. (ft)      *   10.84  *   69.03  *
  44.19  *
* Min Ch El (ft)         * 1200.56  * Shear (lb/sq ft)      *    0.67  *    2.75  *
   0.76  *
* Alpha                  *    1.22  * Stream Power (lb/ft s) *    1.92  *   26.83  *
   2.38  *
* Frctn Loss (ft)        *    0.79  * Cum Volume (acre-ft)  *    0.78  *   22.17  *
   1.49  *
* C & E Loss (ft)        *    0.07  * Cum SA (acres)        *    0.46  *    3.10  *
   1.65  *
************************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.

CROSS SECTION OUTPUT  Profile #500-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1212.92  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.51  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1211.41  * Reach Len. (ft)       *   83.90  *  110.70  *
```

```
 130.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   45.66  *  673.93  *
 194.65  *
* E.G. Slope (ft/ft)     *0.004752  * Area (sq ft)           *   45.66  *  673.93  *
 194.65  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *  152.31  * 7007.68  *
 760.00  *
* Top Width (ft)         *  138.73  * Top Width (ft)        *   15.45  *   67.45  *
  55.83  *
* Vel Total (ft/s)       *    8.66  * Avg. Vel. (ft/s)      *    3.34  *   10.40  *
   3.90  *
* Max Chl Dpth (ft)      *   10.85  * Hydr. Depth (ft)      *    2.96  *    9.99  *
   3.49  *
* Conv. Total (cfs)      *114891.9  * Conv. (cfs)           *  2209.5  *101657.3  *
11025.1  *
* Length Wtd. (ft)       *  111.38  * Wetted Per. (ft)      *   16.72  *   69.03  *
  56.28  *
* Min Ch El (ft)         * 1200.56  * Shear (lb/sq ft)      *    0.81  *    2.90  *
   1.03  *
* Alpha                  *    1.30  * Stream Power (lb/ft s) *    2.70  *   30.12  *
   4.01  *
* Frctn Loss (ft)        *    0.75  * Cum Volume (acre-ft)  *    1.65  *   26.36  *
   4.96  *
* C & E Loss (ft)        *    0.13  * Cum SA (acres)        *    0.96  *    3.10  *
   4.22  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1           RS: 611

INPUT
Description:
Station Elevation Data    num=     452
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1251.23     1.7 1251.03       3 1250.82     6.4 1249.78     7.1 1249.49
     9.8 1248.26    13.2 1246.15    16.6 1244.44    17.8 1243.75      20 1242.38
    23.1 1239.92    26.8  1237.5    30.2 1235.15    33.6 1232.64      37 1230.05
    37.9 1229.45    39.2 1228.51    40.4 1227.72    41.8 1227.12    43.8 1226.43
```

47.2	1225.59	50.6	1224.86	54	1224.34	57.9	1224.05	60.8	1223.91
64.2	1223.65	71	1222.63	74.4	1222.28	77.8	1222.02	84.5	1221.91
88	1221.76	94.8	1221.33	97.2	1221.21	101.6	1221.08	108.4	1220.65
111.8	1220.64	121.9	1220.5	125.4	1220.38	128.8	1220.14	132.2	1219.83
135.6	1219.48	142.4	1219.23	149.2	1218.78	152.6	1218.72	156	1218.82
166.1	1218.69	169.5	1218.82	172.8	1219	175.5	1218.98	176.3	1218.95
178.2	1218.72	180.8	1218.32	182.5	1218.01	186.2	1217.38	189.9	1216.56
191.5	1216.12	193.3	1215.71	194.2	1215.65	196.9	1216.03	197.4	1216.23
200.1	1217.47	201.2	1217.87	202.2	1218.33	203.5	1218.79	204.9	1219.1
205.8	1219.2	206.9	1219.4	210.2	1219.46	212.9	1219.25	213.7	1219.15
217.1	1218.86	218.3	1218.87	220.9	1219.04	222.4	1219.07	223.6	1219.06
223.9	1219.05	224.5	1219.01	226.3	1218.85	227.3	1218.82	228.9	1218.79
233.8	1218.85	237.5	1219.13	239.6	1219.36	247.7	1220.06	251.1	1219.82
254.5	1219.32	257.9	1218.91	258.3	1218.89	264.7	1218.75	271.5	1218.89
272.5	1218.79	278.3	1217.98	281.7	1217.61	285.1	1217.59	288.5	1217.91
289.8	1217.92	291.9	1217.92	295.3	1217.64	297.5	1217.5	302.1	1217.25
306.5	1216.74	308.9	1216.28	309.1	1216.26	310	1216.16	311.8	1216
319.1	1215.42	322.5	1215.34	325.2	1215.16	325.9	1215.15	327.8	1215.18
332.7	1215.36	336.1	1215.15	336.3	1215.13	339.7	1214.84	343.3	1214.43
343.4	1214.43	345.8	1214.34	346.9	1214.36	348.2	1214.44	350.2	1214.67
350.6	1214.71	350.7	1214.7	353.2	1214.68	354.2	1214.85	357.8	1215.1
360.6	1215.35	361.4	1215.39	363	1215.44	365.5	1215.4	366.4	1215.36
370.4	1214.98	370.7	1214.96	372.3	1214.83	372.9	1214.77	374.1	1214.7
375.9	1214.54	379.6	1214.04	382.7	1213.4	383.2	1213.35	384.4	1213.24
385.2	1213.14	386.8	1213.05	387.7	1213.05	389.6	1213	390.1	1212.96
390.4	1212.94	392.6	1212.74	397.7	1212.5	400	1212.28	401.3	1212.12
404.8	1211.97	408.5	1212.07	409.9	1212.2	414.8	1212.52	415.8	1212.56
419.4	1212.4	423	1212.03	424.7	1211.97	425.3	1211.97	427.1	1211.94
428.1	1211.94	430.3	1212.01	433.9	1211.84	434.5	1211.82	437	1211.76
439	1211.8	439.5	1211.82	441.1	1211.85	441.9	1211.89	443.6	1211.99
444.4	1211.99	448.4	1211.57	449.3	1211.38	451.3	1211.04	451.8	1210.96
452	1210.92	455.6	1210.4	456.7	1210.2	459	1209.81	459.2	1209.78
462.9	1208.95	464.1	1208.62	466.5	1207.9	466.6	1207.87	466.7	1207.8
469.1	1206.59	470.1	1205.95	471.5	1205.23	473.8	1204.19	474	1204.1
474.5	1203.91	481	1201.27	482.2	1200.81	483.8	1200.29	484.6	1200.13
486.3	1199.9	488.3	1199.76	488.8	1199.76	489.9	1199.76	491.2	1199.77
491.9	1199.77	492.1	1199.77	493.6	1199.77	495.5	1199.77	496.2	1199.77
497.6	1199.79	498.6	1199.81	510	1199.81	513.1	1199.84	513.6	1199.85
514.1	1199.84	518.4	1199.8	520.9	1199.81	524.5	1200.05	525.8	1200.24
527.41	1200.547	528.2	1200.7	528.5	1200.76	531.7	1201.62	535.4	1202.76
539.12	1204.17	540.6	1204.74	543	1205.76	543.9	1206.16	545.5	1206.9
548	1207.66	548.3	1207.7	549.9	1208.04	550.4	1208.11	551.7	1208.27
552.9	1208.44	553.5	1208.55	555.4	1209.03	557.1	1209.51	560.3	1210.51
560.7	1210.61	561.9	1210.89	562.8	1211.11	564.3	1211.43	567.1	1211.93
567.7	1212.06	570.1	1212.49	571.8	1212.72	574.9	1213.07	583.3	1213.73
584.4	1213.76	586.1	1213.83	586.8	1213.86	587.2	1213.88	591.6	1214.07
596.3	1214.74	598.6	1215.13	598.7	1215.15	598.8	1215.17	599.1	1215.22
601.1	1215.54	611	1217.25	615.4	1218.17	617.3	1218.45	618.1	1218.59
620.1	1218.99	621.9	1219.33	622.5	1219.47	623.5	1219.7	624.9	1220.08
625.8	1220.31	629.6	1221.27	634.4	1221.93	635.9	1222.16	637.4	1222.43

```
   639.2 1222.83   639.7 1222.94   641.6 1223.38     644 1223.99   645.1 1224.28
   648.4 1225.13   648.9 1225.27   652.8 1226.31   655.9 1227.36   656.7 1227.61
   658.3 1228.19     660 1228.76   660.5 1228.94   660.6 1228.97   660.9 1229.03
     663 1229.38   664.4 1229.59   665.4 1229.68   667.8 1230.04   668.2 1230.13
   670.1 1230.56   672.1    1231   672.6 1231.09   673.3 1231.26   675.9 1231.95
   677.3 1232.33   679.8 1233.06   680.3 1233.23   682.1  1233.9   683.7 1234.51
   684.5 1234.86   685.8 1235.44   687.5 1236.25   689.2 1236.84   691.4 1237.63
   691.6 1237.72     692 1237.86     694 1238.69   695.2 1239.18   698.8  1240.5
   699.1 1240.63   700.6 1241.32   701.1  1241.6     703 1242.51   703.5 1242.81
   704.4 1243.31   706.8 1244.61   710.7 1246.65   710.7 1246.67   715.4 1248.96
   716.9 1249.77   717.8 1250.26   718.4 1250.56   720.2 1251.42   720.8 1251.73
   722.6 1252.55   723.1  1252.8     725 1253.62   726.1 1254.17   729.7 1255.98
     730  1256.1     731 1256.58   732.1 1257.11   733.8  1257.9   734.5 1258.18
   735.6 1258.66   736.9 1259.23   737.7 1259.59   739.3 1260.28   741.1 1261.13
   741.5 1261.32   741.6 1261.36   741.8 1261.43   745.4 1263.08   749.2 1264.87
   750.4 1265.41   751.3 1265.77   753.7 1266.87   755.5 1267.62   756.2 1267.92
   756.5 1268.07   760.2 1269.58   763.8 1271.15   768.4 1273.09   771.7 1274.23
   773.3 1274.78   774.7 1275.25   778.3  1276.7   785.6 1280.18   788.1 1281.44
   792.9  1284.1     793 1284.12     793 1284.13     793 1284.14   795.4 1285.43
   796.6 1286.04   797.9 1286.65     800 1287.55   800.3 1287.66   800.3 1287.68
   800.5 1287.71   802.8 1288.02   803.9 1288.13   805.3 1288.22   807.1 1288.27
   807.6 1288.28   807.7 1288.29     808 1288.26   810.2 1288.12   811.2 1288.06
   814.2 1287.97   814.8 1287.95   822.1 1287.56   822.4 1287.55   823.1  1287.5
   825.8 1287.23   827.4 1287.08   829.4 1286.92   829.8 1286.93   830.6 1286.95
   832.3 1286.99   833.1 1286.99   835.4 1286.95   836.7 1286.91   837.2 1286.91
   839.6  1286.9   840.4  1286.9   844.5 1286.76   845.6 1286.72   849.6 1286.64
   851.3 1286.63   851.9 1286.64   856.7 1286.71   858.6 1286.68   859.3 1286.68
   860.6 1286.67   861.7 1286.69   862.2  1286.7   863.8 1286.79   864.2 1286.81
   866.6 1286.95   869.5 1287.08   870.8 1287.12   871.5 1287.15   873.2  1287.2
   876.8  1287.2   883.2 1287.23   883.8 1287.25   884.1 1287.26   887.8 1287.48
   888.7 1287.51   890.7 1287.57   891.2 1287.58   895.1 1287.55   898.2 1287.47
   898.7 1287.46   912.7 1287.62   913.4 1287.61   920.1 1287.26   921.2 1287.22
   923.1 1287.14   923.5 1287.12   923.8 1287.12   924.5 1287.12   926.4 1287.12
     927 1287.11   928.3 1287.09     929 1287.07   930.4 1287.04   931.5 1287.01
   933.4 1286.96   933.9 1286.95   934.1 1286.94   934.8 1286.91   937.4 1286.81
   938.6 1286.73   940.8  1286.6   941.9 1286.53   943.8 1286.44   944.3 1286.41
   944.5 1286.41   944.9 1286.39

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   473.8    .045  539.12     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         473.8  539.12             124.7   157.5   159.1             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
*************************************************************************************
***********
* E.G. Elev (ft)         * 1209.95  * Element                *  Left OB *  Channel *
```

```
Right OB *
* Vel Head (ft)          *    2.10  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1207.85  * Reach Len. (ft)        *  124.70  *  157.50  *
 159.10  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   13.54  *  471.48  *
  16.60  *
* E.G. Slope (ft/ft)     *0.009305  * Area (sq ft)           *   13.54  *  471.48  *
  16.60  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   45.70  * 5530.73  *
  53.57  *
* Top Width (ft)         *   82.38  * Top Width (ft)         *    7.17  *   65.32  *
   9.88  *
* Vel Total (ft/s)       *   11.22  * Avg. Vel. (ft/s)       *    3.38  *   11.73  *
   3.23  *
* Max Chl Dpth (ft)      *    8.09  * Hydr. Depth (ft)       *    1.89  *    7.22  *
   1.68  *
* Conv. Total (cfs)      * 58366.0  * Conv. (cfs)            *   473.7  * 57336.9  *
  555.4  *
* Length Wtd. (ft)       *  157.11  * Wetted Per. (ft)       *    8.06  *   66.71  *
  10.58  *
* Min Ch El (ft)         * 1199.76  * Shear (lb/sq ft)       *    0.98  *    4.11  *
   0.91  *
* Alpha                  *    1.07  * Stream Power (lb/ft s) *    3.29  *   48.16  *
   2.94  *
* Frctn Loss (ft)        *    1.45  * Cum Volume (acre-ft)   *    0.75  *   20.89  *
   1.32  *
* C & E Loss (ft)        *    0.05  * Cum SA (acres)         *    0.44  *    2.93  *
   1.57  *
*******************************************************************************
***********

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1212.04  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.84  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1209.20  * Reach Len. (ft)        *  124.70  *  157.50  *
 159.10  *
* Crit W.S. (ft)         * 1208.43  * Flow Area (sq ft)      *   26.27  *  559.58  *
  35.19  *
* E.G. Slope (ft/ft)     *0.010128  * Area (sq ft)           *   26.27  *  559.58  *
  35.19  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  104.17  * 7677.19  *
```

```
 138.64  *
* Top Width (ft)         *   94.20  * Top Width (ft)         *   12.01  *   65.32  *
  16.88  *
* Vel Total (ft/s)       *   12.75  * Avg. Vel. (ft/s)       *    3.97  *   13.72  *
   3.94  *
* Max Chl Dpth (ft)      *    9.44  * Hydr. Depth (ft)       *    2.19  *    8.57  *
   2.09  *
* Conv. Total (cfs)      * 78696.5  * Conv. (cfs)            *  1035.1  * 76283.9  *
 1377.6  *
* Length Wtd. (ft)       *  156.76  * Wetted Per. (ft)       *   13.09  *   66.71  *
  17.71  *
* Min Ch El (ft)         * 1199.76  * Shear (lb/sq ft)       *    1.27  *    5.30  *
   1.26  *
* Alpha                  *    1.12  * Stream Power (lb/ft s) *    5.03  *   72.77  *
   4.95  *
* Frctn Loss (ft)        *    1.48  * Cum Volume (acre-ft)   *    1.58  *   24.79  *
   4.61  *
* C & E Loss (ft)        *    0.14  * Cum SA (acres)         *    0.93  *    2.93  *
   4.11  *
*******************************************************************************
***********

