FIRST BRANCH WHITE RIVER WATERSHED

STREAM GEOMORPHIC ASSESSMENT and RIVER CORRIDOR PLAN 2012-2013

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1.0 EXECUTIVE SUMMARY

In June 2012 the White River Partnership (WRP), as part of a project funded by the Vermont Agency of Natural Resources Ecosystem Restoration Grant Program, engaged Redstart to conduct a Phase 2 Stream Geomorphic Assessment (SGA) on the White River's First Branch and the first reach of seven major tributaries in east-central Vermont (overview map in Fig. 2 on p. 12) and to produce a Phase 2 SGA report and River Corridor Management Plan (RCMP).

The WRP is a community-based, non-profit organization whose mission is to bring together people and local communities to improve the long-term health of the White River and its watershed in central Vermont. The First Branch corridor planning project builds on fifteen years of community-based efforts undertaken by the WRP and partners throughout the White River watershed. Key partners in the First Branch basin have included riparian landowners, local elementary and high schools and Verdana Ventures, the Vermont Law School, the Vermont Youth Conservation Corps, the Vermont Department of Fish & Wildlife, Two Rivers-Ottauquechee Regional Commission, local water-quality monitors and other volunteers active in the First Branch Stream Team (now combined with the 'Tween (Mid-White) Stream Team), town road crews and Recreation and Planning Commissions in Chelsea, Tunbridge, Washington, Royalton and Corinth, the Connecticut River Watershed Council and Joint Commissions, the USDA Forest Service, and Trout Unlimited.

Stream Geomorphic Assessment and River Corridor Planning

Fluvial (= flow-related) geomorphology (geo = earth, morphology = shape) is the study of the physical river forms and processes that explain many of the current conditions observed in streams. Streams have a natural tendency to maintain equilibrium between the amount and power of water moving through the system and the amount and type of sediment being carried by that water. With significant changes in the landscape and development patterns in the last 200 years, many streams in Vermont, including the First Branch and some of its tributaries, have been confined to deeper, straighter channels and lost access to historic floodplains. Additional stress has come from changes in precipitation timing and patterns, notable in flash flooding in portions of the First Branch basin in 2007, 2008, 2009, and 2010; damage from Irene in 2011 was lower in this basin than in nearby communities, largely due to the distribution of rainfall.

The work reported here is based on protocols and guidelines developed by the Vermont River Management Program, designed to identify a range of top-priority issues with a goal of managing toward, protecting, and restoring the fluvial geomorphic equilibrium condition of Vermont's rivers and streams as a means to help resolve conflicts between human investments and river dynamics in an economically and ecologically sustainable manner. Objectives following from this goal include:

1. fluvial erosion hazard mitigation;
2. sediment and nutrient load reduction; and
3. aquatic and riparian habitat protection and restoration

Assessments typically proceed through a series of phases that integrate information from an overarching watershed context down to project-specific scales, with each previous stage informing the successors. Phase 1 is a preliminary analysis of the condition of the stream through remotely sensed data such as aerial photographs, maps, and 'windshield survey' data. Phase 2 involves "rapid assessment fieldwork" to inform a more detailed analysis of adjustment processes that may be taking place, whether the stream has departed from its reference conditions, and how the river might continue to evolve in the future. River Corridor Plans analyze the data from the Phase 1 and 2 assessments to inform project prioritization and methodology. Phase 3 involves detailed fieldwork for projects requiring survey and engineering-level data and is not included with this report.

Assessment summary

Current geomorphic conditions in the First Branch basin are largely related to two primary factors:

1) widespread restriction of access to historic floodplains through glacial legacies as well as significant land and river use changes; and

2) extensive and pervasive channel straightening

The dense road network and diffuse settlement pattern of the basin amplify these factors through increased rate and intensity of water delivered to the stream network, working in tandem with the topography in strongly predisposing the basin to flash flooding.

These factors place the highest priority (in terms of project prioritization) on protection or restoration of optimal floodplain functions (especially attenuation of high flows and storage of sediment and nutrients) and accommodation of stable planform geometries (typically allowing establishment of meanders that help to reduce stream slope). In the First Branch basin, this primarily translates to accommodating streams that are widening and/or migrating laterally at this point in time.

Project recommendation summary

Project prioritization following from the assessment and analysis conducted for this study is reported in Chapter 6 (section 6.2), and the Project and Strategy Summary Table presented at the end of that section can be considered the heart of this Corridor Plan. While numerous maps are included in this report, readers are highly encouraged to utilize the online interactive Natural Resource Atlas hosted by the Vermont Agency of Natural Resources (VT-ANR 2013) for specific areas of interest; data from these assessments can be viewed within the 'Rivers Management Theme' and displayed against a variety of background imagery.

Project prioritization for this iteration of a River Corridor Plan for the First Branch basin falls loosely into a three-pronged approach:

- Watershed (largely municipal) strategies
- Buffer establishment and protection
- Reach-scale restoration of incised streams

Buffers will be important to reach-scale projects and are discussed jointly following the municipal strategies.

Due to the extensive and pervasive nature of current stressors in the First Branch basin (only 2 of 61 segments assessed in stable condition: 2 segments in Good geomorphic condition, 50 segments Fair, 9 segments Poor), the success of localized project implementation is highly dependent on moving toward best management practices on a watershed scale. The highest priority recommendations thus feature watershed strategies that may be best or most efficiently implemented at a municipal level.

