FUSS & O'NEILL

M E M O R A N D U M

TO: Wood-Pawcatuck Watershed Project Steering Committee

FROM: Erik Mas, P.E.

DATE: May 26, 2015

RE: Technical Assessment Methods and Geographic Priorities
Wood-Pawcatuck Watershed Flood Resiliency Management Plan

This memorandum outlines the proposed methods and geographic priorities for the following technical field assessments that will be conducted as part of the Wood-Pawcatuck Watershed Flood Resiliency Management Plan project:

- Fluvial Geomorphic and Flood Hazard Assessment
- Bridge, Culvert, and Dam Assessment
- Natural Resource Assessment
- Green Infrastructure Assessment.

Each of these assessments involves an initial desktop evaluation to identify and prioritize geographic areas of the Wood-Pawcatuck watershed where subsequent field assessments will be performed. During the field work, we will evaluate current conditions and opportunities for restoration and protection projects that will enhance flood resiliency. This memorandum summarizes the desktop and field assessment methods and data sources, including the proposed geographic priorities for the fluvial geomorphic and bridge, culvert, and dam field assessments. Specific locations for the natural resource and green infrastructure assessment field work will be determined based upon the respective desktop evaluations and informed by the findings of the other ongoing field assessments.

The assessment methods and proposed geographic priorities presented in this memorandum are intended for review by the Project Steering Committee. The geographic priorities may be refined with input from the steering committee members based on local knowledge of site-specific conditions and other factors.

1. Fluvial Geomorphic and Flood Hazard Assessment

Data acquisition through direct measurements and field data collection for the fluvial geomorphic and flood hazard assessment will be collected using the Phase 1, Phase 2, and Bridge and Culvert field forms (Attachment 1) and will follow procedures described in Vermont's Stream Geomorphic Assessment Protocols handbook. The protocol procedures will be used to identify geomorphically stable (reference) and unstable (in-adjustment) stream reaches. The determination of geomorphic condition is made through analysis of historic aerial photos, survey data, topographic maps and ortho-photos for assessment of lateral adjustment, watershed land use / land cover, river corridor land uses, instream management activities, floodplain modifications, in-field qualitative assessment of stability indicators and

cursory quantitative assessment of morphology. Topographic survey, substrate, and riparian vegetation data will be used to describe and verify the geomorphic condition of each reach assessed in the Wood-Pawcatuck Watershed. At each bridge and culvert encountered in the assessed reaches the Bridge and Culvert assessment field form will be completed to determine the potential impact the stream crossing structure has had on channel morphology and to identify potential hazards that exist to the roadway as the result of channel constriction, bank erosion, bed incision, or overtopping.

Standard map and field survey work will be conducted to measure the parameters that define watershed and stream geomorphology for purposes of classification and assessment of channel condition, adjustment, and sensitivity. The work will be conducted by Field Geology Services staff and compiled into an Excel database file for each reach assessed. A comprehensive list of the parameters and methods of assessment and survey are described in detail in Vermont's Stream Geomorphic Assessment Protocol handbook (see Web citation 1). Given the differences in relief and tidal influences between Vermont streams and the coastal Wood-Pawcatuck Watershed, some parameters for which data will be collected may need to be adjusted to be consistent with conditions observed in the assessed reaches.

A more detailed explanation of the data collection techniques to be used and the reasoning for collecting such data is described below:

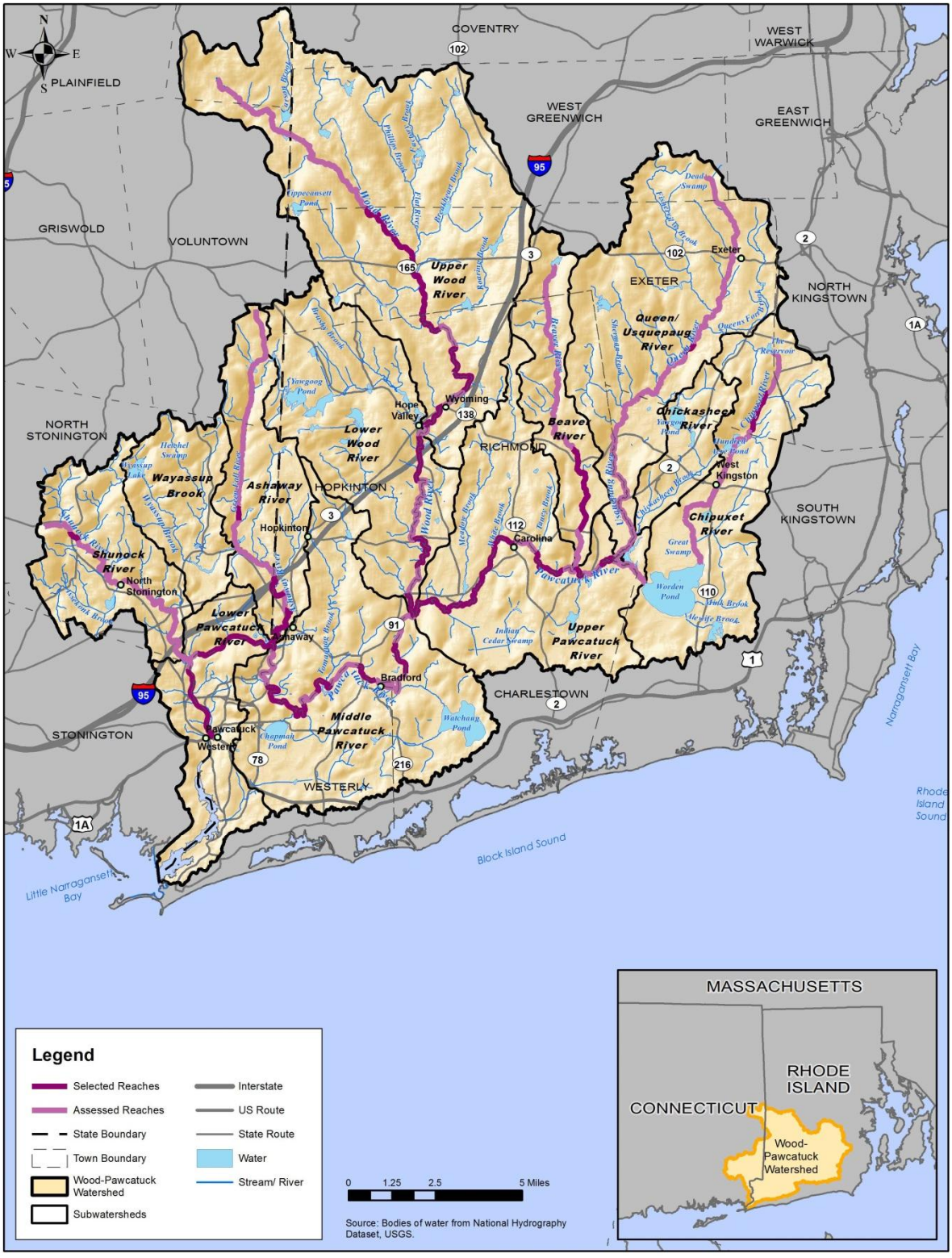
Phase 1 Assessment (Map and aerial photo interpretation) – Field Geology Services will review and incorporate current and historic topographic and aerial photo data into the decision-making process and incorporate this analysis into an ArcView GIS database. Aerial photographs will include both historical and the newest available versions available. Approximate dates for historical photographs should be from the 1940s or 1950s and possibly the 1960s; however, this will depend on availability of material. Photographs should have acceptable resolution, scale, and temporal relationships with known large floods or significant land use/land cover changes. The channel position for the length of the assessed reaches will be traced, if feasible, and direct human interferences on stream channel position and sinuosity noted. Land use/land cover will be visually inspected on each of the photograph sets and an estimation made of the percentage of land within the watershed falling into each of the six land use/land cover classes employed by the United States Geological Survey (USGS) (Web citation 2): urban or built-up land; agricultural land; forest land; water; wetland; and barren land. The estimated land use/land cover in each class for each photo year will be input into an Excel spreadsheet.

Phase 1 Assessment (Reach delineation) – Since different portions of a river can respond differently to the same natural and human influences, one of the first assessment tasks will be to subdivide the Wood-Pawcatuck River into distinct reaches of varying length. Within a given reach, the river is likely to respond similarly to changing watershed conditions, while adjacent reaches may respond differently. Reaches that share similar traits are referred to as "like-reaches" and an understanding of channel response or effective restoration techniques gained in one reach may apply to other "like-reaches". The break points between different reaches for the Wood-Pawcatuck river geomorphic assessment will be delineated at: a) large tributary confluences (or sites of major stormwater inputs, b) grade controls (e.g.,

ledge across the channel, culverts), c) abrupt changes in channel slope or valley confinement, and d) significant human impacts (e.g., dams). The procedures used for delineating reaches for the assessment follow those detailed in the Vermont Geomorphic Assessment Protocol handbook.

An initial review of topographic maps as part of the Phase 1 assessment has been completed to subdivide the Wood and Pawcatuck Rivers into discrete geomorphic reaches of uneven length. Some of the watershed's major tributaries were similarly subdivided, including the Shunock River, Ashaway-Green Fall River, Beaver River, Usquepaug-Queen River, and Chipuxet River. The breaks between reaches are placed at valley constrictions and expansions, major tributary confluences, where channel slope changes rapidly, and at grade controls (including dams). Twenty-nine reaches were identified on the 29.4 miles of the Pawcatuck River and 27 reaches delineated on the 25.5 miles of the Wood River (attached Table 1). On the tributaries, 13 reaches were identified on the Shunock River, 18 on the Ashaway-Green Fall River, 12 on the Beaver River, 24 on the Usquepaug-Queen River, and 10 on the Chipuxet River. The reach break delineation is the initial step of the Phase 1 assessment and was completed on a large part of the watershed to assist in the prioritization of reaches to be assessed in greater detail; the remainder of the Phase 1 assessment and all of the Phase 2 assessment will be completed for only those reaches within the 38 river miles chosen to be assessed in greater detail, as defined in the project scope.

To prioritize 38 miles of river to assess among the 111 river miles for which reaches were delineated on the Pawcatuck River, Wood River, and other tributaries, several considerations were made. First, all impounded reaches upstream of dams were removed from the list (to the upstream extent of the obviously ponded areas observed on aerial photographs). Impounded reaches are not dominated by normal riverine processes so are not typically assessed when using the Vermont Geomorphic Assessment protocols. Second, priority was given to those reaches that contained sites that have been identified as areas of problematic flood inundation or erosion in the FEMA Flood Insurance Studies or hazard mitigation plans of the watershed municipalities. Third, reaches upstream of valley constrictions were given a higher priority for assessment as such areas are typically more prone to flood inundation and rapid channel migration due to flow impoundment during high discharges. Fourth, priority was also given to those reaches that contained stream crossings or other infrastructure near the river's edge. Consequently, reaches in more rural areas of the watershed (e.g., WOR-19 to WOR-27) were eliminated from consideration. Finally, the assessment results are most valuable when several contiguous reaches are assessed together. As such, those reaches remaining on the Wood and Pawcatuck Rivers (after considering the four items above) were given preference over other tributaries to prevent breaking up the overall assessment into small piecemeal sections spread out over several tributaries. Through this process, a total of 41 reaches extending over 38.7 miles were prioritized for assessment. Of these reaches, 19 are on the Pawcatuck River, 12 on the Wood River, and 10 on other tributaries (see the reaches shaded in dark red on the following figure and the shaded cells in attached Table 1). A Phase 1 and Phase 2 assessment will be undertaken on these 41 reaches unless project stakeholders consider other reaches a higher priority for assessment due to known flooding, erosion, or habitat concerns not captured in this initial prioritization process.



Stream Reaches Proposed for Detailed Geomorphic Assessment (dark red shading)

Phase 2 Assessment (Mapping of channel features) – Several channel features will be mapped continuously along the reaches selected for assessment in the Wood-Pawcatuck Watershed. The mapping will: 1) identify locations of channel instability and sensitivity; 2) characterize physical habitat conditions; and 3) document the impacts of past human activities on channel morphology and evolution (e.g., channel straightening, culverts). The features to be mapped include: 1) bank height (to determine areas of confinement and assess the potential for mass failures along the river); 2) bank stability (e.g., eroding areas); 3) bank composition (e.g., alluvial floodplain sediments, impoundment sediments, bedrock); 4) grade controls (e.g., culverts, waterfalls); 5) past management activities (e.g., artificial fill in floodplain, channel straightening); 6) bar types (e.g., point bars, mid-channel bars); 7) channel reach morphology (e.g., pool-riffle, step-pool); 8) habitat features (e.g., woody material, log jams, deep pools); and 9) substrate size/embeddedness (visual estimate of percentage of boulders, cobbles, fines). The mapping will be completed using a hand-held Yuma Tablet computer with embedded GPS and loaded with ArcPad and the most recent digital orthophotos as a base map. The location of beginning and end points of mapped features (e.g., an eroding bank) will be recorded, so GIS shapefiles of the mapped features can be created and analyzed to reveal changes in the various stream features along the length of the assessed reaches. Existing publicly available data layers such as soils, surficial geology, topography, and roads will also be included in the GIS database to aid in determining the relative level of stability throughout the watershed. The creation of GIS shapefiles will be completed in a process similar to that described for the Feature Indexing Tool in Vermont's Geomorphic Assessment Protocol handbook.

Phase 2 Assessment (Topographic surveying) – Topographic surveying of at least one representative cross section will be undertaken in each assessed reach. Additional cross sections will be surveyed in reaches where the morphology of the channel varies within the reach due to human impacts. Survey will occur at two locations (one disturbed reach and one reference reach). The surveyed cross sections will extend across the entire channel. Where possible, the surveys will encompass a portion of the floodplain or higher surface on both banks until an elevation twice the bankfull depth is reached in order to calculate the entrenchment ratio (Rosgen, 1996). The surveys will also include the position and elevation of slope changes on the banks, bars, and within the channel so as to accurately characterize channel morphology. Data from the surveys will be used to establish bankfull parameters (i.e., area, width, depth). A comparison of surveys from disturbed and reference reaches will provide information on how human impacts have altered channel dimensions, morphology, and physical habitat. A Sokkia Set 5 Electronic Total Station will be used to complete the surveying.

Phase 2 Assessment (Substrate particle size analysis) – A substrate particle size analysis will be completed at each of the surveying locations; data will be recorded using a form provided in the Phase 2 Assessment handbook. The particle size analysis will establish the D50 and other relevant particle size classes useful for determining bed armoring, the embeddedness of the channel substrate (i.e., percentage of fines covering the channel bottom), and other important habitat and geomorphic features. The substrate particle size analysis will be completed using the "pebble count" method described by Wolman (1954).

2. Bridge, Culvert, and Dam Assessment

Bridges and Culverts - An assessment will be performed of the bridges and culverts in the watershed, including an assessment of their flood conveyance capacity, flood risk potential, and aquatic connectivity.

Bridge and culvert locations in the watershed will be initially identified by intersecting roads, rail lines, and developed bike/hiking trails with streams, augmented by other existing data including structures previously evaluated as part of the Rhode Island Stream Continuity Project. Additional locations of bridges and culverts will be added by visually reviewing aerial imagery of the watershed. It is anticipated that there will be approximately 550 bridges/culverts in the final database. Assessments of the structures will be initially prioritized by stream order (i.e. structures of major rivers and streams will be prioritized over structures on smaller tributaries) and by downstream land use/structures/population density (i.e., structures upstream or downstream of areas where potential flooding could cause the most significant impact to human lives or key infrastructure.) In order to maximize efficiency, structures near each other will be inspected in the same day; therefore if there are low priority structures adjacent to high priority structures, they will be assessed during the same day. Structures near dams that are being inspected will be inspected at the time of the dam inspection.

It is the project team's goal to assess all of the approximately 550 structures (see list of structures in Table 2 attached). Depending on the time requirements to complete the assessments, assessment of all structures may not be possible given the fixed project budget. Inspections will be prioritized by stream order. Structures on higher order streams (high-priority structures) will be assessed first and structures on lower order tributaries (low priority structures) will be assessed after completion of the inspection of the high-priority structures. Some low-priority structures (i.e., those that are expected to pose low flood risk) may be excluded from the assessment as necessary. The locations of all bridges and culverts within each subwatershed are shown on the attached Figures 1-12.

The location and condition of the identified structures will be assessed through field inspection. During the assessment process, field observations and other data collection will include:

- Site characteristics (e.g. aerial sketch, photos, GPS location, street name, road configuration, etc.)
- Classification information (CTDOT/RIDOT designation, location, purpose, etc.)
- Deficiencies and condition of the structure
- Dimensions and slope of the structure to assess approximate hydraulic capacity
- Upstream and downstream geomorphic conditions (approximate channel slope/configuration, perched culvert discharge, sedimentation, evidence of erosion/scour/overtopping, bankfull width, etc.)

Field measurements will be made using standard topographic surveying techniques, a laser rangefinder, or similar equipment. The field assessment will follow procedures described in Vermont's Stream Geomorphic Assessment Protocols handbook and will use the bridge and culvert field forms included in Attachment 1.

The maximum flow conveyance capacity of a given culvert will be estimated based on field measurements and using standard FHWA and RIDOT/CTDOT culvert analysis methods. Haested Methods CulvertMaster will be used to calculate maximum flow conveyance or required cross sectional areas. Peak discharges will be estimated using USGS StreamStats regional regression equations for RI and CT (or NRCS rainfall-runoff methods or other standard hydrologic analysis techniques for areas where regional regression analysis is not valid). USGS-derived flood magnification factors developed for Rhode Island (Zariello et al., 2012) will be used to estimate anticipated future peak discharge due to the combined effects of climate change and urbanization.

The maximum flow conveyance capacity (or actual cross sectional area) of the culvert will be compared to the estimated peak discharge (or minimum required cross sectional area required to safely pass the estimated peak flow) to evaluate the adequacy of the culvert. If a structure has less than the calculated required capacity based on peak flows, flooding may occur and therefore the pipe size is considered undersized. The required size will be estimated primarily based on hydrologic capacity. Other site-specific design factors may be considered on a case-by-case basis (e.g., ponding to headwater depth ratios greater than 1, fish passage, geomorphic compatibility with the stream reach, or natural stream channel bottom).

Culvert capacity information and identification of undersized culverts will be added to the database. Under-sized culverts will be prioritized based on consideration of factors such as potential for upstream or downstream damage, the importance to the community's transportation system of the road that a culvert crosses, and the degree to which a culvert is vulnerable to becoming undersized.

Dams - Dams in the watershed will be assessed for potential removal, repair or modification to reduce flood risk due to dam failure, potential re-purposing to increase flood storage, and to enhance fish passage and aquatic habitat. The approximately 150 dams in the watershed will be initially prioritized based on hazard classification, potential for downstream flood damage (in terms of risk to both humans, infrastructure, and the environment) and current condition (if available) as assigned by RIDEM and CTDEEP. Approximately 70 of the highest priority dams will be assessed through visual inspection to collect information on deficiencies and physical characteristics of the dam, current uses of the impoundment, environmental features observed at the site, and the characteristics of upstream and downstream areas as observed from the dam and review of aerial imagery and USGS mapping. It is anticipated that all of the dams classified as high, significant and moderate hazard dams will be assessed and that the remaining dams to be assessed will be those located on major (higher order) streams/rivers and those located upstream of high population density areas or key infrastructure and environmental features (i.e., those that would have the highest potential to cause flood damage if damaged or

breached). Dam locations will be reviewed on aerial imagery to determine a final recommended list of 70 dams for inspection. Some dams that Fuss & O'Neill, Inc. has already inspected or worked on (regardless of their hazard classification) will not be included in the list of 70 dams to inspect due to existing access to the information and knowledge about potential recommendations for those dams. The locations of all dams within each subwatershed are shown on the attached Figures 1-12. The 70 dams to be inspected are shown as large shapes coded by dam hazard classification. The other dams in the watershed, which will not be inspected, are shown on the maps as small green circles. Table 3 lists all of the dams in the watershed, including those proposed to be inspected.

The assessments will be conducted following standard dam safety procedures to gather pertinent information documenting each dam and its appurtenances. Assessments will be performed following customized protocols developed by the Massachusetts Office of Dam Safety through its Phase 1 Formal Dam Safety Inspection Checklist. A modified version of this checklist is provided in Attachment 2. The following information will be gathered for each dam:

- Classification information (current size, classification, condition, name, location, purpose, etc.)
- Deficiencies and condition of each part of the structure (embankment, dikes, upstream face, downstream face, appurtenances, walls, concrete structures, masonry structures, spillways, etc.)
- General published hydrologic information (drainage area, impoundment area, discharge capacity, etc.).

3. Natural Resource Assessment

Watershed riparian and wetland habitats will be assessed to identify and prioritize wetland restoration, enhancement, and creation opportunities that will enhance flood mitigation and associated water quality and habitat functions. The assessment will consist of the following tasks:

Desktop Evaluation – A desktop evaluation of selected riparian corridors and wetland habitats within the watershed will include, but not be limited to, review of:

- Data collected during previous phases of the watershed assessment
- Information from the baseline watershed assessment
- Habitat evaluations completed during the fluvial geomorphic assessment
- Review of available state GIS layers (i.e., threatened and endangered species areas, critical habitat areas, inland wetland soils, flood mapping)
- Review of related and available Town mapping
- Federal Emergency Management Agency Flood Hazard Information
- U.S. Department of Agriculture Natural Resource and Conservation Service site-specific soil mapping
- U.S. Fish and Wildlife Service National Wetlands Inventory mapping.

Wetland and riparian habitats that provide flood protection will be identified and prioritized based on methods described in: (1) *Development of a Statewide Freshwater Wetland Restoration Strategy, Site Identification and Prioritization Methods* (Miller and Golet, 2001), which was developed by the University of Rhode Island for RIDEM and USEPA and subsequently applied in the Woonasquatucket River watershed, and (2) the New Hampshire Department of Environmental Services (NHDES) Wetland Restoration Assessment Model (WRAM) Flood Protection, similar to the prioritization model used for the Merrimack River Watershed Wetland Restoration Strategy completed in March 2009 by Vanasse Hangen Brustlin, Inc.

The desktop evaluation will help to identify and prioritize wetland areas that provide flood protection. Wetlands will be assessed for potential preservation, enhancement/mitigation, and creation. These areas will also be assessed for additional qualities such as wildlife habitat and water quality. Depending on the findings of previous phases of the assessment and readily available mapping, additional factors may be considered in the identification and prioritization process. Additional desktop evaluation assessment is anticipated following the field evaluation.

Field Evaluation – Wetland and riparian areas identified during the desktop evaluation will be evaluated in the field to further assess and prioritize the wetlands based upon existing conditions. Approximately 15 locations will be identified for field evaluation.

An evaluation of existing field conditions will be conducted at each of the selected riparian corridor and wetland habitats. Each location will be evaluated using a modified version of *The Highway Methodology Workbook Supplement* produced by the U.S. Army Corps of Engineers. Field data sheets provided in Attachment 3 will be completed for each location. Evaluations conducted at each location will consist of:

- Confirmation of hydrology identified during the desktop evaluation
- Confirmation of dominant NRCS soil type identified during the desktop evaluation
- A description of dominant wetland vegetation
- Confirmation of the existing wetland system identified during the desktop evaluation
- Confirmation of the dominant NWI Wetland class identified during the desktop evaluation
- Completion of a wetland functions and values assessment, including consideration of:
    - Groundwater recharged & discharge
    - Floodflow alteration
    - Finfish habitat
    - Sediment, pollutant & nutrient removal
    - Production export
    - Wildlife habitat
    - Educational, scientific & recreational value
    - Uniqueness & heritage.

In addition to evaluation of wetland habitat, the selected areas will be assessed for their ability to provide flood protection, proximity of additional flood retention, and potential/need for preservation and/or mitigation.

4. Green Infrastructure Assessment

A green infrastructure assessment of the Wood-Pawcatuck watershed will be performed to identify potential sites for green infrastructure retrofits that will reduce stormwater volumes that contribute to flooding, recharge groundwater, and reduce pollutant loads to surface waters. The assessment will begin with a desktop screening analysis using existing geospatial information and GIS mapping, focusing on sites on publicly-owned land and along public rights-of-way. The screening analysis will be based upon EPA-recommended methods (EPA, 2014) and will consider the following data for the identification of potential green infrastructure retrofit sites:

- Geospatial data from RIGIS, CTDEEP Environmental GIS Data Set, the University of Connecticut Map and Geographic Information Center (MAGIC), the UConn Center for Land Use Education and Research (CLEAR)
    - Parcel ownership
    - Parcel size and contributing drainage area
    - Soils, infiltration capacity and depth to groundwater
    - Slope
    - Proximity to targeted subwatersheds
    - Surface water quality impairments
    - Proximity to environmentally sensitive or protected areas
    - Impervious area (site and drainage area)
    - Percent impervious
    - Proximity to storm drainage networks
    - Proximity to parks and schools
- Known stormwater/MS4 capacity issues

Field inventories will then be performed within priority areas identified by the screening level review to verify the feasibility of candidate sites. Information to be collected during the field inventories includes verification of site land uses and activities, areas of impervious surfaces, drainage patterns and approximate drainage areas, the presence of utilities, areas of potential green infrastructure stormwater retrofits, and site constraints such as evidence of shallow groundwater or bedrock that could limit the feasibility of infiltration-based green infrastructure practices. Field data on potential green infrastructure retrofit sites will be collected using inventory forms developed by the Center for Watershed Protection (Attachment 4).

5. References

Miller and Golet, 2001, *Development of a Statewide Freshwater Wetland Restoration Strategy, Site Identification and Prioritization Methods,* Final Research Report Prepared for RI Department of Environmental Management Office of Water Resources and U.S. Environmental Protection Agency Region 1, Department of Natural Resources Science, University of Rhode Island, Kingston, RI.

Rosgen, D.L., 1996, *Applied River Morphology* (Second Edition), Wildland Hydrology, Pagosa Springs, Colorado.

U.S. Army Corps of Engineers, New England District, 1999, *The Highway Methodology Workbook Supplement: Wetland Functions and Values, A Descriptive Approach,* NAEEP-360-1-30, September 1999.

U.S. Environmental Protection Agency, 2014, *Coastal Stormwater Management through Green Infrastructure: A Handbook for Municipalities,* EPA 842-R-14-004, December 2014.

Vanasse Hangen Brustlin, Inc., 2009, Merrimack River Watershed Wetland Restoration Strategy, Prepared for New Hampshire Department of Environmental Services, March 2009.

Wolman, M.G. 1954. A method of sampling coarse river-bed material: Transactions of the American Geophysical Union, 35:951-956.

Zarriello, P.J., Ahearn, E.A., and Levin, S.B., 2012, Magnitude of flood flows for selected annual exceedance probabilities in Rhode Island through 2010 (ver. 1.2, revised March 2013): U.S. Geological Survey Scientific Investigations Report 2012–5109, 81 p.
http://pubs.usgs.gov/sir/2012/5109)

Web Citation 1: Vermont Stream Geomorphic Assessment Protocol Handbook
http://www.watershedmanagement.vt.gov/rivers/htm/rv_geoassesspro.htm

Web Citation 2: A Land Use and Land Cover Classification System for Use With Remote Sensor Data, USGS, 1976
http://landcover.usgs.gov/pdf/anderson.pdf

Web Citation 3: Massachusetts Office of Dam Safety Phase 1 Formal Dam Safety Inspection Checklist
http://www.mass.gov/eea/docs/dcr/pe/dam-safety/inspectionchecklist.xls

FUSS & O'NEILL

Tables

Stream Reaches Proposed for Detailed Geomorphic Assessment
List of Bridges and Culverts to be Assessed
List of Dams to be Inspected

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
Stonington	Pawcatuck	PAR-1		y	y	0.58	Channel constriction, head of tide?
Stonington	Pawcatuck	PAR-2	y	y	y	0.87	Dam
Stonington	Pawcatuck	PAR-3		y	y	0.84	Canal reenters stream
Westerly/ North Stonington	Pawcatuck	PAR-4	y	n			
Westerly/ North Stonington	Pawcatuck	PAR-5		y		0.64	DS trib input, was impoundment
Hopkinton/ North Stonington/ Westerly	Pawcatuck	PAR-6		y	y	1.93	DS tributary, floodplain and valley constriction
Hopkinton/ North Stonington/ Westerly	Pawcatuck	PAR-7		y		0.19	DS trib, HUC12 boundary
Hopkinton/ North Stonington/ Westerly	Pawcatuck	PAR-8	y	n	y		
Hopkinton/ Westerly	Pawcatuck	PAR-9		y	y	2.73	Major valley constriction
Hopkinton/ Westerly	Pawcatuck	PAR-10		n			
Hopkinton/ Westerly	Pawcatuck	PAR-11		y		0.92	Major Valley constriction
Hopkinton/ Westerly	Pawcatuck	PAR-12		n			
Hopkinton/ Westerly	Pawcatuck	PAR-13		y	y	0.77	Dam at reach break
Hopkinton/ Westerly	Pawcatuck	PAR-14		n			
Charlestown/ Hopkinton	Pawcatuck	PAR-15		y	y	1.06	Valley opens up significantly DS
Charlestown/ Hopkinton	Pawcatuck	PAR-16	y	n			
Charlestown/ Richmond	Pawcatuck	PAR-17		y	y	2.24	Trib input DS
Charlestown/ Richmond	Pawcatuck	PAR-18		y	y	1.41	Trib input and valley widens
Charlestown/ Richmond	Pawcatuck	PAR-19		y	y	0.71	Valley constriction at break
Charlestown/ Richmond	Pawcatuck	PAR-20		y		0.40	US completely confined, DS partially confined
Charlestown/ Richmond	Pawcatuck	PAR-21		y	y	0.67	Trib input DS, HUC12 boundary
Charlestown/	Pawcatuck	PAR-22	y	n	y		

FUSS & O'NEILL

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
Richmond							
Charlestown/ Richmond	Pawcatuck	PAR-23		y	y	0.85	DS tributary input, DS impoundment?
Charlestown/ Richmond	Pawcatuck	PAR-24		y	y	0.46	At grade control and valley constriction DS; valley wider
Charlestown/ Richmond	Pawcatuck	PAR-25	y	n	y		
Charlestown/ Richmond	Pawcatuck	PAR-26		y	y	0.37	DS trib influence; lidar shows negative slope?
Charlestown/ Richmond	Pawcatuck	PAR-27	y	n	y		
Charlestown/ Richmond	Pawcatuck	PAR-28		y	y	0.77	DS reach is straightened, valley more constricted
Charlestown/ Richmond	Pawcatuck	PAR-29		n			
Charlestown/ Richmond/ Hopkinton	Wood	WOR-1		y	y	0.74	Junction with mainstem downstream
Hopkinton/ Richmond	Wood	WOR-2	y	n	y		
Hopkinton/ Richmond	Wood	WOR-3		y	y	1.70	Beginning of impoundment
Hopkinton/ Richmond	Wood	WOR-4	y	n	y		
Hopkinton/ Richmond	Wood	WOR-5		n			
Hopkinton/ Richmond	Wood	WOR-6		y	y	0.98	Valley wider with greater sinuosity DS
Hopkinton/ Richmond	Wood	WOR-7		y	y	0.47	Straightened DS
Hopkinton/ Richmond	Wood	WOR-8	y	n			
Hopkinton/ Richmond	Wood	WOR-9		y	y	0.94	Beginning of pond backwater
Hopkinton/ Richmond	Wood	WOR-10	y	n	y		
Hopkinton/ Richmond	Wood	WOR-11		y		1.03	DS a pond begins
Hopkinton/ Richmond	Wood	WOR-12		y	y	0.93	Valley constriction DS
Hopkinton/ Richmond	Wood	WOR-13	y	n	y		
Exeter/ Hopkinton/ Richmond	Wood	WOR-14		y		1.30	Tributary comes in DS
Exeter	Wood	WOR-15		y		0.73	Valley widens DS
Exeter	Wood	WOR-16		y	y	1.05	Tributary at reach break
Exeter	Wood	WOR-17		y	y	1.04	Tributary DS
Exeter	Wood	WOR-18		y	y	1.39	Valley confinement DS

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
West Greenwich/ Exeter	Wood	WOR-19		n	y		
West Greenwich	Wood	WOR-20		n			
West Greenwich	Wood	WOR-21		n	y		
West Greenwich	Wood	WOR-22		n			
West Greenwich	Wood	WOR-23		n	y		
West Greenwich/ Voluntown	Wood	WOR-24	y	n	y		
Voluntown/ Sterling	Wood	WOR-25		n	y		
Sterling	Wood	WOR-26	y	n			
Sterling	Wood	WOR-27		n	y		
Richmond	Beaver	BER-1		n	y		
Richmond	Beaver	BER-10		n	y		
Richmond/ Exeter	Beaver	BER-11	y	n			
Exeter	Beaver	BER-12		n			
Richmond	Beaver	BER-2		y	y	1.52	Valley more constricted here
Richmond	Beaver	BER-3		y	y	0.91	Valley constriction at old bridge
Richmond	Beaver	BER-4		y	y	0.46	Valley and channel constriction
Richmond	Beaver	BER-5		n			
Richmond	Beaver	BER-6		n	y		
Richmond	Beaver	BER-7		n	y		
Richmond	Beaver	BER-8		n	y		
Richmond	Beaver	BER-9		n			
South Kingstown	Chipuxet	CHIP-1		n			
Exeter/ North Kingstown	Chipuxet	CHIP-10		n	y		
South Kingstown	Chipuxet	CHIP-2		n			
South Kingstown	Chipuxet	CHIP-3		n			
South Kingstown	Chipuxet	CHIP-4		n			
South Kingstown	Chipuxet	CHIP-5	y	n			
South Kingstown	Chipuxet	CHIP-6		n	y		
Exeter/ South Kingstown	Chipuxet	CHIP-7	y	n			
Exeter	Chipuxet	CHIP-8		y		1.27	Pond at backwater
Exeter/ North	Chipuxet	CHIP-9		n			

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
Kingstown							
North Stonington/ Hopkinton/ Westerly	Green Fall Ashaway	GAS-1		y		0.82	DS end of stream
North Stonington	Green Fall Ashaway	GAS-10		n			
North Stonington	Green Fall Ashaway	GAS-11	y	n			
North Stonington/ Voluntown	Green Fall Ashaway	GAS-12		n			
Voluntown	Green Fall Ashaway	GAS-13		n			
Voluntown	Green Fall Ashaway	GAS-14		n			
Voluntown	Green Fall Ashaway	GAS-15		n			
Voluntown	Green Fall Ashaway	GAS-16	y	n			
Voluntown	Green Fall Ashaway	GAS-17		n			
Voluntown	Green Fall Ashaway	GAS-18		n			
Hopkinton	Green Fall Ashaway	GAS-2	y	y		0.80	At mill canal bypass and trib input, small dam, DS valley wider
Hopkinton / North Stonington	Green Fall Ashaway	GAS-3	y	n			
Hopkinton/ North Stonington	Green Fall Ashaway	GAS-4		y		0.93	Beginning of impoundment, US of valley constriction
Hopkinton/ North Stonington	Green Fall Ashaway	GAS-5		n			
North Stonington	Green Fall Ashaway	GAS-6		n			
North Stonington	Green Fall Ashaway	GAS-7		n			
North Stonington	Green Fall Ashaway	GAS-8		y		0.43	Trib input, DS reach becoming more constricted
	Green Fall Ashaway	GAS-9		n			
Charlestown/ South Kingstown/ Richmond	Queen Usquepaug	QUS-1		n	y		
Exeter	Queen Usquepaug	QUS-10		n			
Exeter	Queen Usquepaug	QUS-11		y	y	0.41	Valley constricts for section
Exeter	Queen Usquepaug	QUS-12		n			
Exeter	Queen Usquepaug	QUS-13		n			
Exeter	Queen Usquepaug	QUS-14		n			
Exeter	Queen Usquepaug	QUS-15		n	y		
Exeter	Queen Usquepaug	QUS-16	y	n			
Exeter	Queen Usquepaug	QUS-17		n			
Exeter	Queen Usquepaug	QUS-18	y	n			

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
Exeter	Queen Usquepaug	QUS-19		n	y		
South Kingstown/ Richmond	Queen Usquepaug	QUS-2		n	y		
Exeter	Queen Usquepaug	QUS-20		n			
Exeter	Queen Usquepaug	QUS-21	y	n			
Exeter	Queen Usquepaug	QUS-22		n			
Exeter	Queen Usquepaug	QUS-23		n			
Exeter/ East Greenwich	Queen Usquepaug	QUS-24		n			
South Kingstown/ Richmond	Queen Usquepaug	QUS-3		n	y		
South Kingstown/ Richmond	Queen Usquepaug	QUS-4		n			
South Kingstown/ Richmond	Queen Usquepaug	QUS-5		n	y		
South Kingstown	Queen Usquepaug	QUS-6	y	n	y		
South Kingstown	Queen Usquepaug	QUS-7		n			
South Kingstown/ Exeter	Queen Usquepaug	QUS-8		n			
Exeter	Queen Usquepaug	QUS-9		n			
North Stonington	Shunock	SHUN-1		n			
North Stonington	Shunock	SHUN-10		y		0.38	Trib input
North Stonington	Shunock	SHUN-11	y	n			
North Stonington	Shunock	SHUN-12		n			
North Stonington	Shunock	SHUN-13		n			
North Stonington North Stonington	Shunock	SHUN-2		n			
North Stonington	Shunock	SHUN-3		n			
North Stonington	Shunock	SHUN-4	y	n			
North Stonington	Shunock	SHUN-5		n			
North Stonington	Shunock	SHUN-6	y	n			

Table 1. Geomorphic Reach Characteristics and Prioritization

Town	River/Stream	Reach Number	Impoundment?	To Be Assessed?	Stream Crossing?	Channel Length (mi)	Notes
North Stonington	Shunock	SHUN-7		n			
North Stonington	Shunock	SHUN-8	y	n			
North Stonington	Shunock	SHUN-9		n			
				Total Miles to be Assessed:		38.66	

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
AWR-ASH-0-1	Hopkinton	Ashaway River	Laurel St	124019.36	248059.3	692
AWR-ASH-0-2	Hopkinton	Ashaway River	High St	124542.99	248662.9	699
AWR-ASH-0-3	Hopkinton	Ashaway River	I 95 S	131187.49	246953.7	721
AWR-ASH-0-4	Hopkinton	Ashaway River	Providence-New London Tpke	131277.76	246856.6	719
AWR-ASH-1-1	North Stonington	Ashaway River	Post Office Ln	124631.49	246417.9	477
AWR-ASH-1-2	North Stonington	Ashaway River	Anthony Rd	125372.87	244851.4	396
AWR-ASH-2-1	Hopkinton	Ashaway River	Main St	127252.13	250077.3	2240
AWR-GLA-0-1	North Stonington	Ashaway River	E Clarks Falls Rd	136586.94	243677.7	64
AWR-GLA-0-2	North Stonington	Ashaway River	Pine Woods Rd	140361.76	243632	148
AWR-GLA-0-3	North Stonington	Ashaway River	Pine Woods Rd	142138.55	245031.6	601
AWR-GLA-0-4	Hopkinton	Ashaway River	Gun Club Path	150603.17	249258.6	2723
AWR-GLA-1-1	North Stonington	Ashaway River	Near Denison Hill Rd	151715.43	246159.9	377
AWR-GRE-0-1	North Stonington	Ashaway River	State Hwy 216	135494.12	242105.4	62
AWR-GRE-0-10	Voluntown	Ashaway River	Green Fall Pond Rd	164505.03	244264.3	589
AWR-GRE-0-11	Voluntown	Ashaway River		164626.13	244555.1	124
AWR-GRE-0-12	Voluntown	Ashaway River	Green Fall Pond Rd	167624.19	245333.8	125
AWR-GRE-0-13	Voluntown	Ashaway River	Pachaug Trail	171672.35	244108.6	5470
AWR-GRE-0-2	North Stonington	Ashaway River	Clarks Falls Rd	136005.11	241314	150
AWR-GRE-0-3	North Stonington	Ashaway River	Denison Hill Rd	140990.25	241464.5	527
AWR-GRE-0-4	North Stonington	Ashaway River	Puttker Rd	141899.76	241391.6	347
AWR-GRE-0-5	North Stonington	Ashaway River		150350.04	241986.2	364
AWR-GRE-0-6	Voluntown	Ashaway River	Sand Hill Rd	160346.28	243480.1	129
AWR-GRE-0-7	Voluntown	Ashaway River		162218.12	243313.6	588
AWR-GRE-0-8	Voluntown	Ashaway River	Green Falls Loop Trail	162307.21	243277.6	5501
AWR-GRE-0-9	Voluntown	Ashaway River		164234.84	244150.7	587
AWR-GRE-10-1-1	Voluntown	Ashaway River	Green Fall Pond Rd	164776.36	242956.8	126
AWR-GRE-10-1-2	Voluntown	Ashaway River	Nehantic Trail	165183.46	242404.2	5538
AWR-GRE-10-1-3	Voluntown	Ashaway River		165938.55	241862.4	516
AWR-GRE-10-2-1	Voluntown	Ashaway River	Green Fall Pond Rd	165330.66	243160.4	127
AWR-GRE-10-2-2	Voluntown	Ashaway River	Pachaug Forest Trail	165509.75	243064	5522
AWR-GRE-10-2-3	Voluntown	Ashaway River	Green Fall Pond Rd	165628.54	243045.8	360
AWR-GRE-10-2-4	Voluntown	Ashaway River	Green Fall Pond Rd	165689.15	243010.5	361
AWR-GRE-10-2-5	Voluntown	Ashaway River	Pachaug/nehantic Connector	169015.9	241804	5474
AWR-GRE-1-1	North Stonington	Ashaway River	Clarks Falls Rd	135406.38	245926.4	535
AWR-GRE-1-2	North Stonington	Ashaway River	E Clarks Falls Rd	136588.27	245204.5	63
AWR-GRE-3-1	North Stonington	Ashaway River	State Hwy 216	135033.74	242259.5	65
AWR-GRE-3-2	North Stonington	Ashaway River	Boom Bridge Rd	132453.47	240994	70
AWR-GRE-4-1	North Stonington	Ashaway River	Denison Hill Rd	136937.78	241701.8	387
AWR-GRE-5-1	North Stonington	Ashaway River	Denison Hill Rd	140164.06	241923.8	389
AWR-GRE-5-2	North Stonington	Ashaway River	Pine Woods Rd	140415.46	242213.9	144
AWR-GRE-6-1	North Stonington	Ashaway River	Loin Hill Rd	143230.04	239799.7	27