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 453

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1250.52     3.8 1250.51     4.7 1250.46     6.3 1250.21     8.2 1249.85
    10.5 1249.13    11.7  1248.7    16.5 1246.28    22.2 1243.51    24.1 1242.47
    25.7 1241.47    26.6 1240.83    28.9 1239.02    32.8 1235.83    34.2 1234.58
    36.3  1232.9    38.1 1231.21    39.8 1229.69    43.3 1226.35    44.4 1225.49
    47.3 1223.43    50.3 1221.93    53.8 1220.77    56.5 1219.98    57.3 1219.82
    59.7 1219.56    64.4 1218.97    71.4  1217.5      75 1216.81    78.4 1216.32
    82.5 1215.88    87.6 1215.26    90.2 1215.06    92.4 1214.98   107.9 1215.21
     110 1215.17   111.8 1214.97   115.6 1214.71     117 1214.58   120.7 1214.33
   123.2  1214.2   125.7 1214.01   127.6 1213.79   128.3 1213.81   130.2 1213.68
   131.6 1213.67   133.4 1213.85   134.6 1213.72   139.4 1213.43   143.5 1213.59
   148.6 1213.91   151.1 1214.28   153.7 1214.58   155.6 1214.72   159.1 1214.56
   166.2 1214.65   168.9 1214.56   171.5  1214.6     174 1214.55   176.7 1214.37
   183.7 1214.27   187.2 1214.16   196.9 1213.58   203.8 1213.38   204.8  1213.4
```

209.6	1213.38	211.8	1213.34	212.1	1213.36	213	1213.38	214.7	1213.45
217.2	1213.51	229.3	1213.52	233.5	1213.63	236.8	1213.65	239.3	1213.66
244.1	1213.73	248.4	1213.69	253.8	1213.5	255.9	1213.47	256.7	1213.5
258.6	1213.53	261	1213.56	263.1	1213.62	267.1	1213.86	270.7	1213.87
274.6	1213.46	278	1213.23	282.8	1212.83	285.8	1212.75	293.2	1212.79
297	1212.7	297.3	1212.67	297.9	1212.65	302.1	1212.57	304.4	1212.47
304.6	1212.46	307	1212.24	308.2	1212.16	314.2	1211.86	315.6	1211.73
326.3	1211.32	330.6	1211.02	332.2	1210.84	334.3	1210.69	336	1210.61
338	1210.57	340.8	1210.61	341.8	1210.61	345.5	1210.5	348.1	1210.33
349.2	1210.25	352.8	1209.83	352.9	1209.82	353	1209.82	355.3	1209.96
356.7	1210.15	357.8	1210.25	360.4	1210.27	362.6	1210.01	364.2	1209.76
365	1209.67	366.6	1209.41	367.9	1209.25	369.9	1209.52	371.6	1209.72
375.4	1210.06	377.7	1210.04	379.1	1210.04	381.9	1210.07	384.4	1210
386.6	1209.81	386.8	1209.81	387.1	1209.81	389.2	1209.7	391.5	1209.39
394.5	1209.16	398.6	1208.75	400.9	1208.39	402.8	1208.16	403.3	1208.09
403.9	1207.98	406.9	1207.72	407.9	1207.58	409.3	1207.36	414.8	1206.02
415	1205.99	415.1	1205.97	417.3	1205.79	419.6	1205.55	420.21	1205.459
423.3	1204.99	424.3	1204.89	425.6	1204.79	426.7	1204.63	427.5	1204.48
429	1204.22	431	1203.76	431.3	1203.67	431.6	1203.59	433.12	1202.99
435.7	1201.92	436	1201.74	438.4	1200.54	439.8	1199.93	440.7	1199.6
441.9	1199.36	443.1	1199.23	443.9	1199.18	447.3	1199.1	447.7	1199.1
448	1199.1	450.1	1199.12	450.3	1199.12	452.2	1199.12	452.4	1199.12
452.8	1199.12	454.8	1199.1	456.3	1199.08	475.8	1199.12	485.1	1199.06
492.2	1199.15	493.3	1199.23	494.6	1199.45	496.2	1199.88	496.9	1200.15
497.4	1200.37	501.4	1202.1	501.6	1202.15	501.6	1202.17	503.25	1202.92
503.9	1203.25	504.71	1203.606	505.7	1204.05	506.3	1204.31	508.6	1205.24
509.8	1205.62	512.5	1206.2	517.9	1207.48	522.1	1208.53	525	1209.3
528.7	1210.21	530.4	1210.52	534.2	1210.88	534.4	1210.89	534.5	1210.9
535.6	1210.95	539.6	1211.21	541.4	1211.39	546.8	1212.09	548.5	1212.23
549	1212.27	550.5	1212.4	550.9	1212.44	554.2	1212.77	557.9	1213.31
563.1	1213.96	564.7	1214.11	565.3	1214.17	565.5	1214.2	565.9	1214.25
567.9	1214.53	569	1214.69	575.2	1215.8	576.4	1215.98	577.6	1216.14
579.9	1216.39	583.8	1216.94	587.5	1217.38	594	1217.95	597.1	1218.44
602.4	1219.38	606.1	1220.12	614.1	1221.83	617.2	1222.61	618.9	1223.18
619.4	1223.34	620.9	1223.81	621.3	1223.94	622.2	1224.16	623.8	1224.57
624.6	1224.8	626.2	1225.22	628.3	1225.82	633.5	1226.84	635.1	1227.23
635.7	1227.38	635.9	1227.44	639.4	1228.36	640.8	1228.76	642.9	1229.44
645.6	1230.44	646.8	1230.95	648.1	1231.55	650.4	1232.8	650.5	1232.86
650.5	1232.89	650.7	1232.96	652.9	1233.77	654.3	1234.32	661.7	1237.34
662.6	1237.79	665.1	1239.04	669.1	1241.32	669.9	1241.74	671.5	1242.46
676.5	1244.42	679.6	1245.73	680.2	1245.96	682	1246.7	682.1	1246.71
683.9	1247.37	684.5	1247.63	685.6	1248.08	686.9	1248.72	687.6	1249.05
691.3	1251.64	691.8	1251.93	692.6	1252.48	694.2	1253.42	695	1253.91
697.7	1255.3	698.7	1255.85	699.7	1256.29	702.4	1257.48	703.9	1258.08
708.8	1260.34	709.9	1260.92	711.2	1261.6	713.3	1262.73	713.6	1262.85
716.1	1264.03	717.3	1264.58	718.5	1265.11	720.8	1266.04	720.9	1266.09
721	1266.11	724.7	1267.99	725.8	1268.62	727.8	1269.85	728.2	1270.05
728.4	1270.15	730.5	1271.27	735.4	1273.66	737.8	1274.74	739.7	1275.56
740.2	1275.76	741.1	1276.1	742.6	1276.77	743.5	1277.2	747.3	1278.81
747.4	1278.84	747.6	1278.9	752.2	1280.33	754.9	1281.22	757	1281.85

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   759.4  1282.6   760.6 1282.94   761.8 1283.24   762.5 1283.39   764.2 1283.71
   765.1 1283.84   766.3 1284.03   766.6 1284.06   773.7 1284.46   773.8 1284.47
   773.9 1284.47   776.2 1284.55   777.7 1284.57   778.6 1284.55   781.5 1284.44
   783.3 1284.41   783.4  1284.4   788.2 1284.42   789.1 1284.38   790.6 1284.33
   792.9 1284.26     793 1284.26   793.2 1284.26   797.8 1284.36   799.7 1284.37
   800.2 1284.37   800.4 1284.37   801.4 1284.34   804.2 1284.27     805 1284.28
   806.3 1284.32   807.4 1284.36     808 1284.39   809.8 1284.55   811.8 1284.69
   814.6 1284.66     817 1284.64   819.3 1284.65   819.4 1284.66   819.6 1284.66
   825.8 1284.72   826.6 1284.74   828.7 1284.78     829 1284.79   830.8 1284.83
   831.4 1284.84   832.3 1284.86   834.6 1284.84   836.2 1284.77   837.8 1284.69
   838.4 1284.66   838.9 1284.65   842.2 1284.55   845.4 1284.43     846 1284.41
   849.8 1284.48   850.6  1284.5   851.9 1284.52     853 1284.53   853.6 1284.54
   855.4 1284.61   855.9 1284.65   857.8 1284.75   858.4 1284.78   864.9 1284.87
   871.4 1285.04   872.2 1285.06   872.6 1285.08   874.1 1285.16   876.4 1285.28
   876.9 1285.31     878 1285.34   879.3 1285.38   880.2 1285.41   891.5 1285.44
   892.3 1285.46   896.1 1285.58   897.5  1285.6   898.5 1285.61   899.1 1285.61
   905.7 1285.68   906.7 1285.68   908.1 1285.64   910.5  1285.6   910.5 1285.59
   910.6 1285.59   912.9 1285.57   914.3 1285.54   915.3  1285.5   917.1 1285.48
   918.1 1285.46   919.5 1285.45   920.1 1285.44   921.9 1285.41   922.5  1285.4
   923.6 1285.36   924.9 1285.31   925.7 1285.28     927 1285.24   927.3 1285.23
     928  1285.2   929.3 1285.15   931.5 1285.12   932.4 1285.13   932.8 1285.13
     935 1285.07   936.3 1285.02   940.1 1284.91   946.8 1284.77   947.8 1284.77
   950.3 1284.75   952.9 1284.67   953.8 1284.67   955.4 1284.68   955.8 1284.69
     958  1284.7   960.5 1284.67   960.8 1284.66   961.4 1284.68   963.1 1284.72
   964.3 1284.75   965.6 1284.85     967 1284.97   967.8 1285.04   968.2 1285.07
   969.2 1285.14   971.3  1285.3   978.6 1285.57   985.3 1285.57   988.8 1285.52
   989.2 1285.51   991.1 1285.46   992.3 1285.44   998.8  1285.3   999.3 1285.28
  1000.4 1285.23  1006.4 1284.97  1007.2 1284.97

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  433.12    .045  503.25     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        433.12  503.25             147.9   148.7   157.6             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1208.45  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.95  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1206.51  * Reach Len. (ft)       *  147.90  *  148.70  *
 157.60  *
* Crit W.S. (ft)         * 1205.51  * Flow Area (sq ft)     *   30.66  *  484.62  *
  15.85  *
* E.G. Slope (ft/ft)     *0.009189  * Area (sq ft)          *   30.66  *  484.62  *
  15.85  *
```

```
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   94.61  * 5487.91  *
  47.48  *
* Top Width (ft)         *  101.00  * Top Width (ft)         *   20.32  *   70.13  *
  10.55  *
* Vel Total (ft/s)       *   10.60  * Avg. Vel. (ft/s)       *    3.09  *   11.32  *
   3.00  *
* Max Chl Dpth (ft)      *    7.45  * Hydr. Depth (ft)       *    1.51  *    6.91  *
   1.50  *
* Conv. Total (cfs)      * 58731.7  * Conv. (cfs)            *   986.9  * 57249.4  *
  495.3  *
* Length Wtd. (ft)       *  148.80  * Wetted Per. (ft)       *   20.69  *   71.62  *
  11.19  *
* Min Ch El (ft)         * 1199.06  * Shear (lb/sq ft)       *    0.85  *    3.88  *
   0.81  *
* Alpha                  *    1.11  * Stream Power (lb/ft s) *    2.62  *   43.96  *
   2.44  *
* Frctn Loss (ft)        *    1.16  * Cum Volume (acre-ft)   *    0.69  *   19.16  *
   1.26  *
* C & E Loss (ft)        *    0.15  * Cum SA (acres)         *    0.40  *    2.68  *
   1.53  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1210.42  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.39  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1208.04  * Reach Len. (ft)       *  147.90  *  148.70  *
 157.60  *
* Crit W.S. (ft)         * 1207.12  * Flow Area (sq ft)     *   67.33  *  591.84  *
  36.88  *
* E.G. Slope (ft/ft)     *0.008842  * Area (sq ft)          *   67.33  *  591.84  *
  36.88  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *  268.54  * 7511.38  *
 140.09  *
* Top Width (ft)         *  116.53  * Top Width (ft)        *   29.53  *   70.13  *
  16.88  *
* Vel Total (ft/s)       *   11.38  * Avg. Vel. (ft/s)      *    3.99  *   12.69  *
   3.80  *
* Max Chl Dpth (ft)      *    8.98  * Hydr. Depth (ft)      *    2.28  *    8.44  *
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```
   2.19  *
* Conv. Total (cfs)      * 84227.4  * Conv. (cfs)            *  2855.8  * 79881.8  *
 1489.8  *
* Length Wtd. (ft)       *  148.88  * Wetted Per. (ft)       *   30.04  *   71.62  *
  17.70  *
* Min Ch El (ft)         * 1199.06  * Shear (lb/sq ft)       *    1.24  *    4.56  *
   1.15  *
* Alpha                  *    1.19  * Stream Power (lb/ft s) *    4.93  *   57.89  *
   4.37  *
* Frctn Loss (ft)        *    1.05  * Cum Volume (acre-ft)   *    1.45  *   22.71  *
   4.48  *
* C & E Loss (ft)        *    0.23  * Cum SA (acres)         *    0.87  *    2.68  *
   4.04  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 305

INPUT
Description:
Station Elevation Data    num=     194
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1248.63     2.2 1249.27     2.6 1249.34     4.6 1249.48     6.4 1249.56
     9.4  1249.6    10.2 1249.58    11.8 1249.37    14.1 1248.87    16.6 1247.87
    54.8 1222.53    59.9  1220.3    63.7 1218.59    64.4 1218.29    65.6 1217.83
    66.8 1217.45    67.5 1217.27    71.3 1216.49    75.1 1215.66    79.7 1214.89
    83.6 1214.32    86.6    1214    90.7  1213.7    93.1  1213.5    97.9 1213.03
   101.9 1212.73   104.1 1212.75   105.1  1212.8   105.7 1212.87   109.5 1213.13
   112.3 1213.24   113.3 1213.35   117.1 1214.06   119.4 1214.03   124.8 1213.91
   128.6 1213.44   132.4  1212.9   193.5 1212.48   201.1 1212.33   205.6  1212.2
   284.5  1210.3   292.8 1210.36   294.1 1210.26     297 1209.91   298.9 1209.69
   300.4 1209.49   302.7 1209.36   303.7 1209.33   304.2 1209.31   306.1  1209.3
   315.5    1209   334.8 1208.78   337.2 1208.76   358.7 1208.35   361.1 1208.33
   361.5 1208.32   363.5 1208.18   365.3 1207.99   365.3 1207.98   366.6 1207.76
   369.4 1207.13   370.6 1206.78   372.2 1206.26   372.9  1206.1   375.3 1205.71
   377.4 1205.29     380 1204.86   381.5 1204.56   385.5 1203.91     387 1203.74
   389.4 1203.32   389.6 1203.28   391.7  1202.7   393.6 1202.09   394.1 1201.97
  395.24 1201.55   397.6 1200.86   398.8 1200.52   401.1  1199.7   401.7 1199.49
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   403.5 1198.89   405.8 1198.26     406 1198.24   408.61198.124   409.8 1198.07
   417.2 1198.05   419.4  1198.1   429.3 1198.24     434 1198.19   443.4 1198.32
   445.3 1198.36   446.1 1198.38   448.1 1198.41   450.1 1198.46   450.5 1198.47
   450.9 1198.47   452.8 1198.49   456.6 1198.65   459.9 1198.87   462.2 1199.09
   464.6 1199.25   466.9 1199.45   469.3 1199.64   470.3 1199.81   471.6 1200.14
     474 1200.96   474.4 1201.12  475.21 1201.55   476.3 1201.96   476.7 1202.12
   478.4 1202.79   478.7 1202.89   479.1 1203.02   481.51203.544   482.4 1203.74
   483.4 1203.87   485.7 1204.18   486.5 1204.34   488.1 1204.95   490.3 1205.99
   490.4 1206.06   490.5  1206.1   491.1 1206.42   492.8 1207.38   494.6 1208.33
   495.1 1208.51   498.6 1209.69   514.8 1213.68   534.9 1217.59   535.1 1217.62
     585 1227.93   625.5 1241.94   626.2 1242.12   626.5 1242.24   719.2 1278.57
   720.1 1278.93   722.5 1279.73   724.4 1280.31   725.9 1280.87   727.3 1281.31
   729.7 1281.95     731 1282.22   731.9 1282.43   732.1 1282.48   732.6 1282.57
   735.6 1283.09   739.3 1283.37   739.4 1283.37   743.2 1283.51   744.2 1283.52
     746 1283.52   753.8 1283.63   754.5 1283.67   756.8 1283.94   758.6 1284.16
     761 1284.44     762 1284.54   763.4 1284.61   765.6 1284.71   765.9 1284.72
   779.2 1284.59   780.3 1284.59   780.9 1284.59   782.7  1284.6     783  1284.6
   784.6 1284.61   785.1 1284.61   792.2 1284.47   792.5 1284.48   795.9 1284.59
   797.1 1284.62   799.5 1284.68   799.7 1284.69   803.5 1284.66   804.3 1284.63
   809.1 1284.45   811.6 1284.38   812.5 1284.36   814.8 1284.35   816.4 1284.38
   817.8 1284.42   821.2 1284.38   848.7 1282.13   852.4 1281.88   852.5 1281.88
   852.7 1281.88   897.8 1283.35   898.2 1283.36   898.9 1283.37   912.6 1283.56
   912.8 1283.56   913.7 1283.56     915 1283.56   915.9 1283.57

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  395.24    .045  475.21     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        395.24  475.21            113.2   128.1   151.2             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1207.14  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.44  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1205.70  * Reach Len. (ft)       *  113.20  *  128.10  *
 151.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   36.12  *  554.33  *
  30.03  *
* E.G. Slope (ft/ft)     *0.006747  * Area (sq ft)          *   36.12  *  554.33  *
  30.03  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *  107.74  * 5425.85  *
  96.41  *
* Top Width (ft)         *  114.31  * Top Width (ft)        *   19.87  *   79.97  *
  14.47  *
* Vel Total (ft/s)       *    9.07  * Avg. Vel. (ft/s)      *    2.98  *    9.79  *
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   3.21  *
* Max Chl Dpth (ft)      *    7.65  * Hydr. Depth (ft)       *    1.82  *    6.93  *
   2.08  *
* Conv. Total (cfs)      * 68542.2  * Conv. (cfs)            *  1311.6  * 66056.8  *
 1173.7  *
* Length Wtd. (ft)       *  128.21  * Wetted Per. (ft)       *   20.34  *   80.86  *
  15.14  *
* Min Ch El (ft)         * 1198.05  * Shear (lb/sq ft)       *    0.75  *    2.89  *
   0.84  *
* Alpha                  *    1.13  * Stream Power (lb/ft s) *    2.23  *   28.26  *
   2.68  *
* Frctn Loss (ft)        *    0.70  * Cum Volume (acre-ft)   *    0.57  *   17.39  *
   1.18  *
* C & E Loss (ft)        *    0.09  * Cum SA (acres)         *    0.34  *    2.43  *
   1.49  *
*******************************************************************************
***********

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1209.15  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.63  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1207.52  * Reach Len. (ft)        *  113.20  *  128.10  *
 151.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   79.86  *  700.00  *
  59.54  *
* E.G. Slope (ft/ft)     *0.005737  * Area (sq ft)           *   79.86  *  700.00  *
  59.54  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  299.39  * 7381.34  *
 239.27  *
* Top Width (ft)         *  125.39  * Top Width (ft)         *   27.57  *   79.97  *
  17.85  *
* Vel Total (ft/s)       *    9.44  * Avg. Vel. (ft/s)       *    3.75  *   10.54  *
   4.02  *
* Max Chl Dpth (ft)      *    9.47  * Hydr. Depth (ft)       *    2.90  *    8.75  *
   3.34  *
* Conv. Total (cfs)      *104565.5  * Conv. (cfs)            *  3952.8  * 97453.7  *
 3159.1  *
* Length Wtd. (ft)       *  128.29  * Wetted Per. (ft)       *   28.26  *   80.86  *
  18.99  *
* Min Ch El (ft)         * 1198.05  * Shear (lb/sq ft)       *    1.01  *    3.10  *
   1.12  *
* Alpha                  *    1.18  * Stream Power (lb/ft s) *    3.79  *   32.70  *
   4.51  *
* Frctn Loss (ft)        *    0.64  * Cum Volume (acre-ft)   *    1.20  *   20.51  *
   4.31  *
* C & E Loss (ft)        *    0.06  * Cum SA (acres)         *    0.78  *    2.43  *
```

```
   3.98  *
*******************************************************************************
**********

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: 177

INPUT
Description:
Station Elevation Data    num=     254
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1248.69      .7 1248.65     2.7 1248.41     3.8 1248.17     5.2  1247.7
     7.5 1246.75      10  1245.6    12.5 1244.33    14.9 1242.85    17.3 1241.25
    18.7 1240.27    40.9 1223.33    44.6 1221.05    48.3 1218.92    48.9 1218.66
    49.8  1218.2    52.1 1217.22    53.7  1216.6    55.8 1215.93    56.1 1215.79
    56.8 1215.62    58.6 1215.25    59.5 1215.15      61 1214.91    63.2 1214.68
    63.8 1214.68    66.9 1214.51    68.3 1214.49    70.7 1214.37    74.3 1213.89
    85.3 1212.66    89.2 1212.16    91.9 1211.97      95 1211.94    97.4 1211.88
   100.3 1211.72     104 1211.62   111.4 1211.54   118.9  1211.5   122.6 1211.35
   126.3 1210.95     130 1209.91   133.7 1209.25   144.8 1210.74   147.9 1210.97
   148.3 1210.99   153.2 1211.09   160.5 1211.35   165.4 1211.42   167.7 1211.41
   174.8 1211.26   179.5  1210.9   183.2 1210.73   185.6 1210.76   190.6  1210.7
     196 1210.56   203.1 1210.22   207.1 1209.99   211.1 1209.63   214.8 1209.25
   217.2  1209.1   219.1 1208.99   219.6 1208.97   220.3 1208.95   223.1 1208.94
   250.2 1208.48   255.1 1208.53   257.3 1208.46   273.8  1207.6   274.9 1207.59
   278.9 1207.79   283.7 1207.67   306.7 1207.57   306.8 1207.56     309 1207.37
   312.4 1207.16   325.5 1206.89   327.3 1206.88   328.6 1206.84   331.5  1206.5
   337.2 1205.58   339.4 1205.16   339.6  1205.1   341.9 1204.22   343.8 1203.47
   344.3 1203.31   344.8 1203.09  350.22 1200.83   352.1 1200.11   355.6 1198.62
   360.4 1196.97     361 1196.83   361.51196.818     363 1196.78   364.5 1196.79