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
AWR-GRE-7-1	North Stonington	Ashaway River	Denison Hill Rd	146512.58	242979.2	390
AWR-GRE-8-1-1	Voluntown	Ashaway River	Narragansett Trail	157250.42	240335.7	5502
AWR-GRE-8-2-1	Voluntown	Ashaway River	Tom Wheeler Rd	156485.17	239497.8	576
AWR-GRE-8-2-2	Voluntown	Ashaway River	Sand Hill Rd	159332.35	239704.5	128
AWR-PAR-0-1	Hopkinton	Ashaway River	Providence-New London Tpke	132801.13	248536.9	720
AWR-PAR-0-2	Hopkinton	Ashaway River	Clark Falls Rd	137963.8	250601.6	2263
AWR-PEG-0-1	Voluntown	Ashaway River	Sand Hill Rd	160853.06	244662	449
AWR-WIN-0-1	Hopkinton	Ashaway River	Clark Falls Rd	139076.1	248139	715
BVR-BEA-0-1	Richmond	Beaver River	SHANNOCK HILL RD	138730.37	293038.5	4037
BVR-BEA-0-2	Richmond	Beaver River	Beaver River School House Rd	144418	294202.9	3310
BVR-BEA-0-3	Richmond	Beaver River	Kingstown Rd	149110.43	293013.9	2914
BVR-BEA-0-4	Richmond	Beaver River	Hillsdale Rd	161154.31	289922.3	2967
BVR-BEA-0-5	Richmond	Beaver River	OLD MOUNTAIN TRL	165947.71	289444.3	3470
BVR-BEA-0-6	Richmond	Beaver River	NEW LONDON TPKE	173649.52	288107.6	3398
BVR-BEA-2-1	Richmond	Beaver River	Hillsdale Rd	157296.99	288740.4	2968
BVR-BEA-3-1	Richmond	Beaver River	Hillsdale Rd	159044.61	289282.3	2969
BVR-BEA-3-2	Richmond	Beaver River	OLD MOUNTAIN TRAIL	162946.29	284282.5	3497
BVR-BEA-5-1	Richmond	Beaver River	NEW LONDON TPKE	170467.34	285680.4	2856
BVR-BEA-6-1	Richmond	Beaver River	NEW LONDON TPKE	173288.77	287795.9	3253
BVR-BEA-6-2	Richmond	Beaver River	Dawley Park Rd	173710.65	285872.7	3391
CKR-CHK-0-1	South Kingstown	Chickasheen River	Amtrak Shore Line	138373.5	301955.3	5242
CKR-CHK-0-2	South Kingstown	Chickasheen River	Amtrak Shore Line	138604.44	302244.5	5241
CKR-CHK-0-3	South Kingstown	Chickasheen River	Liberty Ln	144687.7	307964.2	4510
CKR-CHK-0-4	South Kingstown	Chickasheen River	Kingstown Rd	146885.72	310363	4463
CKR-CHK-0-5	South Kingstown	Chickasheen River	WAITES CORNER RD	148148.97	312105.3	4560
CKR-CHK-1-1	South Kingstown	Chickasheen River	Liberty Ln	144394.7	304129.3	3416
CKR-CHK-1-2	South Kingstown	Chickasheen River	S COUNTY TRL	145547.18	303770.7	3272
CKR-CHK-2-1-1	South Kingstown	Chickasheen River	Kingstown Rd	148983.28	308199.2	4342
CKR-CHK-2-1-2	South Kingstown	Chickasheen River	S COUNTY TRL	149717.3	308568.4	4434
CKR-CHK-2-2-1	South Kingstown	Chickasheen River	S COUNTY TRL	148567.93	307245.1	2988
CKR-CHK-3-1	South Kingstown	Chickasheen River	S COUNTY TRL	151283.79	310373.5	4536

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
CKR-CHK-3-1-1	Exeter	Chickasheen River	SOUTH COUNTY TRL	156360.03	312582.1	4435
CKR-CHK-3-2	South Kingstown	Chickasheen River	Barbard Pond Rd	151350.59	310335.6	4445
CKR-CHK-3-3	Exeter	Chickasheen River	SOUTH COUNTY TRL	160407.34	313501.3	4387
CPR-ALE-0-1	South Kingstown	Chipuxet River	WORDENS POND RD	126046.58	309332.1	4243
CPR-ALE-0-2	South Kingstown	Chipuxet River		125117.17	309646.8	9012
CPR-ALE-0-3	South Kingstown	Chipuxet River	MINISTERIAL RD	124184.95	311122.9	4207
CPR-CHP-0-1	South Kingstown	Chipuxet River	South County Bike Path	142737.9	312885.1	5084
CPR-CHP-0-2	South Kingstown	Chipuxet River	Kingstown Rd	145486.27	314094.4	4534
CPR-CHP-0-3	South Kingstown	Chipuxet River	Amtrak Shore Line	149706.42	315961.3	5238
CPR-CHP-0-4	Exeter	Chipuxet River	WOLF ROCKS RD	153994.53	319478.7	4455
CPR-CHP-0-5	Exeter	Chipuxet River	Yawgoo Valley Rd	158329.7	321132.7	4509
CPR-CHP-0-6	Exeter	Chipuxet River	DORSET MILL RD	159302.04	321504.7	4548
CPR-CHP-0-7	Exeter	Chipuxet River	Bridge Rd	160749.47	322591.7	4554
CPR-CHP-0-8	North Kingstown	Chipuxet River	LIBERTY RD	162862.11	323315.9	4721
CPR-CHP-2-1	South Kingstown	Chipuxet River	Amtrak Shore Line	152869.06	319524.5	5237
CPR-CHP-2-1-1	South Kingstown	Chipuxet River	PLAINS RD	152872.64	320013	4469
CPR-CHP-2-1-2	Exeter	Chipuxet River	STONY FORT RD	152902.85	321093.3	4513
CPR-CHP-2-1-3	Exeter	Chipuxet River	TUPELO DR	153273.29	321703.7	4558
CPR-CHP-2-2	South Kingstown	Chipuxet River	PLAINS RD	152477.28	320036.1	4470
CPR-CHP-2-2-1	Exeter	Chipuxet River	STONY FORT RD	153054.86	320446.7	4514
CPR-CHP-3-1	Exeter	Chipuxet River	Amtrak Shore Line	154987.15	320517.4	5235
CPR-CHP-5-1	Exeter	Chipuxet River	Amtrak Shore Line	159005.2	322043.5	5236
CPR-CHP-5-1-1	Exeter	Chipuxet River	SLOCUM RD	158600.21	324271.5	4327
CPR-CHP-5-1-2-1	Exeter	Chipuxet River	SLOCUM RD	155643.23	325164.2	4298
CPR-CHP-5-2	Exeter	Chipuxet River	SLOCUM RD	159220.09	324035.8	4328
CPR-CHP-5-2-1	North Kingstown	Chipuxet River	SYLVAN CT	161136.34	327312.2	4490
CPR-CHP-5-2-2	North Kingstown	Chipuxet River	GLEN HILL DR	159723.52	326717.3	4364
CPR-CHP-5-3-1	North Kingstown	Chipuxet River	EXPLORER DR	161179.42	327635.3	4823
CPR-CHP-6-1	Exeter	Chipuxet River	LIBERTY RD	162873.93	319523.9	4676
CPR-CHP-7-1	Exeter	Chipuxet River	SOUTH COUNTY TRL	167655.15	318361.7	4742
CPR-CHP-7-2	Exeter	Chipuxet River	Rockville Rd	165688.93	316507.5	9018
CPR-CHP-7-3	Exeter	Chipuxet River	LIBERTY RD	164165.41	314922.2	4782
CPR-MIN-0-1	South Kingstown	Chipuxet River	MINISTERIAL RD	127543.5	312514.8	4274
CPR-WHB-0-1	South Kingstown	Chipuxet River	MINISTERIAL RD	138350.26	313106.1	4160
CPR-WHB-0-2	South Kingstown	Chipuxet River	South County Bike Path	139819.6	314674.9	5083
CPR-WHB-2-1	South Kingstown	Chipuxet River	Pine Woods Rd	144378.89	317531.8	9014
CPR-WHB-2-2	South Kingstown	Chipuxet River	Kingstown Rd	145317.25	318098.3	4385
CPR-WHB-2-3	South Kingstown	Chipuxet River	Pine Woods Rd	145585.49	318347.7	9013
CPR-WHB-2-4	South Kingstown	Chipuxet River	FRATERNITY CIR	145922.86	318551.3	4333

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
CPR-WHB-2-5	South Kingstown	Chipuxet River	Pine Woods Rd	146193.13	318625.5	9015
CPR-WHB-2-6	South Kingstown	Chipuxet River	Pine Woods Rd	146679.24	318738.4	9016
CPR-WHB-2-7	South Kingstown	Chipuxet River	Pine Woods Rd	147095.91	318807.8	9017
CPR-WHB-2-8	South Kingstown	Chipuxet River	Alumin Ave	147672.18	318856	4462
CPR-WHB-2-9	South Kingstown	Chipuxet River	FLAGG RD	148620.58	319098.2	4603
CPR-WHB-3-1	South Kingstown	Chipuxet River	SPRINGDALE RD	142679.22	318407.7	4481
LPR-MAS-0-1	Westerly	Lower Pawcatuck River	WATCH HILL RD	94885.17	239472	731
LPR-MAS-1-1	Westerly	Lower Pawcatuck River	Airport Rd	98075.19	242726.3	954
LPR-PAW-0-1	Stonington	Lower Pawcatuck River	State Hwy 2	107454.75	237129	9
LPR-PAW-0-2	Stonington	Lower Pawcatuck River	Amtrak Shore Line	108213.62	237016.7	5309
LPR-PAW-0-3	Stonington	Lower Pawcatuck River	Stillman Ave	110185.94	236706.7	557
LPR-PAW-0-4	Stonington	Lower Pawcatuck River	Westerly Byp	113397.46	234509.8	4
LPR-PAW-0-5	Stonington	Lower Pawcatuck River	White Rock Rd	114657.99	234239.9	486
LPR-PAW-0-6	North Stonington	Lower Pawcatuck River	Boom Bridge Rd	121927.91	239369.8	69
LPR-PAW-0-7	North Stonington	Lower Pawcatuck River		121346.07	245994	478
LPR-PAW-11-1	North Stonington	Lower Pawcatuck River	Pendleton Hill Rd	120270.09	234001.6	9004
LPR-PAW-11-2	North Stonington	Lower Pawcatuck River	Ella Wheeler Rd	122200.65	234612.7	9005
LPR-PAW-12-1	North Stonington	Lower Pawcatuck River	Boom Bridge Rd	122984.79	239817.9	66
LPR-PAW-12-1-1	North Stonington	Lower Pawcatuck River	Boom Bridge Rd	126422.59	241967.8	68
LPR-PAW-12-1-2	North Stonington	Lower Pawcatuck River	I- 95	126734.28	242116.5	385
LPR-PAW-12-1-3	North Stonington	Lower Pawcatuck River	I- 95	128311.85	243390	146
LPR-PAW-12-2-1	North Stonington	Lower Pawcatuck River	I- 95	124965.85	238265.4	384
LPR-PAW-12-2-1-1	North Stonington	Lower Pawcatuck River	Cranberry Bog Rd	126777.11	238541.7	55
LPR-PAW-12-2-2	North Stonington	Lower Pawcatuck River	I- 95	125118.76	238129.5	145
LPR-PAW-13-1	North Stonington	Lower Pawcatuck River	Anthony Rd	124617.32	243656.6	395
LPR-PAW-2-1	Stonington	Lower Pawcatuck River	Washington St	107830.57	235324.5	416

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
LPR-PAW-2-2	Stonington	Lower Pawcatuck River	Morgan St	108024.45	234992.6	251
LPR-PAW-4-1-1	Westerly	Lower Pawcatuck River	HIGH ST	114855.3	239954.5	1469
LPR-PAW-4-2-1	Westerly	Lower Pawcatuck River	Canal St	112047.42	236432.2	1407
LPR-PAW-5-1	Stonington	Lower Pawcatuck River	W Arch St	109903.94	234275	91
LPR-PAW-6-1	Stonington	Lower Pawcatuck River	State Hwy 78	112751.36	233464.8	262
LPR-PAW-6-2	Stonington	Lower Pawcatuck River	State Hwy 2	112772.06	233365.1	10
LPR-PAW-7-1	Westerly	Lower Pawcatuck River	WHITE ROCK RD	114160.98	235027.1	1520
LPR-PAW-7-1-1	Westerly	Lower Pawcatuck River	SPRINGBROOK RD	116211.89	236489.3	1972
LPR-PAW-7-2	Westerly	Lower Pawcatuck River	Boom Bridge Rd	115909.98	239521	1906
LPR-PAW-7-2-1	Westerly	Lower Pawcatuck River	SPRINGBROOK RD	116517.4	237292.3	1971
LPR-PAW-8-1	Stonington	Lower Pawcatuck River	Liberty St	113958.42	233360.1	244
LPR-PAW-8-2	Stonington	Lower Pawcatuck River	Timberridge Rd	114492.65	232441.1	9003
LPR-PAW-8-3	Stonington	Lower Pawcatuck River	Somersett Dr	114610.64	231723	319
LPR-PAW-8-4	Stonington	Lower Pawcatuck River	Canterbury Ln	114386.41	231030.8	318
LPR-PAW-8-5	Stonington	Lower Pawcatuck River	Fairview Dr	114235.46	230559.3	320
LPR-PAW-8-6	Stonington	Lower Pawcatuck River	Elmridge Rd	114453.01	230125.8	551
LPR-PAW-9-1	Stonington	Lower Pawcatuck River	Voluntown Rd	118632.15	233493.7	333
LWR-BRU-0-1	Hopkinton	Lower Wood River	NOOSENECK HILL RD	154702.56	268914.7	3246
LWR-BRU-0-2	Hopkinton	Lower Wood River	SAWMILL RD	162381.82	263396.6	2530
LWR-BRU-0-3	Hopkinton	Lower Wood River	DYE HILL RD	163671.01	261362.4	2788
LWR-BRU-0-4	Hopkinton	Lower Wood River	WOODY HILL RD	164442.99	260176.7	2603
LWR-BRU-2-1	Hopkinton	Lower Wood River	HARRINGTONS CROSSING	157122.43	267445.2	2577
LWR-BRU-2-2	Hopkinton	Lower Wood River	SPRING ST	156679.15	267031.9	2776
LWR-BRU-3-1	Hopkinton	Lower Wood	Green Fall Rd	161259.91	266291.6	9023

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		River				
LWR-BRU-3-2	Hopkinton	Lower Wood River	DYE HILL RD	163002.54	265812	2685
LWR-BRU-5-1	Hopkinton	Lower Wood River	PLEASANT VIEW DR	162109.44	264132.1	2647
LWR-BRU-5-2	Hopkinton	Lower Wood River	DYE HILL RD	162914.86	264349.6	2686
LWR-BRU-5-3	Hopkinton	Lower Wood River	STONE BRIDGE WAY	163297.57	263959.8	2787
LWR-BRU-6-1	Hopkinton	Lower Wood River	DYE HILL RD	163257.03	262651.7	2791
LWR-CAN-0-1	Hopkinton	Lower Wood River	WICASTA FARM RD	141941.76	265359.6	2173
LWR-CAN-0-2	Hopkinton	Lower Wood River	WOODVILLE ALTON RD	143740.85	265227.7	2699
LWR-CAN-0-3	Hopkinton	Lower Wood River	PALMER CIR	143935.56	263802.3	2713
LWR-CAN-0-4	Hopkinton	Lower Wood River	I 95 S	144824.85	261288.9	2790
LWR-CAN-0-5	Hopkinton	Lower Wood River	NOOSENECK HILL RD	145551.51	260571.8	2520
LWR-CAN-0-6	Hopkinton	Lower Wood River	LAWTON FOSTER RD N	146243.29	257500.7	2663
LWR-CAN-1-1	Hopkinton	Lower Wood River	PALMER CIR	144979.78	265013.4	2719
LWR-CAN-2-1	Hopkinton	Lower Wood River	NOOSENECK HILL RD	144395.33	259469.4	2653
LWR-CAN-3-2-1	Hopkinton	Lower Wood River	MARSHALL DRIFTWAY	150070.37	259704.1	2789
LWR-CAN-3-2-1-1	Hopkinton	Lower Wood River	CANONCHET RD	151747.9	259279.1	2612
LWR-CAN-3-2-1-2	Hopkinton	Lower Wood River	CANONCHET RD	154280.35	255542.4	2613
LWR-CAN-3-3-1	Hopkinton	Lower Wood River	CANONCHET RD	149859.71	259216.3	2660
LWR-DIA-0-1	Richmond	Lower Wood River	SWITCH RD	144762.67	270980.6	3297
LWR-DIA-0-2	Richmond	Lower Wood River	SHIPPEE TRL	145519.97	272249.2	2888
LWR-DIA-0-3	Richmond	Lower Wood River	KENYON MILL TRL	147467.39	272622.7	3365
LWR-M0S-0-5	Hopkinton	Lower Wood River	WINCHECK POND RD	159363.54	256590.5	2666
LWR-M0S-0-6	Hopkinton	Lower Wood River	WINCHECK POND EXT	159362.08	256478.1	2715
LWR-M0S-3-1	Hopkinton	Lower Wood River	GRASSY POND RD	166761.01	253969.5	2598

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
LWR-M0S-4-1	Voluntown	Lower Wood River	Green Fall Rd	161351.73	247429.5	518
LWR-M0S-4-1-1	Hopkinton	Lower Wood River	Camp Yawgoog Rd	161336.04	249050.7	2661
LWR-M0S-4-2	Voluntown	Lower Wood River	Green Fall Rd	164497.55	247470.2	284
LWR-MOS-0-1	Hopkinton	Lower Wood River	SAWMILL RD	161822.79	263373.1	2531
LWR-MOS-0-10	Hopkinton	Lower Wood River	VOLUNTOWN RD	166707.82	253020.1	2767
LWR-MOS-0-2	Hopkinton	Lower Wood River	WOODY HILL RD	160539.88	261878.9	2671
LWR-MOS-0-3	Hopkinton	Lower Wood River	DYE HILL RD	160502.68	259306.5	2762
LWR-MOS-0-4	Hopkinton	Lower Wood River	MAIN ST	159671.12	257295.5	2590
LWR-MOS-0-7	Hopkinton	Lower Wood River	Camp Yawgoog Rd	160367.64	255217.3	2755
LWR-MOS-0-8	Hopkinton	Lower Wood River	VOLUNTOWN RD	160962.45	255355.9	2763
LWR-MOS-0-9	Hopkinton	Lower Wood River	GRASSY POND RD	166520.4	253593.3	2597
LWR-MOS-2-1	Hopkinton	Lower Wood River	MAIN ST	159663.33	257722	2591
LWR-WOR-0-1	Hopkinton	Lower Wood River	Alton Bradford Rd	129215.37	267152.9	2088
LWR-WOR-0-2	Richmond	Lower Wood River	WOODVILLE RD	137371.81	268147.3	2157
LWR-WOR-0-3	Richmond	Lower Wood River	SWITCH RD	148737.62	269088.4	3244
LWR-WOR-0-4	Hopkinton	Lower Wood River	I 95 N	150110.69	268897.5	2861
LWR-WOR-0-5	Hopkinton	Lower Wood River	OLD SWITCH RD	152909.29	268840.5	2822
LWR-WOR-1-1	Hopkinton	Lower Wood River	Alton Bradford Rd	129203.34	266877.2	2190
LWR-WOR-1-2	Hopkinton	Lower Wood River	WOODVILLE ALTON RD	129378.68	266698.4	2079
LWR-WOR-1-2-1	Hopkinton	Lower Wood River	Providence-New London Tpke	132107.8	264777.3	2023
LWR-WOR-1-3-1	Hopkinton	Lower Wood River	Providence-New London Tpke	132789.23	265905.7	9022
LWR-WOR-2-1	Richmond	Lower Wood River	CHURCH ST	129233.15	267510.7	2143
LWR-WOR-4-1	Hopkinton	Lower Wood River	CROTHERS PL	136341.13	268306.4	2166
LWR-WOR-4-2	Hopkinton	Lower Wood	WOODVILLE ALTON	136862.81	266308.1	2167

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		River	RD			
LWR-WOR-4-3	Hopkinton	Lower Wood River	WOODVILLE RD	137029.42	265998.7	2110
LWR-WOR-5-1	Hopkinton	Lower Wood River	WOODVILLE RD	137225.53	268124.6	2156
LWR-WOR-6-1	Hopkinton	Lower Wood River	Wood River Junction Branch	138697.03	267430.4	5266
LWR-WOR-6-1-1	Hopkinton	Lower Wood River	WOODVILLE ALTON RD	138115.9	266100.8	2171
LWR-WOR-8-1	Hopkinton	Lower Wood River	GRANVILLE EXT	148287.07	268484.7	2677
LWR-WOR-8-2	Hopkinton	Lower Wood River	I 95 S	148843.83	267398.3	2561
LWR-WOR-9-1	Hopkinton	Lower Wood River	MECHANIC ST	150705.14	268718.7	3307
LWR-WOR-9-2	Hopkinton	Lower Wood River	NOOSENECK HILL RD	153119.67	267428.8	2626
MPR-ISO-NE	Westerly	Middle Pawcatuck River	MOOREHOUSE RD	103586.19	256094.9	2270
MPR-ISO-NW	Westerly	Middle Pawcatuck River	STATE HWY 78 S	102419.11	244365.1	681
MPR-ISO-SE	Westerly	Middle Pawcatuck River	S WOODY HILL RD	99721.61	257422	1256
MPR-ISO-SW	Westerly	Middle Pawcatuck River	STATE HWY 78 S	100209.02	243745.8	682
MPR-MCG-0-1	Westerly	Middle Pawcatuck River	Amtrak Shore Line	110204.77	252301.3	5275
MPR-MCG-0-2	Westerly	Middle Pawcatuck River	WESTERLY-BRADFORD RD	108458.54	252470.4	2416
MPR-MCG-1-1	Westerly	Middle Pawcatuck River	WESTERLY-BRADFORD RD	108032.85	255130.5	2343
MPR-MCG-1-2	Westerly	Middle Pawcatuck River	Bradford Rd	111013.69	256942.4	2432
MPR-MIL-0-1	Hopkinton	Middle Pawcatuck River	LAUREL ST	120895.07	246947	1765
MPR-MIL-0-2	Hopkinton	Middle Pawcatuck River	MAIN ST	121435.19	248309.3	1995
MPR-MIL-0-3	Hopkinton	Middle Pawcatuck River	Ashaway Rd	123253.2	251260.5	2209
MPR-MIL-1-2	Hopkinton	Middle Pawcatuck River	EGYPT ST	124192.75	251221.2	2186
MPR-PAW-0-10	Westerly	Middle Pawcatuck River	Alton Bradford Rd	118202.84	259958.5	2401
MPR-PAW-0-11	Westerly	Middle Pawcatuck River	Amtrak Shore Line	116330.18	260969.2	5272
MPR-PAW-0-12	Hopkinton	Middle Pawcatuck River	Amtrak Shore Line	119179.54	265703.6	5271

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
MPR-PAW-0-13	Charlestown	Middle Pawcatuck River	Burdickville Rd	121368.05	265274.6	2378
MPR-PAW-0-8	Westerly	Middle Pawcatuck River	POTTER HILL RD	120538.29	246585.3	1419
MPR-PAW-0-9	Westerly	Middle Pawcatuck River	MAIN ST	115307.57	245827.1	1494
MPR-PAW-16-1	Westerly	Middle Pawcatuck River	HISCOX RD	115847.73	245350.6	1378
MPR-PAW-16-1-1	Westerly	Middle Pawcatuck River		116476.31	244199.3	9001
MPR-PAW-16-2	Westerly	Middle Pawcatuck River	FORRESTAL DR	116029.49	244375.2	1873
MPR-PAW-16-3	Westerly	Middle Pawcatuck River	LANGLEY ST	115636.44	243956.9	1880
MPR-PAW-16-4	Westerly	Middle Pawcatuck River	Berry Dr	115854.66	242144.3	1385
MPR-PAW-16-5	Westerly	Middle Pawcatuck River	Berry Dr	116024.83	242031.5	1386
MPR-PAW-16-6	Westerly	Middle Pawcatuck River		116316.97	242008.3	9000
MPR-PAW-17-1	Hopkinton	Middle Pawcatuck River		114318.7	248821	9006
MPR-PAW-17-1-1	Hopkinton	Middle Pawcatuck River	NARRAGANSETT WAY	115359.24	248317.3	2284
MPR-PAW-17-2	Hopkinton	Middle Pawcatuck River	NARRAGANSETT WAY	114844.61	248543.4	2283
MPR-PAW-17-3	Hopkinton	Middle Pawcatuck River	CHASE HILL RD	115095.72	247784.7	1707
MPR-PAW-18-1	Westerly	Middle Pawcatuck River	Amtrak Shore Line	110021.51	248315.3	5277
MPR-PAW-18-1-1	Westerly	Middle Pawcatuck River	WESTERLY-BRADFORD RD	109886.99	247891	1427
MPR-PAW-18-1-2	Westerly	Middle Pawcatuck River	Amtrak Shore Line	110006.04	247811.9	5276
MPR-PAW-18-2	Westerly	Middle Pawcatuck River	WESTERLY-BRADFORD RD	109871.79	248297.6	1428
MPR-PAW-18-3	Westerly	Middle Pawcatuck River	LARRY HIRSCH LN	108510.77	245152.2	1783
MPR-PAW-18-4	Westerly	Middle Pawcatuck River	EXIT 5	108931.09	244693	1921
MPR-PAW-23-1-1	Westerly	Middle Pawcatuck River	CHURCH ST	113521.62	262545.7	2329
MPR-PAW-23-1-2	Westerly	Middle Pawcatuck River	VARS RD	113050.26	262058.8	2452
MPR-PAW-24-1	Westerly	Middle Pawcatuck River	ROSS HILL RD	112170.48	263927	2444
MPR-PAW-26-1-1	Charlestown	Middle	Amtrak Shore Line	122541.66	268581.9	5270

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		Pawcatuck River				
MPR-PAW-26-2-1	Charlestown	Middle Pawcatuck River	Burdickville Rd	122557.93	267625.7	3665
MPR-PER-0-1	Charlestown	Middle Pawcatuck River	KLONDIKE RD	106280.97	268781.2	3699
MPR-PER-0-2	Charlestown	Middle Pawcatuck River	ROSS HILL RD	107524.22	265593.6	2272
MPR-PER-0-3	Westerly	Middle Pawcatuck River	WOODY HILL MAN AREA	107028.91	262678.9	2402
MPR-PER-3-1-1	Charlestown	Middle Pawcatuck River	WOODY HILL MAN AREA	105738.82	265132.4	2404
MPR-POQ-0-1	Charlestown	Middle Pawcatuck River	Buckeye Brook Rd	114029.52	270955.4	3623
MPR-POQ-1-1	Charlestown	Middle Pawcatuck River	UNNAMED_216	118014.12	270192.8	3592
MPR-POQ-1-2	Charlestown	Middle Pawcatuck River	UNNAMED_216	118081.56	270446.8	3593
MPR-POQ-1-3	Charlestown	Middle Pawcatuck River	UNNAMED_207	119020.68	271643.1	3629
MPR-TOM-0-1	Hopkinton	Middle Pawcatuck River	Ashaway Rd	119450.35	255715.7	2274
MPR-TOM-0-2	Hopkinton	Middle Pawcatuck River	DIAMOND HILL RD	122264.55	255823.1	2323
MPR-TOM-0-3	Hopkinton	Middle Pawcatuck River	TOMAQUAG VALLEY RD	125465.95	256662.6	2076
MPR-TOM-0-4	Hopkinton	Middle Pawcatuck River	COLLINS RD	130971.38	255628.3	2078
MPR-TOM-0-5	Hopkinton	Middle Pawcatuck River	I 95 N	136592.13	252931.1	2119
MPR-TOM-0-6	Hopkinton	Middle Pawcatuck River	WOODVILLE RD	137598.98	252483.8	2144
MPR-TOM-0-7	Hopkinton	Middle Pawcatuck River	NOOSENECK HILL RD	138699.35	252414	2117
MPR-TOM-1-1	Hopkinton	Middle Pawcatuck River	Ashaway Rd	119882.15	258119.7	2476
MPR-TOM-1-1-1	Hopkinton	Middle Pawcatuck River	PANCIERA LN	121724.82	260672.2	2410
MPR-TOM-1-2	Hopkinton	Middle Pawcatuck River	TOMAQUAG RD	120018.94	258307.6	2363
MPR-TOM-1-2-1	Hopkinton	Middle Pawcatuck River	PANCIERA LN	123006.1	260418.1	2411
MPR-TOM-1-3	Hopkinton	Middle Pawcatuck River	VUONO PL	120243.09	259246.7	2475
MPR-TOM-3-1	Hopkinton	Middle Pawcatuck River	COLLINS RD	131144.1	256659.9	2077
MPR-TOM-3-1-1	Hopkinton	Middle Pawcatuck River	WOODVILLE RD	137525.68	255614.7	2261

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
MPR-TOM-3-2	Hopkinton	Middle Pawcatuck River	WOODVILLE RD	137645.56	257849	2262
MPR-TOM-3-2-1	Hopkinton	Middle Pawcatuck River	WOODVILLE RD	137476.53	258639.3	2260
MPR-TOM-3-3	Hopkinton	Middle Pawcatuck River	I 95 S	141200.68	257236.2	2239
MPR-TOM-3-4-1	Hopkinton	Middle Pawcatuck River	NOOSENECK HILL RD	142849.79	257579.4	2138
MPR-TOM-3-5-1	Hopkinton	Middle Pawcatuck River	NOOSENECK HILL RD	141851.76	256485.4	2139
MPR-TOM-3-5-2	Hopkinton	Middle Pawcatuck River	LAWTON FOSTER RD N	142957.9	255322.4	2786
MPR-TYD-0-1	Charlestown	Middle Pawcatuck River	KLONDIKE RD	103262.8	269759.5	1279
QUR-DUT-0-1	Exeter	Queen Usquepaug River	HALLVILLE RD	178217.58	308420.7	4725
QUR-DUT-0-2	Exeter	Queen Usquepaug River	TEN ROD RD	180869.13	305506.8	3326
QUR-DUT-0-3	Exeter	Queen Usquepaug River	WIDOW SWEETS RD	183007.98	304200.8	4942
QUR-FIS-0-1	Exeter	Queen Usquepaug River	TEN ROD RD	180965.49	308923.9	4796
QUR-FIS-0-2	Exeter	Queen Usquepaug River	PARDON JOSLIN RD	184234.84	307966.7	5058
QUR-FIS-0-3	West Greenwich	Queen Usquepaug River	HENRY BROWN RD	191723.27	303492.6	5056
QUR-FIS-3-1	West Greenwich	Queen Usquepaug River	HENRY BROWN RD	192949.58	308309.4	5057
QUR-FIS-3-2	West Greenwich	Queen Usquepaug River	Shetucket Tpke	193085.06	308797	9033
QUR-GLE-0-1	South Kingstown	Queen Usquepaug River	GLEN ROCK RD	157856.45	299185	3285
QUR-GLE-0-2	Richmond	Queen Usquepaug River	GARDINER RD	159920.7	297299.6	3181
QUR-GLE-2-1-1	Richmond	Queen Usquepaug River	JAMES TRL	158838.77	294844.2	2910

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
QUR-GLE-2-2-1	Richmond	Queen Usquepaug River	JAMES TRL	159093.12	293419.9	2911
QUR-GLE-2-3-1	Richmond	Queen Usquepaug River	JAMES TRL	160073.91	292610.4	3129
QUR-ISO-E	South Kingstown	Queen Usquepaug River	JINGLE VALLEY RD	152680.74	303610.9	2877
QUR-ISO-M	South Kingstown	Queen Usquepaug River	JINGLE VALLEY RD	152535.97	303431.6	2876
QUR-ISO-W	South Kingstown	Queen Usquepaug River	USQUEPAUGH RD	152275.04	303001.6	2980
QUR-LOC-0-1	Exeter	Queen Usquepaug River	MAIL RD	165424.44	304138.3	3252
QUR-LOC-0-2	Exeter	Queen Usquepaug River	TRIPPS CORNER RD	173345.48	299434.3	3228
QUR-LOC-0-3	Exeter	Queen Usquepaug River	GARDNER RD	175895.95	295064.4	3419
QUR-QFB-0-1	Exeter	Queen Usquepaug River	LADD DR	169598.08	315831.5	4740
QUR-QFB-0-10	Exeter	Queen Usquepaug River	PINOAK DR	177344.27	320123.4	4726
QUR-QFB-0-11	Exeter	Queen Usquepaug River	TEN ROD RD	179357.73	321218.2	4751
QUR-QFB-0-12	Exeter	Queen Usquepaug River	STONY LN	185688.53	321610.6	5070
QUR-QFB-0-2	Exeter	Queen Usquepaug River	MAIN ST	169566.38	316088.2	4686
QUR-QFB-0-3	Exeter	Queen Usquepaug River		169359.81	317873.9	9032
QUR-QFB-0-4	Exeter	Queen Usquepaug River	SOUTH RD	169387.3	319042.2	4758
QUR-QFB-0-7	Exeter	Queen Usquepaug	ONE STAMP PL	176389.61	320656.2	4637

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		River				
QUR-QFB-0-8	Exeter	Queen Usquepaug River	Bayview DR	176716.86	320217.1	4731
QUR-QFB-0-9	Exeter	Queen Usquepaug River	TARBOX DR	177039.23	320116	4780
QUR-QFB-2-1	Exeter	Queen Usquepaug River	Brookridge Rd	181880.59	319520.1	5062
QUR-QFB-2-2	Exeter	Queen Usquepaug River	STONY LN	186114.55	320100.9	5071
QUR-QUR-0-3	South Kingstown	Queen Usquepaug River	Kingstown Rd	152743.24	298574.8	3040
QUR-QUR-0-4	Richmond	Queen Usquepaug River	OLD USQUEPAUGH RD	153117.27	298353.8	3183
QUR-QUR-0-5	South Kingstown	Queen Usquepaug River	GLEN ROCK RD	158120.81	300610.5	2986
QUR-QUR-0-6	Exeter	Queen Usquepaug River	MAIL RD	166049.6	309293.7	4768
QUR-QUR-0-7	Exeter	Queen Usquepaug River	WILLIAM REYNOLDS RD	174601.86	314942.2	4649
QUR-QUR-0-8	Exeter	Queen Usquepaug River	TEN ROD RD	180432.76	316339	4636
QUR-QUR-0-9	Exeter	Queen Usquepaug River	STONY LN	186044.57	316219.7	5081
QUR-QUR-10-1	Exeter	Queen Usquepaug River	WILLIAM REYNOLDS RD	174465.93	315506	4650
QUR-QUR-1-1	South Kingstown	Queen Usquepaug River	GLEN ROCK RD	155424.19	298461.1	3378
QUR-QUR-11-1	Exeter	Queen Usquepaug River	PURGATORY RD	179539.15	313994.2	4786
QUR-QUR-12-1	Exeter	Queen Usquepaug River	Shore Rd	181089.96	316231.1	9019
QUR-QUR-6-1	Exeter	Queen	MAIL RD	166030.8	306293.1	2891

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		Usquepaug River				
QUR-QUR-7-1	Exeter	Queen Usquepaug River	LIBERTY CHURCH RD	169365.55	307518.5	2879
QUR-SHE-0-1	South Kingstown	Queen Usquepaug River	GLEN ROCK RD	158314.45	299455.3	3287
QUR-SHE-0-2	Exeter	Queen Usquepaug River	HOG HOUSE HILL RD	166869.34	298547	2913
QUR-SOD-0-1	Exeter	Queen Usquepaug River	LIBERTY CHURCH RD	175307	310472.5	4763
QUR-SOD-0-2	Exeter	Queen Usquepaug River	HALLVILLE RD	175867.21	307763.1	3078
QUR-SOD-0-3	Exeter	Queen Usquepaug River	TEN ROD RD	180747.58	300740.3	3095
QUR-USQ-0-1	Richmond	Queen Usquepaug River	Amtrak Shore Line	137987.72	301478.1	5240
QUR-USQ-0-2	South Kingstown	Queen Usquepaug River	S COUNTY TRL	143347.94	299352.1	2956
SNR-ASS-0-1	North Stonington	Shunock River	State Hwy 2	129671.53	222830	234
SNR-ASS-0-2	North Stonington	Shunock River	Jeremy Hill Rd	129840.83	215580.6	352
SNR-ASS-0-3	North Stonington	Shunock River	State Hwy 201	130114.21	215185.2	436
SNR-ASS-1-1	Stonington	Shunock River	New London Tpke	123096.36	219938.9	178
SNR-ASS-2-1	North Stonington	Shunock River	State Hwy 627	131918.21	217307.1	36
SNR-ASS-4-1	North Stonington	Shunock River	Wintechog Hill Rd	133560.13	215021.1	24
SNR-ASS-5-1	North Stonington	Shunock River	State Hwy 201	129585.58	214158.4	437
SNR-PHE-0-1	North Stonington	Shunock River	State Hwy 2	140095.37	214415.1	233
SNR-PHE-1-1	North Stonington	Shunock River	Hewitt Pond	142267.83	214076.1	37
SNR-SHU-0-1	North Stonington	Shunock River	Pendleton Hill Rd	119183.51	233493.5	242
SNR-SHU-0-10	North Stonington	Shunock River		132722.66	220717	510
SNR-SHU-0-11	North Stonington	Shunock River		133572.55	220782.3	280
SNR-SHU-0-12	North Stonington	Shunock River	State Hwy 201	138145.23	216059.7	119
SNR-SHU-0-13	North Stonington	Shunock River	Norwich-Westerly Rd	138562.5	215876.6	201
SNR-SHU-0-14	North Stonington	Shunock River	Norwich-Westerly Rd	139533.21	214573.9	9028
SNR-SHU-0-15	North Stonington	Shunock River	Norwich-Westerly Rd	139574.88	214133	9029
SNR-SHU-0-2	North Stonington	Shunock River	I- 95	121807.19	232355.9	386
SNR-SHU-0-3	North Stonington	Shunock River	I- 95	122008.11	232305.3	147
SNR-SHU-0-4	North Stonington	Shunock River	I-95	122078.03	232214.4	52

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
SNR-SHU-0-5	North Stonington	Shunock River	State Hwy 617	121917.76	231275.7	544
SNR-SHU-0-6	North Stonington	Shunock River	Surrey Ln	126681.54	231615	2
SNR-SHU-0-7	North Stonington	Shunock River	Old Trolley Ln	130341.07	225563.5	58
SNR-SHU-0-8	North Stonington	Shunock River	Main St	130556.18	223584.8	81
SNR-SHU-0-9	North Stonington	Shunock River	Main St	130510.9	223255	439
SNR-SHU-10-1	North Stonington	Shunock River	State Hwy 201	135669.7	216618.9	121
SNR-SHU-10-2	North Stonington	Shunock River	Norwich-Westerly Rd	135931.36	215978.1	299
SNR-SHU-1-1	North Stonington	Shunock River	Norwich-Westerly Rd	123549.78	229581.5	1
SNR-SHU-11-1	North Stonington	Shunock River	State Hwy 201	136478.46	216256.3	120
SNR-SHU-11-2	North Stonington	Shunock River	Norwich-Westerly Rd	136433.02	215701.5	300
SNR-SHU-1-2	North Stonington	Shunock River	Providence New London Tpke	124115.68	228558.9	540
SNR-SHU-2-1	North Stonington	Shunock River	Surrey Ln	127193.76	231230.2	0
SNR-SHU-2-2	North Stonington	Shunock River	Pendleton Hill Rd	128587.05	232652.4	240
SNR-SHU-3-1	North Stonington	Shunock River	Babcock Rd	129954.66	230164.9	534
SNR-SHU-3-1-1	North Stonington	Shunock River	Cossaduck Hill Rd	145201.63	214201.2	39
SNR-SHU-3-2	North Stonington	Shunock River	Reutemann Rd	132856.43	230640.4	466
SNR-SHU-3-2-1	North Stonington	Shunock River	Swantown Hill Rd	144857.03	213998	38
SNR-SHU-4-1	North Stonington	Shunock River	Babcock Rd	130600.7	226850.4	536
SNR-SHU-4-1-3	North Stonington	Shunock River	Reutemann Rd	133883.63	227405	464
SNR-SHU-4-2	North Stonington	Shunock River	Bergius Ln	133682.68	226881.5	537
SNR-SHU-4-3	North Stonington	Shunock River	Reutemann Rd	134110.51	226788	467
SNR-SHU-4-4	North Stonington	Shunock River		135635.44	226571.9	134
SNR-SHU-6-1	North Stonington	Shunock River	State Hwy 2	131739.61	220765.6	235
SNR-SHU-6-2	North Stonington	Shunock River	Norwich-Westerly Rd	132611.48	219777	9027
SNR-SHU-6-3	North Stonington	Shunock River	Mains Xing	134212.47	216982.3	198
SNR-SHU-6-4	North Stonington	Shunock River	Mains Xing	134487.92	216673.9	379
SNR-SHU-7-1	North Stonington	Shunock River	Wyassup Rd	134296.55	223429.7	157
SNR-SHU-7-1-1	North Stonington	Shunock River	Wyassup Rd	134555.35	223438	158
SNR-SHU-7-1-2	North Stonington	Shunock River	Chester Main Rd	136233.43	223336.1	346
SNR-SHU-7-2	North Stonington	Shunock River	Reutemann Rd	134394.58	223639.2	465
SNR-SHU-8-1	North Stonington	Shunock River	Ryder Rd	135338.58	221387.8	504
SNR-YAW-0-1	North Stonington	Shunock River	Ryder Rd	137489.09	217637.1	503
SNR-YAW-0-10	North Stonington	Shunock River	Legend Wood Rd	152559.85	223405.3	351
SNR-YAW-0-2	North Stonington	Shunock River	Yawbux Valley Rd	139311.72	219899.9	435
SNR-YAW-0-3	North Stonington	Shunock River	Narragansett Trail	141574.14	220099.2	5675
SNR-YAW-0-4	North Stonington	Shunock River		141892.4	219989.5	590
SNR-YAW-0-5	North Stonington	Shunock River		142095.61	220089.8	591
SNR-YAW-0-6	North Stonington	Shunock River	Pachaug Forest Trail	146829.09	222883	5638
SNR-YAW-0-7	North Stonington	Shunock River	Narragansett Trail	147069.38	222948.3	5673
SNR-YAW-0-8	North Stonington	Shunock River	Pachaug Forest Trail	150179.22	223258.9	5656
SNR-YAW-0-9	North Stonington	Shunock River	Pachaug Forest Trail	150332.74	223227.1	5634
SNR-YAW-1-1	North Stonington	Shunock River	Yawbux Valley Rd	139285.71	220432.1	434

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
SNR-YAW-2-1	North Stonington	Shunock River	Pachaug Forest Trail	142886.77	219258.1	5657
SNR-YAW-3-1	North Stonington	Shunock River	Pachaug Forest Trail	143304.13	220100.3	5658
SNR-YAW-4-1	North Stonington	Shunock River	Pachaug Forest Trail	145951.02	222064.6	5637
UPR-CED-0-1	Charlestown	Upper Pawcatuck River	Kings Factory Rd	125282.5	274614.3	3843
UPR-CED-0-2	Charlestown	Upper Pawcatuck River	OLD MILL RD	126411.56	282777.3	3871
UPR-CED-1-1	Charlestown	Upper Pawcatuck River	SHUMANKANUC HILL RD	125001.77	274152.5	3751
UPR-CED-3-1	Charlestown	Upper Pawcatuck River	Kings Factory Rd	120668.44	276416.9	3599
UPR-CED-6-1	Charlestown	Upper Pawcatuck River	OLD MILL RD	123225.18	283756.1	3680
UPR-CED-7-1	Charlestown	Upper Pawcatuck River	NARRAGANSETT TRL	128008.78	284034.8	3915
UPR-CED-8-1	Charlestown	Upper Pawcatuck River	NARRAGANSETT TRL	127465.82	282857.7	3916
UPR-MEA-0-1	Richmond	Upper Pawcatuck River	Amtrak Shore Line	128934.21	275557.5	5264
UPR-MEA-0-2	Richmond	Upper Pawcatuck River	CHURCH ST	129177.77	275618.6	3833
UPR-MEA-0-3	Richmond	Upper Pawcatuck River	PINE HILL RD	139629.83	275983.4	3892
UPR-MEA-0-4	Richmond	Upper Pawcatuck River	KENYON MILL TRL	147225.48	279692.6	3019
UPR-MEA-0-5	Richmond	Upper Pawcatuck River	Kingstown Rd	152147.2	282791.3	3016
UPR-MEA-0-6	Richmond	Upper Pawcatuck River	Green Fall Rd	160059.59	282865.9	9007
UPR-MEA-0-7	Richmond	Upper Pawcatuck River	Green Fall Rd	161344.31	282671.4	9008
UPR-MEA-0-8	Richmond	Upper Pawcatuck River	Carolina Nooseneck Rd	164073.98	282388.6	3281
UPR-MEA-1-1	Richmond	Upper Pawcatuck River	KENYON MILL TRL	147619.11	277947.6	2982
UPR-MEA-2-1	Richmond	Upper Pawcatuck River	MEADOWBROOK RD	150806.03	278985.6	3206
UPR-PAS-0-1	Charlestown	Upper Pawcatuck River	S COUNTY TRL	131475.49	293297.8	4025
UPR-PAS-0-2	Charlestown	Upper Pawcatuck River	SHANNOCK RD	129045.91	293121.9	4031
UPR-PAS-1-1	Charlestown	Upper Pawcatuck River	PIONEER RD	124327.79	290069.8	4034
UPR-PAS-1-2	Charlestown	Upper Pawcatuck River	S COUNTY TRL	126023.91	288579.3	3984
UPR-PAW-0-14	Richmond	Upper Pawcatuck River	Amtrak Shore Line	127636.79	271717.8	5267

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
UPR-PAW-0-15	Richmond	Upper Pawcatuck River	Kings Factory Rd	127434.98	274846.2	3739
UPR-PAW-0-16	Charlestown	Upper Pawcatuck River	Amtrak Shore Line	129484.47	277282.6	5265
UPR-PAW-0-17	Charlestown	Upper Pawcatuck River	CHURCH ST	132031.64	278424.6	3759
UPR-PAW-0-18	Richmond	Upper Pawcatuck River	Carolina Back Rd	136712.93	283234.4	3873
UPR-PAW-0-19	Charlestown	Upper Pawcatuck River	Clarks Falls Rd	133697.61	287150.6	9010
UPR-PAW-0-20	Charlestown	Upper Pawcatuck River	Providence-New London Tpke	132405.94	290254.7	9011
UPR-PAW-0-21	Charlestown	Upper Pawcatuck River	OLD SHANNOCK RD	132959.44	288417.5	3869
UPR-PAW-0-22	Charlestown	Upper Pawcatuck River	SHANNOCK RD	132755.1	290615.8	3963
UPR-PAW-0-23	Richmond	Upper Pawcatuck River	Amtrak Shore Line	132416.3	293251.4	5259
UPR-PAW-0-24	Charlestown	Upper Pawcatuck River	SHERMAN AVE	131879.06	293308.8	3955
UPR-PAW-0-25	Charlestown	Upper Pawcatuck River	S COUNTY TRL	132167.33	294832.2	3936
UPR-PAW-0-26	Charlestown	Upper Pawcatuck River	Biscuit City Rd	133500.17	296363.9	4005
UPR-PAW-30-1	Richmond	Upper Pawcatuck River	CHURCH ST	129209.6	270051.6	3881
UPR-PAW-30-2-1	Richmond	Upper Pawcatuck River	HOMESTEAD RD	130275.14	270746	3883
UPR-PAW-33-1	Charlestown	Upper Pawcatuck River	Alton Carolina Rd	132849.92	279766.1	3908
UPR-PAW-33-2	Charlestown	Upper Pawcatuck River	Amtrak Shore Line	131801.97	281845.7	5263
UPR-PAW-37-1	Richmond	Upper Pawcatuck River	SHANNOCK VILLAGE RD	132712.97	289757	4053
UPR-TNY-0-1	Richmond	Upper Pawcatuck River	SHANNOCK HILL RD	137509.24	287572.3	3788
UPR-WEB-0-1	Richmond	Upper Pawcatuck River	PINE HILL RD	139915.07	281349.2	3817
UWR-BAK-0-1	Richmond	Upper Wood River	Arcadia Rd	167260.13	275177	3286
UWR-BAK-0-2	Richmond	Upper Wood River	K AND G RANCH RD	167304.57	277256.3	3300
UWR-BAK-0-3	Richmond	Upper Wood River	I 95 S	167498.54	279735.4	3467
UWR-BAK-0-4	Richmond	Upper Wood River	NOOSENECK HILL RD	167283.98	279953.2	2895
UWR-BRE-0-1	Exeter	Upper Wood	Camp E-Hun-Tee Pl	183926.36	270846.8	5052

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		River				
UWR-BRE-0-2	Exeter	Upper Wood River	Austin Farm Rd	186573.85	272451.1	5003
UWR-BRE-0-3	West Greenwich	Upper Wood River	RACCOON HILL RD	195552.01	276054.3	5054
UWR-BRE-0-4	West Greenwich	Upper Wood River	MATTESON PLAIN RD	200658.7	275038.1	5016
UWR-BRE-0-5	West Greenwich	Upper Wood River	PLAIN MEETING HOUSE RD	204551.51	273811.8	4920
UWR-BRE-1-1	Exeter	Upper Wood River	Austin Farm Rd	185391.7	274034.1	5002
UWR-BRE-1-2	Exeter	Upper Wood River	Bliven Trail	185043.19	274754	5025
UWR-BRE-1-3	Exeter	Upper Wood River	Austin Farm Rd	185039.52	277246.7	4953
UWR-CAR-0-1	Voluntown	Upper Wood River	Bailey Pond Rd	200813.84	248217.4	29
UWR-CAR-0-2	Sterling	Upper Wood River	Netop Trl	202979.77	249113.3	635
UWR-CAR-0-3	Sterling	Upper Wood River		207969.67	248804	657
UWR-CAR-0-4	Sterling	Upper Wood River		212139.27	248994.1	634
UWR-CAR-0-5	Sterling	Upper Wood River	Newport Rd	214517.6	247737.8	627
UWR-CON-0-1	West Greenwich	Upper Wood River	MUDDY BROOK RD	200573.47	253832.3	4881
UWR-CON-0-2	West Greenwich	Upper Wood River	PLAIN RD	206256.38	257241.5	4890
UWR-FAC-0-1	West Greenwich	Upper Wood River	Shetucket Tpke	193732.03	268342.6	9030
UWR-FAC-0-2	West Greenwich	Upper Wood River	WELCH HOLLOW RD	207096.63	268574.2	4891
UWR-FAC-1-1	West Greenwich	Upper Wood River	Shetucket Tpke	193862.24	268993.7	9031
UWR-FAC-2-1	West Greenwich	Upper Wood River	STUBBLE BROOK RD	201832.52	272602.7	4999
UWR-FLA-0-1	Exeter	Upper Wood River	Arcadia Main Area	180800.41	268223.7	2709
UWR-FLA-0-2	Exeter	Upper Wood River	PLAIN RD	186721.14	267902.5	4878
UWR-KEL-0-1	West Greenwich	Upper Wood River	FALLS RIVER RD	192835.14	258837.4	4867
UWR-KEL-0-2	West Greenwich	Upper Wood River	HUDSON POND RD	196053.09	257762.1	4831
UWR-KEL-0-3	West Greenwich	Upper Wood River	LIBERTY HILL RD	198575.56	257044.1	4842

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
UWR-KEL-0-4	West Greenwich	Upper Wood River	HUDSON POND RD	201245.58	255391.3	4870
UWR-PHI-0-1	West Greenwich	Upper Wood River	SPRAGUE RD	195797.92	264536.7	4872
UWR-PHI-0-2	West Greenwich	Upper Wood River	PLAIN MEETING HOUSE RD	202504.86	260738.9	4849
UWR-PHI-0-3	West Greenwich	Upper Wood River	NARROW LN	204815.98	261313.9	4833
UWR-PHI-1-1	West Greenwich	Upper Wood River	PLAIN MEETING HOUSE RD	201437.21	263688.4	4885
UWR-ROA-0-1	Exeter	Upper Wood River	SUMMIT RD	172618.02	273943.4	3190
UWR-ROA-0-2	Exeter	Upper Wood River	Arcadia Road	173169.47	277449.2	3276
UWR-ROA-0-3	Exeter	Upper Wood River	TEN ROD RD	180038.31	278430.7	3235
UWR-ROA-0-4	Exeter	Upper Wood River	WEST SHORE DR	181547.78	279240.5	3112
UWR-ROA-0-5	Exeter	Upper Wood River	Austin Farm Rd	185896.48	282220.2	5044
UWR-WOR-0-10	Exeter	Upper Wood River	TEN ROD RD	178877.23	267687	2624
UWR-WOR-0-11	Exeter	Upper Wood River	Arcadia Main Area	181045.11	267592.8	2714
UWR-WOR-0-12	Exeter	Upper Wood River	PLAIN RD	187687.22	260835.3	4836
UWR-WOR-0-13	West Greenwich	Upper Wood River	FALLS RIVER RD	192974.28	256845.4	4854
UWR-WOR-0-14	West Greenwich	Upper Wood River	HAZARD RD	197995.99	251053.7	4858
UWR-WOR-0-15	Voluntown	Upper Wood River	Bailey Pond Rd	199716.63	246845.5	277
UWR-WOR-0-16	Voluntown	Upper Wood River	Pachaug Forest Trail	202446.22	245124.5	5388
UWR-WOR-0-17	Sterling	Upper Wood River	Pachaug Forest Trail	203585.52	242015.7	5393
UWR-WOR-0-18	Sterling	Upper Wood River	Pachaug Trail	204350.72	241251.4	5422
UWR-WOR-0-19	Sterling	Upper Wood River	Brown Rd	204642.86	241062.2	9002
UWR-WOR-0-20	Sterling	Upper Wood River	Cedar Swamp Rd	207387.41	238120.4	651
UWR-WOR-0-6	Richmond	Upper Wood River	NOOSENECK HILL RD	157079.52	271939.3	2871
UWR-WOR-0-7	Hopkinton	Upper Wood River	Bridge ST	157681.25	272290.8	3279
UWR-WOR-0-8	Hopkinton	Upper Wood	SKUNK HILL RD	160049.52	275573.5	3273

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
		River				
UWR-WOR-0-9	Hopkinton	Upper Wood River	Arcadia Road	166633.86	274397.5	2979
UWR-WOR-11-1	Richmond	Upper Wood River	Green Fall Rd	152299.57	271427	9024
UWR-WOR-12-1	Hopkinton	Upper Wood River	Bank St	157687.4	271155	3223
UWR-WOR-12-2	Hopkinton	Upper Wood River	SKUNK HILL RD	163149.97	269698.7	3261
UWR-WOR-13-1	Richmond	Upper Wood River	NOOSENECK HILL RD	159535.59	275576.9	3509
UWR-WOR-14-1	Richmond	Upper Wood River	K AND G RANCH RD	161229.63	276872	3476
UWR-WOR-14-2	Richmond	Upper Wood River	NOOSENECK HILL RD	161079.94	277185.6	2830
UWR-WOR-14-3	Richmond	Upper Wood River	Green Fall Rd	160882.91	277505.1	9025
UWR-WOR-14-4	Richmond	Upper Wood River	Buttonwoods Rd	159930.96	278450.7	3341
UWR-WOR-14-5	Richmond	Upper Wood River	Buttonwoods Rd	160222.52	281262.9	3410
UWR-WOR-17-1	Hopkinton	Upper Wood River	Blitzkrieg Trail	169548.56	269125.2	3013
UWR-WOR-17-2	Exeter	Upper Wood River	SKUNK HILL RD	172369.39	264541.3	2683
UWR-WOR-18-1	Exeter	Upper Wood River	WHITE PINE DR	175566.02	266302.7	2568
UWR-WOR-18-1-1	Exeter	Upper Wood River	SKUNK HILL RD	173105.23	264032.5	2618
UWR-WOR-18-1-1-1	Exeter	Upper Wood River	WOODY HILL RD	176032.32	260541.3	2749
UWR-WOR-18-2	Exeter	Upper Wood River	MOUNT TOM RD	175444.15	265329	2553
UWR-WOR-18-3	Exeter	Upper Wood River	TEN ROD RD	179646.91	259151.1	2552
UWR-WOR-18-4	Exeter	Upper Wood River	ESCOHEAG HILL RD	180239.26	258180.8	2734
UWR-WOR-18-4-1	Exeter	Upper Wood River	OLD VOLUNTOWN RD	184326.3	255699.9	4907
UWR-WOR-18-5	Exeter	Upper Wood River	OLD VOLUNTOWN RD	184197.96	255328.3	4856
UWR-WOR-19-1	Exeter	Upper Wood River	Shore Rd	179467.97	269535.5	9026
UWR-WOR-19-2	Exeter	Upper Wood River	Camp E-Hun-Tee Pl	180088.73	270811.1	5053
UWR-WOR-19-3	Exeter	Upper Wood River	TEN ROD RD	179852.38	271675.5	3170

Table 2. Bridges and Culverts to be Assessed

Structure Name	Town	Watershed	Road Name	LAT	LONG	GIS Structure Number
UWR-WOR-22-2	West Greenwich	Upper Wood River	HAZARD RD	194730.68	251190.3	4905
UWR-WOR-24-1	Voluntown	Upper Wood River	Pachaug Forest Trail	203190.86	244472.8	5389
UWR-WOR-24-2	Sterling	Upper Wood River	Gallup Homestead Rd	205838.93	246122.4	665
UWR-WOR-25-1	Sterling	Upper Wood River	Pachaug Forest Trail	204201.55	242887.5	5390
UWR-WOR-25-2	Sterling	Upper Wood River	Gallup Homestead Rd	205171.07	243054.6	666
UWR-WOR-25-3	Sterling	Upper Wood River	Pachaug Forest Trail	206503.98	243380.1	5395
WPB-HET-0-2	North Stonington	Wayassup Brook	Wyassup Rd	150709.75	232050.7	154
WPB-HET-0-3	North Stonington	Wayassup Brook	Legend Wood Rd	155374.71	231020.1	359
WPB-HET-0-3.5	North Stonington	Wayassup Brook	Grindstone Hill Rd	142830.48	236465.2	9021
WPB-HET-0-4	North Stonington	Wayassup Brook		156273.32	230735.7	362
WPB-PHB-0-1	North Stonington	Wayassup Brook	State Hwy 49	135688.12	235895.5	155
WPB-PHB-0-2	North Stonington	Wayassup Brook		138358.01	235525.2	418
WPB-PHB-0-3	North Stonington	Wayassup Brook	Sleepy Hollow Rd	141217.07	235900.6	452
WPB-PHB-0-4	North Stonington	Wayassup Brook		148184.51	236097.4	290
WPB-PHB-0-5	North Stonington	Wayassup Brook	State Hwy 49	150128.14	237076.8	156
WPB-PHB-1-1	North Stonington	Wayassup Brook	State Hwy 49	136285.4	235972.4	151
WPB-PHB-3-1	North Stonington	Wayassup Brook	Sleepy Hollow Rd	140945.71	234810.9	9020
WPB-PHB-3-2	North Stonington	Wayassup Brook	Grindstone Hill Rd	142825.95	233751.9	132
WPB-WAY-0-1	North Stonington	Wayassup Brook	Clarks Falls Rd	135467.84	238663.9	67
WPB-WAY-0-2	North Stonington	Wayassup Brook	State Hwy 49	134241.56	233388.2	152
WPB-WAY-0-3	North Stonington	Wayassup Brook	Sleepy Hollow Road No 2	138753.14	231709.4	293
WPB-WAY-0-4	North Stonington	Wayassup Brook	Grindstone Hill Rd	141671.12	230334.5	133
WPB-WAY-0-5	North Stonington	Wayassup Brook		141782.83	229748.8	593
WPB-WAY-0-6	North Stonington	Wayassup Brook	Wyassup Rd	147116.91	227065.8	153
WPB-WAY-3-1	North Stonington	Wayassup Brook	Sleepy Hollow Rd	139525.92	232740.5	292
WPB-WAY-4-1	North Stonington	Wayassup Brook	Hangman Hill Rd	139091.41	230351.6	450
WPB-WAY-5-1	North Stonington	Wayassup Brook		143710.55	229259	50
WPB-WAY-5-2	North Stonington	Wayassup Brook	Fowler Rd	144533.24	231974.2	457
WPB-WAY-7-1	North Stonington	Wayassup Brook	Murphy Rd	149615.33	227085.5	223
WPB-WAY-8-1	North Stonington	Wayassup Brook	Wyassup Lake Rd	149578.73	225900.7	304
WPB-WAY-8-1-1	North Stonington	Wayassup Brook	Murphy Rd	151285.13	226805.1	224
WPB-WAY-8-2-1	North Stonington	Wayassup Brook	Pachaug Forest Trail	149616.23	224946.6	5655

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
Yes	RI	HIGH	216	WYOMING UPPER	HOPKINTON / RICHMOND	WOOD RIVER	41.515923	-71.703407
Yes	RI	HIGH	219	BOONE LAKE	EXETER	ROARING BROOK	41.582012	-71.677994
Yes	RI	HIGH	221	BROWNING MILL POND	EXETER	ROARING BROOK	41.558346	-71.692909
Yes	RI	HIGH	226	YAWGOOG POND	HOPKINTON	WINCHECK BROOK	41.517095	-71.780546
Yes	RI	HIGH	239	SLOCUM RESERVOIR	EXETER	CHIPUXET RIVER	41.539917	-71.520012
Yes	RI	HIGH	240	YORKER MILL POND	EXETER	CHIPUXET RIVER	41.521706	-71.523246
Yes	RI	HIGH	261	WHITE'S POND	RICHMOND	WHITE BROOK	41.470379	-71.669395
Yes	RI	HIGH	262	LOCUSTVILLE POND	HOPKINTON	BRUSHY BROOK	41.508514	-71.716446
Yes	RI	HIGH	527	METCALF WILDLIFE MARSH	EXETER	LOCKE BROOK	41.557250	-71.610030
Yes	RI	HIGH	693	SLOCUM WOODS	NORTH KINGSTOWN	CHIPUXET RIVER-TRIB	41.523960	-71.510720
Yes	RI	HIGH	710	SLOCUM ROAD UPPER	NORTH KINGSTOWN	CHIPUXET RIVER-TRIB	41.517940	-71.512460
Yes	RI	SIGNIFICANT	215	BARBERVILLE POND	HOPKINTON / RICHMOND	WOOD RIVER	41.540840	-71.696180
Yes	RI	SIGNIFICANT	225	WINCHECK POND	HOPKINTON	MOSCOW BROOK	41.520313	-71.762306
Yes	RI	SIGNIFICANT	227	ASHVILLE POND	HOPKINTON	BLUE POND BROOK	41.499764	-71.751122
Yes	RI	SIGNIFICANT	229	BLUE POND	HOPKINTON	BLUE POND BROOK	41.505688	-71.747253
Yes	RI	SIGNIFICANT	236	GLEN ROCK RESERVOIR	SOUTH KINGSTOWN	USQUEPAUG RIVER	41.503860	-71.608170
Yes	RI	SIGNIFICANT	238	EDWARD'S POND	EXETER	QUEEN RIVER	41.581562	-71.541122
Yes	RI	SIGNIFICANT	247	ALTON POND	HOPKINTON / RICHMOND	WOOD RIVER	41.437775	-71.721497
Yes	RI	SIGNIFICANT	273	WOOD RIVER JUNCTION	RICHMOND	MEADOW BROOK	41.437874	-71.691086
Yes	RI	SIGNIFICANT	274	HARRIS POND	HOPKINTON	TOMAQUAG BROOK-TRIB	41.461311	-71.755913
Yes	RI	SIGNIFICANT	285	LANGWORTHY POND	HOPKINTON	BRUSHY BROOK-TRIB	41.508286	-71.718376
Yes	RI	SIGNIFICANT	440	HOXIE FARM POND	HOPKINTON	CANONCHET BROOK-TRIB	41.479084	-71.750961
Yes	CT	SIGNIFICANT	10205	CLARK FALLS DAM	NORTH STONINGTON	WYASSUP BROOK	41.456481	-71.818448
Yes	CT	MODERATE	10208	SPAULDING POND DAM	NORTH STONINGTON	WASSUP BROOK	41.454581	-71.826156
Yes	CT	MODERATE	13602	PORTER POND DAM	STERLING	WOOD RIVER	41.645162	-71.818852
Yes	CT	MODERATE	13713	LIEPOLD POND DAM	STONINGTON	PAWCATUCK RIVER	41.382276	-71.845918
Yes	CT	MODERATE	14701	GREEN FALLS RESERVOIR	VOLUNTOWN	GREEN FALL RIVER	41.528206	-71.809785
Yes	RI	LOW	200	HAZARD POND	WEST GREENWICH	FALLS RIVER	41.626453	-71.782066
Yes	RI	LOW	214	BREAKHEART POND	EXETER	BREAKHEART BROOK	41.595459	-71.703293
Yes	RI	LOW	217	WYOMING POND LOWER	HOPKINTON	WOOD RIVER	41.514760	-71.704900

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
Yes	RI	LOW	222	MOSCOW POND	HOPKINTON	MOSCOW BROOK	41.523785	-71.741890
Yes	RI	LOW	223	CENTERVILLE POND	HOPKINTON	MOSCOW BROOK	41.522713	-71.747383
Yes	RI	LOW	228	LOWER MILL POND	HOPKINTON	BLUE POND BROOK	41.492733	-71.749237
Yes	RI	LOW	232	TUG HOLLOW POND	RICHMOND	BEAVER RIVER	41.559933	-71.646370
Yes	RI	LOW	233	GLEN ROCK LOWER POND	SOUTH KINGSTOWN	GLEN ROCK BROOK	41.516640	-71.606606
Yes	RI	LOW	234	GLEN ROCK MIDDLE POND	SOUTH KINGSTOWN	GLEN ROCK BROOK	41.518349	-71.607025
Yes	RI	LOW	235	GLEN ROCK UPPER POND	SOUTH KINGSTOWN	GLEN ROCK BROOK	41.519253	-71.607513
Yes	RI	LOW	243	DOLLY POND	EXETER	SODOM BROOK	41.565910	-71.574928
Yes	RI	LOW	245	HOPE VALLEY MILL POND	HOPKINTON / RICHMOND	WOOD RIVER	41.503132	-71.716339
Yes	RI	LOW	246	WOODVILLE POND	HOPKINTON / RICHMONE	WOOD RIVER	41.459949	-71.718956
Yes	RI	LOW	251	BURDICKVILLE	CHARLESTOWN/HOPKINTON	PAWCATUCK RIVER	41.417030	-71.729150
Yes	RI	LOW	252	CAROLINA POND	CHARLESTOWN / RICHMOND	PAWCATUCK RIVER	41.458862	-71.663590
Yes	RI	LOW	254	POTTER HILL	HOPKINTON	PAWCATUCK RIVER	41.414051	-71.796936
Yes	RI	LOW	256	STILLMANVILLE	WESTERLY / CT	PAWCATUCK RIVER	41.384980	-71.833070
Yes	RI	LOW	264	BETHEL POND	HOPKINTON	ASHAWAY RIVER	41.430778	-71.790237
Yes	RI	LOW	265	ASHAWAY MILL POND	HOPKINTON	ASHAWAY RIVER	41.424810	-71.789700
Yes	RI	LOW	266	ASHAWAY LINE POND	HOPKINTON	ASHAWAY RIVER	41.423431	-71.792191
Yes	RI	LOW	272	SMITH'S ICE POND	HOPKINTON	PARMENTER BROOK	41.462456	-71.782005
Yes	RI	LOW	276	KNAPP POND	HOPKINTON	KNAPP BROOK	41.423805	-71.795921
Yes	RI	LOW	280	TANNER POND	RICHMOND	WHITE BROOK	41.463890	-71.671684
Yes	RI	LOW	288	UNION POND	HOPKINTON	BLUE POND BROOK	41.490616	-71.748497
Yes	RI	LOW	289	GRASSY POND	HOPKINTON	WINCHECK POND-TRIB	41.540325	-71.774757
Yes	RI	LOW	290	YAWGOO POND	SOUTH KINGSTOWN	CHICKSHEEN BROOK	41.507248	-71.569038
Yes	RI	LOW	382	AUSTIN UPPER POND	EXETER	ROARING BROOK	41.595680	-71.665817
Yes	RI	LOW	402	ARCADIA MILL LOWER	HOPKINTON	ROARING BROOK	41.555130	-71.695450
Yes	RI	LOW	468	KASELLA FARM POND	WEST GREENWICH	BREAKHEART BROOK	41.645267	-71.696991
Yes	RI	LOW	493	OLAF FARM POND	WESTERLY	CEDAR SWAMP BROOK	41.394188	-71.730736
Yes	RI	LOW	531	GREAT SWAMP GOOSE MARSH	SOUTH KINGSTOWN	PAWCATUCK RIVER	41.448498	-71.595360
Yes	RI	LOW	571	HALLVILLE POND	EXETER	SODOM BROOK	41.567417	-71.571022
Yes	RI	LOW	711	SLOCUM ROAD LOWER	EXETER	CHIPUXET RIVER-TRIB	41.519750	-71.514930

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
Yes	RI	LOW	715	WILLIAM REYNOLDS ROAD POND	EXETER	QUEEN RIVER	41.564160	-71.547620
Yes	RI	LOW	722	BROWNING MILL BYPASS POND	EXETER	ROARING BROOK	41.555130	-71.695450
Yes	RI	LOW	755	NEW ROAD POND	EXETER	QUEEN RIVER	41.588530	-71.539760
Yes	RI	LOW	767	SODCO			41.519846	-71.521158
Yes	CT	LOW	10217	LEWIS POND	NORTH STONINGTON	PAWCATUCK RIVER TRIB	41.420731	-71.822093
Yes	CT	LOW	10218	UPPER GLADE BROOK POND	NORTH STONINGTON	GLADE BROOK	41.468581	-71.806989
Yes	CT	LOW	10219	LOWER GLADE BROOK POND	NORTH STONINGTON	GLADE BROOK	41.468158	-71.808112
Yes	CT	LOW	10220	GREEN RIVER POND	NORTH STONINGTON	GREEN FALL R TRIB	41.468279	-71.813518
Yes	CT	LOW	10250	SHINGLE MILL POND DAM	NORTH STONINGTON	Glade Brook	41.478926	-71.801546
Yes	CT	UNKNOWN	10232	LAUREL GLEN POND DAM	NORTH STONINGTON	GREEN FALL R TRIB	0.000000	0.000000
No	RI	SIGNIFICANT	249	HORSESHOE FALLS	CHARLESTOWN / RICHMOND	PAWCATUCK RIVER	41.447662	-71.636398
No	CT	SIGNIFICANT	10201	WYASSUP LAKE DAM	NORTH STONINGTON	WYASSUP BROOK	41.486858	-71.869133
No	RI	LOW	201	TILLINGHAST POND	WEST GREENWICH	CONEY BROOK	41.649128	-71.758820
No	RI	LOW	203	HUDSON POND	WEST GREENWICH	KELLEY BROOK	41.629070	-71.759750
No	RI	LOW	205	PRATT POND	EXETER	PARRISS BROOK	41.578751	-71.757690
No	RI	LOW	206	TIPPECANSETT POND	WEST GREENWICH	PARRIS BROOK	41.599831	-71.778938
No	RI	LOW	207	EISENHOWER LAKE	WEST GREENWICH	ACID FACTORY BK	41.617016	-71.719215
No	RI	LOW	208	DEXTER POND	EXETER	WOODY HILL BROOK	41.563156	-71.759819
No	RI	LOW	210	OLD MILL POND #1	WEST GREENWICH	FLAT RIVER	41.600224	-71.719719
No	RI	LOW	211	OLD MILL POND #2	WEST GREENWICH	PHILLIPS BROOK	41.621361	-71.732307
No	RI	LOW	212	KNOX FARM POND	WEST GREENWICH	ACID FACTORY BROOK	41.632164	-71.720367
No	RI	LOW	213	OLD MILL NO. 3	WEST GREENWICH	BREAKHEART BROOK	41.632620	-71.693460
No	RI	LOW	218	AUSTIN FARM POND	EXETER	ROARING BROOK	41.593548	-71.667458
No	RI	LOW	220	BARBERVILLE MILL POND	EXETER	ROARING BROOK	41.560493	-71.681129
No	RI	LOW	224	ROCKVILLE POND	HOPKINTON	MOSCOW BROOK	41.520706	-71.757744
No	RI	LOW	230	DECAPPETT POND	RICHMOND	BEAVER RIVER	41.521328	-71.640602
No	RI	LOW	231	JAMES POND	EXETER	BEAVER RIVER	41.574631	-71.641449
No	RI	LOW	237	RODMAN SAWMILL	EXETER	QUEEN RIVER	41.597670	-71.546260

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
				POND				
No	RI	LOW	241	GRINNELL UPPER POND	EXETER	FISHERSVILLE BROOK	41.585312	-71.570747
No	RI	LOW	242	GRINNELL LOWER POND	EXETER	FISHERSVILLE BROOK	41.581276	-71.570930
No	RI	LOW	244	SHERMAN SHINGLE MILL POND	EXETER	LOCKE BROOK	41.560017	-71.604584
No	RI	LOW	248	KENYON MILL POND	CHARLESTOWN / RICHMOND	PAWCATUCK RIVER	41.445774	-71.625809
No	RI	LOW	253	BRADFORD POND	HOPKINTON / WESTERLY	PAWCATUCK RIVER	41.407524	-71.749405
No	RI	LOW	255	WHITE ROCK	WESTERLY / CT	PAWCATUCK RIVER	41.405899	-71.843292
No	RI	LOW	259	LILLIBRIDGE POND	RICHMOND	WHITE BROOK	41.494175	-71.664597
No	RI	LOW	260	WELLS POND	RICHMOND	WHITE BROOK-TRIB	41.477951	-71.672447
No	RI	LOW	275	LINEWALK POND	HOPKINTON	CANONCHET BROOK	41.483685	-71.756706
No	RI	LOW	278	BISCUIT CITY POND	SOUTH KINGSTOWN	WHITE HORN BROOK	41.474812	-71.534454
No	RI	LOW	279	INDIAN CEDAR SWAMP	CHARLESTOWN	CEDAR SWAMP BROOK	41.430374	-71.664719
No	RI	LOW	286	PINEDALE MILL POND	HOPKINTON	MOSCOW BROOK	41.527081	-71.737251
No	RI	LOW	287	LONG POND	HOPKINTON	BLUE POND BROOK	41.506657	-71.765350
No	RI	LOW	400	GRINNEL'S SAWMILL POND	EXETER	LOCKE BROOK	41.541862	-71.589378
No	RI	LOW	423	BURLINGAME RESERVATION	CHARLESTOWN	POQUIANT BROOK-TRIB	41.407211	-71.709485
No	RI	LOW	430	COTTRELL FARM POND	HOPKINTON	ASHAWAY RIVER-TRIB	41.437962	-71.785652
No	RI	LOW	441	MCLEOD FARM POND	CHARLESTOWN	PASQUISET BROOK-TRIB	41.432114	-71.624115
No	RI	LOW	447	CONGDON FARM POND	SOUTH KINGSTOWN	USQUEPAUG RIVER	41.475510	-71.597610
No	RI	LOW	448	WARWICK SPORTSMEN'S ASSOC. POND	EXETER	QUEEN RIVER-TRIB	41.545582	-71.584206
No	RI	LOW	454	WOODY HILL RESERVOIR	WESTERLY	PERRY HEALY BROOK	41.376820	-71.738197
No	RI	LOW	457	CLAUSEN FARM POND	CHARLESTOWN	POQUIANT BROOK-TRIB	41.410271	-71.705666
No	RI	LOW	458	HABEREK FARM POND	RICHMOND	DIAMOND BROOK	41.488647	-71.703476
No	RI	LOW	466	DUCK POND	RICHMOND	WHITE BROOK	41.492859	-71.666382
No	RI	LOW	469	FROSTY HOLLOW POND	EXETER	BREAKHEART BROOK	41.587387	-71.709206
No	RI	LOW	472	MAPLE LAWN FARM POND	HOPKINTON	ASHAWAY RIVER-TRIB	41.443043	-71.785576
No	RI	LOW	476	CAROLINA TROUT POND	RICHMOND	DIAMOND BROOK	41.484370	-71.702900

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
No	RI	LOW	487	GOBEILLE POND	CHARLESTOWN	CEDAR SWAMP BROOK	41.424919	-71.696953
No	RI	LOW	494	JAMES FARM POND	HOPKINTON	TOMAQUAG BROOK-TRIB	41.426800	-71.759514
No	RI	LOW	508	LABRECQUE FARM POND	HOPKINTON	GLADE BROOK-TRIB	41.483055	-71.790665
No	RI	LOW	530	SILLMAN WILDLIFE MARSH	HOPKINTON	BLUE POND BROOK-TRIB	41.509373	-71.758446
No	RI	LOW	532	MT. TOM WILDLIFE MARSH	EXETER	WOODY HILL BROOK	41.558285	-71.734596
No	RI	LOW	533	LEWIS, DONALD WILDLIFE MARSH	HOPKINTON	TOMAQUAG BROOK-TRIB	41.431168	-71.765511
No	RI	LOW	547	MISQUAMICUT COUNTRY CLUB POND	WESTERLY	UNNAMED	41.325463	-71.834007
No	RI	LOW	560	ASHAWAY SPORTSMAN'S CLUB MARSH	HOPKINTON	GLADE BROOK-TRIB	41.496552	-71.791946
No	RI	LOW	588	SHERMAN FARM	SOUTH KINGSTOWN	GENESEE BROOK	41.455080	-71.534240
No	RI	LOW	597	LEYDEN WILDLIFE POND	WEST GREENWICH	ACID FACTORY BROOK-TRIB	41.648346	-71.710632
No	RI	LOW	603	BARBERVILLE MILL LOWER	EXETER	ROARING BROOK	41.558291	-71.683826
No	RI	LOW	605	OLD MILL #1 UPPER	WEST GREENWICH	FLAT RIVER	41.601208	-71.720310
No	RI	LOW	695	STUBBLE BROOK ROAD POND	WEST GREENWICH	ACID FACTORY BROOK-TRIB	41.637050	-71.702290
No	RI	LOW	696	LEYDEN TREE FARM UPPER	WEST GREENWICH	ACID FACTORY BROOK-TRIB	41.644390	-71.704390
No	RI	LOW	697	LEYDEN TREE FARM LOWER	WEST GREENWICH	ACID FACTORY BROOK-TRIB	41.641650	-71.703200
No	RI	LOW	714	EXETER COUNTRY CLUB	EXETER	QUEEN RIVER	41.572540	-71.544300
No	RI	LOW	716	SHERMAN SHINGLE MILL UPPER	EXETER	LOCKE BROOK	41.560545	-71.604553
No	RI	LOW	717	BAILEY	RICHMOND	UNNAMED	41.509470	-71.649570
No	RI	LOW	718	TUG HOLLOW ROAD POND	RICHMOND	BEAVER RIVER-TRIB	41.558900	-71.644530
No	RI	LOW	719	SODOM TRAIL LOWER	EXETER	SODOM BROOK	41.566290	-71.585080
No	RI	LOW	721	SPRING STREET POND	HOPKINTON	MOSCOW BROOK	41.521500	-71.758060
No	RI	LOW	723	HIDDEN OUTLET	SOUTH KINGSTOWN	USQUEPAUG RIVER	41.502230	-71.607340
No	RI	LOW	724	VEILED OUTLET	HOPKINTON	TOMAQUAG BROOK	41.464240	-71.778010