   366.4 1196.84   368.6 1196.85   372.3 1196.81   376.9 1196.87   382.6 1196.78
     388 1196.78   393.4 1196.81   398.8 1196.79   404.2 1196.86   409.6 1196.87
   409.8 1196.87   412.1 1196.81     414 1196.81   414.5 1196.83     415 1196.88
   416.8 1197.03   418.1 1197.09   419.1 1197.17   420.4 1197.27   421.5 1197.42
   422.3  1197.6   426.2 1198.93  430.98 1200.77   434.6  1202.3   436.6 1203.05
   437.9 1203.49   438.41203.668   438.8 1203.81   440.2  1204.4     442 1205.17
   442.9 1205.53   444.9 1206.42   445.7 1206.76     447 1207.35   449.6 1208.02
   451.2 1208.44   451.9 1208.65   454.2  1209.2   455.3 1209.43   456.6 1209.72
   458.9 1210.33   459.4 1210.49   461.3 1211.14   463.5 1211.95   463.6 1211.97
   463.7 1211.99   491.7 1219.53   492.4 1219.76   496.6 1220.86   518.4 1229.67
   519.6 1230.26   533.5 1236.57   535.3 1237.36   536.4 1237.89   540.1  1239.5
   540.5 1239.72   542.8 1240.71   544.8 1241.55   545.1 1241.67   545.4 1241.76
   547.5 1242.46   549.6  1243.2   554.4 1244.84   554.4 1244.85   554.5 1244.89
   556.7 1245.72   558.9 1246.57   559.1 1246.63   561.4 1247.68   563.7 1248.67
     564 1248.81   567.9 1250.59   568.8 1250.93   570.7 1251.69   572.4 1252.42
     573 1252.64   573.6 1252.88   576.9 1254.31   577.6  1254.7   578.4 1255.09
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   579.9 1255.94   582.3 1257.19   612.4 1271.11   612.9 1271.32   614.8 1272.07
   616.7 1272.88   617.1 1273.05     631 1277.74     631 1277.75   635.5 1278.94
   635.6 1278.98     638 1279.42   640.3 1279.94   640.6 1280.03   644.9 1280.56
   645.4 1280.62     649  1280.9   650.2    1281   654.3 1281.46     656 1281.63
   656.6 1281.68     659 1281.78   661.4 1281.86   662.1  1281.9   663.8 1282.03
   695.9 1282.69     697  1282.7   698.9 1282.76   699.4 1282.77   701.4 1282.83
   701.8 1282.84   703.7 1282.89   711.3 1282.81     712 1282.82   713.7 1282.84
   718.4    1283   719.2 1283.02   722.7 1283.12   723.1 1283.13   723.2 1283.13
   723.3 1283.13   725.6 1283.11     727 1283.06   727.9 1283.01   729.5 1282.92
   735.6 1282.78   737.4 1282.81   770.7 1283.54   773.1 1283.61   773.6 1283.62
   775.5 1283.59   777.5 1283.54   777.8 1283.54   778.4 1283.54   780.2 1283.55
   781.4 1283.56   784.5 1283.79     785 1283.83     816 1285.06   819.7 1285.13
   826.9 1284.69   828.3 1284.78   829.9 1284.93   830.8 1285.01   831.3 1285.06
   833.3 1285.29   834.2 1285.38   835.7 1285.37   836.8 1285.33   838.2 1285.27
   861.9 1279.97   862.8 1279.86   863.2 1279.79   865.3 1279.59   866.9 1279.47
   903.2 1280.31   904.6 1280.31     906 1280.32   906.8 1280.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  350.22    .045  430.98     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        350.22  430.98             208.2   208.2   208.2             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
*************************************************************************************
***********
* E.G. Elev (ft)         * 1206.35  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.15  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1205.20  * Reach Len. (ft)       *  208.20  *  208.20  *
 208.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   23.27  *  633.44  *
  24.47  *
* E.G. Slope (ft/ft)     *0.004541  * Area (sq ft)          *   23.27  *  633.44  *
  24.47  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   60.88  * 5503.23  *
  65.88  *
* Top Width (ft)         *  102.86  * Top Width (ft)        *   11.02  *   80.76  *
  11.09  *
* Vel Total (ft/s)       *    8.27  * Avg. Vel. (ft/s)      *    2.62  *    8.69  *
   2.69  *
* Max Chl Dpth (ft)      *    8.42  * Hydr. Depth (ft)      *    2.11  *    7.84  *
   2.21  *
* Conv. Total (cfs)      * 83549.1  * Conv. (cfs)           *   903.5  * 81667.9  *
  977.7  *
* Length Wtd. (ft)       *  208.20  * Wetted Per. (ft)      *   11.86  *   82.10  *
  11.94  *
```

```
* Min Ch El (ft)         * 1196.78  * Shear (lb/sq ft)       *    0.56  *    2.19  *
   0.58  *
* Alpha                  *    1.08  * Stream Power (lb/ft s) *    1.46  *   19.00  *
   1.56  *
* Frctn Loss (ft)        *    1.37  * Cum Volume (acre-ft)   *    0.50  *   15.64  *
   1.08  *
* C & E Loss (ft)        *    0.10  * Cum SA (acres)         *    0.30  *    2.19  *
   1.45  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1208.45  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.44  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1207.01  * Reach Len. (ft)        *  208.20  *  208.20  *
 208.20  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   53.78  *  779.84  *
  48.42  *
* E.G. Slope (ft/ft)     *0.004367  * Area (sq ft)           *   53.78  *  779.84  *
  48.42  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  125.66  * 7631.95  *
 162.39  *
* Top Width (ft)         *  126.58  * Top Width (ft)         *   30.55  *   80.76  *
  15.27  *
* Vel Total (ft/s)       *    8.98  * Avg. Vel. (ft/s)       *    2.34  *    9.79  *
   3.35  *
* Max Chl Dpth (ft)      *   10.23  * Hydr. Depth (ft)       *    1.76  *    9.66  *
   3.17  *
* Conv. Total (cfs)      *119850.1  * Conv. (cfs)            *  1901.6  *115491.2  *
 2457.3  *
* Length Wtd. (ft)       *  208.20  * Wetted Per. (ft)       *   31.52  *   82.10  *
  16.50  *
* Min Ch El (ft)         * 1196.78  * Shear (lb/sq ft)       *    0.47  *    2.59  *
   0.80  *
* Alpha                  *    1.15  * Stream Power (lb/ft s) *    1.09  *   25.34  *
   2.68  *
```

```
* Frctn Loss (ft)        *    1.37  * Cum Volume (acre-ft)   *    1.03  *   18.33  *
   4.12  *
* C & E Loss (ft)        *    0.15  * Cum SA (acres)         *    0.70  *    2.19  *
   3.92  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)
is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: -31

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
       0 1245.93      .5 1245.75      .9 1245.55     2.8 1244.51     4.9  1243.2
     5.7 1242.55    11.6 1238.11    17.5 1233.61    19.4 1232.14    20.6 1231.19
    23.4  1229.1    26.5 1226.75    28.5 1225.21    29.3 1224.67    31.2 1223.55
    32.5 1222.84    33.6 1222.22    35.3 1221.34    40.7 1218.35    41.2 1218.09
      43 1217.21    44.3 1216.66    47.1 1215.35    47.8 1215.16    50.1 1214.71
    52.2 1214.38      53 1214.28    54.9  1214.1    56.1 1214.07    57.2 1214.13
    58.9 1214.14    59.6 1214.07      60 1214.07      62 1214.13      64 1214.15
    64.8  1214.1    66.7 1213.83    69.1 1213.37    70.7 1212.89    71.9  1212.5
    73.8  1211.9    76.2 1211.12    76.7 1211.02    78.5 1210.74    80.9 1210.44
    82.6 1210.28    83.2 1210.22    83.7 1210.19    88.5 1210.02    94.4 1209.85
    95.1 1209.84    95.5 1209.84    97.4 1209.91   103.4 1210.27   104.5 1210.25
   106.2 1210.19   112.1 1209.92   115.2 1209.81   121.1 1209.55   125.8 1209.39
   130.6 1209.31   135.3 1209.12   138.9 1208.95     140 1208.92   141.7 1208.84
   142.4 1208.81   142.8 1208.78   146.8 1208.62   149.5 1208.52   154.7 1208.28
   156.6 1208.21   158.9 1208.11   162.5    1208   166.5 1207.82   170.8 1207.47
   174.4 1207.26   180.2  1207.1   182.6 1207.06   183.1 1207.05   186.2 1206.92
   190.1  1206.6     192 1206.52   194.1 1206.45   194.4 1206.45   194.9 1206.44
   196.8 1206.43   201.5 1206.39     211 1206.19   216.1 1205.96   218.6 1205.82
   220.4 1205.75   221.7  1205.7   222.8 1205.68   229.9 1205.42   230.4 1205.42
   232.3 1205.42   234.6 1205.46   236.3 1205.46     237 1205.45   237.4 1205.44
   239.4 1205.22   241.7 1204.99   242.2 1204.97   245.3 1204.92   246.4 1204.96
   248.8 1204.93   251.2 1204.91   253.2 1204.84     254  1204.8   255.9 1204.75
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257.2	1204.7	260.6	1204.65	263	1204.55	263.4	1204.51	265.9	1204.27
269	1204.04	270.1	1204.02	271.8	1203.99	272.5	1203.99	272.9	1203.99
274.8	1203.98	275.2	1203.97	276.9	1203.92	281.2	1203.88	281.9	1203.88
284.3	1203.88	291.4	1204.03	292.7	1204.07	293.7	1204.12	295.2	1204.27
296.7	1204.49	298.5	1204.68	299.8	1204.81	300.6	1204.9	300.8	1204.91
301.1	1204.89	303.2	1204.61	305.5	1204.37	306.9	1204.2	308.6	1203.95
310.3	1203.82	310.6	1203.79	312.2	1203.63	312.5	1203.6	312.6	1203.6
312.7	1203.59	315	1203.44	316.5	1203.27	317.3	1203.07	320.5	1202.08
322.1	1201.23	324.4	1199.91	324.4	1199.88	324.5	1199.86	324.6	1199.75
325.52	1199.2	328.4	1197.47	329.1	1197.17	330.2	1196.79	331.5	1196.4
332.4	1196.22	336	1195.71	336.2	1195.69	336.4	1195.68	340.3	1195.32
340.9	1195.28	343.3	1195.23	348	1195.25	348.3	1195.25	349.5	1195.25
350.4	1195.26	359.3	1195.32	359.8	1195.32	360.2	1195.32	361.9	1195.31
362.2	1195.3	364.6	1195.3	368.1	1195.22	369.3	1195.22	371	1195.22
374.4	1195.25	376	1195.27	376.4	1195.28	376.8	1195.31	378.7	1195.37
380	1195.39	381.1	1195.46	382.7	1195.6	384	1195.86	385.8	1196.44
391.9	1198.62	392.9	1198.95	393.49	1199.15	394.3	1199.44	395.2	1199.76
395.9	1199.99	397.6	1200.6	399.2	1201.22	400	1201.5	400.1	1201.56
402.3	1202.32	407	1203.69	407.8	1203.95	409.4	1204.59	411.8	1205.62
411.8	1205.64	414.1	1206.71	415.7	1207.44	416.5	1207.78	417.6	1208.29
419.7	1209.23	423.4	1210.83	423.6	1210.88	423.7	1210.92	424.1	1211.12
427.6	1212.8	428.3	1213.2	429.3	1213.85	430.7	1214.77	431.6	1215.43
433	1216.32	435.6	1217.77	436.5	1218.15	439.5	1219.4	440.1	1219.62
440.9	1219.92	442.5	1220.51	443.5	1220.93	444.8	1221.42	447.5	1222.31
449	1222.96	451.4	1224.05	452.6	1224.68	454.3	1225.57	458.4	1227.71
463.3	1230	463.7	1230.21	464.2	1230.54	466.1	1231.26	467.3	1231.68
468.4	1232.16	470.1	1232.88	470.8	1233.34	471.3	1233.65	473.1	1234.61
474	1235.03	475.2	1235.61	475.5	1235.76	477.9	1236.83	482.5	1239.08
482.8	1239.28	483.4	1239.56	485.1	1240.36	486.7	1241.09	487.5	1241.47
489.9	1242.7	490.5	1243.02	492.3	1243.93	493	1244.31	494.3	1245
494.7	1245.14	495.2	1245.39	497	1246.21	498.1	1246.75	499.4	1247.3
501.6	1248.36	501.8	1248.47	502.6	1248.79	504.2	1249.5	505.8	1250.19
508	1251.13	509	1251.59	509.6	1251.89	511.4	1252.62	513.4	1253.55
513.8	1253.67	514.3	1253.89	516.2	1254.6	517.3	1255.07	518.6	1255.63
520.9	1256.65	521.1	1256.71	521.7	1256.9	524.9	1258.01	525.7	1258.28
527.1	1258.72	528.1	1259.06	530.5	1260.06	531.2	1260.41	532.9	1261.2
533.5	1261.47	535.3	1262.29	536.4	1262.77	537.7	1263.3	539.8	1264.24
546.2	1267.12	547.2	1267.54	547.9	1267.8	551.7	1269.44	552	1269.59
552.6	1269.83	554.4	1270.65	555.5	1271.11	556.8	1271.62	559.2	1272.44
559.3	1272.48	563.2	1273.5	564	1273.74	565.3	1274.12	566.4	1274.42
567	1274.59	568.8	1275.06	569.5	1275.24	571.2	1275.65	571.7	1275.76
573.5	1276.08	574.6	1276.25	575.9	1276.42	578.1	1276.72	578.3	1276.75
578.5	1276.76	580.7	1276.88	582.3	1276.95	583.1	1276.97	584.5	1277.02
585.5	1277.03	586.1	1277.04	587.9	1277.1	588.6	1277.13	589.9	1277.18
590.3	1277.2	590.8	1277.25	592.7	1277.37	593.8	1277.44	597.2	1277.66
597.5	1277.68	598.2	1277.72	599.8	1277.82	601.4	1277.91	602.2	1277.92
603.6	1277.95	604.6	1277.97	605.2	1277.99	607	1278.06	607.7	1278.1
609.1	1278.16	609.4	1278.21	610	1278.28	611.8	1278.55	612.9	1278.69
614.2	1278.8	616.3	1278.91	616.6	1278.92	616.7	1278.92	619	1278.69
621.4	1278.45	622.7	1278.37	624.4	1278.36	626.1	1278.49	626.9	1278.55

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   628.2 1278.65   628.5 1278.68   629.1 1278.74   630.9 1278.88     632 1278.98
   633.3 1279.09   635.3  1279.3   635.7 1279.33   635.9 1279.35   636.8 1279.38
   638.1 1279.42   639.8 1279.46   640.4 1279.45   641.5 1279.44   642.8 1279.47
   643.6  1279.5   647.3  1279.7   647.5 1279.72   647.6 1279.72   647.7 1279.72
   651.4 1279.69   652.3 1279.68   653.8 1279.72   654.7 1279.76   655.3 1279.78
   657.1 1279.84   657.8 1279.87   659.2 1279.93   659.5 1279.94   661.8 1280.06
     663 1280.14   664.2 1280.21   666.1 1280.32   666.9 1280.36   668.2 1280.39
     669 1280.42   670.8 1280.44   671.4 1280.43   672.3 1280.41   674.7 1280.45
   678.4 1280.56   678.5 1280.56   678.5 1280.57   678.7 1280.58   680.9 1280.76
   682.4 1280.85   683.3 1280.95   685.6 1281.31   686.3 1281.42     688  1281.8
   689.2 1281.99   690.2 1282.17   692.8 1282.31     694 1282.36   695.1 1282.36
   696.9 1282.33   697.9 1282.28   699.6 1282.09   699.9 1282.05   701.8 1281.85
   702.3 1281.81   703.1 1281.79   704.7 1281.83   705.7 1281.89   709.2 1282.11
   709.4 1282.12   709.5 1282.12   710.1 1282.11   711.8  1282.1   713.4  1282.1
   714.2 1282.12   715.4  1282.2   716.6  1282.3   717.3 1282.36   718.9  1282.5
   720.6 1282.65   721.2 1282.71   721.5 1282.74   723.7 1282.88     725 1282.99
   726.1 1283.04   727.7 1283.12   728.4 1283.14     731 1283.14   732.8 1283.15
   733.2 1283.15   733.8 1283.15   735.6 1283.06   736.7 1283.01     738 1282.95
     740 1282.88   740.3 1282.86   740.4 1282.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  325.52    .045  393.49     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        325.52  393.49             379.1   379.1   379.1             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1204.87  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.19  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1202.68  * Reach Len. (ft)       *  379.10  *  379.10  *
 379.10  *
* Crit W.S. (ft)         * 1201.88  * Flow Area (sq ft)     *   10.56  *  462.49  *
  17.33  *
* E.G. Slope (ft/ft)     *0.010460  * Area (sq ft)          *   10.56  *  462.49  *
  17.33  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   32.63  * 5536.56  *
  60.81  *
* Top Width (ft)         *   84.94  * Top Width (ft)        *    6.94  *   67.97  *
  10.03  *
* Vel Total (ft/s)       *   11.48  * Avg. Vel. (ft/s)      *    3.09  *   11.97  *
   3.51  *
* Max Chl Dpth (ft)      *    7.45  * Hydr. Depth (ft)      *    1.52  *    6.80  *
   1.73  *
* Conv. Total (cfs)      * 55047.9  * Conv. (cfs)           *   319.1  * 54134.3  *
```

```
  594.6  *
* Length Wtd. (ft)       *  379.10  * Wetted Per. (ft)       *    7.83  *   69.30  *
  10.63  *
* Min Ch El (ft)         * 1195.22  * Shear (lb/sq ft)       *    0.88  *    4.36  *
   1.06  *
* Alpha                  *    1.07  * Stream Power (lb/ft s) *    2.72  *   52.17  *
   3.73  *
* Frctn Loss (ft)        *    3.05  * Cum Volume (acre-ft)   *    0.42  *   13.02  *
   0.98  *
* C & E Loss (ft)        *    0.23  * Cum SA (acres)         *    0.25  *    1.84  *
   1.39  *
*******************************************************************************
***********

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1206.94  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    2.90  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1204.04  * Reach Len. (ft)        *  379.10  *  379.10  *
 379.10  *
* Crit W.S. (ft)         * 1203.40  * Flow Area (sq ft)      *   27.50  *  554.96  *
  34.13  *
* E.G. Slope (ft/ft)     *0.010980  * Area (sq ft)           *   27.50  *  554.96  *
  34.13  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *   82.89  * 7686.13  *
 150.98  *
* Top Width (ft)         *  122.31  * Top Width (ft)         *   39.82  *   67.97  *
  14.52  *
* Vel Total (ft/s)       *   12.84  * Avg. Vel. (ft/s)       *    3.01  *   13.85  *
   4.42  *
* Max Chl Dpth (ft)      *    8.82  * Hydr. Depth (ft)       *    0.69  *    8.16  *
   2.35  *
* Conv. Total (cfs)      * 75582.9  * Conv. (cfs)            *   791.0  * 73351.0  *
 1440.9  *
* Length Wtd. (ft)       *  379.10  * Wetted Per. (ft)       *   40.83  *   69.30  *
  15.33  *
* Min Ch El (ft)         * 1195.22  * Shear (lb/sq ft)       *    0.46  *    5.49  *
   1.53  *
* Alpha                  *    1.13  * Stream Power (lb/ft s) *    1.39  *   76.03  *
   6.75  *
```

```
* Frctn Loss (ft)        *    3.30  * Cum Volume (acre-ft)   *    0.83  *   15.14  *
   3.92  *
* C & E Loss (ft)        *    0.30  * Cum SA (acres)         *    0.53  *    1.84  *
   3.85  *
*********************************************************************************
**********

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may
indicate the need for additional cross
         sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION


RIVER: Coaticook
REACH: Reach 1            RS: -410

INPUT
Description:
Station Elevation Data    num=     453
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 1249.28      .7 1249.11    17.7 1244.38    20.1 1244.05    22.9 1243.42
    24.7 1243.14    27.1 1242.65      28 1242.41    31.7 1241.76    33.1 1241.56
    36.4 1241.21    38.2 1240.96      41 1240.88    43.4 1240.69      48 1239.15
    60.5 1234.66    64.7  1232.8      69 1230.76    71.3 1229.55    73.6 1228.43
    77.5 1226.91    78.3 1226.66    81.8  1225.3    86.1  1224.3    89.5  1223.3
    92.3 1222.56    94.6 1221.85    99.3 1220.32   101.6 1219.61   103.2 1219.02
   107.4 1218.05   108.6 1217.82   113.2 1217.06     116 1216.72   117.9 1216.28
   120.2 1215.88   124.9 1214.84   127.2  1214.2   128.8 1213.68   130.4 1213.07
   134.2 1211.83   135.6 1211.34   136.5 1210.94   137.3 1210.65   138.9 1210.15
   140.7 1209.65   141.6 1209.45   143.5  1209.2   145.8 1208.79   150.5 1208.13
   150.9 1208.04   152.8 1207.73   156.1 1207.34   158.7    1207   161.2 1206.75
   164.5 1206.25   169.1 1205.44   171.4 1205.07   175.7 1204.69   178.4 1204.54
   181.7 1204.38   184.3 1204.33   188.5  1204.2   191.9 1203.93   197.1 1203.44
   199.4 1202.96   202.2 1202.59   204.1 1202.43   205.6 1202.35   207.3 1202.33
   211.9 1202.01   214.8 1201.75   220.6 1201.31   224.7  1200.9   225.1 1200.85
   225.6 1200.79   227.4 1200.58   228.8 1200.47     231 1200.27   232.9 1200.05
   236.4 1199.55   239.1 1199.13   241.5 1198.72   241.8 1198.64   245.3 1197.61
   246.31197.304  249.19 1196.42   257.8 1193.78     258 1193.74   260.2 1193.24
   261.8 1192.98     266 1192.45   268.8 1192.31   274.1 1192.46   278.9 1192.54
   279.7 1192.54   281.2 1192.53   282.5 1192.51   285.9 1192.34   290.7 1192.22
   295.3 1192.22   297.6 1192.26   303.1 1192.39   311.3 1192.37   312.1 1192.46
     314 1192.72   315.5 1192.94   316.3 1193.07   317.5 1193.31   318.7 1193.52
   319.6 1193.73     321 1193.82   323.4 1194.12   325.7 1194.89   326.3 1195.15
   327.8 1195.76   328.3 1195.99  329.28 1196.38   330.4 1196.84     332 1197.43
```