Table 3. Dams to be Inspected

To Be Inspected?	State	Hazard Classification	State Dam ID	Dam Name	Town	River	LAT	LONG
No	RI	LOW	726	GAVITT	EXETER	RAKE FACTORY BROOK	41.528640	-71.598500
No	RI	LOW	741	STINKY	EXETER	RAKE FACTORY BROOK	41.529170	-71.599679
No	RI	LOW	748	SCREAMING WOMAN POND	EXETER	SODOM BROOK	41.567830	-71.587560
No	RI	LOW	752	BOILING SPRING	WESTERLY	MASTUXET BROOK	41.369970	-71.809760
No	CT	LOW	10209	STONE POND	NORTH STONINGTON	UNNAMED	41.424381	-71.843980
No	CT	LOW	10210	MORGAN POND	NORTH STONINGTON	PAWCATUCK RIVER TRIB	41.415728	-71.841876
No	CT	LOW	10221	PENDLETON POND	NORTH STONINGTON	UNNAMED	41.505616	-71.838589
No	CT	LOW	13608	CARSON BROOK DAM	STERLING	CARSON BROOK	41.675834	-71.794763
No	CT	LOW	14715	PACHAUG WILDLIFE POND	VOLUNTOWN	GREAT FALL RIVER	41.556064	-71.806812
No	CT	LOW	14722	PALMER POND	VOLUNTOWN	GREEN FALL R TRIB	41.523683	-71.822840