336.1 1198.39	339.1 1198.91	339.7 1199.03	340.2 1199.16	342.1 1199.92
343.8 1200.61	344.4 1200.88	346.8 1201.47	348.11201.682	353.8 1202.61
355.3 1202.89	356.1 1203.06	356.7 1203.19	358.5 1203.42	360.8 1203.66
360.9 1203.66	361.2 1203.71	363.2 1204.02	367.8 1204.49	369.1 1204.51
370.2 1204.36	372.5 1203.93	374.9 1203.56	377.2 1203.37	379 1203.37
380 1203.45	381.7 1203.79	382 1203.84	383.9 1204.17	384.4 1204.26
387.8 1204.51	389.1 1204.57	391.3 1204.62	391.5 1204.62	395.5 1204.49
396.3 1204.47	397.4 1204.48	398.6 1204.47	399.4 1204.5	401 1204.69
402.9 1205.02	403.3 1205.08	403.4 1205.1	405.8 1205.5	407.2 1205.73
412.9 1206.27	415 1206.52	415.3 1206.55	418.8 1206.7	420 1206.72
422.7 1206.67	426.6 1206.96	427.2 1207	429.5 1207.1	430.5 1207.09
434.2 1206.91	442.1 1207.07	443.8 1207.19	445.3 1207.29	446 1207.34
446.2 1207.36	446.4 1207.39	448.6 1207.64	449.9 1207.77	450.9 1207.84
452.6 1207.94	453.3 1207.96	453.8 1207.97	457.7 1208.02	458.7 1208.02
460.4 1208.03	461.5 1208	462.8 1207.95	467.6 1207.67	469.9 1207.59
471 1207.64	472.3 1207.75	473.2 1207.8	477.1 1207.78	479.5 1207.73
481.8 1207.78	483.2 1207.87	484.2 1207.93	484.8 1207.96	486.6 1208.02
487.6 1208.02	488.7 1208.03	489 1208.04	492.6 1207.96	496.2 1207.76
496.4 1207.74	499.3 1207.46	499.5 1207.44	499.7 1207.42	502.2 1207.17
502.8 1207.11	503.7 1207.11	506.1 1207.11	507.6 1207.14	507.9 1207.15
509.5 1207.19	512.8 1207.34	513.7 1207.37	515.5 1207.4	516.1 1207.42
516.5 1207.41	519.3 1207.38	519.4 1207.37	522.7 1207.41	523.4 1207.39
525.1 1207.34	526.1 1207.33	532.7 1207.27	533.8 1207.28	535.2 1207.31
536 1207.32	536.6 1207.34	539.1 1207.46	539.3 1207.47	539.5 1207.47
542.4 1207.52	542.7 1207.52	543.1 1207.54	545.2 1207.61	546 1207.64
551 1207.94	551 1207.95	559.3 1208.53	562.8 1209.12	565.3 1209.51
565.9 1209.61	569.2 1209.96	571.1 1210.22	572.5 1210.44	573.9 1210.71
574.6 1210.85	575.9 1211.11	576.8 1211.32	579.2 1211.91	582.5 1213.02
582.5 1213.03	582.5 1213.04	589.1 1214.92	592.5 1216.11	594 1216.69
594.3 1216.8	595.8 1217.35	596.9 1217.72	599.7 1218.63	602.2 1219.3
602.4 1219.38	602.6 1219.45	603.8 1219.95	605.5 1220.67	605.7 1220.78
606.1 1220.95	608.4 1222.01	609.1 1222.35	612.4 1224.11	614.1 1224.76
615.7 1225.36	617 1225.8	617.9 1226.14	619 1226.53	622.7 1227.61
625 1228.38	628.4 1229.62	632.3 1230.82	634.2 1231.45	635.6 1231.94
637 1232.42	641.6 1233.98	642.3 1234.22	645.5 1235.49	645.6 1235.53
645.7 1235.55	646.1 1235.73	648.5 1236.74	648.9 1236.88	649.4 1237.08
651.4 1237.82	654.3 1239	655.5 1239.6	657.1 1240.38	657.3 1240.47
658.9 1241.24	660 1241.68	662.2 1242.49	662.9 1242.7	665.2 1243.38
667.2 1244.04	668.6 1244.51	669.1 1244.68	671.5 1245.43	672.2 1245.65
673.1 1245.97	674.3 1246.38	675.5 1246.77	680.1 1248.46	681 1248.78
682.1 1249.22	683 1249.57	684.9 1250.35	688.8 1251.88	692.1 1253.08
692.8 1253.32	694.4 1253.91	695.4 1254.25	698.7 1255.47	700.2 1256.04
700.6 1256.23	702 1256.77	704.6 1257.9	705.4 1258.24	705.9 1258.5
708.5 1259.73	708.7 1259.8	708.8 1259.84	709.5 1260.13	711.7 1261.03
712 1261.18	715.3 1262.84	716.4 1263.42	717.4 1263.95	720.3 1265.37
722 1266.17	723.1 1266.65	724.3 1267.1	726 1267.79	728.6 1268.83
728.9 1268.95	730.6 1269.71	731.7 1270.21	731.9 1270.28	732.2 1270.36
734.6 1271.23	734.7 1271.24	735.2 1271.43	737.7 1272.03	738.5 1272.23
739.5 1272.45	740.7 1272.7	741.8 1272.93	743.1 1273.23	743.8 1273.37
745.1 1273.68	746.6 1274.08	746.8 1274.13	748.4 1274.53	749.9 1274.79

```
   751.7  1275.1   753.7 1275.27     755 1275.37     756  1275.4   757.3 1275.39
   758.3 1275.41   759.1 1275.47   760.9 1275.66   764.8 1276.04   765.2 1276.05
     768 1276.17   768.1 1276.18   768.3 1276.18   771.3 1276.13   771.5 1276.13
   774.4 1276.22   774.7 1276.23   775.1 1276.25   777.4 1276.32   778.6 1276.37
   780.5 1276.44   781.3 1276.48   782.2 1276.55   783.6 1276.66   784.6 1276.75
   785.7 1276.84   787.9 1277.03   789.3 1277.05   789.7 1277.06     801 1277.23
   804.3 1277.42     805 1277.49   807.1 1277.66   807.6 1277.71     808 1277.75
   810.6 1278.02   810.9 1278.04   811.1 1278.06   813.9 1278.41   814.2 1278.44
   817.2 1278.75   817.5 1278.77   817.7  1278.8   820.3 1279.01   823.3 1279.37
     824 1279.44   824.9 1279.45   826.4 1279.51   827.3 1279.51   828.4 1279.54
   829.5 1279.58   830.6 1279.61     832 1279.65   832.5 1279.66   837.2 1279.68
   838.6 1279.72   839.1 1279.75   840.5 1279.79   841.7 1279.82   842.6 1279.84
   843.8 1279.86   844.8 1279.82   846.2 1279.76   847.1 1279.72   849.7 1279.65
   850.4 1279.64   850.9 1279.65   853.3 1279.69   853.6  1279.7   853.9 1279.72
   856.9  1279.9   856.9 1279.91     857 1279.91   857.8 1279.94   860.1 1280.01
   863.1 1279.89     864 1279.88   866.2 1279.81   866.8 1279.81   867.5 1279.82
   869.2 1279.88   870.1 1279.89   870.7 1279.89

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06  249.19    .045  329.28     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        249.19  329.28             322.3   322.3   322.3             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1201.59  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.41  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1200.17  * Reach Len. (ft)        *  322.30  *  322.30  *
 322.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   26.49  *  568.57  *
  25.22  *
* E.G. Slope (ft/ft)     *0.006376  * Area (sq ft)           *   26.49  *  568.57  *
  25.22  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)             *   68.30  * 5487.92  *
  73.77  *
* Top Width (ft)         *  110.87  * Top Width (ft)         *   17.34  *   80.09  *
  13.44  *
* Vel Total (ft/s)       *    9.08  * Avg. Vel. (ft/s)       *    2.58  *    9.65  *
   2.93  *
* Max Chl Dpth (ft)      *    7.95  * Hydr. Depth (ft)       *    1.53  *    7.10  *
   1.88  *
* Conv. Total (cfs)      * 70507.9  * Conv. (cfs)            *   855.4  * 68728.6  *
  923.9  *
* Length Wtd. (ft)       *  322.30  * Wetted Per. (ft)       *   17.78  *   81.17  *
```

```
  14.01  *
* Min Ch El (ft)         * 1192.22  * Shear (lb/sq ft)       *    0.59  *    2.79  *
   0.72  *
* Alpha                  *    1.10  * Stream Power (lb/ft s) *    1.53  *   26.91  *
   2.10  *
* Frctn Loss (ft)        *    1.90  * Cum Volume (acre-ft)   *    0.25  *    8.54  *
   0.80  *
* C & E Loss (ft)        *    0.05  * Cum SA (acres)         *    0.15  *    1.19  *
   1.29  *
*******************************************************************************
***********

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
*******************************************************************************
***********
* E.G. Elev (ft)         * 1203.34  * Element                *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.91  * Wt. n-Val.             *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1201.43  * Reach Len. (ft)        *  322.30  *  322.30  *
 322.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)      *   56.24  *  669.39  *
  44.29  *
* E.G. Slope (ft/ft)     *0.007055  * Area (sq ft)           *   56.24  *  669.39  *
  44.29  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)             *  175.21  * 7577.80  *
 167.00  *
* Top Width (ft)         *  127.62  * Top Width (ft)         *   30.17  *   80.09  *
  17.36  *
* Vel Total (ft/s)       *   10.29  * Avg. Vel. (ft/s)       *    3.12  *   11.32  *
   3.77  *
* Max Chl Dpth (ft)      *    9.21  * Hydr. Depth (ft)       *    1.86  *    8.36  *
   2.55  *
* Conv. Total (cfs)      * 94294.4  * Conv. (cfs)            *  2086.0  * 90220.2  *
 1988.3  *
* Length Wtd. (ft)       *  322.30  * Wetted Per. (ft)       *   30.68  *   81.17  *
  18.14  *
* Min Ch El (ft)         * 1192.22  * Shear (lb/sq ft)       *    0.81  *    3.63  *
   1.08  *
* Alpha                  *    1.16  * Stream Power (lb/ft s) *    2.51  *   41.11  *
   4.05  *
* Frctn Loss (ft)        *    2.30  * Cum Volume (acre-ft)   *    0.47  *    9.81  *
   3.58  *
* C & E Loss (ft)        *    0.02  * Cum SA (acres)         *    0.23  *    1.19  *
   3.71  *
*******************************************************************************
```

****

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
         the need for additional cross sections.

CROSS SECTION

RIVER: Coaticook
REACH: Reach 1   RS: -732

INPUT
Description:
Station Elevation Data   num=   452

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1250.06	2	1250.19	6.6	1250.78	8.9	1250.97	11.3	1251.01
13.3	1250.98	14	1250.87	15.9	1250.24	17.6	1249.57	19	1248.78
20.6	1247.74	22.9	1245.94	26.3	1243.05	30.6	1239.77	32.2	1238.45
34.5	1236.42	36.8	1234.53	39	1232.97	39.3	1232.76	41.5	1231.72
44	1230.43	46.1	1229.21	48	1228.18	50.8	1226.89	52.3	1226.14
54	1225.45	55.4	1225.03	57.8	1224.17	59	1223.68	60.1	1223.37
65.3	1221.61	67.1	1221.16	69.4	1220.43	76.4	1218.8	78.4	1218.19
81	1217.2	84.1	1215.94	90.3	1213.87	91.4	1213.56	94.1	1212.53
95.7	1211.73	99.1	1209.7	100.1	1209.2	104.4	1206.73	106.6	1205.82
111.2	1203.79	113.1	1203.05	115.9	1202.11	119.1	1201.21	121.8	1200.36
122.9	1199.89	133.82	1194.48	134.6	1194.08	136.8	1192.87	139.4	1191.44
141.5	1190.91	143.2	1190.66	144.7	1190.56	147.4	1190.51	151.5	1190.64
155.2	1190.68	164.8	1190.51	176.3	1190.57	181.2	1190.47	188.2	1190.5
195.2	1190.46	197.5	1190.5	202.2	1190.76	202.6	1190.81	204.5	1191.14
206.9	1191.67	207.9	1191.94	211.5	1193.26	214.4	1194.13	215.78	1194.49
216.2	1194.57	223.7	1196.26	227.9	1196.98	229	1197.13	230.2	1197.28
235.61	197.871	239.7	1198.32	247.9	1198.69	252.1	1198.78	258.2	1198.83
260.6	1198.72	265.9	1198.32	269.9	1198.24	273.1	1198.27	276.9	1198.06
279.2	1198.01	281.6	1198.06	286.2	1198.52	290.9	1198.76	292.2	1198.82
294	1198.82	298.2	1198.92	300.2	1199	302.6	1199.16	306.6	1199.27
308	1199.25	309.6	1199.14	310.8	1199.1	314.2	1199.16	318.9	1199.02
331.5	1198.79	337.7	1199.03	339.5	1199.15	347.1	1198.9	351.5	1199.21
355.4	1199.57	359.4	1199.56	361.3	1199.42	368.3	1199.07	373	1198.68
375.4	1198.4	377.8	1198.22	379.4	1198.13	380.1	1198.16	381.1	1198.24
383.4	1198.54	386.8	1198.86	387.4	1198.87	392.6	1198.7	407.4	1199.18
409.8	1198.99	411.4	1198.8	415.5	1198.69	417.8	1198.54	421.3	1198.13
422.5	1198.03	423.4	1197.94	427.2	1197.72	434.3	1197.92	436.7	1198.03
438.5	1198.05	443.7	1198	444.2	1198	446.1	1198.02	447.4	1198.03
448.4	1198.06	451.4	1198.21	453.1	1198.14	455.4	1198.03	455.5	1198.03
455.7	1198.03	457.9	1198.02	459.4	1198.05	460.2	1198.11	461.4	1198.17
463.4	1198.27	464.9	1198.41	467.3	1198.56	472	1199.06	478.7	1199.6
481.4	1199.7	483.4	1199.66	487.4	1199.44	490.1	1199.22	490.8	1199.15
491.3	1199.11	493.2	1199	494.1	1198.95	495.9	1198.87	499.3	1198.74