FUSS & O'NEILL

Figures

Bridges, Culverts, and Dams Proposed for Field Assessment

Figure1: Ashaway River Watershed

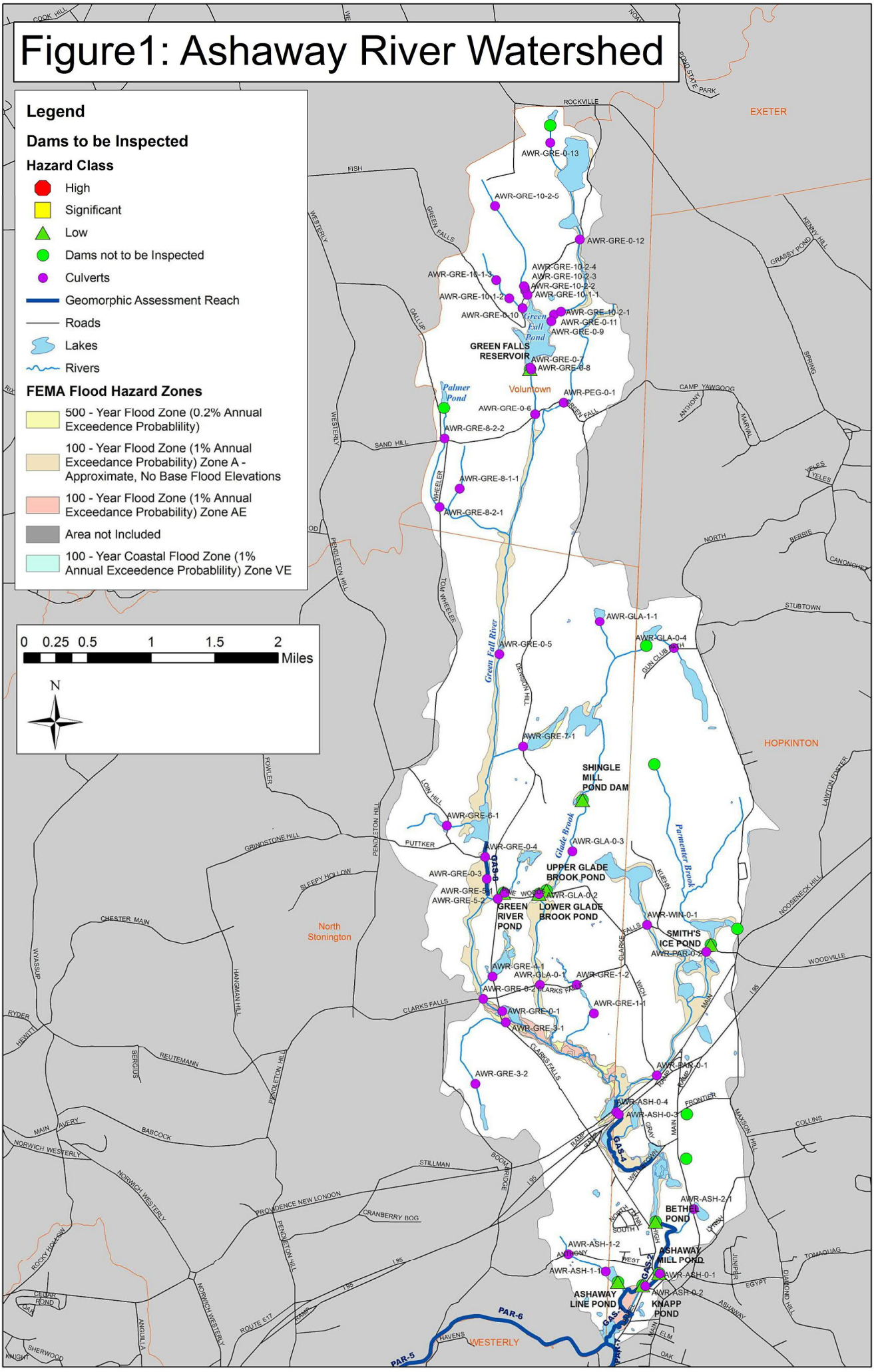


Figure 2: Beaver River Watershed

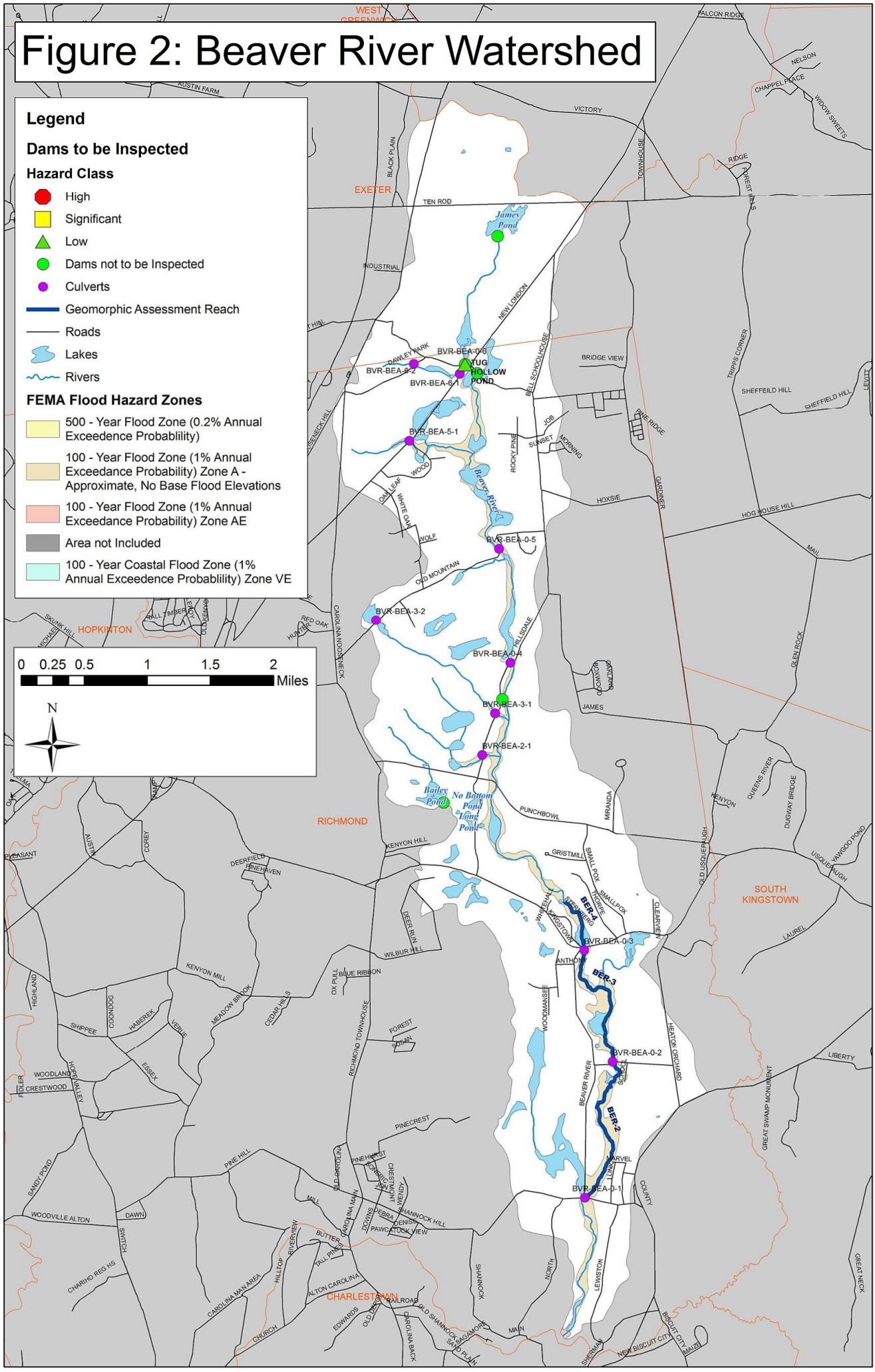


Figure 3: Chickasheen River Watershed

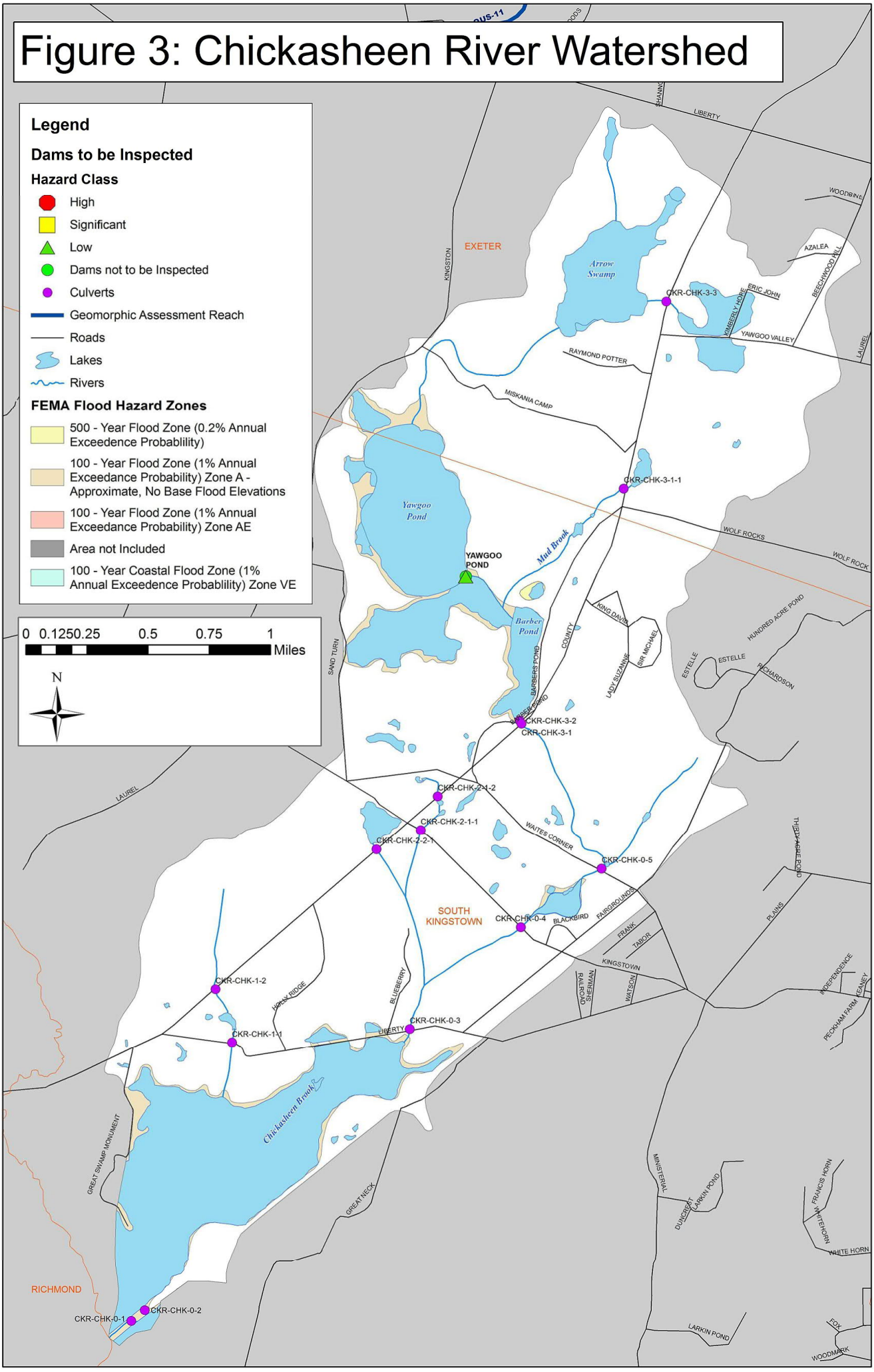


Figure 4: Chipuxet River Watershed

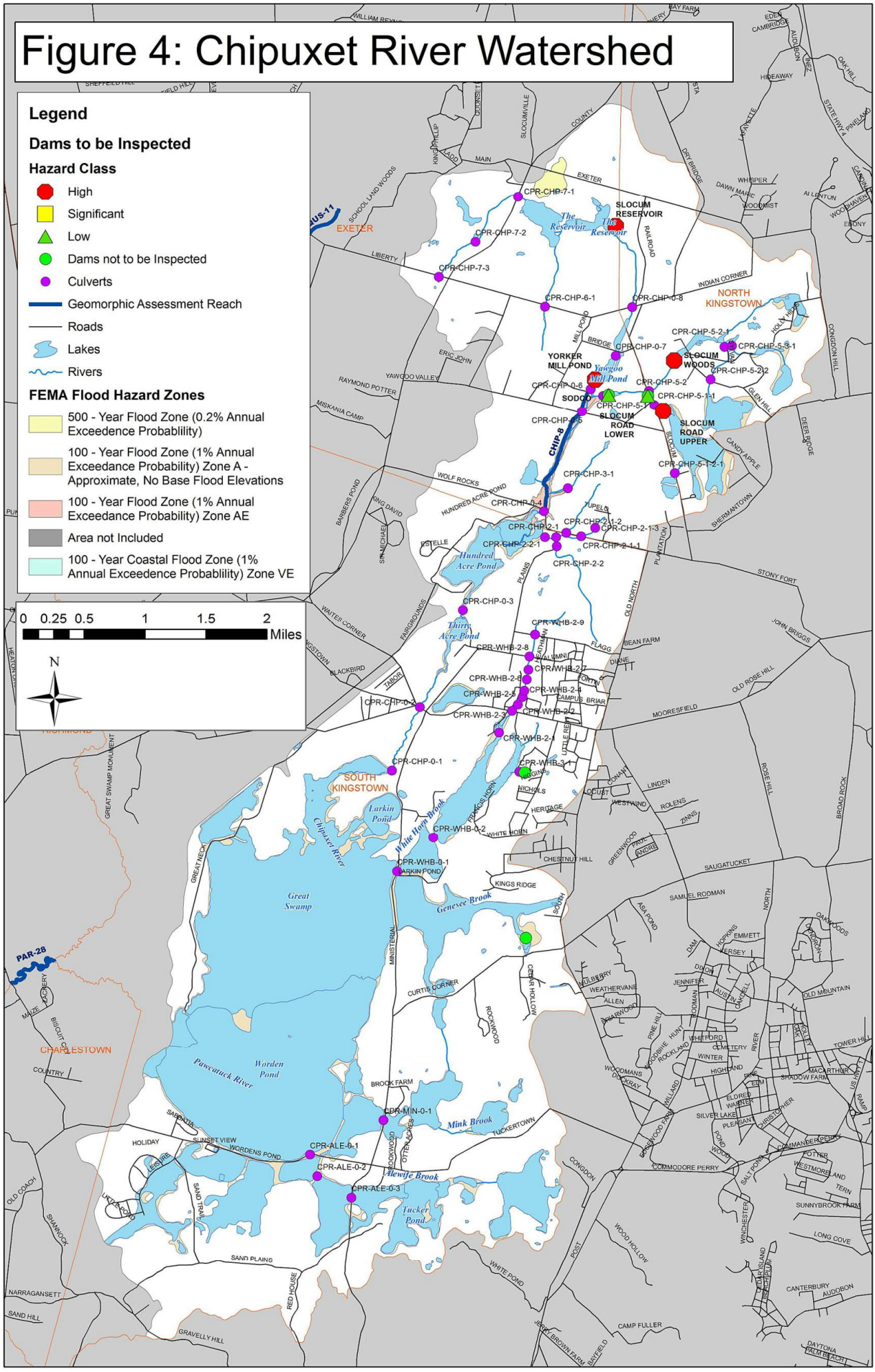


Figure 5: Middle Pawcatuck River Watershed

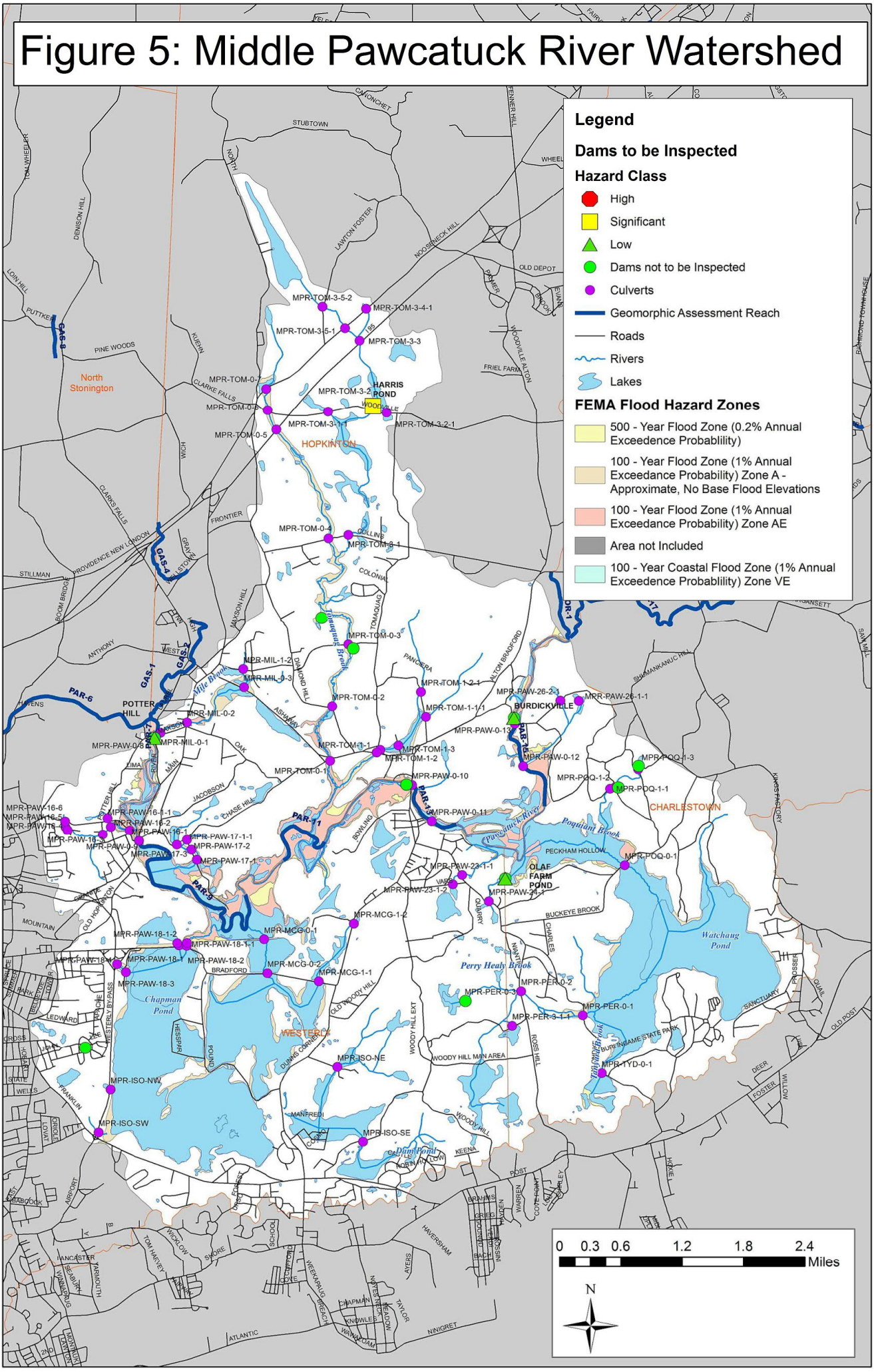


Figure 6: Lower Pawcatuck River Watershed

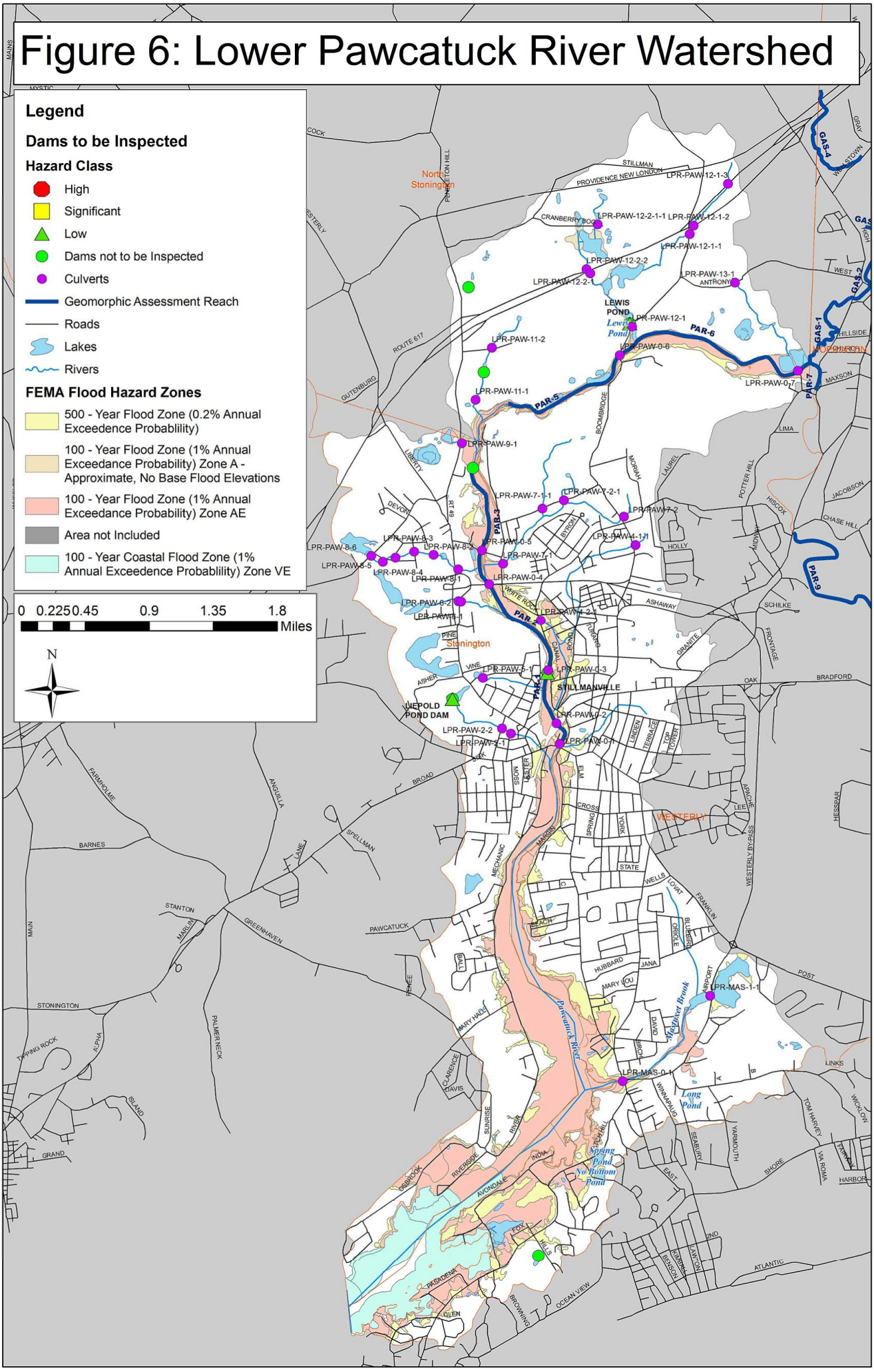


Figure 7: Lower Wood River Watershed

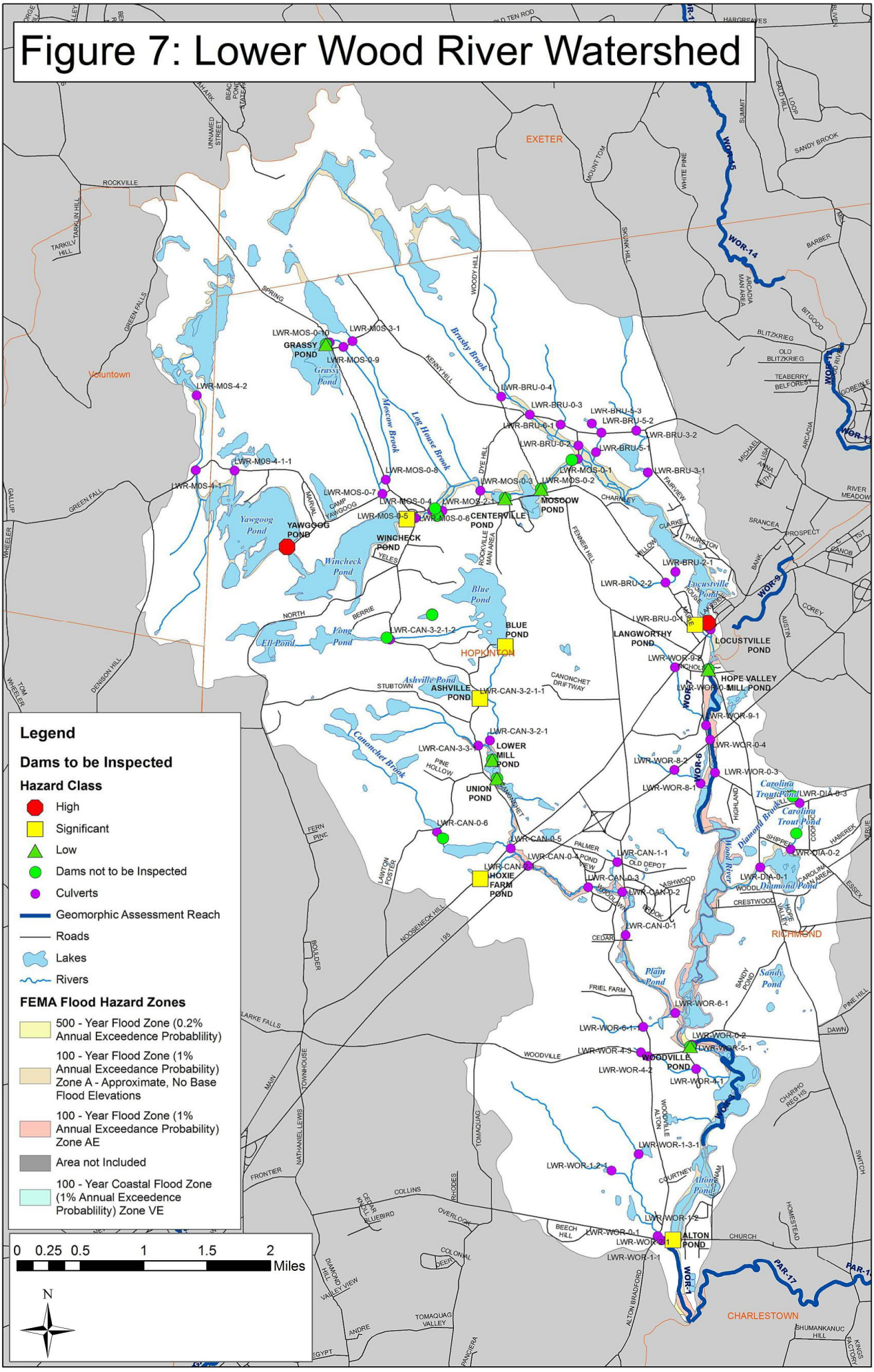


Figure 8: Shunock River Watershed

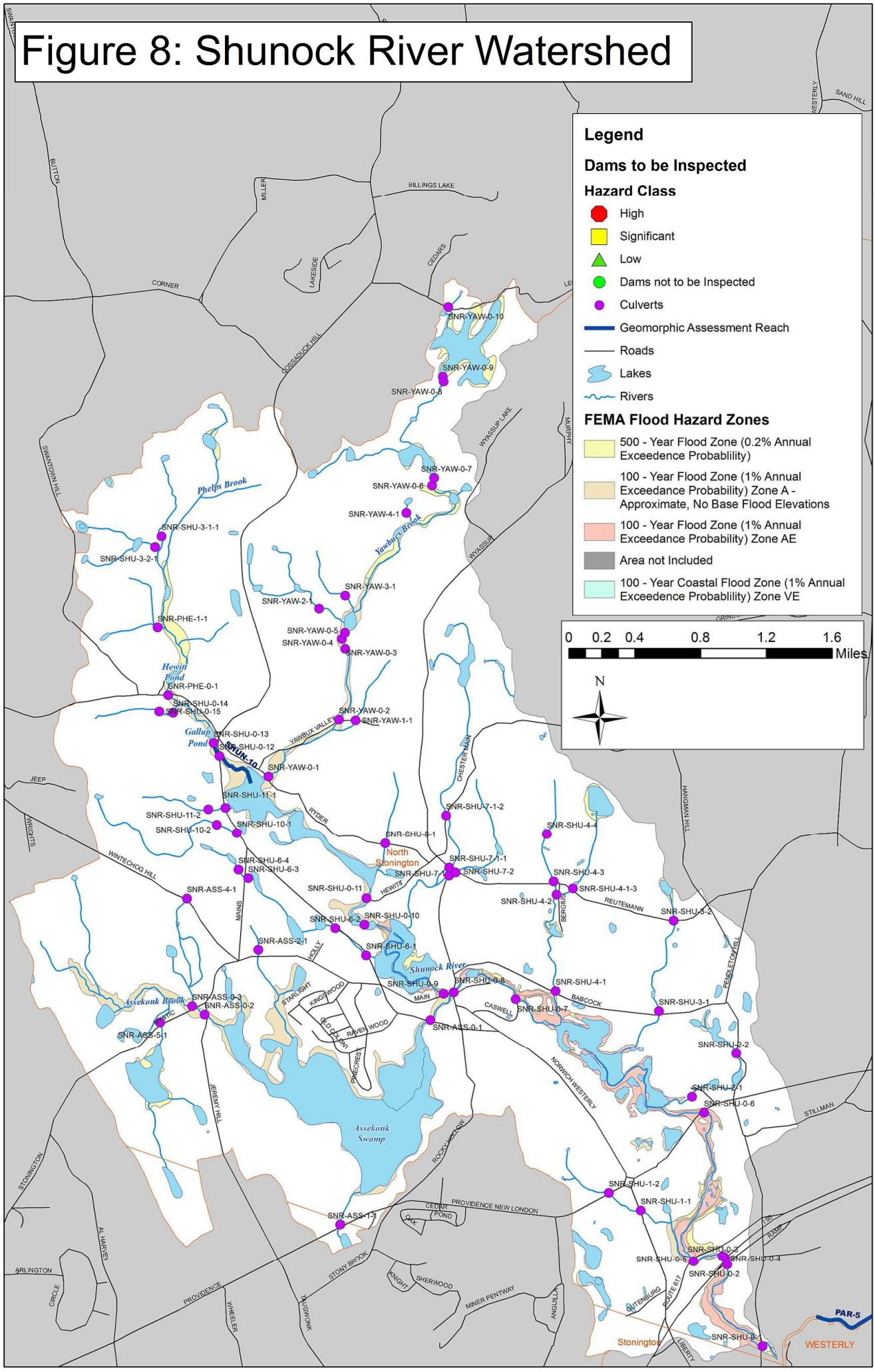


Figure 9: Upper Pawcatuck River Watershed

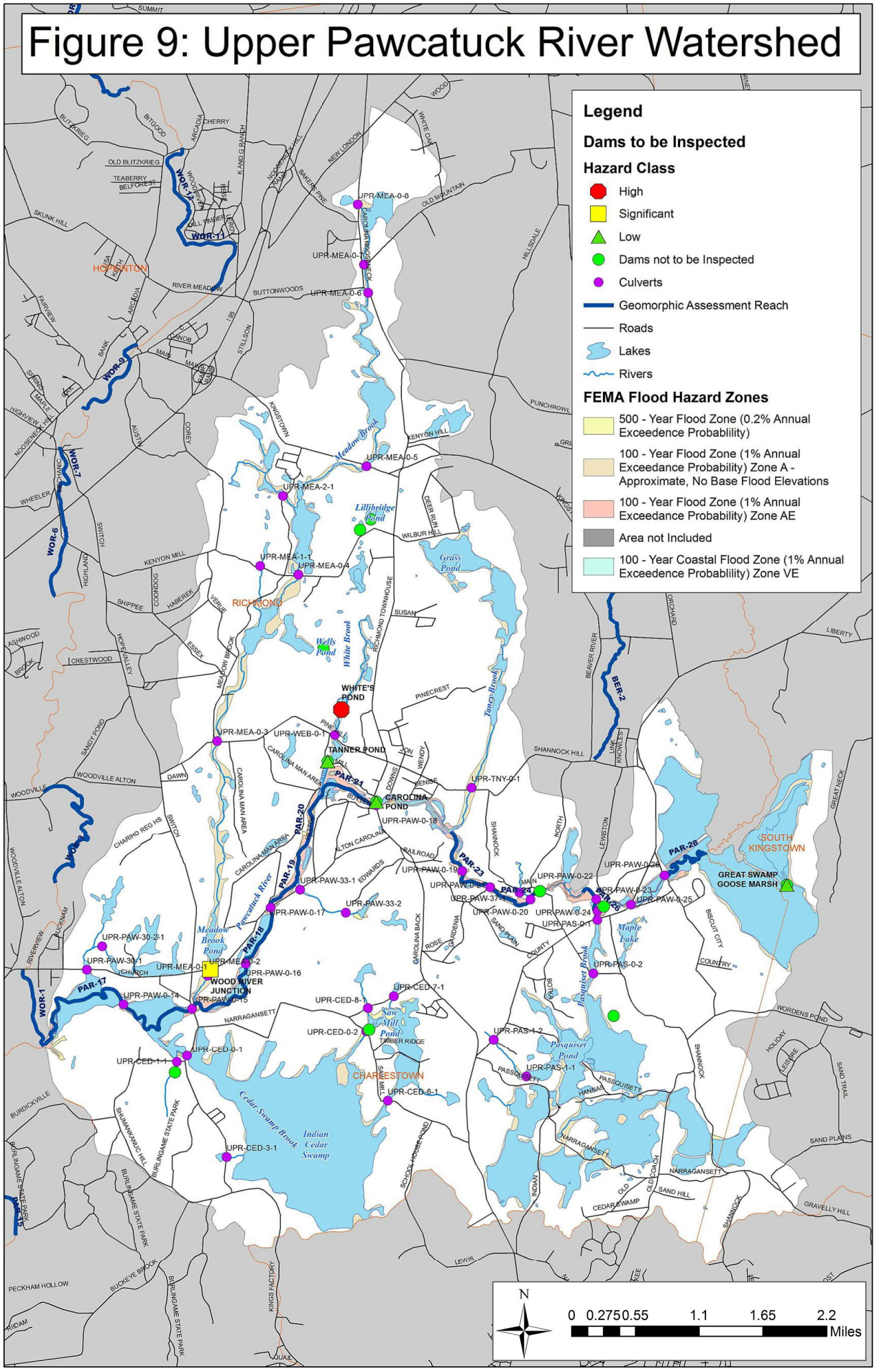


Figure 10: Upper Wood River Watershed

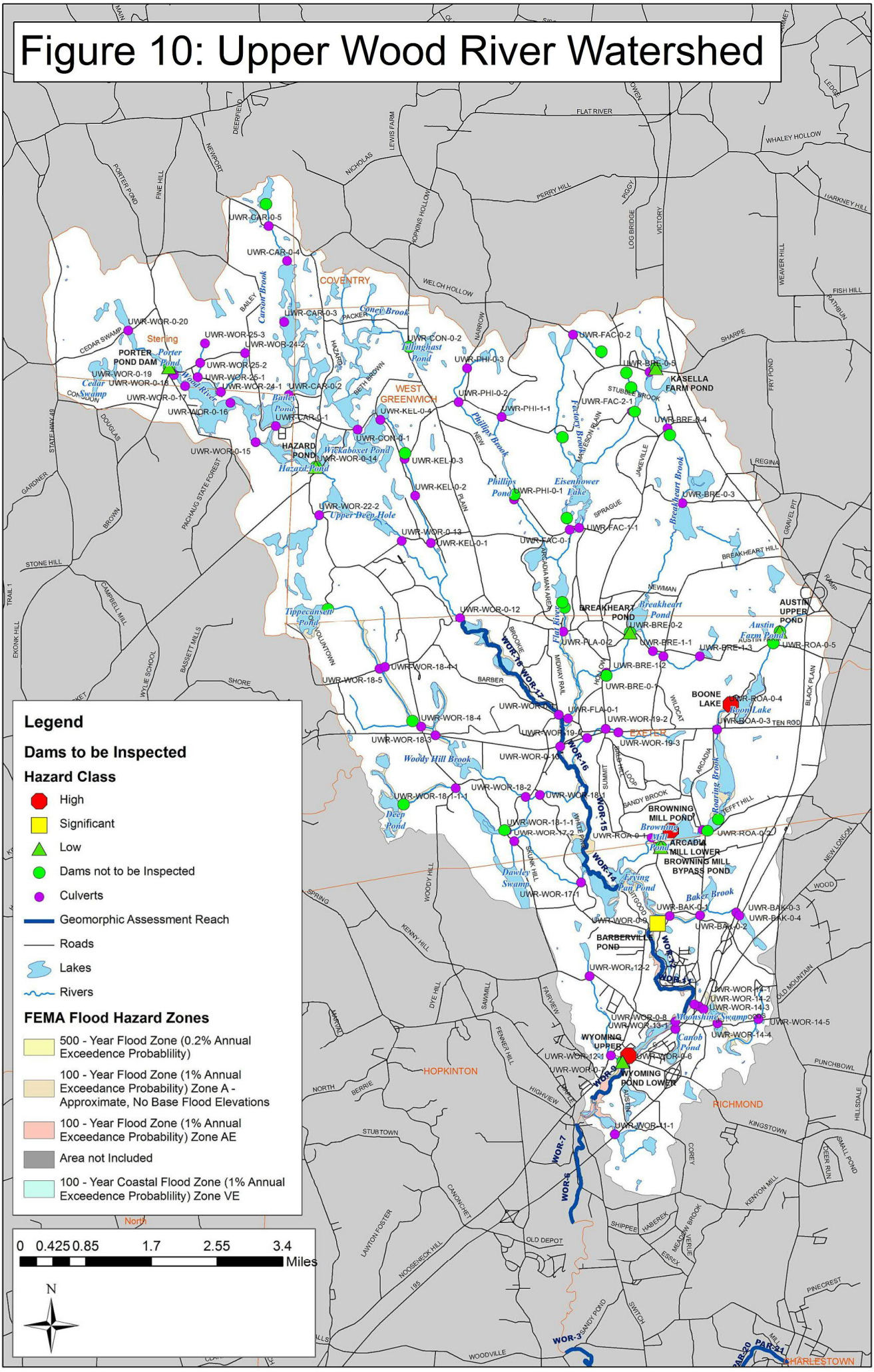


Figure 11: Usquepaug River Watershed

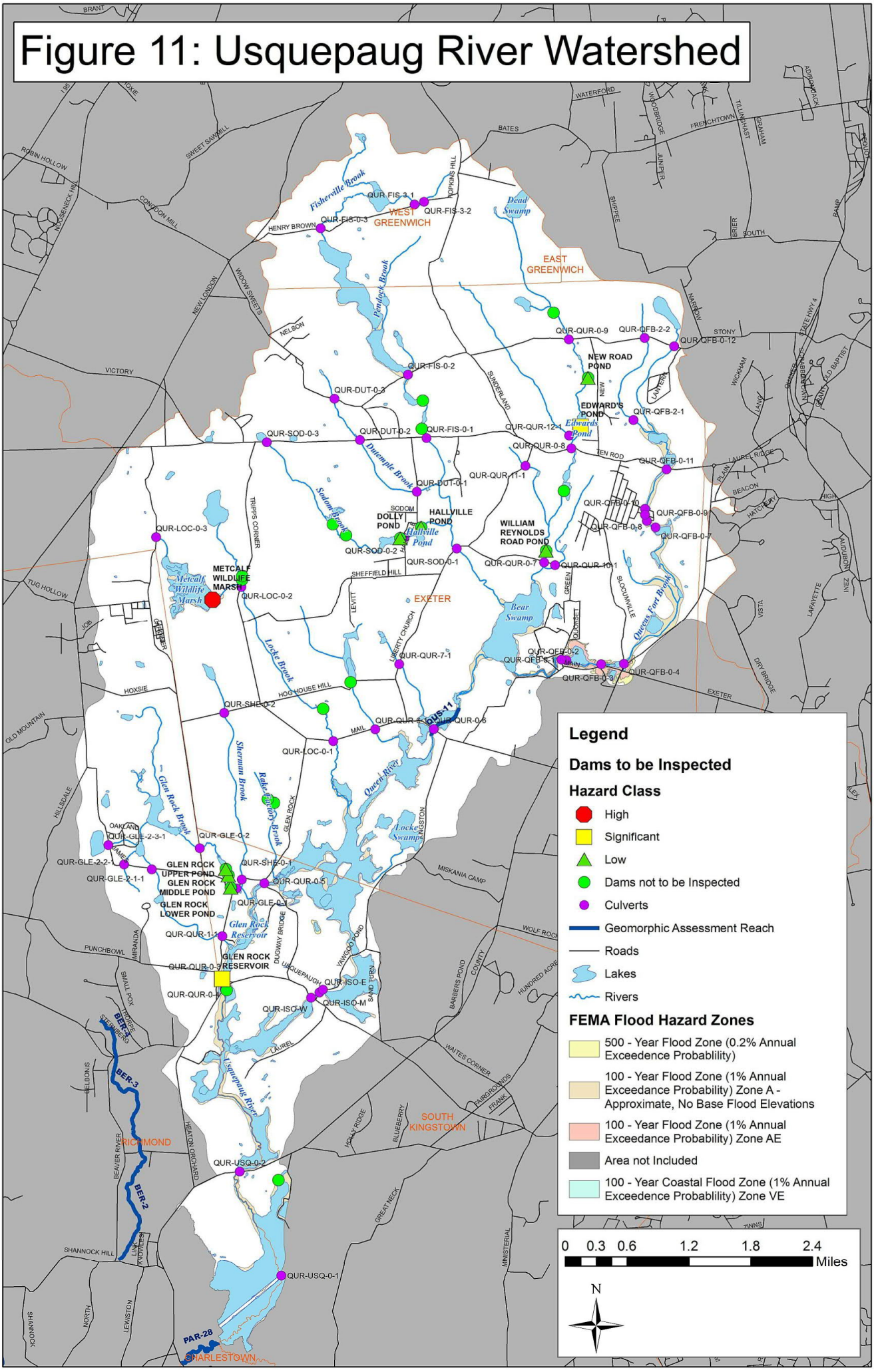
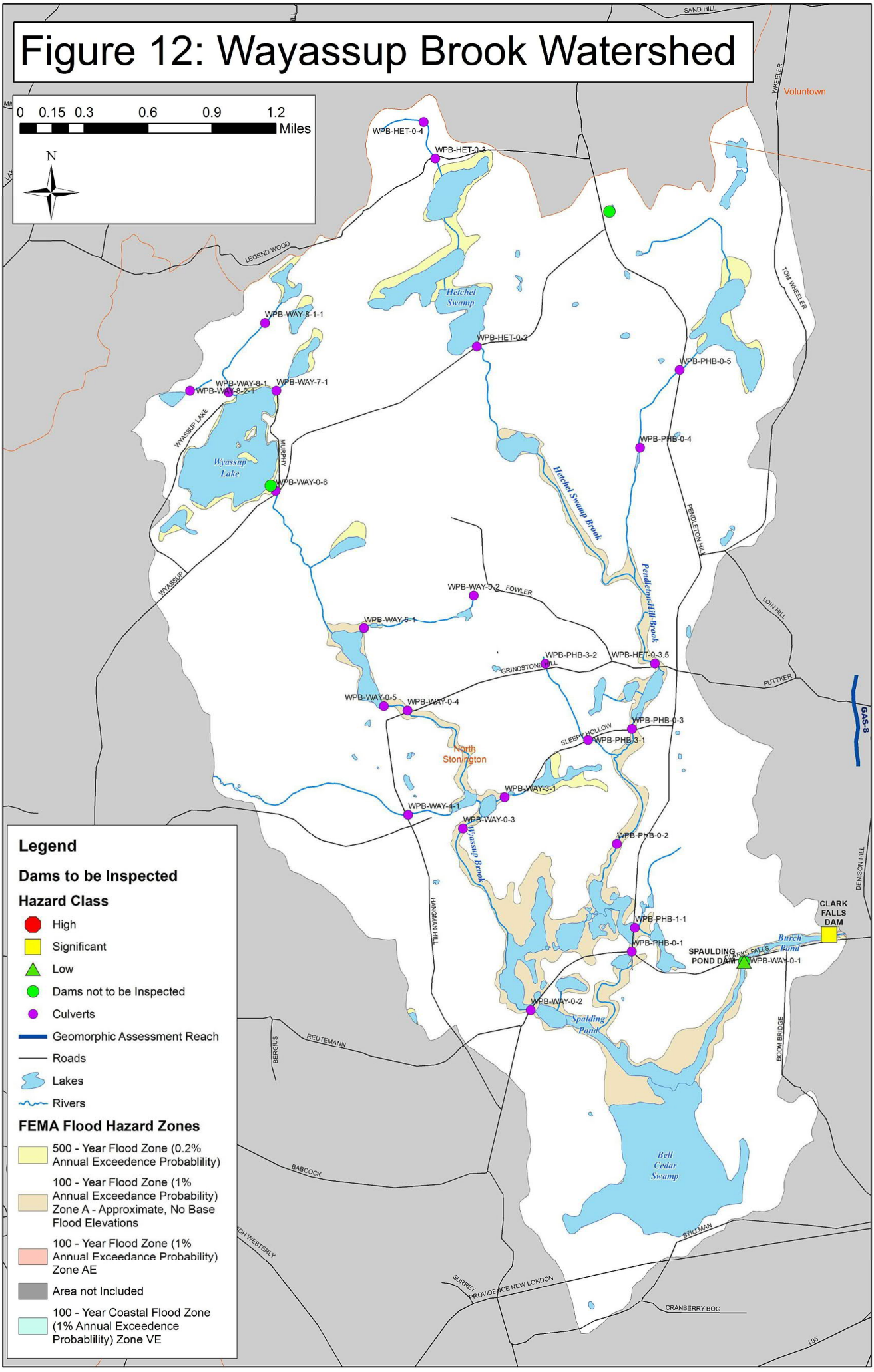


Figure 12: Wayassup Brook Watershed



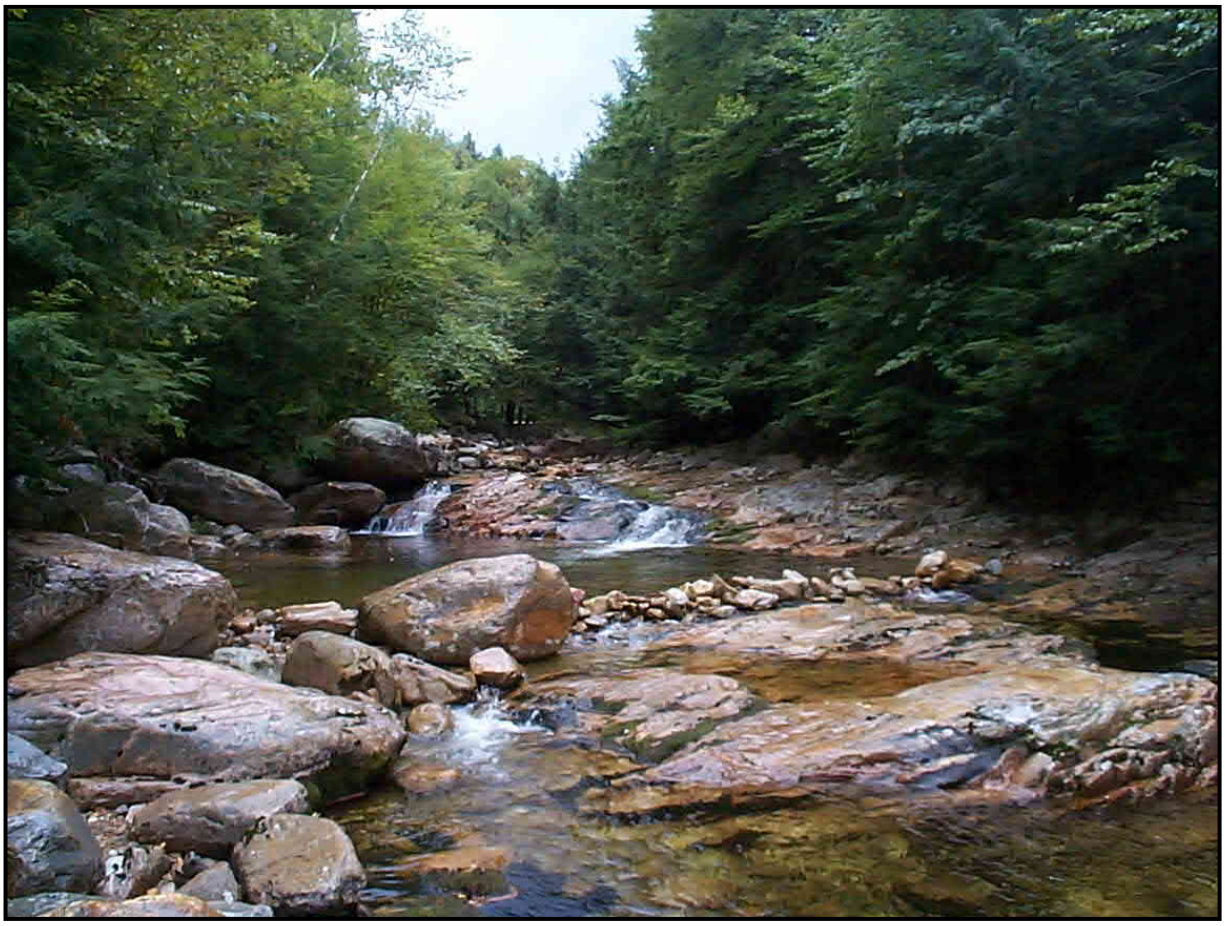
FUSS & O'NEILL

Attachment 1

Geomorphic Assessment Data Forms

Vermont Stream Geomorphic Assessment

Appendix A



Map, Sketch, and Photo Documentation
&
Data Sheets and Field Forms

Vermont Agency of Natural Resources
May, 2009

Vermont Stream Geomorphic Assessment

Appendix A - Phase 1 Data Sheets

Phase 1 Data Sheets for Steps 1 - 9

Phase 1 Quality Assurance Sheet

Data Sheet 1

Phase 1 - Step 1. Reach Locations

Stream Name: (DMS)_____ Watershed: (DMS)_____ Date:_____
USGS Map Name(s): _____ Organization /Agency: (DMS)_____
Observers: (DMS)_____

Indicate the tools and materials used to collect data in the shaded box at the bottom of each data column.

Reach No. (SGAT)	**1.1 Reach Description**	**1.2 Town**	**1.3 Upstream End of Reach** Latitude/Longitude **(SGAT)**		**Downstream End of Reach** Latitude/Longitude **(SGAT)**	

Phase 1 - Step 2. Reference Stream Types

Data Sheet 2

Reach No. (SGAT)	2.1 Elevation (ENTER INTO STEP 10 OF SGAT)			2.2 Valley Length (feet) (SGAT)	2.3 Valley Slope (%) (DMS)	2.4 Channel Length (feet) (SGAT)	2.5 Channel Slope (%) (DMS)	2.6 Sinuosity (DMS)	2.7 Watershed Size (Sq. Mi.) (SGAT)	2.8 Channel Width (feet) (DMS)	2.9 Valley Width (feet) (SGAT)	2.10 Confinement (Can be manually entered into		2.11 Stream Type	
	Up	Down	Gentle Gradient									Ratio (DMS)	Type (DMS)	Letter	Bed Material

Data Sheet 3

Phase 1 - Step 3. Basin Characteristics - Geology and Soils

Reach No. (SGAT)	3.1 Alluvial Fan (Y / N)	3.2 Grade Controls (menu)	3.3 Geologic Materials (SGAT)			3.4 Valley Side Slopes		3.5 Soil Properties (menus) (SGAT)									
			Dominant	% Dom	Sub-Dominant	Right	Left	Hydro Group	% Hydro	Flooding	% Flood	Water Table: Deep	%	Water Table: Shallow	%	Erod-ibility	% Erod

Data Sheet 4

Phase 1 - Step 4. Land Cover - Reach Hydrology

Reach No. (SGAT)	4.1 Watershed Land Cover / Use (Menu)						4.2 Corridor Land Cover / Use (Menu)						4.3 Riparian Buffers (Menu) (DMS)			4.4 Ground Water Inputs
	Historic	Current (SGAT) Dom	% Dom	Sub-Dom	% Urban Crop	Impact H / L / NS (DMS)	Historic	Current (SGAT) Dom	% Dom	Sub-Dom	% Urban Crop	Impact H / L / NS (DMS)	RB	LB	Impact H / L / NS	High/Low/ None

Data Sheet 5

Phase 1 - Step 5. Instream Channel Modifications

Reach No. (SGAT)	5.1 Flow Regulation (FIT) (Menu)		5.2 Bridges – Culverts (FIT)			5.3 Bank Armoring (FIT) (Menu)				5.4 Channel Straightening (FIT) (Menu)				5.5 Dredging History (FIT) (Menu)	
	Type/Size/Use	Impact H / L / NS	Length (feet) (FIT)	% Impact (DMS)	Impact H / L / NS (DMS)	Type (FIT)	Length (FIT)	% Impact (DMS)	Impact H / L / NS (DMS)	Type (FIT)	Length (FIT)	% Impact (DMS)	Impact H / L / NS (DMS)	Type	Impact H / L / NS

Phase 1 - Step 6. Floodplain Modifications and Planform Changes

Data Sheet 6

Reach No. (SGAT)	6.1 Berms & Roads (RIT)			6.2 River Corridor Development			6.3 Depositional Features		6.4 Meander Migration		6.5 Meander Width Ratio (B/Wbkf)			6.6 Wavelength Ratio (Lm/Wbkf)		
	One Bank (FIT)	Both Banks (DMS)	% & Impact H / L / NS	One Bank (feet) (FIT)	Both Banks (feet) (FIT)	% & Impact H / L / NS (DMS)	Type	Impact H / L / NS	Type	Impact H / L / NS	Belt Width	MW Ratio	Impact H / L / NS (DMS)	Wave Length	WL Ratio	Impact H / L / NS (DMS)

Data Sheet 7

Phase 1 - Step 7. Bed and Bank Windshield Survey

Reach No. (SGAT)	7.1 Bank Erosion / Bank Height			7.2 Ice & Debris Jam Potential		Comments
	Erosion (H /L /N)	Bank Height (H /M /L)	Impact H / L / NS	Type (Menu)	Impact H / L / NS	

Data Sheet 8

Phase 1 - Step 8. Stream And Watershed Impact Rating

								8.1 (DMS)										8.2	8.3
Reach No.	**Stream Type**	**4.1 Watershed Land Use / Cover**	**4.2 Corridor Land Use / Cover**	**4.3 Riparian Buffer Width**	**5.1 Flow Regulation / Withdrawals**	**5.2 Bridges and Culverts**	**5.3 Bank Armoring / Revetments**	**5.4 Channel Straightening**	**5.5 Dredging / Gravel Mining**	**6.1 Berms, Roads, Railroads, Paths**	**6.2 Floodplain Developments**	**6.3 Depositional Features**	**6.4 Meander Migration**	**6.5 Meander Width Ratio**	**6.6 Wavelength Ratio**	**7.1 Bank Erosion / Bank Height**	**7.2 Ice / Debris Jam Potential**	**Total Impact Score**	**Priority Ranking**

Data Sheet 9

Phase 1 - Step 9. Geomorphic Condition Evaluation

Reach No.	Stream Type	9.1 Channel Adjustment Process		9.2 Reach Condition (DMS)	9.3 Reach Sensitivity 9.4 (DMS)
		Adjustment (DMS)	**Concurrent Adjustment** (DMS)		

Phase 1 – Quality Assurance Report

Stream Name:_____ Watershed: _____ Date:_____
QA Team Leader: _____ Organization /Agency:_____
ANR Team Leader:_____

Check one or more boxes to indicate the types of ANR sponsored training received by one or more members of your assessment team.	**Phase 1**	
	SGAT	
	QA	

Windshield Orientation Survey completed	
Reach Breaks reviewed by trained team member for consistency	
ANR SGA Handbook Protocols and Database used exclusively	
Other protocols used:	

Phase 1 Step Number	Tool Used to Collect Data	Confidence Level	Date Completed	Date Updated	Date of Local QA Team Review	Date of State QA Team Review	Comments
Step 1		Low to Moderate Moderate Moderate to High High					
Step 2		Low to Moderate Moderate Moderate to High High					
Step 3		Low to Moderate Moderate Moderate to High High					
Step 4		Low to Moderate Moderate Moderate to High High					
Step 5		Low to Moderate Moderate Moderate to High High					
Step 6		Low to Moderate Moderate Moderate to High High					
Step 7		Low to Moderate Moderate Moderate to High High					
Step 8 / 9		Low to Moderate Moderate Moderate to High High					

Phase 1 – Meta Data Documentation

Stream Name: (DMS)_____ Watershed: (DMS)_____ Date:_____

Step	Parameter Name	Meta Data Options (Circle One)
0.1	Reach breaks	1:24K topos
		1:24K topos, 1:5K NHD
0.2	Watershed delineations	1:24K DEM
		1:24K topos, 1:5K NHD
		1:5K DEM
0.3	Valley walls	1:24K topos
		1:24K topos, SG data
		1:24K topos, SG data, field obs.
		1:24K topos, SG data, field - GPS
0.4	Meander centerline	1:24K topos, 1:5K NHD
1.2	Towns that reaches are in	1:24K topos
		SGAT automated
1.3	Latitude and Longitude	SGAT automated
2.01	Downstream and upstream elevations	1:24K topos
2.02	Valley length	SGAT automated
		1:24K topos
		1:24K topos & 1:5K orthos
2.04	Channel length	SGAT automated
		Field - tape measure
		Field - GPS
		Field - survey
2.08	Channel width	HGC - SGAT Automated
		Field - range finder
		Field - tape measure
		Field - survey

Step	Parameter Name	Meta Data Options (Circle One)
2.09	Valley width	SGAT automated
		1:24K topos
		Field - range finder
		Field - tape measure
2.10	Confinement type	1:24K topos
		1:24K topos, SG data
		Field observation
		Field - tape measure
2.11	Stream type	1:24K topos
		Field observation
		Cross-sections, pebble counts
		Profile, cross-sections, pebble counts
3.1	Alluvial fan	1:24K topos
		1:24K topos, SG data
		1:24K topos, SG data, geologic studies
		1:24K topos, field obs.
3.2	Grade controls	1:24K topos
		1:24K topos, bedrock map
		1:24K topos, bedrock map, dam inventories
		1:24K topos, field obs.
3.4	Valley side slopes	1:24K topos
		1:24K topos, soils slope data
		1:24K topos, field obs.
3.5	Corridor soil data	NRCS soil survey maps
4.1	Historic watershed land use - land cover	1:5K orthos (1970s)
		1:5K orthos (1970s), old aerial photos, topos
		Land use - land cover (1990s statewide)
4.2	Historic corridor land use - land cover	1:5K orthos (1970s)
		1:5K orthos (1970s), old aerial photos, topos
		Land use - land cover (1990s statewide)
		Digitial corridor land use - land cover

Step	Parameter Name	Meta Data Options (Circle One)
4.3	Riparian buffer width	1:5K orthos
		Digitial corridor land use - land cover
		1:5K orthos, recent coverages & photos, field obs.
4.4	Groundwater and small tributary inputs	1:24K topos, 1:5K NHD
		1:24K topos, 1:5K NHD, NWI maps
		1:5K NHD, NWI maps, field obs.
5.1	Flow regulations and water withdrawals	1;24K topos, 1:5K NHD & orthos
		1;24K topos, 1:5K NHD & orthos, files
		1;24K topos, 1:5K NHD & orthos, files, field obs.
5.2	Bridges and culverts	1;24K topos, 1:5K NHD & orthos
		1;24K topos, 1:5K NHD & orthos, files
		1;24K topos, 1:5K NHD & orthos, files, field obs.
5.3	Bank armoring and revetments	1;24K topos & orthos
		1;24K topos, orthos, files
		1;24K topos, orthos, files, field obs.
5.4	Channel straightening	1;24K topos, 1:5K NHD & orthos
		1;24K topos, 1:5K NHD & orthos, files
		1;24K topos, 1:5K NHD & orthos, files, field obs.
5.5	Dredging and gravel mining history	Interviews - DEC, NRCS
		Interviews - DEC, NRCS, Towns, others
6.1	Berms and roads	1:24K topos, 1:5K orthos
		1:24K topos, 1:5K orthos, files
		1:24K topos, 1:5K orthos, files, field obs
6.2	River corridor development	1:24K topos, 1:5K orthos
		1:24K topos, 1:5K orthos, files
		1:24K topos, 1:5K orthos, files, field obs
6.3	Depositional features	1:5K orthos
		1:5K orthos, other aerial photos
		1:5K orthos, field obs.
6.4	Meander migration and channel avulsion	1:5K orthos (1990s & 1970s)
		1:5K orthos (1990s & 1970s), other aerial photos
		1:5K orthos (1990s & 1970s), field obs.

Step	Parameter Name	Meta Data Options (Circle One)
6.5	Belt Width	1:5K NHM, 1:5K orthos
		Field - survey
6.6	Wavelength	1:5K NHM, 1:5K orthos
		Field - survey
7.1	Dominant bed form and material	Preliminary estimate
		Field obs. at access point along reach
		Field obs. along entire reach
		Field obs. and detailed notes along entire reach
7.2	Bank erosion - relative magnitude	Field obs. at access point along reach
		Field obs. along entire reach
		Field obs. and detailed notes along entire reach
7.3	Debris and ice jam potential	Field obs. at access point along reach
		Field obs. along entire reach
		Field obs. and detailed notes along entire reach

Phase 1 Task Register 2005

Watershed: _____ Date:_____
Organization /Agency: _____

Participant Contact Information			
Name (and Agency /Group)	**Telephone**	**E-Mail**	**Mailing Address**

Task to get started **(complete on a paper map first)**				
Task	**Person completing task**	**Schedule**	**Comments**	**Approx time**
Reach Break identification				
Watershed delineation (reach sub-watershed delineation)				
Reach Numbering				

Generate Arcview Themes needed to use SGAT: See attached Phase 1 task document for details				
Task	**Person completing task**	**Schedule**	**Comments**	**Approx time**
1) Watersheds,				
2) Meander Centerline,				
3) Valley Walls				
Upload Themes into DMS for QA review				

SGAT and Database Creation				
Phase 1 steps completed in full or part by SGAT: 1.3; 2.1, 2.2; 2.3; 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 3.3, 3.5, 4.1, 4.2 (see attached document for details)				
Task	**Person completing task**	**Schedule**	**Comments**	**Approx time**
Run SGAT steps 1-10				
Review reach data in step 10; enter elevations; missing valley lengths and widths; towns, orthos; topos, notes				
Export Step 10 table				
Run SGAT steps 11-14 for soils and lulc **(see note below)**				
Parameters clipped in SGAT steps 11-14 for soils and lulc; with Appendix E corridor created in SGAT and/or Watersheds created by user				
Task / Phase 1 step #	**Person completing task**	**Schedule**	**Comments**	**Approx time**
3.3 – Geologic Material				
3.5 – Soils Characteristics				
4.1 Watershed LuLc				
4.2 – Corridor LuLc (this may be more accurate to do with orthophotographs)				
• ***Import tables from SGAT into DMS*** ***Run QA check for each table***				
To assist in steps outside of SGAT it can be useful to print out the reports, for each step and/or the "Data Entry Worksheet", from the database. This will give the user tables with reach numbers in place for completion of the step. If using the "Data Entry Worksheet" simply fill in the step & parameters being collected at the head of each column.				

Steps done without SGAT or SGAT corridor delineation (use Appendix A worksheets to record the data)				
Task / Phase 1 step #	**Person completing task**	**Schedule**	**Comments**	**Approx time**
1.1– Reach Description				
1.2 – Town				
2.11 – Stream Type (steps 2.3 and 2.10 must be completed first)				
DMS – QA step to be completed				
3.1 – Alluvial Fan				
3.2 – Grade Controls				
3.4 – Valley Side Slope				
4.3 – Riparian Buffer Width				
4.4 – Groundwater and Small Tributary Input				
For several parameters in Steps 5-7 it will be necessary to create, and/or modify current, GIS shapefiles. Steps 5.1, 5.3, 5.4, 6.1, 6.2, 6.5, 6.6, 7.2. The type of GIS layer suggested will be noted below, in the step. The Feature Indexing Tool (FIT) is required for steps 5.3, 5.4 and 6.1 (see attached document for details)				
5.1 – Flow Regulations (FIT – point theme)				
5.2 – Bridges (FIT –line theme)				
5.3 – Bank Revetments (FIT – line theme)				
5.4 – Channel Modifications (FIT- line theme)				
5.5 – Dredging and Gravel Mining				
Steps 6.1 & 6.2 are done with Appendix E corridor (created by SGAT) and orthophotographs (use Appendix A worksheets to record the data)				
6.1 – Berms, Roads, Railroads, and Improved Paths (FIT – line theme)				
6.2 – River Corridor Development (FIT – line theme)				

Con't - Steps done without SGAT or SGAT corridor delineation (use Appendix A worksheets to record the data)				
Task / Phase 1 step #	**Person completing task**	**Schedule**	**Comments**	**Approx time**
6.3 – Channel Bars				
6.4 – Meander Migration				
6.5 – Meander Width Ratio (GIS – line theme)				
6.6 – Wavelength Ratio (GIS – line theme)				
7.1 – Dominant Bed Material				
7.2 – Bank Erosion (FIT – line theme)				
7.3 – Debris and Ice Jam Potential				
DMS – QA step to be completed				
8.1 – Impact Rating				
8.2 – Priority Rating				
9.1- Channel Adjustment Process				
9.2- Reach Condition				
9.3- Reach Sensitivity				
10 - Like Reach Evaluation				

Phase 1 Tasks 2005

It is very valuable, and recommended, to take the time to mark all reach breaks, draw all watersheds (reach sub-watersheds, as well as the overall watershed), and to label/number all reaches on a paper map before starting on the computer. This will provide a working map and will help those members of the team who may be completing steps not done on the computer.

*** See protocols for details on collecting the data for all steps.**

Task to get started

1) Reach Break identification
2) Watershed delineation (reach sub-watershed delineation)
3) Reach Numbering

Step done totally or in part by SGAT:

*** Use the SGAT user manual for working through the program. Use the Phase 1 assessment handbook protocols for understanding and evaluating the information for each step listed below.**

The user must generate 3 ArcView themes;

1) **Watersheds,**
2) **Meander Centerline, and**
3) **Valley Walls**

*** The user will also need the 1:5000 stream layer, digital NRCS soils maps, and the digital State-wide Land-use/Land-cover for their area/watershed (data can be obtained from VCGI's web site or by contacting them for a CD).**

1.3 *– Latitude/Longitude*

- Completed for all reaches by SGAT

2.1 *– Elevation*

- User enters elevation, off the topographic map, for each reach point in Step 10 of SGAT)
- **Note:** If the user is unable to distinguish an elevation for the reach break, due to a long reach in a very low slope valley where there are no contour lines crossing the valley, the user may find it difficult to interpolate an elevation. For those reaches where no elevation change is distinguishable on the topographic map, the user can check (on the data sheet and in the database, not in SGAT) the "Gentle Gradient" descriptor for valley and channel slope.

2.2 *– Valley Length*

- Completed by SGAT for reaches where valley wall polygon has been drawn {those reaches that are in Narrow, Broad, or Very Broad valleys}; for reaches in Semi-confined and Narrow-confined valleys, the user must measure the valley length and enter the data in Step 10 of SGAT)

2.3 *– Valley Slope*

- Calculated by SGAT for reaches where valley length and reach elevations have either been generated by SGAT or entered by the user in Step 10 of SGAT.

2.4*-Channel Length*

- Completed for all reaches by SGAT

2.5 *– Channel Slope*

- Calculated for all reaches by SGAT once elevations have been entered in SGAT Step 10

***2.6** – Sinuosity*

- Calculated for reaches where valley length is provided by either SGAT or entered by the user in SGAT Step 10.

***2.7** – Watershed Size*

- Calculated for all reaches by SGAT

***2.8** – Channel Width*

- Calculated, by SGAT, for all reaches

***2.9** – Valley Width*

- Calculated, by SGAT, for only those reaches where a valley wall polygon has been drawn {typically, those reaches that are in Narrow, Broad, or Very Broad valleys}; the user may choose not to measure confined valley widths due to the inability to discern valley toes on the topographic map, so this parameter may be left blank for confined valleys. If the user measures a confined valley width ,the data can be entered in SGAT Step 10.

***2.10** – Confinement*

- The confinement ratio will be calculated for those reaches where a valley wall polygon has been drawn {those reaches that are in Narrow, Broad, or Very Broad valleys}; if the user entered a valley width for a confined valley in SGAT Step10 then a ratio will be calculated by SGAT. The user will then choose a confinement type in the Phase 1-2 database. For those confined valleys, where no valley wall lines were drawn, use confinement type "1-SC" (semi-confined) as a default choice unless you are aware that the valley is "V" shaped and the stream is narrowly confined, then choose 1-NC.

* SGAT will generate the Appendix E corridor (see Phase 1 handbook for details on the corridor used to determine the information for the following steps)

***3.3** – Geologic Materials*

- Complete steps 11, 12, and 14 in SGAT

***3.5** – Soils Characteristics*

- Complete steps 11, 12, and 14 in SGAT

***4.1** – Watershed Land Cover / Land Use*

- Complete steps 11, 12, **13** and 14 in SGAT

***4.2** – Corridor Land Cover / Land Use*

- Complete steps 11, 12, and 14 in SGAT
-
- **Note: The State-wide LuLc layer is not very accurate at the corridor level. If you have a more detailed LuLc layer (that has the same categories as the State-wide, but has been done for your area more recently) you can clip that layer for your corridor information. Otherwise it is recommended that you get this information from the current orhtophotographs and the windshield orientation survey. (Overlay the corridor generated in SGAT on the orhtophotograph and look for the LuLc that is within the corriodor.)**

Steps 3.3, 3.5, 4.1 and 4.2: **SGAT will clip and sum the information from the NRCS soils data and/or the state-wide Land-use/Land-cover layer. Importing the tables into the DMS will calculate the corrected percents and impact scores for these steps.**

Steps that will be completed once the Appendix E corridor has been created (by SGAT or by hand if not using SGAT)

3.3 –Geologic Material (see SGAT above)
3.5 – Soils Characteristics (see SGAT above)
4.2 – Corridor Land-use/Land-cover (see SGAT above)

6.1 – Berms, Roads, Railroads, and Improved Paths
6.2 – River Corridor Development

Steps that can be done without assistance from SGAT or SGAT corridor delineations:

- Review of orthophotos and topographic maps can be done on the computer, but the paper copies will also be okay for completing these steps, so members of your team who are not computer savvy can work on these tasks while other people do the computer work.
- For all reaches, Complete the Appendix A worksheets for each step. Have a QAQC meeting to review the data before entering it into the database.

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
1.1- Reach Description **1.2** – Town	*** 2.11** – Stream Type	**3.1** – Alluvial Fan **3.4** – Valley Side Slope	*** 4.3** – Riparian Buffer Width **4.4** – Groundwater and Small Tributary Input	**5.1** – Flow Regulations **5.2** – Bridges **5.3** – Bank Revetments **5.4** – Channel Modifications **5.5** – Dredging and Gravel Mining	**6.3** – Channel Bars **6.4** – Meander Migration **6.5** – Meander Width Ratio **6.6** – Wavelength Ratio	**7.1** – Dominant Bed Material **7.2** – Bank Erosion **7.3** – Debris and Ice Jam Potential	**8.1** – Impact Rating **8.2** – Priority Rating	**9.1**- Channel Adjustment Process **9.2**- Reach Condition **9.3**- Reach Sensitivity	**10** - Like Reach Evaluation

* 2.11 – Stream Type

(To complete the stream type for each reach, data from steps 2.3 and 2.10 must be completed first; additional information from steps 7.1 may also be used for a more detailed stream type; but is not necessary for the initial stream type classification, if step 7.1 has not been completed).

* 4.3 – Riparian Buffer Width

(If this is done on the computer, it can be useful to have the various buffer widths displayed, such aa 100 ft "buffer"; polygon created for the stream layer, then overlay it on the orthophoto to help with quickly determining the buffer widths within each category.) When using the centerline, it is more accurate to create the buffer widths based on the equation (channel width / 2) + X ; where channel width comes from SGAT step 8 and X is the widths (25, 50, and 100)

Create the following GIS layers that correspond to Steps 5-7.

- **Step 5.1 Flow Modifications**- identify water withdrawal sites, dams and other features that modify flow (point theme).
- **Step 5.3 Bank Armoring**- locate areas of bank protection (line theme). (**RIT)**
- **Step 5.4 Channel Modification**- document sections of channel that have been modified (line theme). (**RIT)**
- **Step 6.1 Berms and Roads**- identify roads, berms and railroads within stream corridor (line theme). (**RIT)**
- **Ste6 6.2- River Corridor Development**- utilizing 911 site data, locate structures within the river corridor (point theme).
- **Step 6.5 and Step 6.6 Meander Width and Length**- record how and which meanders were measured (line theme).
- **Step 7.2 Bank Erosion**- identify areas of stream bank erosion (line theme).

These GIS layers will be used in the QAQC process, documenting the length and location of the parameter, and identifying where parameters were assessed. These layers are also very valuable for mapping and display purposes.

QAQC Review :

- Review of data collected by QAQC team
- Complete QA steps as required in DMS (shapefiles, SGAT tables, after Step 2, and after step 7)
- Document any questions, concerns, missing data, etc.
- Complete QAQC form for watershed

Database:

* Entering data for all steps

Note: The reach number and VTID, as well as notes and other information from SGAT step 0.0; and from SGAT for steps : 1.3, 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10; can be imported into the database automatically. Also information from SGAT for Steps: 3.3, 3.5, 4.1, and 4.2 is automatically imported into the DMS.

Information from RIT for steps 5.3, 5.4, 6.1 is automatically uploaded.

Bridge and Culvert Survey:

- Contact town highway department, RPC, and utilize VCGIs' bridge/culvert layer to determine structure numbers (where available)
- Complete Phase ANR Bridge/Culvert Survey
- Enter data into DMS

Vermont Stream Geomorphic Assessment

Appendix A - Phase 2 Field Forms

Field Notes Form for Steps 1 - 5

Cross-Section Worksheet

Field Quick Refer Tables

Quality Assurance Data Sheet

Rapid Habitat Assessment (RHA)

Rapid Geomorphic Assessment (RGA)

Page purposely left blank.

Rapid Stream Assessment Field Notes

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____ ☐ Sub-Reach
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Latitude (N/S):_____
USGS Map Name(s):_____ Longitude (E/W): _____
Weather:_____ Drainage Area: _____ sq. mi.
Rain Storm within past 7 days: Y / N Flood history known: Y / N Segment Length: _____ ft.
Segment Not Assessed: W/I/N/G/B/O

1. Valley and River Corridor

1.1 Segmentation: GC/CD/SS/PS/DF/CE/BB/FS/PA/SR/VW/OT/None **1.2 Alluvial Fan (FIT):** Yes/No/UK

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length			1.4 Slope of the Adjacent Terrace or Hillside	
	One Bank	Both Banks	Height from tw	Left Corridor	Right Corridor
Berms				flat (0-3%) hilly (4-8%) steep (9-15%) very steep (16-25%) x-steep (>25%) **Continuous w/bank** A / S / N **Within 1x Wbkf** A / S / N Texture of Exposed Slope till boulder/cobble gravel sand silt clay bedrock other Not Evaluated	flat (0-3%) hilly (4-8%) steep (9-15%) very steep (16-25%) x-steep (>25%) **Continuous w/bank** A / S / N **Within 1x Wbkf** A / S / N Texture of Exposed Slope till boulder/cobble gravel sand silt clay bedrock other Not Evaluated
Roads					
Railroads					
Improved Paths					
Development			NA		

1.5 Confinement
Valley width / Channel width
Valley Width:_____ ☐ Gorge
Estimated / Measured
☐ Human caused change in valley width

Narrowly Confined (>=1 & < 2)
Semi-confined (>2 & < 4)
Narrow (>= 4 & < 6)
Broad (>= 6 & <10)
Very Broad (>= 10)

1.6 Grade Controls (FIT) ☐ none Fill out height fields for grade controls if applicable →

Location in Reach (record locations on field map) Waterfall // Ledge // Dam // Weir	Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No

2. Stream Channel

2.1 Bankfull Width: _____ ft. **2.1a Wetted Width:** _____ ft. **2.1b Ratio (W_{wetted} / W_{bkf}):**_____

2.2 Max. Bankfull Depth: _____ ft. **2.3 Mean Bankfull Depth**:_____ ft.

2.4 Floodprone Width: _____ft. **2.5 Recently Abandoned FP :** _____ ft. **2.6 Ratio W/d_{mean}:**_____

2.7 Entrenchment: _____ **2.8 Incision Ratio:** _____ IR_{hef} **:**_____ **2.9 Sinuosity:** _____

2.10 Riffles/Steps: complete / eroded / sedimented / NA / NE (partial or none) (diagonal or continuous) **2.11 Riffle/Step Spacing:** _____ ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin	2.13 Avg. Size of Largest Particles on:
						Y / N			Bed:_____ Bar:_____ **circle**: inches or millimeters
									2.13a % Exp. Substrate:_____

2.14 Stream Type: A G F B E C D 1 2 3 4 5 6 a b c Stream Type

Cascade Step-Pool Plane Bed Riffle-Pool Ripple-Dune Braided ☐Reference Type

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	steep	undercut	**(evaluate on the higher of the two banks)**							
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive					
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive					
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive					
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive					
	Bank Erosion (FIT)	**Left**	**Length:** ft.	**Height:** ft.			**Bank Revetment Type:**		**Length:** ft.					
		Right	**Length:** ft.	**Height:** ft.			**Bank Revetment Type:**		**Length:** ft.					
	Near Bank Vegetation Type	**Trees**	L % cover	Invasive	Conifer	Deciduous	R % cover	Invasive	Conifer	Deciduous				
		Shrubs / Saps.	L % cover	Invasive	WADs	Saplings	R % cover	Invasive	WADs	Saplings				
		Herbs	L % cover	Invasive	Grasses	Forbs	R % cover	Invasive	Grasses	Forbs				
	Bank Canopy	**Left**	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	**Channel Canopy**						
		Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open	Closed					
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft	none (SD).							
		Right	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft	none (SD).							
	Buffer Vegetation Type	**Trees**	L % cover	Invasive	Conifer	Deciduous	R % cover	Invasive	Conifer	Deciduous				
		Shrubs / Saps.	L % cover	Invasive	WADs	Saplings	R % cover	Invasive	WADs	Saplings				
		Herbs	L % cover	Invasive	Grasses	Forbs	R % cover	Invasive	Grasses	Forbs				
3.3	**Riparian Corridor (dom/sub)**	**Left**	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)					
		Right	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)					

4.1 Springs or Seeps: extensive / present / minimum / none / altered

4.2 Adjacent Wetlands: extensive / present / minimum / none / altered **4.3 Flow status:** base / low / avg.

4.4 Current Debris Jams (FIT): # _____ **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / none / unk

4.7 Flow Regulation (FIT): SIZE : small / large ; USE: drinking / irrigation, flood-control / hydro-electric / recreation /other

4.6 Upstream/Downstream Flow Regs. : upstream / downstream / both / none

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch___ / urban stormwater ___ / field ditch ___/ overland flow ___

4.8 Constrictions ☐ none **menu**: instream culvert // bridge // old abutment // bedrock outcrop // other

						Problems (check all that apply)					
Constriction Type (from menu)	**Width** (ft)	**Photo** Yes / No		channel constriction	floodprone constriction	deposition above	deposition below	scour above	scour below	alignment	none
				☐	☐						
				☐	☐						
				☐	☐						
				☐	☐						

4.9 Beaver Dams (FIT): # _____ _____ft. of the segment affected. ☐ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

5.4 Stream Ford or Animal Crossing (FIT): Yes / No

5.5 Channel Alterations (FIT) (circle all that apply): dredging gravel mining commercial mining none

Length of Straightening: _____ (With Windrowing : Yes / No)

Comments:

Sketch Form for Sites – Segments – Reaches

Stream Name:_____ Segment or Site ID: _____
Date:_____ Town:_____
Observers:_____ Elevation: _____ Ft.
Organization /Agency: _____

Site Sketch - see reverse side for sketch codes and tally columns for left and right bank erosion, revetments, and corridor developments and calculating the total length of the segment affected by beaver flowages.