501.6 1198.72 503.3 1198.75 509.7 1198.97 512.1 1199.12 514.4 1199.39
515.3 1199.5 516.8 1199.54 519.1 1199.52 519.3 1199.51 521.5 1199.39
523.8 1199.15 527.3 1198.92 528.5 1198.92 531.3 1198.82 533.6 1198.8
535.3 1198.84 535.6 1198.88 536 1198.96 538 1199.24 539.3 1199.38
540.3 1199.45 541.8 1199.51 542.7 1199.53 543.3 1199.55 547.5 1199.55
551.3 1199.81 552.1 1199.92 553.3 1200.06 556.7 1200.76 556.8 1200.8
559 1201.27 563.9 1201.9 567.2 1202.51 570.7 1202.69 573.3 1202.59
575.7 1202.59 576.5 1202.63 579.1 1202.65 580.4 1202.63 587 1202.29
588.2 1202.3 591 1202.41 594.6 1202.33 599.3 1202.04 605.7 1201.77
606.4 1201.76 606.9 1201.76 611.5 1201.95 613.5 1201.96 614.8 1201.95
615.8 1201.99 617.4 1202.09 618.8 1202.14 620.6 1202.07 621.8 1202.02
622.7 1201.98 626.7 1201.64 630.7 1201.44 634.9 1201.52 637.1 1201.68
638.6 1201.78 639.5 1201.86 640.7 1201.96 641.8 1202.06 642.6 1202.1
646.5 1202.25 650.5 1202.15 653.6 1202.02 656 1202.08 658.2 1202.34
662.4 1203.09 665.4 1203.78 670.3 1204.68 674.9 1205.58 677.2 1206.05
682.2 1206.98 686.2 1207.59 686.7 1207.69 687.4 1207.84 689 1208.12
690.2 1208.3 691.4 1208.54 694.1 1208.98 699 1209.82 700.8 1210.05
702.1 1210.22 703.2 1210.39 704.9 1210.61 706 1210.79 710.3 1211.85
714 1212.63 716.5 1213.28 719.7 1214.25 720.9 1214.55 721.9 1214.81
722.1 1214.86 724.5 1215.22 726.8 1215.64 729.2 1216.17 729.8 1216.35
731.5 1216.78 733.8 1217.34 733.9 1217.36 734 1217.38 738.6 1217.95
739.9 1218.08 741 1218.18 743.3 1218.37 745.7 1218.47 748.1 1218.69
749.7 1218.9 750.4 1219.04 751.5 1219.29 757.5 1221.01 757.6 1221.03
761.6 1222 761.7 1222.03 762.4 1222.23 767.6 1223.76 768.2 1223.91
768.7 1224.05 771.1 1224.75 771.4 1224.85 771.8 1224.96 774.5 1225.8
774.7 1225.87 778 1227.07 784.3 1228.91 784.6 1228.98 784.9 1229.09
788.4 1230.25 790.5 1231 793.7 1232.07 801 1234.71 803.1 1235.58
804.3 1236.1 805.6 1236.84 810.9 1239.7 815.6 1242.65 817.4 1243.9
820.7 1245.98 824 1247.22 826.4 1247.92 827.3 1248.19 829.8 1248.72
830.6 1248.87 833.3 1249.03 833.8 1249.07 834.3 1249.08 836.8 1249.12
840.6 1249.3 843.7 1249.68 843.7 1249.69 844.2 1249.79 846.8 1250.31
847 1250.33 847.1 1250.37 850 1250.91 850.3 1250.97 850.6 1251.06
853.5 1251.78 854 1251.92 856.2 1252.61 856.8 1252.78 860.9 1253.92
862.5 1254.35 863.4 1254.61 865.6 1255.26 866.7 1255.57 867.9 1255.97
868.7 1256.28 871.3 1257.13 875 1258.22 878.2 1259.02 879.8 1259.38
881.3 1259.73 884.4 1260.48 885.1 1260.68 886.4 1260.97 887.5 1261.16
888.6 1261.35 889.7 1261.53 890.6 1261.6 892.1 1261.72 893 1261.78
893.8 1261.83 896.2 1261.95 896.9 1261.99 897.5 1262.03 903 1262.56
904.4 1262.6 904.9 1262.62 906.4 1262.66 907.5 1262.62 909.3 1262.59
909.9 1262.57 910.2 1262.56 911.3 1262.52 914.1 1262.4 915.5 1262.34
916.7 1262.28 919 1262.31 920.1 1262.32 920.7 1262.36 922.8 1262.48
927 1262.6 933.8 1262.27 934.4 1262.2 936.6 1261.98 937.2 1261.9
938.4 1261.74 939.2 1261.63 940.6 1261.43 941.9 1261.33 943.3 1261.29
944.1 1261.24 944.5 1261.25 946 1261.28 947.2 1261.28 947.5 1261.27
948.1 1261.28 949.8 1261.31 955.1 1261.34 957.6 1261.47 957.7 1261.48
957.8 1261.48 957.8 1261.49 960.4 1261.9 961.2 1262.01 962.7 1262.35
963 1262.42 964.6 1262.76 965.6 1262.99 967.5 1263.39 968 1263.5
968.3 1263.54 969.2 1263.66 970.9 1263.9 971.4 1263.96 972.4 1264
973.6 1264.07 974.9 1264.11 976.2 1264.23 978.3 1264.4 978.8 1264.46
981.7 1264.7 984.1 1264.76 985.1 1264.77 987 1264.63 992 1264.09

```
   992.3 1264.07   995.4 1263.86   996.7 1263.88   998.8 1263.91    1000 1263.93
  1001.5 1263.97  1002.2 1263.99  1002.6    1264  1003.9 1264.05  1005.2  1264.1
  1005.6 1264.11  1006.4 1264.15  1007.9 1264.25  1009.1 1264.31  1012.5 1264.38
  1013.2 1264.39  1015.5 1264.48  1015.9  1264.5  1016.1 1264.51  1019.3 1264.65
  1020.9 1264.62  1021.1 1264.62  1022.7 1264.59  1030.6 1264.62  1031.6 1264.62
    1033 1264.64  1034.3 1264.69  1038.6 1264.84  1039.6 1264.86  1043.3  1264.8
  1044.8 1264.71  1045.2 1264.69  1046.7 1264.62  1050.1 1264.53  1050.2 1264.53
  1052.8 1264.63  1053.1 1264.63

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
       0     .06  133.82    .045  215.78     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        133.82  215.78             326.3   326.3   326.3             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1199.64  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.26  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1198.38  * Reach Len. (ft)       *  326.30  *  326.30  *
 326.30  *
* Crit W.S. (ft)         *          * Flow Area (sq ft)     *   15.34  *  600.52  *
  60.49  *
* E.G. Slope (ft/ft)     *0.005478  * Area (sq ft)          *   15.34  *  600.52  *
  60.49  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   40.79  * 5474.24  *
 114.98  *
* Top Width (ft)         *  186.59  * Top Width (ft)        *    7.87  *   81.96  *
  96.76  *
* Vel Total (ft/s)       *    8.32  * Avg. Vel. (ft/s)      *    2.66  *    9.12  *
   1.90  *
* Max Chl Dpth (ft)      *    7.92  * Hydr. Depth (ft)      *    1.95  *    7.33  *
   0.63  *
* Conv. Total (cfs)      * 76064.1  * Conv. (cfs)           *   551.1  * 73959.6  *
 1553.4  *
* Length Wtd. (ft)       *  326.30  * Wetted Per. (ft)      *    8.78  *   83.37  *
  97.20  *
* Min Ch El (ft)         * 1190.46  * Shear (lb/sq ft)      *    0.60  *    2.46  *
   0.21  *
* Alpha                  *    1.17  * Stream Power (lb/ft s) *    1.59  *   22.46  *
   0.40  *
* Frctn Loss (ft)        *    2.12  * Cum Volume (acre-ft)  *    0.10  *    4.21  *
   0.48  *
* C & E Loss (ft)        *    0.04  * Cum SA (acres)        *    0.05  *    0.59  *
   0.89  *
```

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********************************************************************************
**********

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #500-yr
********************************************************************************
**********
* E.G. Elev (ft)         * 1201.02  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.85  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1199.17  * Reach Len. (ft)       *  326.30  *  326.30  *
 326.30  *
* Crit W.S. (ft)         * 1197.76  * Flow Area (sq ft)     *   22.20  *  665.36  *
 192.19  *
* E.G. Slope (ft/ft)     *0.007245  * Area (sq ft)          *   22.20  *  665.36  *
 192.19  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *   76.76  * 7468.20  *
 375.03  *
* Top Width (ft)         *  362.81  * Top Width (ft)        *    9.47  *   81.96  *
 271.38  *
* Vel Total (ft/s)       *    9.00  * Avg. Vel. (ft/s)      *    3.46  *   11.22  *
   1.95  *
* Max Chl Dpth (ft)      *    8.71  * Hydr. Depth (ft)      *    2.34  *    8.12  *
   0.71  *
* Conv. Total (cfs)      * 93050.9  * Conv. (cfs)           *   901.9  * 87742.8  *
 4406.2  *
* Length Wtd. (ft)       *  326.30  * Wetted Per. (ft)      *   10.56  *   83.37  *
 272.10  *
* Min Ch El (ft)         * 1190.46  * Shear (lb/sq ft)      *    0.95  *    3.61  *
   0.32  *
* Alpha                  *    1.47  * Stream Power (lb/ft s) *    3.29  *   40.51  *
   0.62  *
* Frctn Loss (ft)        *    2.15  * Cum Volume (acre-ft)  *    0.18  *    4.87  *
   2.70  *
* C & E Loss (ft)        *    0.12  * Cum SA (acres)        *    0.08  *    0.59  *
   2.65  *
********************************************************************************
**********

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and
previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION
```

RIVER: Coaticook
REACH: Reach 1 RS: -1058

INPUT
Description:
Station Elevation Data num= 453

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1239.53	9	1239.21	12.5	1238.89	15.9	1238.15	18.3	1237.54
33.3	1233.23	34.6	1232.92	36.7	1232.48	43.7	1231.92	47.5	1231.58
57.5	1231.06	61	1230.83	70.8	1229.76	71.4	1229.67	74.9	1228.23
78.3	1225.56	81.8	1223.05	85.3	1220.93	89.1	1218.76	94	1215.16
106.1	1205.76	109.5	1203.68	120	1200.94	123.4	1200.19	126.9	1199.54
130.4	1198.83	132.7	1198.23	140.8	1196.36	143	1195.65	144.2	1195.17
144.81	194.827	145.6	1194.37	149.2	1192.18	149.7	1191.77	151.2	1190.91
153.4	1190.1	154.6	1189.69	161.1	1188.5	163.7	1188.26	165	1188.19
168.5	1188.1	174	1188.22	175.4	1188.22	180	1188.1	185.8	1188.16
196.2	1188.19	199.7	1188.28	204.7	1188.61	210.2	1189.07	213.6	1189.47
217	1190.15	220.5	1190.93	225.33	1192.18	227.5	1192.69	230.9	1193.69
233.4	1194.54	237.9	1195.76	240.51	196.311	241.3	1196.48	244.8	1196.9
246.3	1196.82	250.8	1196.48	251.7	1196.44	254.1	1196.43	258.7	1196.27
262.1	1196.32	271	1196.2	276	1195.94	278.6	1195.74	279.9	1195.66
282.9	1195.62	286.4	1195.71	289.9	1195.53	292.8	1195.22	296.8	1194.94
307.2	1194.72	310.7	1194.74	317.6	1195.37	321.2	1195.63	323.8	1195.7
324.5	1195.74	328	1195.77	334.1	1195.66	341.8	1195.63	341.9	1195.63
342	1195.63	344.4	1195.7	345.4	1195.7	347	1195.73	348.8	1195.8
355.8	1196.3	359.2	1196.69	359.9	1196.74	361.9	1196.91	362.5	1196.97
362.7	1197	365.1	1197.17	373.5	1197.62	374.9	1197.74	377.8	1197.95
380.8	1197.99	382.3	1197.98	383.8	1197.97	391.8	1197.98	399.4	1197.79
400	1197.74	402.8	1197.4	406.4	1197.1	406.7	1197.06	407.4	1197
411.6	1196.4	414.1	1196.17	414.8	1196.16	416.5	1196.14	421	1196.12
423.9	1196.05	428.8	1196.15	429.7	1196.16	431.2	1196.17	443	1196.09
445.9	1195.91	453.3	1195.59	454	1195.57	455.7	1195.53	455.9	1195.52
457.6	1195.46	461.3	1195.41	464.9	1195.5	468	1195.71	472.2	1195.82
472.9	1195.8	474.2	1195.77	475.3	1195.77	475.9	1195.76	477.6	1195.69
479.6	1195.64	480.2	1195.65	481.6	1195.73	486.9	1196.18	487.6	1196.23
492	1196.57	494.2	1196.74	497.4	1196.79	504.7	1196.73	512.1	1196.82
516.1	1196.72	517	1196.7	518.7	1196.68	519.8	1196.66	520.8	1196.62
526.8	1196.44	528	1196.38	530.7	1196.24	531.7	1196.21	533.5	1196.15
541.5	1196.04	543.9	1196.11	545.4	1196.12	546.4	1196.17	548.8	1196.24
549	1196.24	552.7	1196.15	555.8	1195.93	556.2	1195.91	560	1195.53
563.7	1195.27	566	1195.35	570.6	1195.35	570.9	1195.37	571	1195.37
571.3	1195.4	574.6	1195.7	575.8	1195.76	578	1195.89	578.2	1195.9
578.3	1195.9	580.7	1195.94	581.9	1195.97	592.9	1196.47	595.4	1196.54
596.6	1196.58	597.8	1196.59	600.2	1196.59	600.3	1196.59	603.9	1196.79
607.5	1197.06	611.2	1197.05	614.6	1196.66	614.9	1196.62	615.1	1196.61
617.4	1196.48	624.7	1196.68	625.8	1196.72	629.6	1196.8	630	1196.8
637.4	1196.68	639.9	1196.52	640.1	1196.51	642.9	1196.35	643.3	1196.34

643.9	1196.32	646.6	1196.25	648.2	1196.27	650	1196.29	656.3	1197.51
656.6	1197.58	660.1	1197.83	673.5	1197.43	674	1197.43	676.9	1197.46
678.3	1197.52	678.7	1197.54	680.2	1197.6	681.4	1197.6	682.6	1197.61
683.6	1197.61	684.2	1197.61	689.7	1197.7	690.3	1197.7	693.7	1197.5
695.2	1197.29	695.5	1197.25	697	1197.04	698	1196.88	699.8	1196.55
700.4	1196.45	700.7	1196.41	702.4	1196.19	703.5	1196.05	707.1	1195.92
708.4	1195.91	709	1195.91	710.4	1195.9	713.8	1195.96	714.5	1195.99
717	1196.14	717.2	1196.15	717.3	1196.16	717.8	1196.22	720	1196.51
720.5	1196.58	721.3	1196.61	723.9	1196.76	727.2	1196.7	730.6	1196.79
731	1196.82	733.1	1196.97	733.9	1197.03	734.2	1197.05	737.3	1197.36
738.5	1197.45	739.3	1197.5	740.7	1197.61	744.8	1197.93	747.1	1198.08
747.4	1198.1	750.3	1198.19	750.7	1198.21	751.3	1198.26	753.1	1198.38
754.1	1198.47	764.2	1199.55	767.5	1199.62	768.5	1199.61	770.9	1199.58
772.4	1199.63	774.2	1199.73	777.1	1199.97	777.6	1200	777.9	1200.02
779.2	1200.09	780.6	1200.18	780.9	1200.19	781.4	1200.22	783.4	1200.36
784.3	1200.41	785.7	1200.45	786.1	1200.47	787.7	1200.49	790	1200.4
794.4	1200.31	801.1	1200.3	802.7	1200.24	802.9	1200.23	804.4	1200.17
807.2	1200.04	807.8	1200.02	810.9	1199.94	813.7	1199.96	814.5	1199.97
817.9	1200.12	819.2	1200.29	820.1	1200.38	821.2	1200.52	822	1200.66
824.4	1201.15	824.6	1201.19	824.7	1201.23	827.5	1201.98	828.7	1202.25
831.3	1202.85	838	1204.72	841.3	1205.81	841.4	1205.86	841.6	1205.93
844	1206.86	844.7	1207.15	845.9	1207.61	848.1	1208.52	849.5	1209.03
850.2	1209.25	851.4	1209.7	854.5	1210.73	854.8	1210.85	855	1210.92
856.1	1211.24	857.8	1211.74	858.2	1211.85	858.7	1211.99	861.5	1212.7
863	1213	863.3	1213.04	866.1	1213.67	867.3	1214.07	868.2	1214.31
871.4	1215.21	871.6	1215.25	871.6	1215.26	874.3	1215.79	875.9	1216.09
877.1	1216.26	878.3	1216.45	879.8	1216.82	881.7	1217.29	882.6	1217.55
885	1218.21	885.3	1218.28	890.8	1219.33	893.1	1219.87	893.6	1220.01
895.1	1220.32	896.4	1220.64	897.4	1220.88	898.5	1221.13	899.1	1221.32
901.7	1222.03	901.8	1222.06	904.6	1222.75	905.2	1222.88	906	1223.05
907.4	1223.32	908.5	1223.56	910.1	1223.94	910.3	1223.99	911.9	1224.36
912.9	1224.65	914.6	1225.06	915.6	1225.35	917.5	1225.84	918.6	1226.17
918.9	1226.29	922	1227.47	923.9	1228.11	925.3	1228.6	926.7	1229.01
927.5	1229.27	928.7	1229.63	929.4	1229.82	932	1230.42	932.2	1230.48
935.4	1231.61	936.1	1231.93	938.7	1233.17	940.4	1233.85	942.1	1234.49
943.2	1234.91	944.7	1235.52	945.5	1235.83	948.7	1237.22	948.8	1237.26
949	1237.32	951.5	1238.29	952.2	1238.54	953.3	1238.87	954.2	1239.17
955.5	1239.56	957	1240.03	957.6	1240.24	958.9	1240.7	959.7	1241.01
961.9	1241.82	962.2	1241.96	962.5	1242.07	963.6	1242.52	965.6	1243.3
969	1244.75	970.8	1245.6	972.3	1246.32	973.5	1246.77	974.7	1247.24
975.7	1247.6	976.3	1247.91	979	1249.54	982.4	1252.33	984.5	1253.86
985.7	1254.65	987.3	1255.39	987.6	1255.54	990	1256.6	991.9	1257.29
992.5	1257.5	992.8	1257.61	994.4	1258.1	995.6	1258.47	996.2	1258.62
998.3	1259.07	999.2	1259.25	1000.5	1259.49	1002.5	1259.85	1003.8	1260.05
1006.6	1260.44	1009.2	1260.72	1009.3	1260.72	1009.7	1260.75	1012.1	1260.93
1012.6	1260.97	1013.4	1261.03	1014.8	1261.13	1016	1261.21	1017.6	1261.33
1019.3	1261.45	1020.4	1261.51	1022.7	1261.65	1023.1	1261.66	1025.1	1261.7
1025.9	1261.71	1026	1261.72	1028.6	1261.72	1029.4	1261.72	1030.6	1261.69
1032.7	1261.64	1034.1	1261.55	1034.9	1261.51	1036.1	1261.43	1036.9	1261.39
1039.2	1261.2	1039.6	1261.18	1042.4	1261.02	1042.8	1260.99	1043.5	1260.95