Scale:

Height of bankfull features above water surface (Ft.)

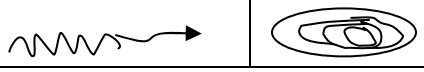
_____ _____ _____ _____ _____ Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

FIT Features

Parameters	Map Codes and Sketch Examples
Alluvial Fan	**AF**
Bank Revetments	**rprp** XXXXXXXX Rip Rap **trvt** XXXXXXXX Tree-revetment
Bars and other Depositional Features	**Pbr** Point Bar **Mbr** Mid-channel Bar **Dbr** Diagonal Bar **Dtbr** Delta Bar **Sbr** Side Bar **BS** Bar Sample 
Bed Features	**Rf** Riffle **Stp** Step **P** Pool 
Bedrock	 BR
Benchmark Locations	**BM**
Berms	B
Buffers	**Bfr** ∈∈∈∈∈∈∈∈∈
Chutes, Cut-offs and Avulsions	**FC** Flood Chutes **NC** Neck Cut-off **CA** Channel Avulsion
Cross Section Locations and Number	**CS#__**
Culverts and Bridges	**Cul** Culvert **Brg** Bridge
Debris Jam Locations	**DJ** Debris Jam
Developments	**D-R** Residential **D-C** Commercial / Industrial
Eroding Banks	**BF** Bank Failure **MF** Mass Failure
Floodplains and Terraces	**Fp** Floodplain **Tr** Terrace
Flow Direction	→
Flow Regulation or Withdrawal Structures	**Dam** **Weir** **Snow** Snowmaking **Irrig** Irrigation
Grade Controls	**GC** (also note type of control)
Head-cuts and Steep Riffles	**HC** Head Cut **ST** Steep Riffle
Longitudinal Profile	**LP-start** and **LP-end**
North Arrow	**N** ↑
Pebble Count (mark start and end points)	PC-start **and** PC-end
Photo Points	P# **(# to correspond w/ photo log #)**
Reach and Segment start/end points (also include reach number from Phase 1 data)	**R-start** and **S-start** **R-end** and **S-end**
Roads, Railroads, Improved Paths	**RD** Roads **RR** Railroads **IP** Improved Path
Seep / Spring	**S**
Stormwater Features	**SI** Stormwater Input **G** Gulley
Stream Fords or Animal Crossings	**SF** Stream Ford **AC** Animal Crossing
Tributary	**Trib**

List showing the field data that will need exact location in the FIT

Impact	Shape	Sub-Impact
Beaver Dam	Point	N/A
Cross Section Location	Point	NOT Representative Representative
Debris Jam	Point	N/A
Gully	Point	N/A
Mass Failure	Polyline	N/A
Steep Riffle or Head Cut	Point	Head Cut Steep Riffle
Storm Water Input	Point	Field Ditch Other Overland Flow Road Ditch Tile Drain Urban Storm Water Pipe
Stream Crossing	Point	Animal Crossing Stream Ford
PHASE	**1**	**UPDATE**
Alluvial Fan	Point	N/A
Bank Armoring or Revetment	Polyline	Rip-Rap Hard Bank Other
Bridge and Culvert	Point	Bridge Culvert Other
Buffer Less than 25 feet	Polyline	N/A
Development	Polyline	N/A
Dredging	Polyline	Commercial Mining Dredging Gravel Mining
Encroachment	Polyline	Berm Improved Path Railroad Road
Erosion	Polyline	N/A
Flow Regulation and Water Withdrawal	Point	Large Bypass Large Run of River Large Store and Release Large Withdrawal Small Bypass Small Run of River Small Store and Release Small Withdrawal
Grade Control	Point	Dam Ledge Waterfall Weir
Migration	Point	Avulsion Braiding Flood Chute Neck Cutoff
Straightening	Polyline	Straightening With Windrowing

Database - Photo Log

Photo ID: ___________________
Photo Date: _________________
Photographer:_________________________

Photo Type: aerial photo / digital photo / referenced aerial
Site Type: degraded / gage / reference / restoration
Instability Type: dimension / hydrology / lateral / pattern profile / sediment regime
Management Activities: floodplain / in channel / riparian / watershed

Site ID (If location is in Sites table): ______________
Stream Name: ______________________________
Town:________________________________
Waterbody ID: __________________
Valley Type: ___________________
XS #: ___________

- ☐ Graphic Enhanced
- ☐ Clear Bankfull Indicators
- ☐ People
- ☐ Structure
- ☐ Monitoring Photo point

Database - Photo Log

Photo ID: ___________________
Photo Date: _________________
Photographer:_________________________

Photo Type: aerial photo / digital photo / referenced aerial
Site Type: degraded / gage / reference / restoration
Instability Type: dimension / hydrology / lateral / pattern profile / sediment regime
Management Activities: floodplain / in channel / riparian / watershed

Site ID (If location is in Sites table): ______________
Stream Name: ______________________________
Town:________________________________
Waterbody ID: __________________
Valley Type: ___________________
XS #: ___________

- ☐ Graphic Enhanced
- ☐ Clear Bankfull Indicators
- ☐ People
- ☐ Structure
- ☐ Monitoring Photo point

Database - Photo Log

Photo ID: ___________________
Photo Date: _________________
Photographer:_________________________

Photo Type: aerial photo / digital photo / referenced aerial
Site Type: degraded / gage / reference / restoration
Instability Type: dimension / hydrology / lateral / pattern profile / sediment regime
Management Activities: floodplain / in channel / riparian / watershed

Site ID (If location is in Sites table): ______________
Stream Name: ______________________________
Town:________________________________
Waterbody ID: __________________
Valley Type: ___________________
XS #: ___________

- ☐ Graphic Enhanced
- ☐ Clear Bankfull Indicators
- ☐ People
- ☐ Structure
- ☐ Monitoring Photo point

Database - Photo Log

Photo ID: ___________________
Photo Date: _________________
Photographer:_________________________

Photo Type: aerial photo / digital photo / referenced aerial
Site Type: degraded / gage / reference / restoration
Instability Type: dimension / hydrology / lateral / pattern profile / sediment regime
Management Activities: floodplain / in channel / riparian / watershed

Site ID (If location is in Sites table): ______________
Stream Name: ______________________________
Town:________________________________
Waterbody ID: __________________
Valley Type: ___________________
XS #: ___________

- ☐ Graphic Enhanced
- ☐ Clear Bankfull Indicators
- ☐ People
- ☐ Structure
- ☐ Monitoring Photo point

Standard Photo Log

Reach or Segment Number	Roll & Photo Number	Photo View* or Feature	Photo Description

6.□ Photo views would include upstream, downstream, right bank, left bank, cross-section, etc.

Tally Sheet (page 1)

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	
	Degrade	Head Cuts	
	Tributary Rejuvenation?	Yes / No	

Step 3.1 Bank Erosion **FIT**

Left Bank Length	Height	Right Bank Length	Height
Total:	**Avg.**	**Total:**	**Avg.**

Step 3.3 Mass Failures and Gullies **FIT**

Mass Fail - Length		Height	Gully - Length		Length
Left	Right		Left	Right	

Step 3.1 Bank Revetment **FIT**

Length	
Left Bank	**Right Bank**
Total:	**Total:**

Step 4.8 Channel Constrictions

	Constriction Type	Width	Photo?	GPS?	Ch. Constr.	FP. Constr.	DA	DB	SA	SB	A	None
1.)												
2.)												
3.)												
4.)												
5.)												

		Tally
Step 2.12	**Large Woody Debris**	
Step 4.4	**Debris Jams**	

Step 2.11	**Riffle/Step Spacing:**		
Step 2.13	**Avg. Largest Particle**	**On Bed:**	**On Bar:**

Step 1.3 River Corridor Encroachments **FIT**

Type	Length		Height of Fill
	One Side	Both Sides	

Step 4.6 Stormwater **FIT**

	Tally
Field Ditch	
Overland Flow	
Road Ditch	
Tile Drain	
Urban Stormwater	
Other	

Tally Sheet (page 2)

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____

☐ Sub-Reach

Note CPOM, algae, location of fines

6.1 Large Woody Debris and Jams

Rank	D_{large} (ft)	L (w_{bkf})	Tally	#	%
1	0.5 - 1.0	< 0.5			
2	0.5 - 1.0	> 0.5			
3	1.0 - 2.0	< 0.5			
4	1.0 - 2.0	> 0.5			
5	> 2.0	< 0.5			
6	> 2.0	> 0.5			
		Total LWDs			
		# LWDs / mile			
		# Debris jams			
		# Debris jams / mile			

6.2 Pools (note vegetative cover, surface turbulence, fines)

Rank	D (ft)	L,W (w_{bkf})	Tally	#	%
1	1.0 - 2.0	< 0.5			
2	1.0 - 2.0	> 0.5			
3	2.0 - 3.0	< 0.5			
4	2.0 - 3.0	> 0.5			
5	> 3.0	< 0.5			
6	> 3.0	> 0.5			
7	> 3.0	≥ 1.0			
		Total pools			
		# Pools / mile			

6.3 Refuge Areas / Connections

ID	Location	Q_{access}	Notes
	in / out	low / bkf	
	in / out	low / bkf	
	in / out	low / bkf	
	in / out	low / bkf	
	in / out	low / bkf	
	in / out	low / bkf	
	in / out	low / bkf	

6.4 Undercut Banks (note stability, overhanging vegetation)

Rank	D_{max} (ft)	L (ft)	Tally	#	%
1	0.5 – 1.0	< 2.0			
2	0.5 – 1.0	> 2.0			
3	1.0 – 2.0	< 2.0			
4	1.0 – 2.0	> 2.0			
5	>2.0	< 2.0			
6	>2.0	> 2.0			
		Total undercuts			
		# undercut banks / mile			

Cross-Section Worksheet

Stream Name:_____ Reach-Segment: _____
Location: _____ Date:_____
Observers: _____

Comments:

BKF Height

Cross-Section Notes Codes

LTER = Left Terrace	RTER = Right Terrace	TW = Thalweg
LFPA = Left Flood Plane	RFPA = Right Flood Plane	LPIN = Left Pin
LTOB = Left Top of Bank	RTOB = Right Top of Bank	RPIN = Right Pin
LBF = Left Bankfull Stage	RBF = Right Bankfull Stage	
LEW = Left Edge of Water	REW = Right Edge of Water	

RAF = Recently Abandoned Floodplain
IRhef= Incision Ratio of Human Elevated Floodplain

Cross-sections - Number and Location Description:

Note	Distance	Depth	Note	Distance	Depth	Note	Distance	Depth

Bankfull Width		Bankfull Width		Bankfull Width	
Max. Depth		Max. Depth		Max. Depth	
Mean Depth		Mean Depth		Mean Depth	
Floodprone Width		Floodprone Width		Floodprone Width	
Low Bank Height		Low Bank Height		Low Bank Height	
Width/depth Ratio		Width/depth Ratio		Width/depth Ratio	
Entrenchment		Entrenchment		Entrenchment	
Incision Ratio		Incision Ratio		Incision Ratio	
IRhef		IRhef		IRhef	
Wetted Width		Wetted Width		Wetted Width	

Drawing of Typical Cross-Section

Size Class	Millimeters	Inches	Relative Size			Distribution of 100 Particles			Percent	
1-Bedrock	> 4096	> 160	Bigger than a VW Bug							
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug							
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball							
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball							
4-Fine Gravel	2 – 16	0.08 – 0.63	Pepper corn to marble							
5-Sand or Smaller	< 2.00	< 0.08	Smaller than a pepper corn							
Embeddedness	Ch1	Ch2	Ch3	Ch4	Ch5	Ma1	Ma2	Ma3	Ma4	Ma5
Largest mobile particles	Bd1	Bd2	Bd3	Bd4	Bd5	Br1	Br2	Br3	Br4	Br5

Step 1: Valley and Floodplain Corridor – Quick Refer Menus and Tables

1.1 SEGMENTATION

GC	Grade Control
CD	Channel Dimensions
SS	Substrate Size
PS	Planform and Slope
DF	Depositional Features
CE	Corridor Encroachments
BB	Banks and Buffers
FS	Flow Status
PA	Property Access
OT	Other Reason – Explain in Comments
None	No segments

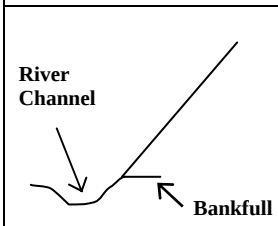
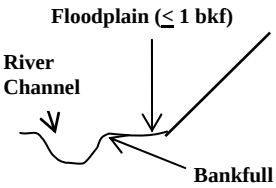
1.2 ALLUVIAL FAN

Yes	Segment or reach potentially on alluvial fan.
No	Segment or reach not potentially on alluvial fan.
Unknown	Unknown whether the segment is located on an alluvial fan

1.3 CORRIDOR ENCROACHMENTS

Yes	Encroachment within the corridor
No	Encroachment <u>not</u> within the corridor

1.4 ADJACENT SIDE SLOPE

Continuous	Within 1 Bankfull Width
	

Classification	Percent Slope
Flat	0-3%
Hilly	4-8%
Steep	9-15%
Very Steep	16-25%
Extremely Steep	>25%

Slope Texture

Bedrock	**Boulder**	**Cobble**	**Gravel**	**Sand**
Silt /Clay	**Mixed Texture**		**Other**	**Not Evaluated (NE)**

1.5 CONFINEMENT

Valley Description	Valley Width / Channel Width Ratio
Narrowly Confined	≥1 and < 2
Semi Confined	≥2 and <4
Narrow	≥4 and <6
Broad	≥6 and <10
Very Broad	≥10 with abandoned terraces on one or both sides

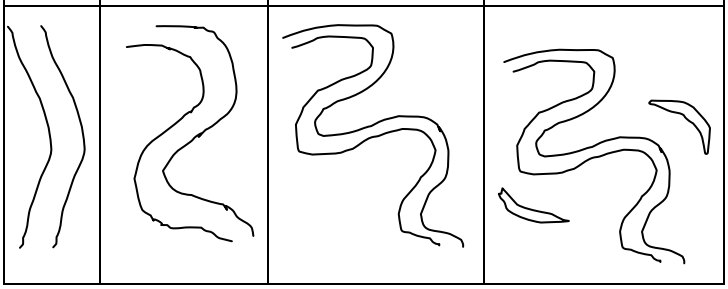
1.6 GRADE CONTROLS

Waterfalls	Bedrock that extends across the channel and forms a vertical, or near vertical, drop in the channel bed, usually ≥ 2 feet high.
Ledge	Bedrock that extends across the channel and forms no noticeable drop in the channel bed, or only a gradual drop in the channel bed, usually < 2' high.
Dams	High cross-channel structures.
Weirs	Low cross-channel structures.

Step 2: Stream Channel – Quick Refer Menus and Tables

2.6 WIDTH / DEPTH RATIO: Divide the bankfull width (2.1) by the mean depth (2.3)
2.7 ENTRENCHMENT RATIO: Divide flood-prone width (2.4) by the bankfull width (2.1)
2.8 INCISION RATIO: Divide the low bank height (2.5) by the bankfull maximum depth (2.2)

2.9 SINUOSITY

Low	Moderate	High	Oxbows
			

2.10 RIFFLES/STEPS

Complete	All or nearly all riffles or steps completely cross the channel and are perpendicular, or slightly askew, to the channel banks
Eroded	Including partially eroded riffles/steps that do not completely cross the channel (scour process). Predominately runs, riffles/steps washing out or not present, as seen in a sediment limited reach or where bed degradation is occurring.
Sedimented	Including steep diagonal or transverse riffle/step features that cross the channel at a sharp angle in relation to the channel banks (depositional process). Riffles/steps may appear continuous, as seen during an aggradation process, and appearing as a coarse plane bed.
Not Applicable	Riffles and steps do not appear in ripple dune and plane bed streambed types.
Not Evaluated	Riffles and steps were not evaluated for completeness – Comment on reason.

2.11 Riffle / Step Spacing

Stream Type		Spacing
Cascade / Step-pool	A	1-3 times W_{bkf}
Step / Riffle-pool	B	3-5 times W_{bkf}
Riffle-pool	C & E	5-7 times W_{bkf}
Plane bed / Ripple-dune	any	Riffles and steps are not present

2.12 BED SUBSTRATE COMPOSITION

Size Class	Millimeters	Inches	Relative Size
1-Bedrock	> 4096	> 160	Bigger than a Volkswagen Bug
2-Boulder	256 – 4096	10.1 - 160	Basketball to Volkswagen Bug
3-Cobble	64 – 256	2.5 - 10.1	Tennis ball to basketball
4-Gravel	2 – 64	0.1 – 2.5	Pepper corn to tennis ball
5-Sand	0.062 – 2.00	0.002 -0.1	Smaller than a pepper corn
6 – Silt	<.062	<.08	

2.14 STREAM TYPE

Stream Type	(1) Entrenchment (+ or – 0.2)	(2) Width/depth (+ or – 2)	(3) Sinuosity (+ or – 0.2)	(4) Slope % (See Note)
A – Single Thread	**<1.4** - Entrenched	**<12** – Low	**<1.2** – Low	**4-10**
G – Single Thread	**<1.4** - Entrenched	**<12** – Low	**>1.2** – Low to Mod.	**2-4**
F – Single Thread	**<1.4** - Entrenched	**>12** – Mod. to High	**>1.2** – Low to Mod.	**<4**
B – Single Thread	**1.4 -2.2** – Moderately Entrenched	**>12** – Moderate	**>1.2** – Low to Mod.	**2-4**
E – Single Thread	**>2.2** – Slightly Entrenched	**<12** – Very Low	**>1.5** – Very High	**<2**
C – Single Thread	**>2.2** – Slightly Entrenched	**>12** – Mod. to High	**>1.2** – Moderate	**<2**
D – Multiple Thread		**>40** – Very high	**<1.2** - Low	**<4**

Slope Subscript	Slope %
a	4-10
b	2-4
c	<2

Cascade	Generally occur in very steep channels, narrowly confined by valley walls. Characterized by longitudinally and laterally disorganized bed materials, typically bedrock, boulders, and cobbles. Small, partial channel-spanning pools spaced < 1 channel width apart common.
Step-Pool	Often associated with steep channels, low width/depth ratios and confining valleys. Characterized by longitudinal steps formed by large particles (boulder/cobbles) organized into discrete channel-spanning accumulations that separate pools, which contain smaller sized materials. Step-pool systems exhibit pool spacing of 1 to 4 channel widths.
Plane Bed	Occur in moderate to high gradient and relatively straight channels, have low width/depth ratios, and may be either unconfined or confined by valley walls. Composed of sand to small boulder-sized particles, but dominated by gravel and cobble substrates. Channel lacks discrete bed features (such as pools, riffles, and point bars) and may have long stretches of featureless bed.
Riffle-Pool	Occur in moderate to low gradient and moderately sinuous channels, generally in unconfined valleys, and has well-established floodplain. Channel has undulating bed that defines a sequence of bars, pools, and riffles. Pools spaced every 5 to 7 channel widths in a self-formed (alluvial) riffle-pool channel.
Dune-Ripple	Usually associated with low gradient and highly sinuous channels. Dominated by sand-sized substrates. Channel may exhibit point bars or other bedforms forced by channel geometry. Typically undulating bed does not establish distinct pools and riffles.
Bedrock	Lack a continuous alluvial bed. Some alluvial material may be temporarily stored in scour holes, or behind obstructions. Often confined by valley walls.
Braided	Multiple channel system found on steep depositional fans and deltas. Channel gradient is generally the same as the valley slope. Ongoing deposition leads to high bank erosion rates. Bed features result from the convergence/divergence process of local bed scour and sediment deposition. Unvegetated islands may shift position frequently during runoff events. High bankfull widths and very low meander (belt) widths.

Step 3: Riparian Banks, Buffers and Corridors – Quick Refer Menus and Tables

3.1 TYPICAL BANK SLOPE

Undercut	upper bank overhanging the streambed
Shallow	bank slope (<30%)
Moderate	bank slope (31-50%)
Steep	bank slope (>51%)

3.1 BANK REVETMENTS

Rip-rap	Blanket of rock covering the bank, usually large angular boulders
Hard Bank	Walls of large rocks, concrete blocks or rectangular gabion wire baskets (filled with stone) lining banks
Other	e.g.: tree revetments or vanes intended to stop the lateral erosion of the stream channel
None	No bank revetments observed

3.1 LOWER & UPPER BANK TEXTURE

Bedrock	Very resistant to erosion
Boulder/ Cobble	(boulders > 10 inches / cobbles 2.5 to 10 inches) Moderately resistant to erosion
Gravel	(0.1 to 2.5 inches) Moderate to high bank erodibility when present as dominant component or as part of the bank materials
Sand	High bank erodibility when present as dominant component or as part of the bank materials
Silt/Clay	Non-cohesive silt has very high / extreme bank erodibility; while cohesive clays are relatively resistant to erosion
Mix	Variety of particle sizes present from very small to very large. Glacial till may be an example of mixed bank materials (Figure 3.3)

3.2 BUFFER WIDTH

0 – 25 ft.
26 – 50 ft.
51 – 100 ft
> 100 ft

3.1 BANK VEGETATION TYPE

Coniferous	Trees that keep their leaves year round i.e. pine, cedar, hemlock
Deciduous	Trees that lose their leaves seasonally i.e. elm, butternut, maple, oak
Shrubs-saplings	Small trees, saplings, and brush species, such as alder, willows, sumac, and dogwood
Herbaceous	Native grasses, rushes and sedges, & plants such as asters, goldenrod
Lawn	Mowed lawn
Pasture	Land managed for grazing livestock
Bare	Bare soil, no or very sparse vegetation. This does not pertain to unvegetated features such as point-bars, mid-channel bars or shoals.
Invasives	Non-native invasive plant species: Phragmites, Japanese knotweed, Purple loosestrife, Honeysuckle (note there are native honeysuckles too)

3.2 BUFFER VEGEATION TYPE

Coniferous	Trees that keep their leaves year round. i.e. pine, cedar, hemlock
Deciduous	Trees that lose their leaves seasonally. i.e. elm, butternut, maple, oak
Mixed Trees	A fairly even mix of conifers and deciduous trees
Shrubs-Saplings	Small trees, saplings, and brush species, such as alder, willows, sumac, and dogwood
Herbaceous	Native grasses, rushes and sedges, & plants such as asters, goldenrod
Invasives	Non-native invasive plant species: Phragmites, Japanese knotweed, Purple loosestrife, Honeysuckle (note there are native honeysuckles too)
None	No buffer present, bare ground up to the top of the bank

3.1 BANK CANOPY

76 – 100 %	canopy over stream channel
51 – 75%	canopy over stream channel
26 – 50%	canopy over stream channel
1 – 25 %	canopy over stream channel
0 %	no canopy over stream channel

3.3 RIPARIAN CORRIDOR

Forest	Woodlands of deciduous or coniferous trees
Shrub-sapling	Fallow field or wetland
Crop Pasture Hay	Agricultural lands planted in row crops, mowed as a hay field, or pastured with livestock. Circle the appropriate type of agriculture.
Commercial Industrial	Retail businesses with land developed for buildings, roads, and parking areas
Residential	Land developed with houses, lawns, and driveways
Bare	Bare soil, no or very sparse vegetation. Pertains to gravel pits, construction sites, and similar bare ground

Step 4: Flow Modifiers – Quick Refer Menus and Tables

4.2 ADJACENT WETLAND

Abundant	Numerous small tributaries, springs and/or seeps entering the segment (reach)
Minimal	Infrequent small tributaries, springs and/or seeps entering the segment (reach)
None	No small tributaries, springs and/or seeps observed entering the segment (reach)

4.1 SPRING, SEEPS AND TRIBUTARIES

Abundant	Extensive wetlands present along stream site.
Minimal	Wetlands present but to small extent along stream segment (reach)
None	No wetlands observed along stream segment (reach)

4.3 STAGE

Low	Flow in channel low due to drought conditions
Moderate	Flow in channel is typical summer flows
High	Flow in channel is high as a result of flooding

4.5 FLOW REGULATION

TYPE:

Withdrawal	A withdrawal of water from the stream
Bypass	The water is diverted away from the channel and re-enters down stream.
Run of River	Upstream or in reach flows are impounded. Flow quantity spilling or released below the dam is the same as flow quantity entering the impoundment at all times.
Store and Release	Water is impounded and stored and released only during certain times.
None	No known flow regulation or water withdrawals. Select "none" if you have completed the appropriate research and have found no evidence of flow regulations.
No Data	No data sources are available to determine if a flow regulation or water withdrawal exists.
Not Evaluated	All data sources (as described by the meta data) HAVE NOT been evaluated.

SIZE:

Small	Impoundments not much wider than river itself or withdrawals not affecting the channel forming flow.
Large	Impoundments much wider than river itself (createng a reservoire) or withdrawals significantly affecting the channel forming flow.

4.6 UPSTREAM FLOW REGULATION OR WATER WITHDRAWAL

Upstream	Flow regulation or water withdrawal upstream affecting the reach.
Downstream	Flow regulation or water withdrawal downstream affecting the reach.
Both	Flow regulation or water withdrawal both upstream and downstream affecting the reach.

4.8 CHANNEL CONSTRICTIONS

Instream culverts	Structures under a transportation route through which the stream flows
Bridges	Structures under a transportation route under which the stream flows
Old abutments	Bridge abutments that no longer have a travel deck between them.
Bedrock outcrops	Bedrock outcrops on both the right and left banks between which the stream flows
Other	Other built structures that constrict the channel, for instance rock rip-rap or gabions on both banks that constrict flood flows
None	No structures or features exist within the segment (or reach) that constricts the bankfull or floodprone widths or flows

Step 5: Channel Bed and Planform Changes – Quick Refer Menus and Tables

5.1 BED SEDIMENT STORAGE AND BAR TYPES

Mid-Channel	Sediment deposits in the middle of the channel with split flow
Point	Unvegetated sediment deposits located on inside of channel meander bend
Side (Lateral)	Unvegetated sediment deposits located along the margins of the channel in locations other than the inside of channel meander bends
Diagonal	Bars that cross the channel at sharp oblique angles, associated with transverse riffles
Delta	Sediment deposits where tributary enters the mainstem.
Islands	Well vegetated mid-channel deposits of sediment
None	No deposits of sediment evident.

5.4: CHANNEL ALTERATIONS

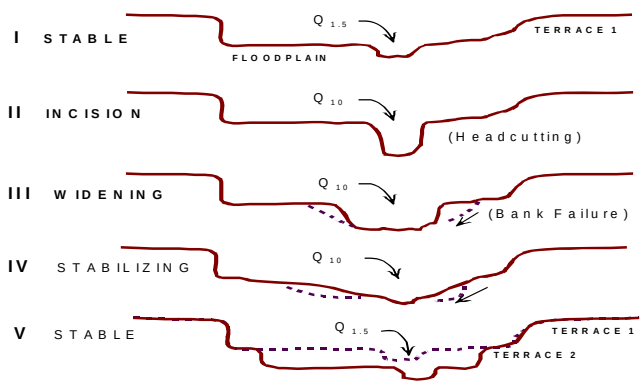
Dredging	Evidence of removal of sediments and other material from the channel.
Commercial Mining	Historic (pre-1988) large-scale commercial extraction of gravel from channel.
Bar scalping / gravel mining	Bar scalping: gravel has been removed from the top of bars. Gravel mining: gravel has been removed from bars or bed of river.
None	No evidence that any channel alterations have been done

5.5 CHANNEL STRAIGHTENING

Straightening	Evidence that there has been the removal of meander bends and realignment of channel. Historically done in village centers and along roadways, railroads, and agricultural fields.
With Windrowing	Pushing gravel up from the stream bed onto the top of either bank as a part of the straightening of the river.

Step 7: Rapid Geomorphic Assessment - Quick Refer Menus and Tables

7.5 Channel Adjustment Process



I) In regime, reference to good condition, insignificant to minimal adjustment.
II) Fair to poor condition, major to extreme channel degradation
III) Fair to poor condition, major to extreme widening and aggradataion
IV) Fair to good condition, major reducing to minor aggradation, widening, and planform adjustments
V) In regime, reference to good condition, insignificant to minimal adjustment.

Schumm Channel Evolution Model – See Appendix C for Vermont modified versions

7.6 Stream Condition

0.85 – 1.0	Reference Condition
0.65 – 0.84	Good Condition
0.35 – 0.64	Fair Condition
0.00 – 0.34	Poor Condition

7.7 Phase 2 Stream Sensitivity Ratings

Existing Stream Type	In regime – Reference or good condition	Major Adjustment – Fair Condition	Stream Type Departure or Poor Condition
A1, A2, B1, B2	Very Low	Very Low	Low
C1, C2	Very Low	Low	Moderate
G1, G2	Low	Moderate	High
F1, F2	Low	Moderate	High
B3, B4, B5	Moderate	High	High
B3c, C3, E3	Moderate	High	High
C4, C5, B4c, B5c	High	Very High	Very High
A3, A4, A5, G3, F3	High	Very High	Extreme
F4, F5, G4, G5	Very High	Very High	Extreme
D3, D4, D5	Extreme	Extreme	Extreme
C6, E4, E5, E6	High	Extreme	Extreme

Phase 2 – Quality Assurance Worksheet

Stream Name:_____ Watershed: _____ Date:_____
QA Team Leader: _____ Organization /Agency: _____
ANR Team Leader: _____

Check one or more boxes to indicate the types of ANR sponsored training received by field team members	**Phase 2**	
	QA	

Segment/Reach Sketch and Map Documentation completed	
Phase 1 Assessment used in Phase 2 analysis of geomorphic condition	
ANR SGA Handbook Protocols and Database used exclusively	
Other protocols used:	

Phase 1 Step Number	Tool Used to Collect Data	Confidence Level	Date Completed	Date Updated	Date of Local QA Team Review	Date of State QA Team Review	Comments
Step 1		Low to Moderate Moderate Moderate to High High					
Step 2		Low to Moderate Moderate Moderate to High High					
Step 3		Low to Moderate Moderate Moderate to High High					
Step 4		Low to Moderate Moderate Moderate to High High					
Step 5		Low to Moderate Moderate Moderate to High High					
Step 6		Low to Moderate Moderate Moderate to High High					
Step 7		Low to Moderate Moderate Moderate to High High					

VT RAPID GEOMORPHIC ASSESSMENT ---- CONFINED STREAMS

For narrowly and semi-confined valley types (confinement ratio < 4)

Stream Name:_____ Segment I.D: _____

Location: _____ Date:_____

_____ Town:_____

Observers: _____ Elevation: _____ ft.

Organization /Agency: _____ Weather:_____

Reference Stream Type _____ ☐ Modified Rain Storm within past 7 days: Y / N

(If bedrock controlled gorge, alluvial fan, or naturally braided system see Handbook Protocols)

Adjustment Process	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
7.1 Channel Degradation (Incision) • Exposed till or fresh substrate in the stream bed and exposed infrastructure (bridge footings). • New terraces or recently abandoned flood prone areas. • Headcuts, or nickpoints significantly steeper bed segment and comprised of smaller bed material than typical steps. • Freshly eroded, vertical banks. • Alluvial sediments that are imbricated (stacked like dominoes) high in the bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. • Depositional features with steep faces, usually occurring on the downstream end. **Stream Type Departure** ☐ **Type of STD:**_____ _____	☐ Little evidence of localized slope increase or nickpoints.	☐ Minor localized slope increase or nickpoints.	☐ Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	☐ Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision ratio ≥ 2.0 **and** Where channel slope < 4% Entrenchment ratio ≤ 1.4 Where channel slope ≥ 4% Entrenchment ratio ≤ 1.2
	☐ Step-pool systems have full complement of expected bed features, steps complete with coarser sediment (≥ D80).	☐ Step-pool systems have full complement of expected bed features, steps mostly complete.	☐ Step-pool systems with incomplete (eroded) steps, dominated by runs.	☐ Step-pool bed features eroded and replaced by plane bed features.
	☐ No significant human-caused change in channel confinement.	☐ Only minor human-caused change in channel confinement.	☐ Significant human-caused change in channel confinement but no change in valley type.	☐ Human caused change in valley type.
	☐ No evidence of historic / present channel straightening, dredging, and/or channel avulsions.	☐ Evidence of minor historic dredging and/or channel avulsion.	☐ Evidence of significant historic channel straightening, dredging, or gravel mining, and/or channel avulsions.	☐ Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsions.
	☐ No known flow alterations (i.e., increases in flow and/or decreases in sediment supply).	☐ Some increase in flow and/or minor reduction of sediment load.	☐ Major historic flow alterations, greater flows and/or reduction of sediment load.	☐ Major existing flow alterations, greater flows and/or reduction of sediment load.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.2 Channel Aggradation • Shallow pool depths. • Abundant sediment deposition on side bars and unvegetated mid-channel bars and extensive sediment deposition at obstructions, channel constrictions. Islands may be present • Most of the channel bed is exposed during typical low flow periods. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. **Stream Type Departure** ☐ **Type of STD:**_____ _____	☐ Step-pool systems have full complement of expected bed features, complete steps and deep pools.	☐ Step-pool systems with full complement of bed features. Pools filling with fine sediment and may be only slightly deeper and wider than runs.	☐ Step-pool systems with incomplete steps, dominated by runs. Pools filling with fine sediment and may be absent with runs prevailing.	☐ Step-pool bed features are filled with sediment and stream appears as a plane bed.
	☐ Minor side or delta bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel, side or diagonal bars present. Minor depositional features typically less than bankfull stage in height.	☐ Multiple unvegetated mid-channel, side or diagonal bars present. Sediment buildup at constrictions leading to steep riffles and/or flood chutes.	☐ Multiple unvegetated mid-channel, side or diagonal bars or islands present, splitting or braiding flows even under low flow conditions.
	☐ No apparent increase in gravel / sand substrates (pebble count).	☐ Some increase in small gravel / sand substrates that may comprise over 50% of the sediments.	☐ Large increase in gravel / sand substrates that may comprise over 70% of the sediments.	☐ Homogenous gravel/sand substrates may comprise over 90% of the sediments. Fine sediment feels soft underfoot.
	☐ Low width/depth ratio ≤ 20 for channel slopes < 4% ≤ 12 for channel slopes ≥ 4%	☐ Low to moderate W/d ratio > 20 ≤ 30 for slopes < 4% > 12 ≤ 20 for slopes ≥ 4%	☐ Moderate to high W/d ratio > 30 ≤ 40 for slopes < 4% > 20 ≤ 30 for slopes ≥ 4%	☐ High width/depth ratio > 40 for channel slopes < 4% > 30 for channel slopes ≥ 4%
	☐ No known flow alterations (i.e., decrease in flow and/or increase in sediment supply).	☐ Minor reduction in flow and / or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	☐ Major historic flow alterations, reduction in flows and / or increase in sediment load.	☐ Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.
	☐ No human-made constrictions causing upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Adjustment Process	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
7.3 Widening Channel • Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. • Erosion on both right and left banks. • Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). • Fracture lines at the top of the bank that appear as cracks parallel to the river. • Evidence of landslides and mass failures. • Mid-channel bars and side bars may be present. • Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement.	☐ Low width/depth ratio ≤ 20 for channel slopes < 4% ≤ 10 for channel slopes ≥ 4%	☐ Low to moderate W/d ratio > 20 ≤ 30 for slopes < 4% > 10 ≤ 12 for slopes ≥ 4%	☐ Moderate to high W/d ratio > 30 ≤ 40 for slopes < 4% > 12 ≤ 20 for slopes ≥ 4%	☐ High width/depth ratio > 40 for channel slopes < 4% > 20 for channel slopes ≥ 4%
	☐ Little to no scour and erosion at the base of both banks. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.	☐ Minimal to moderate scour and erosion at the base of both banks. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Moderate to high scour and erosion at the base of both banks. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Continuous and laterally extensive scour and erosion at the base of both banks. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Where channel slope < 4% Entrenchment ratio > 1.4 Where channel slope ≥ 4% Entrenchment ratio > 1.2	☐ Incision ratio ≥ 2.0 **and** Where channel slope < 4% Entrenchment ratio ≤ 1.4 Where channel slope ≥ 4% Entrenchment ratio ≤ 1.2
	☐ Minor side or delta bars present. Depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel or side bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or side bars present. Major sediment buildup at the head of constrictions leading to steep riffles and/or flood chutes.	☐ Multiple unvegetated mid-channel, side or diagonal bars or islands present, splitting or braiding flows even under low flow conditions.
	☐ No known channel and / or flow alterations (i.e., increase in flow and/or change in sediment supply).	☐ Minor increase in watershed input of flows and/or sediment. Episodic (flood) discharges resulting in short-term enlargement.	☐ Major channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	☐ Major and extensive channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.4 Change in Planform • Flood chutes present. • Channel avulsions evident or impending. • Change or loss in bed form structure, sometimes resulting in a mix of plane bed and step-pool forms. • Island formation and/or multiple thread channels.	☐ Low bank erosion on outside bends, little or no change in sinuosity within the reach.	☐ Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.	☐ Moderate to high lateral bank erosion on most outside bends, may include moderate change in reach sinuosity.	☐ Extensive lateral bank erosion on most outside bends, may include major change in sinuosity within the reach.
	☐ Little or no evidence sediment buildup, only minor delta or side bars typically less than half bankfull stage in height.	☐ Single to multiple unvegetated mid-channel, delta, or side bars. Some potential for channel avulsion.	☐ Multiple unvegetated mid-channel, delta, or side bars, typically greater than bankfull stage in height. Evidence of past channel avulsion and/or islands.	☐ Multiple and major mid-channel, delta, and/or side bars. Evidence of recent channel avulsion, multiple thread channels, and islands.
	☐ No human-caused alteration of channel planform and / or the width of the floodprone area.	☐ Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.	☐ Major alteration of channel planform and/or width of the floodprone area resulting from historic encroachment, dredging, or channel straightening.	☐ Major alteration of channel planform and the width of the floodprone area resulting from recent and extensive encroachment, dredging, and/or channel straightening.
	☐ Human-made constrictions causing only negligible upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive major upstrm / dwnstrm deposition and flow bifurcation.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation								
Aggradation								
Widening							**7.6 Stream Condition:**	
Planform								
Sub-totals:					**Total Score:**			

Channel Adjustment Processes: _____

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

*STD = Stream Type Departure where existing stream type is no longer the same as the reference stream type.

VT RAPID GEOMORPHIC ASSESSMENT ---- UNCONFINED STREAMS

For narrow and broad to very broad valley types (confinement ratio ≥ 4) Typically Riffle-pool and Dune-Ripple Stream Types

Stream Name:_____ Segment I.D: _____

Location: _____ Date:_____

_____ Town:_____

Observers: _____ Elevation: _____ ft.

Organization /Agency: _____ Weather:_____

Reference Stream Type _____ ☐ Modified Rain Storm within past 7 days: Y / N

(If alluvial fan or naturally braided system see Handbook Protocols)

Adjustment Process	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
7.1 Channel Degradation (Incision) • Exposed till or fresh substrate in the stream bed and exposed infrastructure(bridge footings) • New terraces or recently abandoned floodplains. • Headcuts, or nickpoints that are 2-3 times steeper than typical riffle. • Freshly eroded, vertical banks. • Alluvial (river) sediments that are imbricated (stacked like dominoes) high in bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. • Bars with steep faces, usually occurring on the downstream end of a bar. **Stream Type Departure** ☐ **Type of STD:**_____ _____	☐ Little evidence of localized slope increase or nickpoints.	☐ Minor localized slope increase or nickpoints.	☐ Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	☐ Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Entrenchment ratio > 2.0	☐ Incision ratio ≥ 2.0 **OR** Entrenchment ratio ≤ 2.0
	☐ Riffle heads complete and comprised of courser sediments (≥D80). Full complement of expected bed features.	☐ Riffle heads mostly complete. Riffle lengths may appear shorter. Full complement of expected bed features.	☐ Riffles or dunes may appear incomplete; bed profile dominated by runs.	☐ Riffle-pool or ripple-dune features replaced by plane bed features.
	☐ No significant human-caused change in channel confinement or valley type.	☐ Only minor human-caused change in channel confinement but no change in valley type.	☐ Significant human-caused change in channel confinement enough to change valley type, but still unconfined.	☐ Human-caused change in valley type, unconfined or narrow changed to confined.
	☐ No evidence of historic / present channel straightening, gravel mining, dredging and/or channel avulsions.	☐ Evidence of minor bar scalping on a point bar and/or channel avulsion; but minor to no historic channel straightening, gravel mining, or dredging.	☐ Evidence of significant historic channel straightening, dredging, gravel mining and/or channel avulsions.	☐ Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsion.
	☐ No known flow alterations (i.e., increases in flow or decreases in sediment supply).	☐ Minor flow alterations, some flow increase and/or reduction of sediment load.	☐ Major historic flow alterations, greater flows and/or reduction of sediment load.	☐ Major existing flow alterations, greater flows and/or reduction of sediment load.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.2 Channel Aggradation • Shallow pool depths. • Abundant sediment deposition on point bars and mid-channel bars and extensive sediment deposition at obstructions, channel constrictions, and at the upstream end of tight meander bends. Islands may be present. • Most of the channel bed is exposed during typical low flow periods. • High frequency of debris jams. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. ****** This parameter may be a difficult to infeasible to evaluate in ripple-dune stream types **Stream Type Departure** ☐ **Type of STD:**_____ _____	☐ Complete riffle heads and deep pools in riffle-pool systems.****** Full complement of expected bed features.	☐ Mostly complete riffles and/or some filling of pools with fine sediment. Pools may only be slightly deeper and wider than runs.**	☐ Incomplete riffles or dunes and dominated by runs. Significant filling of pools with sediment, pools may be absent with runs prevailing.	☐ Riffle-pool or ripple-dune features replaced by plane bed features.
	☐ Minor point or delta bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or diagonal bars present. Major sediment buildup at the head of bendways leading to steep riffles and flood chutes.	☐ Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	☐ No apparent increase in fine gravel/sand substrates (pebble count).**	☐ Some increase in fine gravel/sand substrates that may comprise over 50% of the sediments.	☐ Large incr. in fine gravel/ sand substrates that may comprise over 70% of the sediments. Sediment feels soft underfoot.	☐ Homogenous fine gravel/ sand substrates may comprise over 90% of the sediments. Sediment feels soft underfoot.
	☐ Low width/depth ratio ≤ 20 for C or B type channels ≤ 10 for E type channels	☐ Low to moderate W/d ratio >20 ≤ 30 for C or B channels >10 ≤ 12 for E channels	☐ Moderate to high W/d ratio >30 ≤ 40 for C or B channels >12 ≤ 20 for E channels	☐ High width/depth ratio >40 for C or B type channels >20 for E type channels
	☐ No known flow alterations (i.e., decrease in flow or increase in sediment supply).	☐ Minor reduction in flow and/or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	☐ Major historic flow alterations, reduction in flows and / or increase in sediment load.	☐ Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.
	☐ No human-made constrictions causing upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Adjustment Process	Condition Category: Reference	Good	Fair	Poor
7.3 Widening Channel • Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. • Erosion on both right and left banks in riffle sections. • Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). • Fracture lines at the top of the bank that appear as cracks parallel to the river. • Mid-channel bars and side bars may be present. • Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement.	☐ Low width/depth ratio ≤ 20 for C or B type channels ≤ 10 for E type channels	☐ Low to moderate W/d ratio >20 ≤ 30 for C or B channels >10 ≤ 12 for E channels	☐ Moderate to high W/d ratio >30 ≤ 40 for C or B channels >12 ≤ 20 for E channels	☐ High width/depth ratio >40 for C or B type channels >20 for E type channels
	☐ Little to no scour and erosion at the base of both banks at the riffle section. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.	☐ Minimal to moderate scour and erosion at the base of both banks at the riffle section. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Moderate to high scour and erosion at the base of both banks at the riffle section. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Continuous and laterally extensive scour and erosion at the base of both banks at the riffle section. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Entrenchment ratio > 2.0	☐ Incision ratio ≥ 2.0 **OR** Entrenchment ratio ≤ 2.0
	☐ Minor point or delta bars present. Depositional features less than half bankfull stage in height.	☐ Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or diagonal bars present. Major sediment buildup at the head of bendways leading to steep riffles and flood chutes.	☐ Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	☐ No known channel and / or flow alterations (i.e., increase in flow and / or change in sediment supply).	☐ Minor increase in watershed input of flows or sediment. Episodic (flood) discharges through reach resulting in short-term enlargement.	☐ Major channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	☐ Major and extensive -channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.4 Change in Planform • Flood chutes or neck cut-offs may be present. • Channel avulsions may be evident or impending. • Change or loss in bed form structure, sometimes resulting in a mix of plane bed and riffle- pool forms. • Island formation and/or multiple thread channels. • In meandering streams the thalweg, or deepest part of the channel, typically travels from the outside of a meander bend to the outside of the next meander bend. Pools are located on downstream third of the concave bends. Riffles are at the cross-over between the pools on successive bends. During planform adjustments, the thalweg may not line up with or follow this pattern. As a result of the lateral extension of meander bends, additional deposition and scour features may be in a channel length typically occupied by a single riffle-pool sequence.	☐ Low bank erosion on outside bends, little or no change in sinuosity within the reach.	☐ Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.	☐ Moderate to high lateral bank erosion on most outside bends, may include potential neck cut-offs and moderate change in sinuosity.	☐ Extensive lateral bank erosion on most outside bends, may include impending neck cut-offs and major change in sinuosity within the reach.
	☐ Little evidence of flood chutes crossing inside of meander bends, only minor point or delta bars.	☐ Minor flood chutes crossing inside of meander bends, evidence of minor to moderate unvegetated mid-channel, delta, or diagonal bars. Some potential for channel avulsion.	☐ Historic or active flood chutes crossing inside of meander bends, evidence of channel avulsion, islands, and unvegetated mid-channel, delta, or diagonal bars.	☐ Active large flood chutes crossing inside of most meander bends, evidence of recent channel avulsion, multiple thread channels, islands, and unvegetated mid-channel, delta, or diagonal bars.
	☐ No additional deposition and scour features in the channel length typically occupied by a single riffle-pool sequence. Thalweg lined up with planform.	☐ Additional minor deposition and scour features in the channel length typically occupied by a single riffle-pool sequence.	☐ Additional large deposition and scour features in the channel length typically occupied by a single riffle-pool sequence. Thalweg not lined up with planform.	☐ Multiple sequences of large deposition and scour features in the channel length typically occupied by a single riffle-pool sequence.
	☐ No human-caused alteration of channel planform and / or the width of the floodprone area.	☐ Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.	☐ Major alteration of channel planform and/or the width of the floodprone area resulting from historic floodplain encroachment, dredging, or channel straightening.	☐ Major alteration of channel planform and width of the floodprone area resulting from recent and extensive floodplain encroachment, dredging, and/or channel straightening.
	☐ Human-made constrictions causing only negligible upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / downstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / downstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive and major upstrm / downstrm deposition and flow bifurcation.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation								
Aggradation								
Widening							**7.6 Stream Condition:**	
Planform								
Sub-totals:					**Total Score:**			

Channel Adjustment Processes: _____

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

*STD = Stream Type Departure where existing stream type is no longer the same as the reference stream type.

VT RAPID GEOMORPHIC ASSESSMENT ---- PLANE BED STREAMS

Typically found in semi-confined to narrow valley types (confinement ratio ≥ 3 and ≤ 5)

Reminder: This RGA form should only be used on streams which are plane bed systems by reference. Many existing plane bed streams in Vermont represent a departure from another stream type.

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Weather:_____
Reference Stream Type _____ ☐ Modified Rain Storm within past 7 days: Y / N
(If alluvial fan or naturally braided system see Handbook Protocols)

Adjustment Process	Condition Category: Reference	Good	Fair	Poor
7.1 Channel Degradation (Incision) • Exposed till or fresh substrate in the stream bed and exposed infrastructure (bridge footings). • New terraces or recently abandoned floodplains. • Headcuts, or nickpoints that are 2-3 times steeper than typical riffle. • Freshly eroded, vertical banks. • Alluvial (river) sediments that are imbricated (stacked like dominoes) high in bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. **Stream Type Departure** ☐ **Type of STD:**_____	☐ Little evidence of localized slope increase or nickpoints.	☐ Minor localized slope increase or nickpoints.	☐ Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	☐ Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.
	☐ Incision ratio ≥ 1.0 < 1.2 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision ratio ≥ 1.2 < 1.4 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision ratio ≥ 1.4 < 2.0 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision ratio ≥ 2.0 **and** Where channel slope > 2% Entrenchment ratio ≤ 1.4 Where channel slope ≤ 2% Entrenchment ratio ≤ 2.0
	☐ No significant human-caused change in channel confinement or valley type.	☐ Only minor human-caused change in channel confinement but no change in valley type.	☐ Significant human-caused change in channel confinement enough to change valley type, but still not narrowly confined.	☐ Human-caused change to a narrowly confined valley type.
	☐ No evidence of historic or present channel straightening, gravel mining, dredging and/or channel avulsions.	☐ Evidence of minor mid-channel bar scalping and/or channel avulsion, but minor to no historic channel straightening, gravel mining or dredging.	☐ Evidence of significant historic channel straightening, dredging, gravel mining and/or channel avulsions.	☐ Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsion.
	☐ No known flow alterations (i.e., increases in flow or decreases in sediment supply).	☐ Minor flow alterations, some flow increase and/or minor reduction of sediment load.	☐ Major historic flow alterations, greater flows and/or reduction of sediment load.	☐ Major existing flow alterations, greater flows and/or reduction of sediment load.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.2 Channel Aggradation • Very shallow pocket pools around and below boulders. • Abundant sediment deposition on side, point and mid-channel bars and extensive sediment deposition at obstructions, channel constrictions, and at the upstream end of tight bendways. Islands may be present. • Most of the channel bed is exposed during typical low flow periods. • Increased frequency of woody debris in channel. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. **Stream Type Departure** ☐ **Type of STD:**_____	☐ Minor side, point or delta bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or diagonal bars present. Sediment buildup at the head of bendways leading to steep riffles and flood chutes.	☐ Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	☐ No apparent increase in fine gravel/sand substrates (pebble count).	☐ Some increase in fine gravel/sand substrates that may comprise over 50% of the sediments.	☐ Large increase in fine gravel/sand substrates that may comprise over 70% of the sediments. Fine sediment feels soft underfoot.	☐ Homogenous fine gravel/sand substrates may comprise over 90% of the sediments. Fine sediment feels soft underfoot.
	☐ Low width/depth ratio W/d ≤ 20	☐ Low to moderate W/d ratio W/d >20 ≤ 30	☐ Moderate to high W/d ratio W/d >30 ≤ 40	☐ High width/depth ratio W/d >40
	☐ No known flow alterations (i.e., decrease in flow or increase in sediment supply).	☐ Minor reduction in flow and/or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	☐ Major historic flow alterations, reduction in flows and / or increase in sediment load.	☐ Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.
	☐ No human-made constrictions causing upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.
Score: **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Adjustment Process	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
7.3 Widening Channel ● Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. ● Erosion on both right and left banks in riffle sections. ● Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). ● Fracture lines at the top of the bank that appear as cracks parallel to the river. ● Mid-channel bars and side bars may be present. ● Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement.	☐ Low width/depth ratio W/d ≤ 20	☐ Low to moderate W/d ratio W/d >20 ≤ 30	☐ Moderate to high W/d ratio W/d >30 ≤ 40	☐ High width/depth ratio W/d >40
	☐ Little to no scour and erosion at the base of both banks. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.	☐ Minimal to moderate scour and erosion at the base of both banks. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Moderate to high scour and erosion at the base of both banks. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Continuous and laterally extensive scour and erosion at the base of both banks. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Where channel slope > 2% Entrenchment ratio > 1.4 Where channel slope ≤ 2% Entrenchment ratio > 2.0	☐ Incision ratio ≥ 2.0 **and** Where channel slope > 2% Entrenchment ratio ≤ 1.4 Where channel slope ≤ 2% Entrenchment ratio ≤ 2.0
	☐ Minor side, point or delta bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or diagonal bars present. Sediment buildup at the head of bendways leading to steep riffles and flood chutes.	☐ Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.
	☐ No known channel and / or flow alterations (i.e., increase in flow and/or change in sediment supply).	☐ Minor increase in watershed input of flows or sediment. Episodic (flood) discharges through reach resulting in short-term enlargement.	☐ Major channel and / or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	☐ Major and extensive -channel and/or flow alterations, increase in flows and / or change in sediment load (increase or decrease).
Score: Historic ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7.4 Change in Planform ● Flood chutes may be present. ● Channel avulsions may be evident or impending. ● Change or loss in bed form structure, sometimes resulting in a mix of plane bed and riffle- pool forms. ● Island formation and/or multiple thread channels.	☐ Low bank erosion on outside bends, little or no change in sinuosity within the reach.	☐ Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.	☐ Moderate to high lateral bank erosion on most outside bends, may include moderate change in sinuosity.	☐ Extensive lateral bank erosion on most outside bends, may include major change in sinuosity within the reach.
	☐ Little evidence of flood chutes crossing inside of bends, only minor side, point, or delta bars.	☐ Minor flood chutes crossing inside of bends, evidence of single to multiple unvegetated mid-channel, delta, or diagonal bars. Some potential for channel avulsion.	☐ Historic or active flood chutes crossing inside of bends, evidence of channel avulsion, islands, and multiple unvegetated mid-channel, delta, or diagonal bars.	☐ Active large flood chutes, evidence of recent channel avulsion, multiple thread channels, islands, and multiple unvegetated mid-channel, delta, or diagonal bars.
	☐ No human-caused alteration of channel planform and / or the width of the floodprone area.	☐ Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.	☐ Major alteration of channel planform and/or the width of the floodprone area resulting from historic floodplain encroachment, dredging, or channel straightening.	☐ Major alteration of channel planform and width of the floodprone area resulting from recent and extensive floodplain encroachment, dredging, and/or channel straightening.
	☐ Human-made constrictions causing only negligible upstream deposition.	☐ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / downstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / downstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive and major upstrm / downstrm deposition and flow bifurcation.
Score: Historic ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation								
Aggradation								
Widening							**7.6 Stream Condition:**	
Planform								
Sub-totals:					**Total Score:**			

Channel Adjustment Processes: _____

7.7 Stream Sensitivity: Very Low / Low / Moderate / High / Very High / Extreme

*STD = Stream Type Departure where existing stream type is no longer the same as the reference stream type.

VTANR REACH HABITAT ASSESSMENT ----- RIFFLE-POOL STREAM TYPE

(Also use this form for dune-ripple stream type.)

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Latitude (N/S):_____
USGS Map Name(s):_____ Longitude (E/W): _____
Weather:_____ Drainage Area: _____ sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N Segment Length: _____ ft.

Habitat Parameter	Condition (Departure) Category																			
	Reference (None)					**Good (Minor)**					**Fair (Major)**					**Poor (Severe)**				
6.1 Woody Debris Cover LWD size rank variable only used if ≥ 10 pieces	☐ LWD pieces / mile > 100 ☐ LWD size rank 3-6 >50% ☐ debris jams / mile > 5 ☐ high woody debris recruitment potential ☐ CPOM present in channel and margins					☐ 100 ≥ LWD / mile > 50 ☐ 50 ≥ LWD rank 3-6 > 25% ☐ 5 ≥ jams / mile > 3 ☐ moderate woody debris recruitment potential ☐ CPOM limited in channel and present in margins					☐ 50 ≥ LWD / mile > 25 ☐ 25 ≥ LWD rank 3-6 > 10% ☐ 3 ≥ jams / mile > 1 ☐ low woody debris recruitment potential ☐ CPOM limited in both channel and margins					☐ LWD / mile ≤ 25 ☐ LWD size rank 3-6 ≤ 10% ☐ debris jams absent ☐ no woody debris recruitment potential ☐ CPOM absent				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.2 Bed Substrate Cover *fines: sand if d_{50} ≥ gravel, otherwise silt. (Dune-ripple stream type: Fining only.)	☐ riffle embeddedness < 20% margin embeddedness < 40% ☐ fining* < 10% ☐ Riffle stability index < 70% ☐ sediment apparently stable & sorted ☐ substrate free of dense algae growth					☐ 20 ≤ emb_{riffle} < 40% 40 ≤ emb_{margin} < 60% ☐ 10 ≤ fining* < 20% ☐ 70 ≤ RSI < 80% ☐ some evidence of sediment mobility & lack of sorting ☐ small substrate patches covered by dense algae growth					☐ 40 ≤ emb_{riffle} < 75% 60 ≤ emb_{margin} < 80% ☐ 20 ≤ fining* < 40% ☐ 80 ≤ RSI < 90% ☐ major evidence of sediment mobility & lack of sorting ☐ large substrate patches covered by dense algae growth					☐ riffle embeddedness ≥ 75% margin embeddedness ≥ 80% ☐ fining* ≥ 40% ☐ RSI ≥ 90% ☐ sediments unstable, unsorted, soft underfoot ☐ most of substrate covered by dense algae growth				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.3 Scour and Deposition Features (Dune-ripple stream type: Only evaluate pools and ripples.) *Depth-velocity combinations* *fast-shallow* *fast-deep* *slow-shallow* *slow-deep* *(cutoffs: 1.0 fps, 1.5 ft)* Pool size rank variable only used if ≥ 5 pools	☐ pools / mile > 40 ☐ pool size rank 3-7 >50% ☐ good cover > 75% of total pool surface area ☐ riffle (ripple) coverage > 25% reach area, distinctly formed and complete ☐ 5 ≤ riffle spacing ≤ 7 bankfull channel widths (w_{bkf}) ☐ well-defined riffle-run-pool-glide pattern with all four depth-velocity combinations present ☐ finer deposition located entirely in slack water below larger substrates/debris, and along margins					☐ 40 ≥ pools / mile > 20 ☐ 50 ≥ pool rank 3-7 > 25% ☐ 75 ≥ good cover > 50% of total pool surface area ☐ 25 ≥ riffle coverage > 10% reach area, moderately well formed and complete ☐ 3 ≤ riffle spacing < 5, or 7 < riffle spacing ≤ 10 x w_{bkf} ☐ well-defined riffle-run-pool-glide pattern with three depth-velocity combinations dominant ☐ finer deposition located in slack water below larger substrates/debris, signs of mid-channel accumulation					☐ 20 ≥ pools / mile > 10 ☐ 25 ≥ pool rank 3-7 > 10% ☐ 50 ≥ good cover > 25% of total pool surface area ☐ 25 ≥ riffle coverage > 10% reach area, poorly formed and incomplete ☐ 1 ≤ riffle spacing < 3, or 10 < riffle spacing ≤ 12 x w_{bkf} ☐ moderately defined riffle-run-pool-glide pattern with two depth-velocity combinations dominant ☐ very large depositional features below larger substrates/debris, abundant mid-channel accumulation					☐ pools / mile ≤ 10 ☐ pool size rank 3-7 ≤ 10% ☐ good cover ≤ 25% of total pool surface area ☐ riffle (ripple) coverage ≤ 10% reach area, or mostly indistinct ☐ riffle spacing ≥ 12 bankfull channel widths ☐ poorly defined riffle-run-pool-glide pattern with one depth-velocity combination dominant ☐ finer deposition throughout channel, even filling pools, larger substrates almost buried **or** bed largely incised				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.4 Channel Morphology	☐ width/depth < 15, natural ☐ entrenchment ratio ≥ 1.4, incision ratio < 1.2, good floodplain access ☐ no evidence of channel alteration					☐ 15 ≤ w / d < 25, widening ☐ entrenchment ratio ≥ 1.4, 1.2 ≤ incision ratio < 1.4, reduced floodplain access ☐ evidence of minor historic channel alteration					☐ 25 ≤ w / d < 40, widening ☐ entrenchment ratio ≥ 1.4, 1.4 ≤ incision ratio < 2.0, limited floodplain access ☐ major historic or minor recent channel alteration					☐ w / d > 40, over-widening ☐ entrenchment ratio < 1.4 **or** incision ratio ≥ 2.0, floodplain access unlikely ☐ extensive historic or major recent channel alteration				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Habitat Parameter	Condition (Departure) Category			
	Reference (None)	**Good (Minor)**	**Fair (Major)**	**Poor (Severe)**
6.5 Hydrologic Characteristics	☐ wetted width / W_{bkf} > 0.75 ☐ exposed substrate < 20% ☐ adjacent springs, seeps, and wetlands extensive ☐ no known flow alteration	☐ 0.75 ≥ W_{wet} / W_{bkf} > 0.50 ☐ 20 ≤ exp. substrate < 40% ☐ adjacent springs, seeps, and wetlands present ☐ minor flow alteration likely due to flow regulation and/or land use changes	☐ 0.50 ≥ W_{wet} / W_{bkf} > 0.25 ☐ 40 ≤ exp. substrate < 60% ☐ adjacent springs, seeps, and wetlands minimal ☐ major flow alteration likely due to flow regulation and/or land use changes	☐ W_{wet} / W_{bkf} ≤ 0.25 ☐ exposed substrate ≥ 60% ☐ adjacent springs, seeps, and wetlands absent or altered ☐ runoff characteristics completely altered due to flow regulation and storm water influence
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.6 Connectivity Tend towards a higher/lower score for natural/man-made obstructions	☐ no obstructions in reach that block longitudinal movement of aquatic species over all but the lowest flows ☐ system obstructions absent ☐ abundant low **and** high flow refuge	☐ one or two small low flow obstructions present in reach that block movement of aquatic species ☐ limited system obstructions ☐ abundant refuge, with low **or** high flow refuge limited	☐ one or two small to medium bankfull obstructions present in reach that block movement of aquatic species ☐ system obstructions present ☐ limited low **and** high flow refuge	☐ more than two bankfull obstructions present in reach that block movement of aquatic species ☐ many system obstructions ☐ refuge absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.7 River Banks Select different boxes for LB and RB if necessary	☐ bank erosion <10%, typical of natural conditions, little or no bank revetments ☐ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank	☐ 10 ≤ bank erosion < 30%, infrequent small areas, some bank revetments ☐ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank	☐ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments ☐ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank	☐ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments ☐ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank
Undercut size rank variable only used if ≥ 5 undercuts	☐ bank canopy > 90% ☐ undercut banks / mile > 30 ☐ undercut bank size rank 3-6 > 50%	☐ 90 ≥ bank canopy > 75% ☐ 30 ≥ undercuts / mile > 15 ☐ 50 ≥ undercut bank size rank 3-6 > 25%	☐ 75 ≥ bank canopy > 50% ☐ 15 ≥ undercuts / mile > 5 ☐ 25 ≥ undercut bank size rank 3-6 > 10%	☐ bank canopy ≤ 50% ☐ undercuts / mile ≤ 5 ☐ undercut bank size rank 3-6 ≤ 10%
(score each bank)	☐ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency ☐ no mass failures in valley	☐ undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency ☐ 1 mass failure in valley	☐ undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency ☐ 1 - 2 mass failures in valley	☐ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency ☐ ≥ 3 mass failures in valley
SCORE _____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1
SCORE _____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1
6.8 Riparian Area Select different boxes for LB and RB if necessary	☐ buffer width > 150 ft ☐ rip. vegetation > 75% in tree, shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy	☐ 150 ≥ buffer width > 100 ft ☐ 75 ≥ rip. veg. > 50% in each layer, one plant type absent, minimal invasives, maximum channel canopy	☐ 100 ≥ buffer width > 50 ft ☐ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy	☐ buffer width ≤ 50 ft ☐ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy
(score each side of the channel)	☐ river corridor development and infrastructure absent	☐ river corridor development and infrastructure minimal	☐ river corridor development and infrastructure common	☐ river corridor development and infrastructure abundant
SCORE _____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1
SCORE _____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1

6.9 Score: front _____ + back _____ = total _____

Percentage: total score _____ x (100 / 160) = _____

Overall Physical Habitat Condition: _____

SHTD ☐ Existing Stream Habitat Type: _____

Score	*Percentage*	*Condition (Departure)*
136 – 160	**85 – 100**	Reference (None)
104 – 135	**65 – 84**	Good (Minor)
56 – 103	**35 – 64**	Fair (Major)
0 – 55	**0 – 34**	Poor (Severe)

VTANR REACH HABITAT ASSESSMENT ----- STEP-POOL STREAM TYPE

(Also use this form for cascade and bedrock stream types.)

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Latitude (N/S):_____
USGS Map Name(s):_____ Longitude (E/W): _____
Weather:_____ Drainage Area: _____ sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N Segment Length: _____ ft.

Habitat Parameter	Condition (Departure) Category			
	Reference (None)	**Good (Minor)**	**Fair (Major)**	**Poor (Severe)**
6.1 Woody Debris Cover LWD size rank variable only used if ≥ 10 pieces	□ LWD pieces / mile > 200 □ LWD size rank 3-6 >75% □ debris jams / mile > 25 □ high woody debris recruitment potential □ CPOM present in channel and margins	□ 200 ≥ LWD / mile > 100 □ 75 ≥ LWD rank 3-6 > 50% □ 25 ≥ jams / mile > 15 □ moderate woody debris recruitment potential □ CPOM limited in channel and present in margins	□ 100 ≥ LWD / mile > 50 □ 50 ≥ LWD rank 3-6 > 25% □ 15 ≥ jams / mile > 5 □ low woody debris recruitment potential □ CPOM limited in both channel and margins	□ LWD / mile ≤ 50 □ LWD size rank 3-6 ≤ 25% □ jams / mile ≤ 5 □ no woody debris recruitment potential □ CPOM absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.2 Bed Substrate Cover *fines: sand if d_{50} ≥ gravel, otherwise silt.	□ pool embeddedness < 25% margin embeddedness < 40% □ fining* < 10% □ sediment apparently stable & sorted □ substrate free of dense algae growth	□ 25 ≤ emb_{pool} < 50% 40 ≤ emb_{margin} < 60% □ 10 ≤ fining* < 20% □ some evidence of sediment mobility & lack of sorting □ small substrate patches covered by dense algae growth	□ 50 ≤ emb_{pool} < 75% 60 ≤ emb_{margin} < 80% □ 20 ≤ fining* < 40% □ major evidence of sediment mobility & lack of sorting □ large substrate patches covered by dense algae growth	□ pool embeddedness ≥ 75% margin embeddedness ≥ 80% □ fining* ≥ 40% □ sediments unstable, unsorted, soft underfoot □ most of substrate covered by dense algae growth
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.3 Scour and Deposition Features *Depth-velocity combinations* *fast-shallow* *fast-deep* *slow-shallow* *slow-deep* *(cutoffs: 1.0 fps, 1.5 ft)* Pool size rank variable only used if ≥ 5 pools (Cascade and bedrock stream types: Do not evaluate variables related to step pattern.)	□ pools / mile > 70 □ pool size rank 3-7 >50% □ good cover > 75% of total pool surface area □ steps are distinctly formed, complete and stable □ 5 ≤ step spacing ≤ 7 bankfull channel widths (w_{bkf}) □ more than two depth-velocity combinations present □ finer deposition located entirely in slack water below larger substrates/debris, and along margins	□ 70 ≥ pools / mile > 50 □ 50 ≥ pool rank 3-7 > 25% □ 75 ≥ good cover > 50% of total pool surface area □ steps are moderately well formed, complete and stable □ 3 ≤ step spacing < 5, or 7 < step spacing ≤ 10 x w_{bkf} □ two depth-velocity combinations present □ finer deposition located in slack water below larger substrates/debris, signs of mid-channel accumulation	□ 50 ≥ pools / mile > 30 □ 25 ≥ pool rank 3-7 > 10% □ 50 ≥ good cover > 25% of total pool surface area □ steps are poorly formed, incomplete and unstable □ 1 ≤ step spacing < 3, or 10 < step spacing ≤ 15 x w_{bkf} □ one or two depth-velocity combinations present □ very large depositional features below larger substrates/debris, abundant mid-channel accumulation	□ pools / mile ≤ 30 □ pool size rank 3-7 ≤ 10% □ good cover over ≤ 25% of total pool surface area □ steps are indistinct or absent, or very unstable □ step spacing ≥ 15 bankfull channel widths □ one depth-velocity combination present □ finer deposition throughout channel, even filling pools, larger substrates almost buried **or** bed largely incised
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.4 Channel Morphology	□ width/depth < 12, natural □ entrenchment ratio ≥ 1.2, incision ratio < 1.2, good floodplain access □ no evidence of channel alteration	□ 12 ≤ w / d < 15, widening □ entrenchment ratio ≥ 1.2, 1.2 ≤ incision ratio < 1.4, reduced floodplain access □ evidence of minor historic channel alteration	□ 15 ≤ w / d < 25, widening □ entrenchment ratio ≥ 1.2, 1.4 ≤ incision ratio < 2.0, limited floodplain access □ major historic or minor recent alteration	□ w / d ≥ 25, over-widening □ entrenchment ratio < 1.2 **or** incision ratio ≥ 2.0, floodplain access unlikely □ extensive historic or major recent alteration
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Habitat Parameter	Condition (Departure) Category																			
	Reference (None)					**Good (Minor)**					**Fair (Major)**					**Poor (Severe)**				
6.5 Hydrologic Characteristics	□ wetted width / W_{bkf} > 0.75 □ exposed substrate < 10% □ adjacent springs, seeps, and wetlands extensive □ no known flow alteration					□ 0.75 ≥ W_{wet} / W_{bkf} > 0.50 □ 10 ≤ exp. substrate < 30% □ adjacent springs, seeps, and wetlands present □ minor flow alteration likely due to flow regulation and/or land use changes					□ 0.50 ≥ W_{wet} / W_{bkf} > 0.25 □ 30 ≤ exp. substrate < 50% □ adjacent springs, seeps, and wetlands minimal □ major flow alteration likely due to flow regulation and/or land use changes					□ W_{wet} / W_{bkf} ≤ 0.25 □ exposed substrate ≥ 50% □ adjacent springs, seeps, and wetlands absent or altered □ runoff characteristics completely altered due to flow regulation and storm water influence				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.6 Connectivity Tend towards a higher/lower score for natural/man-made obstructions	□ no obstructions in reach that block longitudinal movement of aquatic species over all but the lowest flows □ system obstructions absent □ abundant low **and** high flow refuge					□ one or two small low flow obstructions present in reach that block movement of aquatic species □ limited system obstructions □ abundant refuge, with low **or** high flow refuge limited					□ one or two small to medium bankfull obstructions present in reach that block movement of aquatic species □ system obstructions present □ limited low **and** high flow refuge					□ more than two bankfull obstructions present in reach that block movement of aquatic species □ many system obstructions □ refuge absent				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.7 River Banks Select different boxes for LB and RB if necessary Undercut size rank variable only used if ≥ 5 undercuts **(score each bank)**	□ bank erosion <10%, typical of natural conditions, little or no bank revetments □ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank □ bank canopy > 90% □ undercut banks / mile > 15 □ undercut bank size rank 3-6 > 50% □ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency □ no mass failures in valley					□ 10 ≤ bank erosion < 20%, infrequent small areas, some bank revetments □ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank □ 90 > bank canopy > 80% □ 15 ≥ undercuts / mile > 10 □ 50 ≥ undercut bank size rank 3-6 > 25% □ undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency □ 1 mass failure in valley					□ 20 ≤ bank erosion < 50%, mod. unstable banks, and/or extensive bank revetments □ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank □ 80 ≥ bank canopy > 60% □ 10 ≥ undercuts / mile > 5 □ 25 ≥ undercut bank size rank 3-6 > 10% □ undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency □ 1 - 2 mass failures in valley					□ bank erosion ≥ 50%, banks unstable, extensive erosion, and failing bank revetments □ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank □ bank canopy ≤ 60% □ undercuts / mile ≤ 5 □ undercut bank size rank 3-6 ≤ 10% □ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency □ > 3 mass failures in valley				
SCORE _____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2			1	
SCORE _____ (RB)	Right Bank	10	9			8	7	6			5	4	3			2			1	
6.8 Riparian Area Select different boxes for LB and RB if necessary **(score each side of the channel)**	□ buffer width > 200 ft □ rip. vegetation > 90% in tree, shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy □ river corridor development and infrastructure absent					□ 200 ≥ buffer width > 150 ft □ 90 ≥ rip. veg. > 75% in each layer, one plant type absent, minimal invasives, maximum channel canopy □ river corridor development and infrastructure minimal					□ 150 ≥ buffer width > 100 ft □ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy □ river corridor development and infrastructure common					□ buffer width ≤ 100 ft □ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy □ river corridor development and infrastructure abundant				
SCORE _____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2			1	
SCORE _____ (RB)	Right Bank	10	9			8	7	6			5	4	3			2			1	

6.9 Score: front _____ + back _____ = total _____

Percentage: total score _____ x (100 / 160) = _____

Overall Physical Habitat Condition: _____

SHTD □ Existing Stream Habitat Type: _____

Score	*Percentage*	*Condition (Departure)*
136-160	**85 – 100**	Reference (None)
104 – 135	**65 – 84**	Good (Minor)
56 – 103	**35 – 64**	Fair (Major)
0 – 55	**0 – 34**	Poor (Severe)

VTANR REACH HABITAT ASSESSMENT ----- PLANE BED STREAM TYPE

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Latitude (N/S):_____
USGS Map Name(s):_____ Longitude (E/W): _____
Weather:_____ Drainage Area: _____ sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N Segment Length: _____ ft.

Habitat Parameter	Condition (Departure) Category																			
	Reference (None)					Good (Minor)					Fair (Major)					Poor (Severe)				
6.1 Woody Debris Cover LWD size rank variable only used if ≥ 10 pieces	☐ LWD pieces / mile > 50 ☐ LWD size rank 3-6 >50% ☐ debris jams / mile > 5 ☐ high woody debris recruitment potential ☐ CPOM present in channel and margins					☐ 50 ≥ LWD / mile > 25 ☐ 50 ≥ LWD rank 3-6 > 25% ☐ 5 ≥ jams / mile > 3 ☐ moderate woody debris recruitment potential ☐ CPOM limited in channel and present in margins					☐ 25 ≥ LWD / mile > 10 ☐ 25 ≥ LWD rank 3-6 > 10% ☐ 3 ≥ jams / mile > 1 ☐ low woody debris recruitment potential ☐ CPOM limited in both channel and margins					☐ LWD / mile ≤ 10 ☐ LWD size rank 3-6 ≤ 10% ☐ debris jams absent ☐ no woody debris recruitment potential ☐ CPOM absent				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.2 Bed Substrate Cover *fines: sand if d_{50} ≥ gravel, otherwise silt.	☐ run embeddedness < 20% margin embeddedness < 40% ☐ fining* < 10% ☐ sediment apparently stable & sorted ☐ imbrication limited, or mostly with the short axis of particles overlapping in the direction of flow ☐ substrate free of dense algae growth					☐ 20 ≤ emb_{run} < 40% 40 ≤ emb_{margin} < 60% ☐ 10 ≤ fining* < 20% ☐ some evidence of sediment mobility & lack of sorting ☐ imbrication moderate, mostly with the short axis of particles overlapping in the direction of flow ☐ small substrate patches covered by dense algae growth					☐ 40 ≤ emb_{run} < 75% 60 ≤ emb_{margin} < 80% ☐ 20 ≤ fining* < 40% ☐ major evidence of sediment mobility & lack of sorting ☐ imbrication moderate, mostly with the long axis of particles overlapping in the direction of flow ☐ large substrate patches covered by dense algae growth					☐ run embeddedness ≥ 75% margin embeddedness ≥ 80% ☐ fining* ≥ 40% ☐ sediments unstable, unsorted, soft underfoot ☐ imbrication extensive, mostly with the long axis of particles overlapping in the direction of flow ☐ most of substrate covered by dense algae growth				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.3 Scour and Deposition Features *Depth-velocity combinations* *fast-shallow* *fast-deep* *slow-shallow* *slow-deep* *(cutoffs: 1.0 fps, 1.5 ft)* Pool size rank variable only used if ≥ 5 pools	☐ pool formation evident, with ≥50% pool size rank 3-7 ☐ widespread riffle formation ☐ more than two depth-velocity combinations present ☐ meandering thalweg clearly identifiable in cross section, with evidence of side and lateral bar formation ☐ finer deposition located entirely in slack water below larger substrates/debris, and along margins					☐ pool formation evident, with <50% pool size rank 3-7 ☐ moderate riffle formation ☐ two depth-velocity combinations present ☐ meandering thalweg moderately identifiable in cross section, with some evidence of bar formation ☐ finer deposition located in slack water below larger substrates/debris, signs of mid-channel accumulation					☐ limited trace of pool formation ☐ limited riffle formation ☐ one or two depth-velocity combinations present ☐ meandering thalweg barely identifiable in the cross section, with minimal evidence of bar formation ☐ very large depositional features below larger substrates/debris, abundant mid-channel accumulation					☐ pool formation completely absent ☐ no riffle formation ☐ one depth-velocity combination present ☐ meandering thalweg not identifiable in the cross section, with no evidence of bar formation ☐ finer deposition throughout channel, even filling pools, larger substrates almost buried **or** bed largely incised				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.4 Channel Morphology	☐ width/depth < 15, natural ☐ entrenchment ratio ≥ 1.4, incision ratio < 1.2, good floodplain access ☐ no evidence of channel alteration					☐ 15 ≤ w / d < 25, widening ☐ entrenchment ratio ≥ 1.4, 1.2 ≤ incision ratio < 1.4, reduced floodplain access ☐ evidence of minor historic channel alteration					☐ 25 ≤ w /d < 40, widening ☐ entrenchment ratio ≥ 1.4, 1.4 ≤ incision ratio < 2.0, limited floodplain access ☐ major historic or minor recent channel alteration					☐ w /d ≥ 40, over-widening ☐ entrenchment ratio < 1.4 **or** incision ratio ≥ 2.0, floodplain access unlikely ☐ extensive historic or major recent channel alteration				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Habitat Parameter	Condition (Departure) Category																			
	Reference (None)					**Good (Minor)**					**Fair (Major)**					**Poor (Severe)**				
6.5 Hydrologic Characteristics	☐ wetted width / W_{bkf} > 0.75 ☐ exposed substrate < 20% ☐ adjacent springs, seeps, and wetlands extensive ☐ no known flow alteration					☐ 0.75 ≥ W_{wet} / W_{bkf} > 0.50 ☐ 20 ≤ exp. substrate < 40% ☐ adjacent springs, seeps, and wetlands present ☐ minor flow alteration likely due to flow regulation and/or land use changes					☐ 0.50 ≥ W_{wet} / W_{bkf} > 0.25 ☐ 40 ≤ exp. substrate < 60% ☐ adjacent springs, seeps, and wetlands minimal ☐ major flow alteration likely due to flow regulation and/or land use changes					☐ W_{wet} / W_{bkf} ≤ 0.25 ☐ exposed substrate ≥ 60% ☐ adjacent springs, seeps, and wetlands altered or absent ☐ runoff characteristics completely altered due to flow regulation and storm water influence				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.6 Connectivity Tend towards a higher/lower score for natural/man-made obstructions	☐ no obstructions in reach that block longitudinal movement of aquatic species over all but the lowest flows ☐ system obstructions absent ☐ abundant low **and** high flow refuge					☐ one or two small low flow obstructions present in reach that block movement of aquatic species ☐ limited system obstructions ☐ abundant refuge, with low **or** high flow refuge limited					☐ one or two small to medium bankfull obstructions present in reach that block movement of aquatic species ☐ system obstructions present ☐ limited low **and** high flow refuge					☐ more than two bankfull obstructions present in reach that block movement of aquatic species ☐ many system obstructions ☐ refuge absent				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
6.7 River Banks Select different boxes for LB and RB if necessary Undercut size rank variable only used if ≥ 5 undercuts **(score each bank)**	☐ bank erosion <10%, typical of natural conditions, little or no bank revetments ☐ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank ☐ bank canopy > 90% ☐ undercut banks / mile > 20 ☐ undercut bank size rank 3-6 > 50% ☐ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency ☐ no mass failures in valley					☐ 10 ≤ bank erosion < 30%, infrequent small areas, some bank revetments ☐ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank ☐ 90 ≥ bank canopy > 75% ☐ 20 ≥ undercuts / mile > 15 ☐ 50 ≥ undercut bank size rank 3-6 > 25% ☐ undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency ☐ 1 mass failure in valley					☐ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments ☐ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank ☐ 75 ≥ bank canopy > 50% ☐ 15 ≥ undercuts / mile > 5 ☐ 25 ≥ undercut bank size rank 3-6 > 10% ☐ undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency ☐ 1 - 2 mass failures in valley					☐ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments ☐ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank ☐ bank canopy ≤ 50% ☐ undercuts / mile ≤ 5 ☐ undercut bank size rank 3-6 ≤ 10% ☐ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency ☐ > 3 mass failures in valley				
SCORE _____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1			
SCORE _____ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1			
6.8 Riparian Area Select different boxes for LB and RB if necessary **(score each side of the channel)**	☐ buffer width > 150 ft ☐ rip. vegetation > 75% in tree, shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy ☐ river corridor development and infrastructure absent					☐ 150 ≥ buffer width > 100 ft ☐ 75 ≥ rip. veg. > 50% in each layer, one plant type absent, minimal invasives, maximum channel canopy ☐ river corridor development and infrastructure minimal					☐ 100 ≥ buffer width > 50 ft ☐ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy ☐ river corridor development and infrastructure common					☐ buffer width ≤ 50 ft ☐ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy ☐ river corridor development and infrastructure abundant				
SCORE _____ (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1			
SCORE _____ (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1			

6.9 Score: front _____ + back _____ = total _____

Percentage: total score _____ x (100 / 160) = _____

Overall Physical Habitat Condition: _____

SHTD ☐ Existing Stream Habitat Type: _____

Score	*Percentage*	*Condition (Departure)*
136 – 160	**85 – 100**	Reference (None)
104 – 135	**65 – 84**	Good (Minor)
56 – 103	**35 – 64**	Fair (Major)
0 – 55	**0 – 34**	Poor (Severe)

VTANR REACH HABITAT ASSESSMENT ----- BRAIDED STREAM TYPE

(Also use this form for alluvial fans.)