```
  1045.1 1260.85  1046.2 1260.79  1047.1 1260.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0     .06   149.2    .045  225.33     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
         149.2  225.33             .1       .3

CROSS SECTION OUTPUT  Profile #100-yr
************************************************************************************
***********
* E.G. Elev (ft)         * 1197.48  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.65  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1195.83  * Reach Len. (ft)       *          *          *
         *
* Crit W.S. (ft)         * 1194.52  * Flow Area (sq ft)     *   11.23  *  523.60  *
  68.11  *
* E.G. Slope (ft/ft)     *0.007804  * Area (sq ft)          *   11.23  *  523.60  *
  68.11  *
* Q Total (cfs)          * 5630.00  * Flow (cfs)            *   31.58  * 5472.05  *
 126.37  *
* Top Width (ft)         *  222.44  * Top Width (ft)        *    6.75  *   76.13  *
 139.56  *
* Vel Total (ft/s)       *    9.34  * Avg. Vel. (ft/s)      *    2.81  *   10.45  *
   1.86  *
* Max Chl Dpth (ft)      *    7.73  * Hydr. Depth (ft)      *    1.66  *    6.88  *
   0.49  *
* Conv. Total (cfs)      * 63731.3  * Conv. (cfs)           *   357.5  * 61943.3  *
 1430.5  *
* Length Wtd. (ft)       *          * Wetted Per. (ft)      *    7.70  *   77.21  *
 140.23  *
* Min Ch El (ft)         * 1188.10  * Shear (lb/sq ft)      *    0.71  *    3.30  *
   0.24  *
* Alpha                  *    1.22  * Stream Power (lb/ft s) *    2.00  *   34.53  *
   0.44  *
* Frctn Loss (ft)        *          * Cum Volume (acre-ft)  *          *          *
         *
* C & E Loss (ft)        *          * Cum SA (acres)        *          *          *
         *
************************************************************************************
***********

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT  Profile #500-yr
************************************************************************************
```

```
***********
* E.G. Elev (ft)         * 1198.75  * Element               *  Left OB *  Channel *
Right OB *
* Vel Head (ft)          *    1.44  * Wt. n-Val.            *   0.060  *   0.045  *
  0.060  *
* W.S. Elev (ft)         * 1197.30  * Reach Len. (ft)       *          *          *
         *
* Crit W.S. (ft)         * 1197.30  * Flow Area (sq ft)     *   25.10  *  635.85  *
 529.96  *
* E.G. Slope (ft/ft)     *0.006036  * Area (sq ft)          *   25.10  *  635.85  *
 529.96  *
* Q Total (cfs)          * 7920.00  * Flow (cfs)            *   72.58  * 6652.23  *
1195.19  *
* Top Width (ft)         *  523.76  * Top Width (ft)        *   12.48  *   76.13  *
 435.14  *
* Vel Total (ft/s)       *    6.65  * Avg. Vel. (ft/s)      *    2.89  *   10.46  *
   2.26  *
* Max Chl Dpth (ft)      *    9.20  * Hydr. Depth (ft)      *    2.01  *    8.35  *
   1.22  *
* Conv. Total (cfs)      *101940.8  * Conv. (cfs)           *   934.2  * 85622.9  *
15383.7  *
* Length Wtd. (ft)       *          * Wetted Per. (ft)      *   13.62  *   77.21  *
 436.48  *
* Min Ch El (ft)         * 1188.10  * Shear (lb/sq ft)      *    0.69  *    3.10  *
   0.46  *
* Alpha                  *    2.10  * Stream Power (lb/ft s) *    2.01  *   32.47  *
   1.03  *
* Frctn Loss (ft)        *          * Cum Volume (acre-ft)  *          *          *
         *
* C & E Loss (ft)        *          * Cum SA (acres)        *          *          *
         *
*******************************************************************************
***********

Warning: Divided flow computed for this cross-section.
Warning: Slope too steep for slope area to converge during supercritical flow
calculations (normal depth is below critical
         depth). Water surface set to critical depth.

*******************************************************************************

SUMMARY OF MANNING'S N VALUES

River:Coaticook
*****************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *
*****************************************************************
*Reach 1         *    3372        *      .06*     .045*      .06*
*Reach 1         *    3135        *      .06*     .045*      .06*
*Reach 1         *    2993        *      .06*     .045*      .06*
```

*Reach 1	*	2950	*Bridge	*	*	*
*Reach 1	*	2930	*	.06*	.045*	.06*
*Reach 1	*	2779	*	.06*	.045*	.06*
*Reach 1	*	2567	*	.06*	.045*	.06*
*Reach 1	*	2389	*	.06*	.045*	.06*
*Reach 1	*	2238	*	.06*	.045*	.06*
*Reach 1	*	2090	*	.06*	.045*	.06*
*Reach 1	*	2013	*	.06*	.045*	.06*
*Reach 1	*	2000	*Bridge	*	*	*
*Reach 1	*	1926	*	.06*	.045*	.06*
*Reach 1	*	1857	*	.06*	.045*	.06*
*Reach 1	*	1774	*	.06*	.045*	.06*
*Reach 1	*	1632	*	.06*	.045*	.06*
*Reach 1	*	1498	*	.06*	.045*	.06*
*Reach 1	*	1304	*	.06*	.045*	.06*
*Reach 1	*	1060	*	.06*	.045*	.06*
*Reach 1	*	798	*	.06*	.045*	.06*
*Reach 1	*	722	*	.06*	.045*	.06*
*Reach 1	*	611	*	.06*	.045*	.06*
*Reach 1	*	453	*	.06*	.045*	.06*
*Reach 1	*	305	*	.06*	.045*	.06*
*Reach 1	*	177	*	.06*	.045*	.06*
*Reach 1	*	-31	*	.06*	.045*	.06*
*Reach 1	*	-410	*	.06*	.045*	.06*
*Reach 1	*	-732	*	.06*	.045*	.06*
*Reach 1	*	-1058	*	.06*	.045*	.06*

SUMMARY OF REACH LENGTHS

River: Coaticook

Reach	River Sta.	Left	Channel	Right
*Reach 1	* 3372	* 190.5*	237.2*	272.2*
*Reach 1	* 3135	* 14.2*	141.5*	311.4*
*Reach 1	* 2993	* 79.1*	63.1*	64.5*
*Reach 1	* 2950	*Bridge *	*	*
*Reach 1	* 2930	* 227.3*	150.9*	55.5*
*Reach 1	* 2779	* 272.9*	212.2*	132.1*
*Reach 1	* 2567	* 233.4*	178*	107.4*
*Reach 1	* 2389	* 245*	151.3*	52.6*
*Reach 1	* 2238	* 195.2*	148*	72.4*
*Reach 1	* 2090	* 62*	76.9*	111.3*
*Reach 1	* 2013	* 64.4*	86.2*	75.1*
*Reach 1	* 2000	*Bridge *	*	*
*Reach 1	* 1926	* 58.3*	69*	127.4*
*Reach 1	* 1857	* 41.4*	83.7*	149.8*

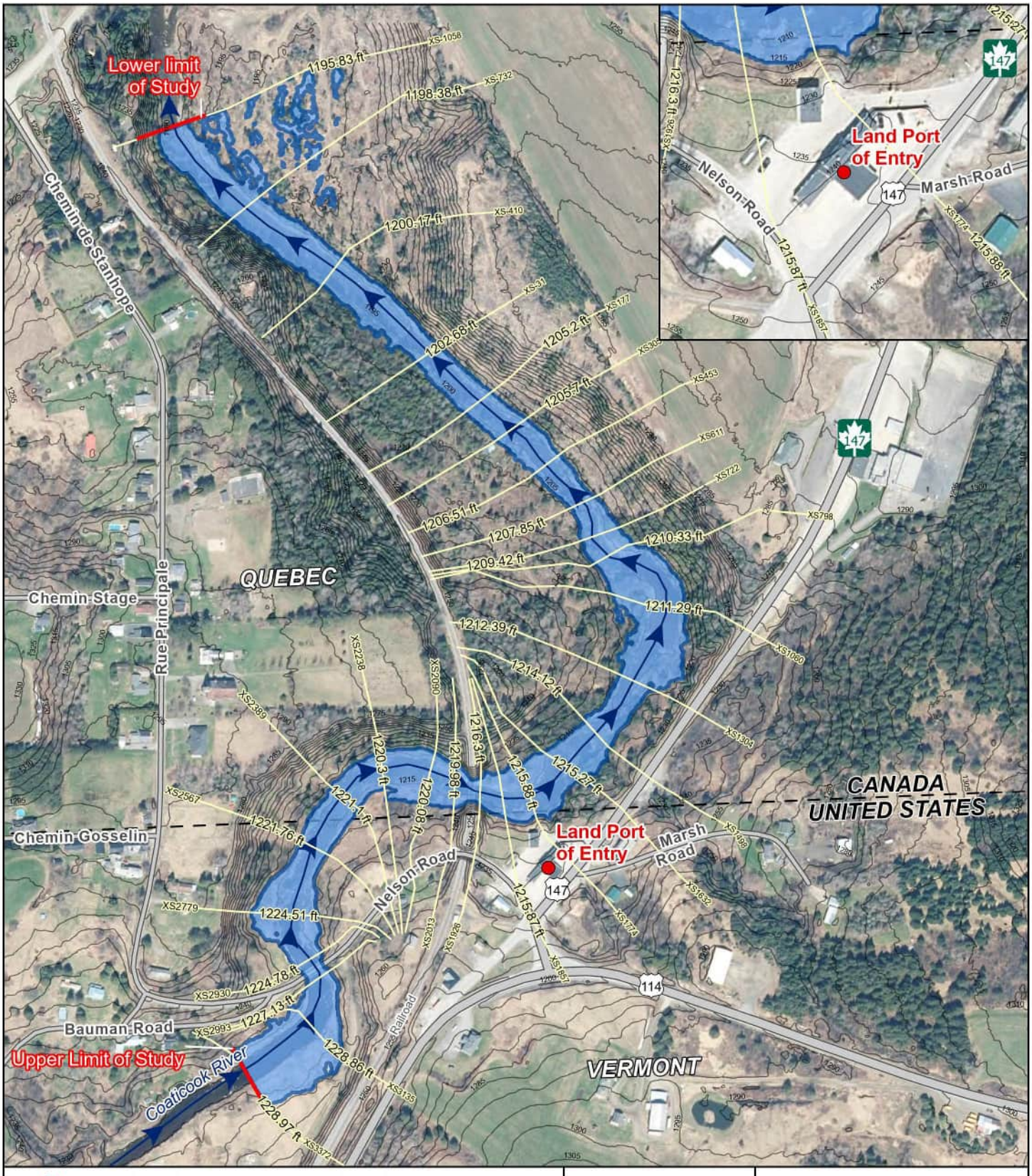
*Reach 1	*	1774	*	72.6*	141.6*	223.1*
*Reach 1	*	1632	*	165.7*	134.5*	124.8*
*Reach 1	*	1498	*	103.9*	193.4*	240.6*
*Reach 1	*	1304	*	190.9*	244.2*	290.1*
*Reach 1	*	1060	*	129.8*	262*	254.2*
*Reach 1	*	798	*	37.6*	76.5*	136.1*
*Reach 1	*	722	*	83.9*	110.7*	130.3*
*Reach 1	*	611	*	124.7*	157.5*	159.1*
*Reach 1	*	453	*	147.9*	148.7*	157.6*
*Reach 1	*	305	*	113.2*	128.1*	151.2*
*Reach 1	*	177	*	208.2*	208.2*	208.2*
*Reach 1	*	-31	*	379.1*	379.1*	379.1*
*Reach 1	*	-410	*	322.3*	322.3*	322.3*
*Reach 1	*	-732	*	326.3*	326.3*	326.3*
*Reach 1	*	-1058	*	*	*	*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Coaticook

Reach	River Sta.		Contr.	Expan.
*Reach 1	*	3372	*	.1*	.3*
*Reach 1	*	3135	*	.3*	.5*
*Reach 1	*	2993	*	.3*	.5*
*Reach 1	*	2950	*Bridge	*	*
*Reach 1	*	2930	*	.3*	.5*
*Reach 1	*	2779	*	.1*	.3*
*Reach 1	*	2567	*	.1*	.3*
*Reach 1	*	2389	*	.1*	.3*
*Reach 1	*	2238	*	.1*	.3*
*Reach 1	*	2090	*	.3*	.5*
*Reach 1	*	2013	*	.3*	.5*
*Reach 1	*	2000	*Bridge	*	*
*Reach 1	*	1926	*	.3*	.5*
*Reach 1	*	1857	*	.1*	.3*
*Reach 1	*	1774	*	.1*	.3*
*Reach 1	*	1632	*	.1*	.3*
*Reach 1	*	1498	*	.1*	.3*
*Reach 1	*	1304	*	.1*	.3*
*Reach 1	*	1060	*	.1*	.3*
*Reach 1	*	798	*	.1*	.3*
*Reach 1	*	722	*	.1*	.3*
*Reach 1	*	611	*	.1*	.3*
*Reach 1	*	453	*	.1*	.3*
*Reach 1	*	305	*	.1*	.3*
*Reach 1	*	177	*	.1*	.3*