Stream Name:_____ Segment I.D: _____
Location: _____ Date:_____
_____ Town:_____
Observers: _____ Elevation: _____ ft.
Organization /Agency: _____ Latitude (N/S):_____
USGS Map Name(s):_____ Longitude (E/W): _____
Weather:_____ Drainage Area: _____ sq. mi.
Flow: base / low / avg. Storm within past 7 days: Y / N Segment Length: _____ ft.

Habitat Parameter	Condition (Departure) Category				
	Reference (None)	**Good (Minor)**	**Fair (Major)**	**Poor (Severe)**	
6.1 Woody Debris Cover LWD size rank variable only used if ≥ 10 pieces	☐ LWD pieces / mile > 100 ☐ LWD size rank 3-6 >50% ☐ debris jams / mile > 5 ☐ high woody debris recruitment potential ☐ CPOM present in channel and margins	☐ 100 ≥ LWD / mile > 50 ☐ 50 ≥ LWD rank 3-6 > 25% ☐ 5 ≥ jams / mile > 3 ☐ moderate woody debris recruitment potential ☐ CPOM limited in channel and present in margins	☐ 50 ≥ LWD / mile > 25 ☐ 25 ≥ LWD rank 3-6 > 10% ☐ 3 ≥ jams / mile > 1 ☐ low woody debris recruitment potential ☐ CPOM limited in both channel and margins	☐ LWD / mile ≤ 25 ☐ LWD size rank 3-6 ≤ 10% ☐ debris jams absent ☐ no woody debris recruitment potential ☐ CPOM absent	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	
6.2 Bed Substrate Cover *fines: sand if d_{50} ≥ gravel, otherwise silt.	☐ riffle embeddedness < 20% margin embeddedness < 40% ☐ fining* < 10% ☐ Riffle stability index < 70% ☐ sediment apparently stable & sorted ☐ substrate free of dense algae growth	☐ 20 ≤ emb_{riffle} < 40% 40 ≤ emb_{margin} < 60% ☐ 10 ≤ fining* < 20% ☐ 70 ≤ RSI < 80% ☐ some evidence of sediment mobility & lack of sorting ☐ small substrate patches covered by dense algae growth	☐ 40 ≤ emb_{riffle} < 75% 60 ≤ emb_{margin} < 80% ☐ 20 ≤ fining* < 40% ☐ 80 ≤ RSI < 90% ☐ major evidence of sediment mobility & lack of sorting ☐ large substrate patches covered by dense algae growth	☐ riffle embeddedness ≥ 75% margin embeddedness ≥ 80% ☐ fining* ≥ 40% ☐ RSI ≥ 90% ☐ sediments unstable, unsorted, soft underfoot ☐ most of substrate covered by dense algae growth	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	
6.3 Scour and Deposition Features *Depth-velocity combinations* *fast-shallow* *fast-deep* *slow-shallow* *slow-deep* *(cutoffs: 1.0 fps, 1.5 ft)* Pool size rank variable only used if ≥ 5 pools	☐ pools / mile > 40 ☐ pool size rank 3-7 >50% ☐ good cover > 75% of total pool surface area ☐ riffle coverage > 25% reach area, distinctly formed and complete ☐ 5 ≤ riffle spacing ≤ 7 bankfull channel widths (w_{bkf}) ☐ well-defined riffle-run-pool-glide pattern with all four depth-velocity combinations present ☐ stable bars, vegetative cover on depositional features ≥ 50%, particles well-sorted	☐ 40 ≥ pools / mile > 20 ☐ 50 ≥ pool rank 3-7 > 25% ☐ 75 ≥ good cover > 50% of total pool surface area ☐ 25 ≥ riffle coverage > 10% reach area, moderately well formed and complete ☐ 3 ≤ riffle spacing < 5, or 7 < riffle spacing ≤ 10 x w_{bkf} ☐ well-defined riffle-run-pool-glide pattern with three depth-velocity combinations dominant ☐ mostly stable bars, vegetative cover on depositional features 50-25%, particles moderately sorted	☐ 20 ≥ pools / mile > 10 ☐ 25 ≥ pool rank 3-7 > 10% ☐ 50 ≥ good cover > 25% of total pool surface area ☐ 25 ≥ riffle coverage > 10% reach area, poorly formed and incomplete ☐ 1 ≤ riffle spacing < 3, or 10 < riffle spacing ≤ 12 x w_{bkf} ☐ moderately defined riffle-run-pool-glide pattern with two depth-velocity combinations dominant ☐ unstable bars present, vegetative cover on depositional features 25-10%, particles minimally sorted	☐ pools / mile ≤ 10 ☐ pool size rank 3-7 ≤ 10% ☐ good cover ≤ 25% of total pool surface area ☐ riffle coverage ≤ 10% reach area, or mostly indistinct or absent ☐ riffle spacing ≥ 12 bankfull channel widths ☐ poorly defined riffle-run-pool-glide pattern with one depth-velocity combination dominant ☐ mostly unstable bars, vegetative cover on depositional features < 10%, particles not sorted	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	
6.4 Channel Morphology	☐ width/depth < 30, natural ☐ entrenchment ratio ≥ 2.0, incision ratio < 1.0, good floodplain access ☐ no evidence of channel alteration	☐ 30 ≤ w/ d < 40, widening ☐ entrenchment ratio ≥ 2.0, 1.0 ≤ incision ratio < 1.2, reduced floodplain access ☐ evidence of minor historic channel alteration	☐ 40 ≤ w / d < 50, widening ☐ entrenchment ratio ≥ 2.0, 1.2 ≤ incision ratio < 1.4, limited floodplain access ☐ major historic or minor recent channel alteration	☐ w / d ≥ 50, over-widening ☐ entrenchment ratio < 2.0 **or** incision ratio ≥ 1.4, floodplain access unlikely ☐ extensive historic or major recent channel alteration	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Habitat Parameter	Condition (Departure) Category			
	Reference (None)	**Good (Minor)**	**Fair (Major)**	**Poor (Severe)**
6.5 Hydrologic Characteristics	□ wetted width / W_{bkf} > 0.50 □ exposed substrate < 50% □ adjacent springs, seeps, and wetlands extensive □ no known flow alteration	□ 0.50 ≥ W_{wet} / W_{bkf} > 0.30 □ 50 ≤ exp. substrate < 60% □ adjacent springs, seeps, and wetlands present □ minor flow alteration likely due to flow regulation and/or land use changes	□ 0.30 ≥ W_{wet} / W_{bkf} > 0.10 □ 60 ≤ exp. substrate < 70% □ adjacent springs, seeps, and wetlands minimal □ major flow alteration likely due to flow regulation and/or land use changes	□ W_{wet} / W_{bkf} ≤ 0.10 □ exposed substrate ≥ 70% □ adjacent springs, seeps, and wetlands absent or altered □ runoff characteristics completely altered due to flow regulation and storm water influence
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.6 Connectivity Tend towards a higher/lower score for natural/man-made obstructions	□ no obstructions in reach that block longitudinal movement of aquatic species over all but the lowest flows □ system obstructions absent □ abundant low **and** high flow refuge	□ one or two small low flow obstructions present in reach that block movement of aquatic species □ limited system obstructions □ abundant refuge, with low **or** high flow refuge limited	□ one or two small to medium bankfull obstructions present in reach that block movement of aquatic species □ system obstructions present □ limited low **and** high flow refuge	□ more than two bankfull obstructions present in reach that block movement of aquatic species □ many system obstructions □ refuge absent
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
6.7 River Banks Select different boxes for LB and RB if necessary	□ bank erosion <10%, typical of natural conditions, little or no bank revetments □ bank vegetation > 90% in tree, shrub and herb layers, diverse assemblages, plants create good cover and roots help stabilize bank	□ 10 ≤ bank erosion < 30%, infrequent small areas, some bank revetments □ 90 ≥ bank vegetation > 75% in each layer, diverse assemblages, plants create good cover and roots help stabilize bank	□ 30 ≤ bank erosion < 60%, mod. unstable banks, and/or extensive bank revetments □ 75 ≥ bank vegetation > 50%, in two of three layers, reduced diversity, plants create limited cover and roots do not stabilize bank	□ bank erosion ≥ 60%, banks unstable, extensive erosion, and failing bank revetments □ bank vegetation ≤ 50% in two of three layers, limited diversity, plants create no cover and roots do not stabilize bank
Undercut size rank variable only used if ≥ 5 undercuts	□ bank canopy > 90% □ undercut banks / mile > 30 □ undercut bank size rank 3-6 > 50%	□ 90 ≥ bank canopy > 75% □ 30 ≥ undercuts / mile > 15 □ 50 ≥ undercut bank size rank 3-6 > 25%	□ 75 ≥ bank canopy > 50% □ 15 ≥ undercuts / mile > 5 □ 25 ≥ undercut bank size rank 3-6 > 10%	□ bank canopy ≤ 50% □ undercuts / mile ≤ 5 □ undercut bank size rank 3-6 ≤ 10%
(score each bank)	□ undercut banks with mostly stable boundaries, abundant overhanging vegetation, and consistent water adjacency □ no mass failures in valley	□ undercuts with some unstable boundaries or reduced overhanging vegetation, and consistent water adjacency □ 1 mass failure in valley	□ undercuts with some unstable boundaries or reduced overhanging vegetation, and reduced water adjacency □ 1 - 2 mass failures in valley	□ undercuts with mostly unstable boundaries, no overhanging vegetation, and reduced water adjacency □ > 3 mass failures in valley
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1
6.8 Riparian Area Select different boxes for LB and RB if necessary	□ buffer width > 150 ft □ rip. vegetation > 75% in tree, shrub and herb layers, diverse assemblages, no invasives, maximum channel canopy	□ 150 ≥ buffer width > 100 ft □ 75 ≥ rip. veg. > 50% in each layer, one plant type absent, minimal invasives, maximum channel canopy	□ 100 ≥ buffer width > 50 ft □ 75 ≥ rip. veg. > 50% in each layer, several types absent, altered patches, invasives present, reduced canopy	□ buffer width ≤ 50 ft □ rip. veg. ≤ 50% in each layer, several types absent, large altered areas, invasives present, reduced canopy
(score each side of the channel)	□ river corridor development and infrastructure absent	□ river corridor development and infrastructure minimal	□ river corridor development and infrastructure common	□ river corridor development and infrastructure abundant
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1

6.9 Score: front _____ + back _____ = total _____

Percentage: total score _____ x (100 / 160) = _____

Overall Physical Habitat Condition: _____

SHTD □ Existing Stream Habitat Type: _____

Score	*Percentage*	*Condition (Departure)*
136 – 160	**85 – 100**	Reference (None)
104 – 135	**65 – 84**	Good (Minor)
56 – 103	**35 – 64**	Fair (Major)
0 – 55	**0 – 34**	Poor (Severe)

FUSS & O'NEILL

Attachment 2

Bridge, Culvert and Dam Assessment Data Forms

Bridge & Arch Assessment - Geomorphic & Habitat Parameters

Structure Type: **bridge / arch** Field Map # _____

SGAStructure ID				Local ID	
Observer(s) / Organization(s)				Date	
Town				Phase 1 Project	
Location				Longitude (E/W)	
Reach VTID				Latitude (N/S)	
Road Name				Road Type	**paved gravel trail railroad**
Stream Name				High Flow Stage	**yes no**
Structure Width (road width)	(ft.)	Structure Material	**aluminum, wrought iron, cast iron** **concrete** **masonry (arches) & slabs** **prestressed concrete/post-tensioned** **steel** **timber** **other**	Channel Width **curve measured**	(ft.)
Structure Clearance	(ft.)			# of bridge piers or # arches at crossing	
Structure Span	(ft.)			Structure skewed to roadway	**yes no**

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** **partially** **not significant**

Structure located at a significant break in valley slope: **yes** **no** **unsure**

Upstream

Is structure opening partially obstructed by (circle all that apply): **wood debris** **sediment** **deformation** **none**

Steep riffle present immediately upstream of structure: **yes** **no**

If channel avulses, stream will: **cross road** **follow road** **unsure**

Estimated distance avulsion would follow road: _____ (feet)

Angle of stream flow approaching structure: **sharp bend** **mild bend** **naturally straight** **channelized straight**

Downstream

Pool present immediately downstream of structure: **yes** **no**
Maximum pool depth: _____ (0.0 feet or >4feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Stepped footers: **yes** **no**

Geomorphic and Fish Passage Data	UPSTREAM	DOWNSTREAM	IN STRUCTURE
Dominant bed material at structure	**1 2 3 4 5 UK** bedrock present: **yes no**	**1 2 3 4 5 UK** bedrock present: **yes no**	**1 2 3 4 5 UK** bedrock present: **yes no**
Sediment deposit types	**none delta side point mid-channel**	**none delta side point mid-channel**	**none delta side point mid-channel**
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation:	**yes no**	**yes no**	**yes no**
Bank erosion	**high low none**	**high low none**	
Hard bank armoring	**intact failing none unknown**	**intact failing none unknown**	
Streambed scour causing undermining around/under structure (circle all that apply)	**none abutments footers wing walls**	**none abutments footers wing walls**	
Beaver dam near structure Distance from structure to dam	**yes no** **distance: _____ ft.**	**yes no** **distance: _____ ft.**	

Bed Material Codes
1-bedrock
2-boulder
3-cobble
4-gravel
5-sand
UK-unknown

Wildlife Data (left/right bank determined facing downstream)	LEFT	RIGHT	LEFT	RIGHT
Dominant vegetation type				
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500'or more up/downstream?	**yes no**	**yes no**	**yes no**	**yes no**

Vegetation Type Codes
C-coniferous forest
D-deciduous forest
M-mixed forest
S-shrub/sapling
H-herbaceous/grass
B-bare
R-road embankment

Road-killed wildlife within ¼ mile of structure? (circle none or list species)	**species:** **none**

Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected w/GPS: **yes no** Photos taken: **yes no** Please fill out photo log below	**Comments:**

Roll and Frame #	Photo View	Description of Features in Photo

Culvert Assessment - Geomorphic & Habitat Parameters Field Map # _____

SGA Structure ID				Local ID	
Observer(s) / Organization(s)				Date	
Town				Phase 1 Project	
Location				Longitude (E/W)	
Reach VTID				Latitude (N/S)	
Road Name				Road Type	**paved gravel trail railroad**
Stream Name				High Flow Stage	**yes no**
Culvert Length	(ft.)	Structure Material	**concrete** **plastic corrugated** **plastic smooth** **tank** **steel corrugated** **stone** **aluminum corrugated** **other** **mixed**	Channel Width **curve measured**	(ft.)
Culvert Height	(ft.)			# of culverts at crossing	
Culvert Width	(ft.)			Overflow pipe(s)	**yes no**
				Structure skewed to roadway	**yes no**

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** **partially** **not significant**

Structure located at a significant break in valley slope: **yes** **no** **unsure**

Culvert slope as compared with the channel slope is: **higher** **lower** **same**

Upstream

Is structure opening partially obstructed by (circle all that apply): **wood debris** **sediment** **deformation** **none**

Steep riffle present immediately upstream of structure: **yes** **no**

If channel avulses, stream will: **cross road** **follow road** **unsure**

Estimated distance avulsion would follow road: _____ (feet)

Angle of stream flow approaching structure: **sharp bend** **mild bend** **naturally straight** **channelized straight**

Downstream

Water depth in culvert (at outlet): _____ (0.0 feet)

Culvert outlet invert: **partially backwatered or at grade** **cascade** **free fall**

Backwater Length (measured from outlet): _____ (0.0 feet)

Outlet drop (invert to water surface): _____ (0.0 feet)

Pool present immediately downstream of structure: **yes** **no**

Pool depth at point of streamflow entry: _____ (0.0 feet)

Maximum pool depth: _____ (0.0 feet or >4feet)

Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**

Geomorphic and Fish Passage Data	**UPSTREAM**	**DOWNSTREAM**	**IN STRUCTURE**
Dominant bed material at structure	**1 2 3 4 5 UK** bedrock present: **yes no**	**1 2 3 4 5 UK** bedrock present: **yes no**	**0 1 2 3 4 5 UK** material throughout: **yes no**
Sediment deposit types	**none delta side point mid-channel**	**none delta side point mid-channel**	**none delta side point mid-channel**
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation:	**yes no**	**yes no**	**yes no**
Bank erosion	**high low none**	**high low none**	
Hard bank armoring	**intact failing none unknown**	**intact failing none unknown**	
Streambed scour causing undermining around/under structure (circle all that apply)	**none culvert footer wing walls**	**none culvert footer wing walls**	
Beaver dam near structure Distance from structure to dam	**yes no** **distance: _____ ft.**	**yes no** **distance: _____ ft.**	

Bed Material Codes
0-none
1-bedrock
2-boulder
3-cobble
4-gravel
5-sand
UK-unknown

Wildlife Data (left/right bank determined facing downstream)	**LEFT**	**RIGHT**	**LEFT**	**RIGHT**
Dominant vegetation type				
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500'or more up/downstream?	**yes no**	**yes no**	**yes no**	**yes no**

Vegetation Type Codes
C-coniferous forest
D-deciduous forest
M-mixed forest
S-shrub/sapling
H-herbaceous/grass
B-bare
R-road embankment

Road-killed wildlife within ¼ mile of structure? (circle none or list species)	**species:** **none**

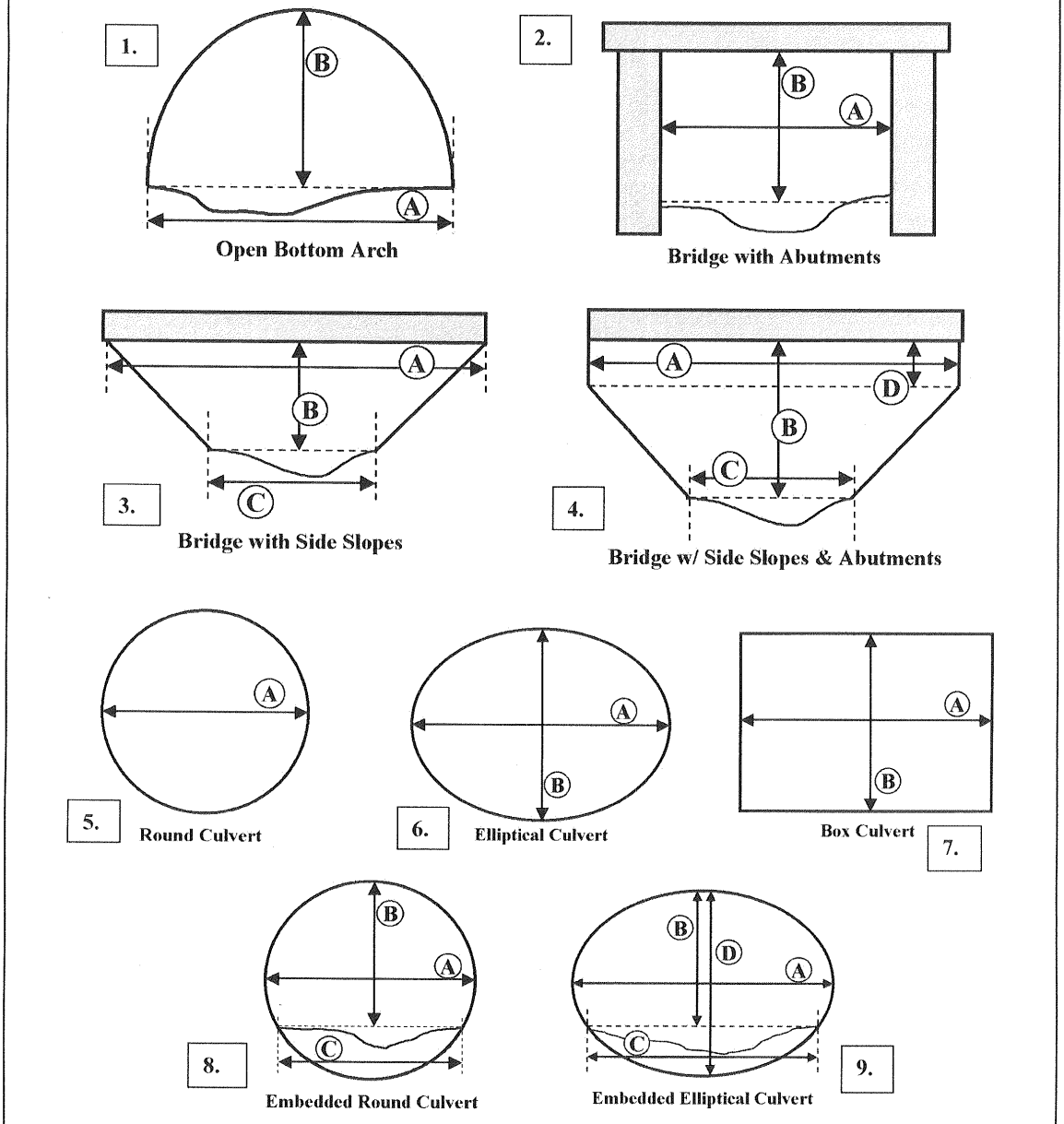
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected w/GPS: **yes no** Photos taken: **yes no** Please fill out photo log below	**Comments:**

Roll and Frame #	**Photo View**	**Description of Features in Photo**

Appendix 2 Field data collection form, p. 3 of 5

Crossing Dimensions



Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Appendix 2 Field data collection form, p. 4 of 5

DIMENSIONS WORKSHEET FOR MULTIPLE CULVERT CROSSINGS **Crossing ID#** _____

Note: *When inventorying multiple culverts, label left culvert 1 and go in increasing order from left to right from downstream end (outlet) looking upstream.*

Number of Culverts or Bridge Cells _____

Culvert or Bridge Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Culvert or Bridge Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Culvert or Bridge Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Culvert or Bridge Cell 5 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Culvert or Bridge Cell 6 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

Downstream Dimensions (ft.): A) _____ B) _____ C) _____ D) _____

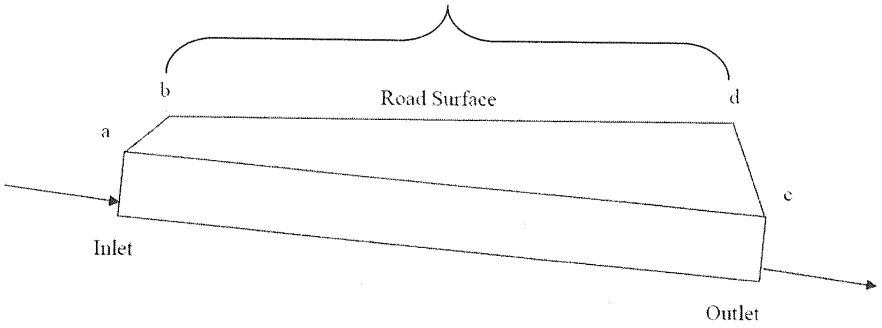
Length of stream through crossing (ft.): _____ **Crossing slope (%)** _____

Appendix 2 Field data collection form, p.5 of 5

Field Data Form: Road-Stream Crossing Inventory

Culvert/Road Elevations (ft.): A) _____ B)_____ C)_____ D)_____

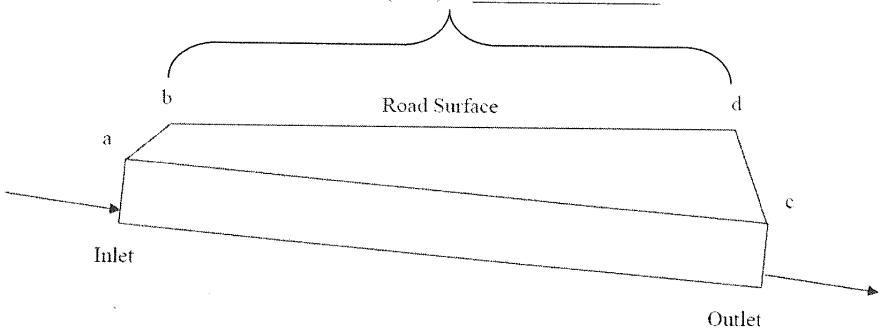
Road + Shoulder Width (RW) = _____feet



Field Data Form: Road-Stream Crossing Inventory

Culvert/Road Elevations (ft.): A) _____ B)_____ C)_____ D)_____

Road + Shoulder Width (RW) = _____feet



FUSS & O'NEILL

Attachment 3

Natural Resource Assessment Data Forms

WETLAND FUNCTION & VALUE ASSESSMENT FIELD FORM

This form has been developed to streamline the function and value assessment process of wetlands and watercourses in the field. The form has largely been developed using the procedure outlined in the U.S. Army Corps of Engineers "Highway Methodology Work Book: Supplement. Wetland Functions and Values: A Descriptive Approach" (1995, NAEEP-360-1-30a). This methodology is a descriptive approach and does not rely upon semi-quantitative numerical models to identify principal functions and values of wetlands and watercourse.

Many of the criteria used as "considerations and qualifiers" are drawn directly from the U.S. Army Corps of Engineers methodology. However, other assessment methods were considered (e.g. Wisc. DNR, 1992, "Rapid Assessment Methodology for Evaluating Wetland functions and Values." and Ammann, et al., 1996,"Method for the Evaluation of Inland Wetlands in Connecticut.") as well professional experience. Each criteria listed is an indicator of that function or value . An affirmative response, therefore, supports the assumptions of a given function or value. Generally, a majority of affirmative responses will indicate that the given function or value is a "principal" function or value. However, the criteria are not weighted and thus it is incumbent upon the inspector to use his or her best professional judgment when identify "principal" functions or values.

Groundwater Recharge & Discharge

The capacity or potential for a wetland to interact with groundwater such that water moves from surface water to ground water (Recharge) or from ground water to surface water (Discharge)

Floodflow Alteration

The storage of inflowing water from storm or flooding events, resulting in detention and retention of water on the wetland surface

Finfish Habitat (Ponds & Lakes)

Considers the quality of the aquatic habitat of a pond or lake, and its capacity to support finfish.

Finfish Habitat (Streams & Rivers)

Considers the quality of the aquatic habitat of a perennial watercourse, and its capacity to support finfish.

Sediment, Pollutant & Nutrient Removal

The capacity of a wetland to remove dissolved, suspended and floatable material from storm water runoff and prevents degradation of water quality.

Production Export

The capacity of a wetland to produce wildlife food sources, or to export biomass that sustains downstream ecosystems and local wildlife populations.

Wildlife Habitat

The capacity of a wetland to support a diverse and abundant wildlife community typically associated with wetland and wetland edges.

Educational, Scientific & Recreation Value

The suitability of a wetland for classroom field trips or scientific research, or to support various recreation activities (e.g., hiking, canoeing, boating, fishing, hunting, bird watching).

Uniqueness & Heritage

The degree to which a wetland is considered a locally or regionally unique natural resource.

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

GROUNDWATER RECHARGE

Considerations/Qualifiers	Yes	No
Wetland is underlain by stratified drift, gravel or sandy soils.	☐	☐
Wetland is *not* underlain by hardpan, impervious soils (e.g., clays and silts) or bedrock	☐	☐
Wetland is associated with a perennial or intermittent watercourse	☐	☐
Wetland formed on relatively gentle slopes (e.g., less than 3%)	☐	☐
Wetland is associated with a watercourse but lacks a defined outlet or contains a constricted outlet	☐	☐
Other evidence of groundwater recharge is present (i.e., local water supplies piezometer data, etc.)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

GROUNDWATER DISCHARGE

Considerations/Qualifiers	Yes	No
Wetland is *not* underlain by stratified drift, gravel or sandy soils.	☐	☐
Wetland is underlain by hardpan; impervious, tight grained soils (high clay and/or silt content); or bedrock	☐	☐
Wetland formed as a result of seeps or springs	☐	☐
Wetland shows strong signs of variable water levels (e.g., well developed microtopography)	☐	☐
Wetland is associated with a watercourse and contains only an outlet, no defined inlet	☐	☐
Other evidence of groundwater discharge are present (i.e., water temperature, piezometer data, etc.)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

Inspector:_____

FUSS & O'NEILL

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

FLOODFLOW ALTERATION

Considerations/Qualifiers	Yes	No
Area of this wetland is large relative to its watershed	☐	☐
Wetland occurs in the upper portions of its watershed and the effective flood storage is small or non-existent upslope of or above the wetland	☐	☐
Wetland watershed contains a high percent of impervious surfaces	☐	☐
Wetland shows strong signs of variable water levels (e.g., well developed microtopography) or ponding (e.g. sediment deposits or lines)	☐	☐
Wetland formed on relatively gentle slopes (e.g., less than 3%).	☐	☐
Wetland located in a floodplain of an adjacent watercourse.	☐	☐
Wetland has a constricted outlet.	☐	☐
Wetland contains hydric soils which are able to absorb and detain water.	☐	☐
Watershed has a history of economic loss due to flooding.	☐	☐
Associated watercourse, if present, is sinuous or diffuse.	☐	☐
Other evidence of floodflow alteration (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

SEDIMENT, POLLUTANT & NUTRIENT REMOVAL

Considerations/Qualifiers	Yes	No
Wetland saturated for most of the season.	☐	☐
Ponded water (including deep water or open water habitat) is present in the wetland.	☐	☐
Wetland edge is broad and intermittently aerobic.	☐	☐
Deep organic/sediment deposits are present	☐	☐
Slowly drained fine grained mineral or organic soils are present.	☐	☐
Alluvial soils present in or immediately adjacent to wetland.	☐	☐
Wetland formed on relatively gentle slopes (e.g., less than 3%).	☐	☐
Water retention/detention time in this wetland is increased by constricted outlet.	☐	☐
Water retention/detention time in this wetland is increased by thick vegetation.	☐	☐
Emergent vegetation and/or dense woody stems are dominant.	☐	☐
Wetland shows strong signs of variable water levels (e.g., well developed microtopography)	☐	☐
Other evidence of sediment, pollutant and nutrient removal (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

Inspector:_____

FUSS & O'NEILL

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

FISH AND SHELLFISH HABITAT (PONDS & LAKES)

Considerations/Qualifiers	Yes	No
Land use adjacent to pond or lake dominated by forest, shrub and/or meadow community	☐	☐
Shallow littoral zone with emergent vegetation present	☐	☐
Pond or lake is ate least 10 feet deep	☐	☐
Pond or lake is covered by more than 15 but less then 40 percent submered or emergent vegetation	☐	☐
Direct stormwater discharge(s) are few to none and , if present, originate from smaller culverts/outfalls	☐	☐
Sand bars or evidence of stormwater runoff at inlet is absent	☐	☐
Water transparency is high	☐	☐
Significant sources of nutrient sources (e.g. fertilizers, over-abundant waterfowl) are absent	☐	☐
Pond or lake is greater than 0.5 acre	☐	☐
Dense algal blooms, nuisance aquatic vegetation or duckweed are not or have not historically been observed	☐	☐
Other evidence of finfish habitat (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

FISH AND SHELLFISH HABITAT (STREAMS & RIVERS)

Considerations/Qualifiers	Yes	No
Land use adjacent to stream or river dominated by forest, shrub and/or meadow community	☐	☐
Channel is shaded by riparian trees or shrubs	☐	☐
Bank is predominantly vegetated with high cover (e.g. trees and shrubs)	☐	☐
Barriers to anadromous fish (i.e. dams, including beaver dams, waterfalls, road crossings, etc.) are absent from the stream reach associated with this wetland.	☐	☐
Dominant bottom substrate is gravel and/or cobbles	☐	☐
Bottom substrate is embedded with minimal sand and silt	☐	☐
Diversity of instream habitat (e.g. riffles, runs, shallow pools and deep pools) is high	☐	☐
Channel alteration (i.e. channelization, islands, point bars, etc.) are few to absent	☐	☐
Bank is stabilized; Little to no evidence of scour or erosion is present	☐	☐
Stream or river contains common to many cover objects (i.e, fallen logs, boulders, undercut banks)	☐	☐

Inspector:_____

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

FISH AND SHELLFISH HABITAT (STREAMS & RIVERS) (cont'd)

Stream or river is predominantly buffered from other land uses by a vegetated zone greater than 20 feet in width	☐	☐
Direct stormwater discharge(s) are few to none, and, if present, originate from smaller culverts/outfalls	☐	☐
Sand bars or evidence of stormwater runoff at inlet is absent	☐	☐
Significant sources of nutrient sources (e.g. fertilizers, over-abundant waterfowl) are absent	☐	☐
Quality of the watercourse associated with this wetland is able to support healthy fish/shellfish	☐	☐
Other evidence of finfish habitat (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

PRODUCTION EXPORT

Considerations/Qualifiers	Yes	No
Wildlife food sources growing within this wetland are abundant and diverse.	☐	☐
Emergent vegetation and/or dense woody stems are dominant.	☐	☐
Wetland exhibits high degree of plant community structure/species diversity	☐	☐
Evidence of wildlife use found within this wetland.	☐	☐
Fish or shellfish develop or occur in this wetland.	☐	☐
Nutrients exported or "flushed" from wetlands to watercourses (permanent outlet present).	☐	☐
Other evidence of production export (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

WILDLIFE HABITAT

Considerations/Qualifiers	Yes	No
Wetland is not degraded or fragmented by human activity.	☐	☐
Wildlife overland access to other wetlands is present and relatively unfragmented or unimpeded.	☐	☐
More than 40% of this wetland edge is bordered by upland wildlife habitat (e.g., shrub thicket, woodland, farmland, or idle land) at least 500 feet in width.	☐	☐
Wetland is contiguous with other wetland systems connected by a watercourse or lake.	☐	☐
Water quality of the watercourse, pond, or lake associated with this wetland meets or exceeds Class A or B standards.	☐	☐

Inspector:_____

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

WILDLIFE HABITAT (cont'd)

Dominant wetland class includes deep or shallow marsh or wooded swamp.	☐	☐
Wildlife food sources growing within this wetland are abundant and diverse.	☐	☐
Wetland exhibits a high degree of interspersion of vegetation classes (e.g. forest, shrub, emergent marsh, wet meadow, open water).	☐	☐
Two or more islands or inclusions of upland within the wetland are present.	☐	☐
Wetland exhibits a high degree of diversity in plant community structure (e.g., tree/shrub/vine/grasses/mosses).	☐	☐
Wetland or watercourse contains numerous and diverse habitat features (e.g., snags, downed woody debris, rocks, seeps/springs, well drained sandy soils).	☐	☐
Evidence of obligate or facultative vernal pool species have been observed in or near the wetland.	☐	☐
Wetland shows strong signs of variable water levels (e.g., well developed microtopography).	☐	☐
Dominant vegetation cover type is not composed of invasive or noxious species.	☐	☐
Other evidence wildlife habitat (Explain below).	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

EDUCATIONAL, SCIENTIFIC & RECREATION VALUE

Considerations/Qualifiers	Yes	No
Wetland contains state or federal listed species.	☐	☐
Wildlife habitat is a principal function of the wetland	☐	☐
Direct access is available to a perennial watercourse (e.g., stream pond or lake)	☐	☐
Wetland is part of a recreation area, park, forest, or refuge.	☐	☐
Hunting and/or fishing is available within or from the wetland.	☐	☐
Hiking occurs or has the potential to occur in the wetland	☐	☐
Off-road public parking available at or near the wetland or watercourse.	☐	☐
Wetland is within a short drive or safe walk from highly populated public and private areas.	☐	☐
Wetland currently used for educational or scientific purposes.	☐	☐
Access to water is available at this potential recreation site for boating, canoeing, or fishing.	☐	☐
No known safety hazards exist (If not, explain below).	☐	☐
Other evidence educational, scientific or recreation value (Explain below).	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

Inspector:_____

FUSS & O'NEILL

Project Name: _____ Project #:_____

Wetland Assessment Area:_____

Date:_____Weather:_____ Photographs Taken? Yes / No

UNIQUENESS & HERITAGE VALUE

Considerations/Qualifiers	Yes	No
Wetland contains state or federal listed species.	☐	☐
Wetland identified as a whole or in part as an exemplary natural community (Explain below)	☐	☐
Wetland considered a locally and/or regionally significant (Explain below)	☐	☐
Other evidence of uniqueness or heritage values (Explain below)	☐	☐

☐ PRINCIPAL FUNCTION or ☐ SECONDARY FUNCTION?

Comments:

SUMMARY OF FUNCTIONS & VALUES

Function/Value	Principal Function	Secondary Function
Groundwater Recharge & Discharge		
Floodflow Alteration		
Sediment, Pollutant & Nutrient Removal		
Finfish Habitat (Ponds & Lakes)		
Finfish Habitat (Streams & Rivers)		
Production Export		
Wildlife Habitat		
Educational, Scientific & Recreation Value		
Uniqueness & Heritage		

MISCELLANEOUS NOTES & COMMENTS:

Inspector:_____

Wetland Function-Value Evaluation Form

Total area of wetland: Human made? Is wetland part of a wildlife corridor? Or a habitat island?
Adjacent land use: Distance to nearest roadway or other development:

Dominate wetland systems present: Continuous underdeveloped buffer zone present?

Is the wetland a separate hydraulic system? If not, where does the wetland lie in the drainage basin?

How many tributaries contribute to the wetland: Wildlife & Vegetation diversity/abundance (see attached list)

Wetland I.D.
Lat Lon -
Preparer: Date:
Wetland Impact:
Type :
Evaluation based on:
Office Field
Corps Manual wetland delineation completed: Y N

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)	Principal Function(s)/Values	Comments
Groundwater Recharge/Discharge	x				
Floodflow Alteration					
Fish and Shellfish Habitat					
Sediment/Toxicant Retention					
Nutrient Removal					
Production Export					
Sediment/Shoreline Stabilization					
Wildlife Habitat					
Recreation					
Educational/Scientific Value					
Uniqueness/Heritage					
Visual Quality/Aesthetics					
ES Endangered Species Habitat					
Other					

Notes:

FUSS & O'NEILL

Attachment 4

Green Infrastructure Assessment Data Forms

WATERSHED:	SUBWATERSHED:	UNIQUE SITE ID:	
DATE:	ASSESSED BY:	CAMERA ID:	PICTURES:
GPS ID:	LMK ID:	LAT:	LONG:

SITE DESCRIPTION

Name:_____
Address:_____

Ownership: ☐ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:_____

Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID:_____

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Above Roadway Culvert
- ☐ Below Outfall
- ☐ In Conveyance System
- ☐ In Road ROW
- ☐ Near Large Parking Lot
- ☐ Other:_____

On-Site
- ☐ Hotspot Operation
- ☐ Individual Rooftop
- ☐ Small Parking Lot
- ☐ Small Impervious Area
- ☐ Individual Street
- ☐ Landscape / Hardscape
- ☐ Underground
- ☐ Other:_____

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ _____
Imperviousness ≈ _____%
Impervious Area ≈ _____

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:_____

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☐ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Existing Head Available and Points Where Measured:

PROPOSED RETROFIT

Purpose of Retrofit:
☐ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:_____

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:_____

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:_____
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:_____

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:_____

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☐ Not Probable
Impacts to Wetlands	☐ Probable	☐ Not Probable
Impacts to a Stream	☐ Probable	☐ Not Probable
Floodplain Fill	☐ Probable	☐ Not Probable
Impacts to Forests	☐ Probable	☐ Not Probable
Impacts to Specimen Trees	☐ Probable	☐ Not Probable

How many?_____
Approx. DBH_____

Other factors:_____
_____

Soils:

Soil auger test holes:	☐ Yes	☐ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No
Evidence of shallow bedrock:	☐ Yes	☐ No
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No

SKETCH

Unique Site ID: _____

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types
- ☐ Other:_____

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION:	☐ YES	☐ NO	☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S):	☐ YES	☐ NO	☐ MAYBE

IF YES, TYPE(S):_____

Unique Site ID:_____