```
*Reach 1         *    -31     *       .1*       .3*
*Reach 1         *    -410    *       .1*       .3*
*Reach 1         *    -732    *       .1*       .3*
*Reach 1         *    -1058   *       .1*       .3*
**************************************************
```

APPENDIX D INUNDATION MAPS



Norton Land Port of Entry
Limits of Study
Cross Sections
Coaticook River
5 Foot Contour
Roads
Highway
United States / Canada Border
100-Year Flood Inundation

Figure D-1
100-Year Inundation Map
GSA LPOE Norton
Essex County, VT
August 30, 2024

0 250 500 Feet

N

Notes : Data Sources: ESRI Aerial Imagery, Date Exported: 8/30/2024 2:48 PM, Vertical Datum: NAD1983

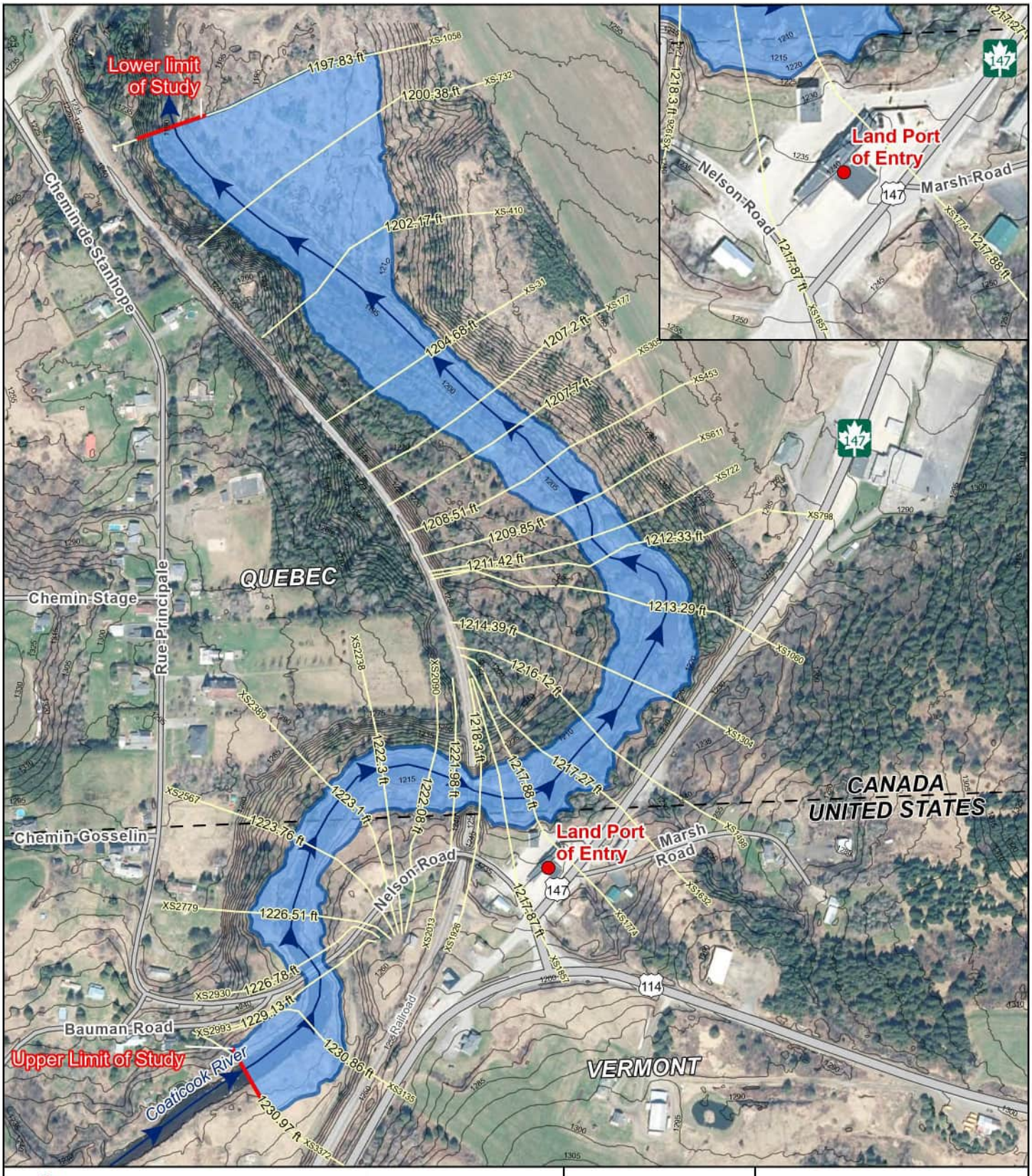
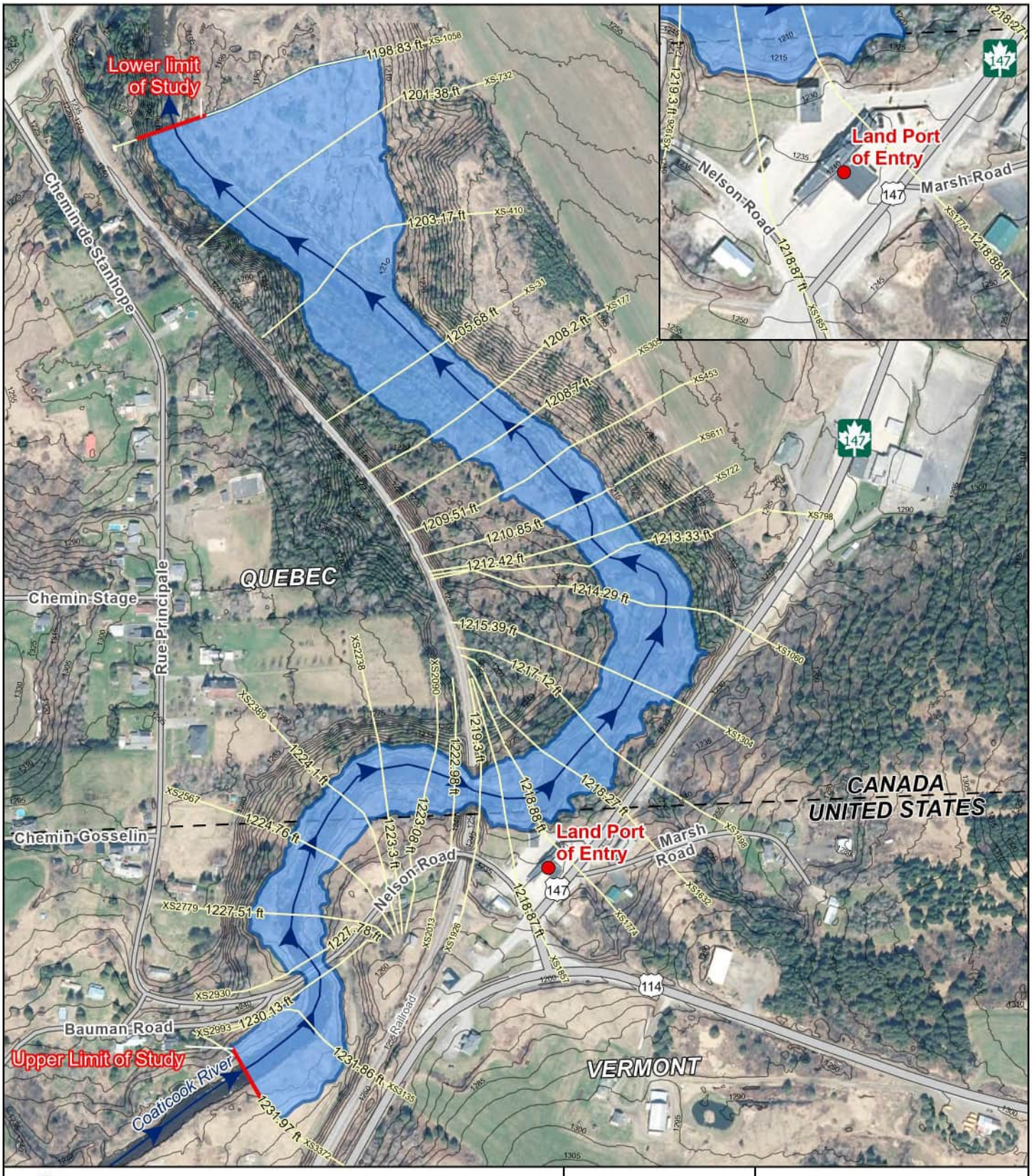
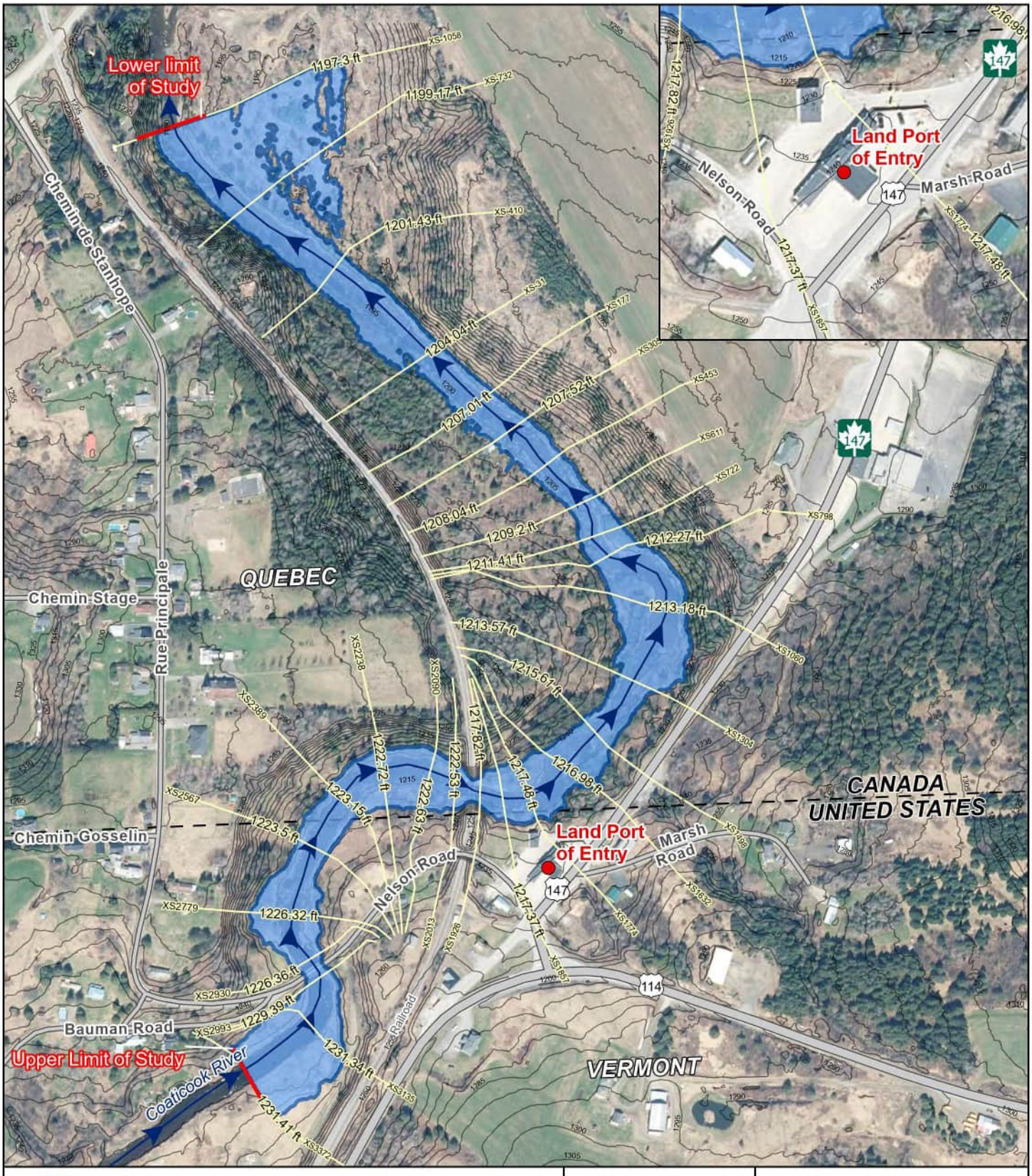


Figure D-2
100-Year + 2-Feet Inundation Map
GSA LPOE Norton
Essex County, VT
August 30, 2024

Notes : Data Sources: ESRI Aerial Imagery, Date Exported: 8/30/2024 2:49 PM, Vertical Datum: NAD1983


Lower limit of Study
1198.83 ft
XS-1058
1201.38 ft
XS-732
1203.17 ft
XS-410
1205.68 ft
XS-31
1208.2 ft
XS-177
1208.7 ft
XS388
XS453
XS611
XS722
XS798
1209.51 ft
1210.85 ft
1212.42 ft
1213.33 ft
1214.29 ft
1215.39 ft
1217.12 ft
XS1060
XS1304
XS1409
XS1632
XS1774
XS1857
1218.27 ft
1218.88 ft
1219.3 ft
1222.98 ft
1223.08 ft
1223.3 ft
1224.1 ft
1224.76 ft
1227.51 ft
1227.78 ft
XS2779
XS2930
1230.13 ft
XS2993
1231.86 ft
XS3135
1231.97 ft
XS3372
XS2238
XS2090
XS2389
XS2567
XS2013
XS1928
Land Port of Entry
Nelson Road
Marsh Road
Marsh-Road
Chemin de Stanhope
Rue Principale
Chemin Stage
Chemin Gosselin
Bauman Road
Upper Limit of Study
Coaticook River
Railroad
QUEBEC
CANADA
UNITED STATES
VERMONT
147
114
Norton Land Port of Entry
Limits of Study
Cross Sections
Coaticook River
5 Foot Contour
Roads
Highway
United States / Canada Border
100-Year + 3-Feet Flood Inundation
VT
NY
NH
Figure D-3
100-Year + 3-Feet Inundation Map
GSA LPOE Norton
Essex County, VT
August 30, 2024
0
250
500
Feet
N
Notes : Data Sources: ESRI Aerial Imagery, Date Exported: 8/30/2024 2:49 PM, Vertical Datum: NAD1983



Norton Land Port of Entry
Limits of Study
Cross Sections
Coaticook River
5 Foot Contour
Roads
Highway
United States / Canada Border
500-Year Flood Inundation

NY VT NH

Figure D-4
500-Year Inundation Map
GSA LPOE Norton
Essex County, VT
August 30, 2024

0 250 500 Feet

N

Notes : Data Sources: ESRI Aerial Imagery, Date Exported: 8/30/2024 2:46 PM, Vertical Datum: NAD1983