Buffer establishment and protection, while included with the watershed strategies due to their extent in the basin and some role for consideration at a municipal level, are a high priority for other groups. These projects are almost always beneficial to stream health and with proper planning generally enhance other project implementations.

Watershed strategies

Floodplain and River Corridor Planning and Protection

- Fluvial Erosion Hazard (FEH) overlay for streams draining more than two square miles, in conjunction with updated Flood Hazard Bylaws; 50 ft setback for other, smaller streams that appear in the Vermont Hydrography Dataset (VT ANR 2013). It would be difficult to overemphasize the importance of the role that encroachments on small streams play in a setting such as the First Branch basin; setbacks, FEH zones, or other belt-width corridors provide not only flood protection for land and structures adjacent to the stream but accommodation of stream processes that will help break a cycle of impacts being amplified and passed to downstream reaches.
- Fluvial Erosion Hazard zones (FEH) are a refinement of belt-width corridors and are recommended as a scientifically based method that uses the size, inherent sensitivity, and current adjustment processes of the stream to determine and map levels of risk and appropriate setbacks. The data needed to inform this process were collected for the twenty-six reaches assessed in this study. Belt-width corridors approximate the extent of lateral adjustments likely to occur over time in a meandering stream, generally a minimum of 3-4 times the stream channel width on each side of the stream. The physical dictates of stream processes mean that a stream denied this room will pass elevated impacts to other areas, and ongoing adjustments at the north end of the Tunbridge Fairgrounds and along Upper Village Rd in Chelsea exemplify the types of risk associated with these zones.
- Given the extent of road encroachments and damages over time in the First Branch basin, a municipal approach to limiting further development in stream corridors is a highly cost-effective method of not only reducing future conflicts and damages but also minimizing impacts on existing encroachments.

Buffer protection (municipal)

- Buffer establishment and protection, while included with the watershed strategies due to their extent in the basin and some role for consideration at a municipal level, are a high priority for other groups. Although buffers are good in many areas, frequent roadside encroachment, intermittent stretches of missing buffers, and long stretches of shallow ledge grade controls contribute to elevated water temperature as a primary stressor, and trees play an especially crucial role in temperature dynamics

on small streams. Road crews are encouraged to leave roadside trees along streams to the greatest extent of safe feasibility.

Road-Stream Crossing Retrofits and Replacements

- All towns: adopt Vermont Agency of Transportation 2013 Bridge and Culvert Standards (VTrans 2014)
- Tunbridge and Washington: get digital bridge and culvert inventories, through VOBCIT at a minimum but preferably also using River Management/Fish & Wildlife data collection protocols to permit use of Culvert Screening Tools for prioritization
- Vermont River Management: Modify Culvert Geomorphic Compatibility Screening Tool to permit prioritization of bridges on geomorphic compatibility basis
- All towns: Capital budget planning with geomorphic compatibility included in prioritization discussions with structure owners on replacement schedules

Drainage and Stormwater Management

- Management of overland flow and keeping entry points well vegetated currently more of an issue on assessed reaches than erosion at entry points
- U-shaped and lined ditches highly desirable, will likely need prioritization as the issue is more prominent along smaller tributaries sharing narrow valleys with a relatively dense road network
- Priority areas (due to more notable cumulative impacts) on tributaries and headwaters portions of the mainstem (upstream of the Nick Gilman farm)

Buffer establishment and protection and Reach-scale restoration strategies

Buffer projects identified during preparation of this Corridor Plan are prioritized for inclusion with high-priority reach-scale restoration projects and then as stand-alone planting projects, with the understanding that adequate buffers will play an important role in reach-scale restoration strategies and can precede implementation of other strategies (though long-term success will greatly benefit from buffer design that acknowledges the current degree of stream instability).

Ten reaches or segments were identified as priorities for reach-scale restoration strategies. With all but two assessed stream segments in the basin historically incised, it will likely be necessary (or at least highly beneficial) to implement reach-scale projects with multiple coordinated strategies (probably requiring multiple partners or organizations) to restore better floodplain function and meander geometry. These sections of stream were prioritized based on their ability to enhance flood resilience, attenuate high flows and store sediment and nutrients, and most quickly and cost-effectively begin to move the stream network toward more stable conditions.

Priority reaches/segments for integrated reach-scale restoration strategies include:

1	M14A-B	First Branch mainstem from Old Chelsea Cemetery to Bobbinshop Rd
2	M16A-B	First Branch mainstem from former Nick Gilman farm (558 VT Rte. 110) to 0.5 mi north of Edwards Rd
3	M08	First Branch mainstem from Foundry Rd. bridge to Dickerman Brook
4	M10	First Branch mainstem from upstream end of pit across from Hanson Rd. to Flint Covered Bridge (north end of Hunt Cemetery on Rte. 110)
5	T1.01	Unnamed tributary along Strafford Road -Tunbridge Recreation Field to approach of stream to road at woods-field edge 1.7 mi up Strafford Road
6	M02	First Branch mainstem from north end of Branch View Cemetery to Rte. 110 bridge at Russell Rd.
7	M07A	First Branch mainstem from Tunbridge Recreation Field to just upstream of Rte 110 bridge at Whitney Hill
8	T6.01	Hart Hollow Brook - Confluence with First Branch (behind Brookhaven School in Chelsea Village
9	M14C	First Branch mainstem from Bobbinshop Rd to former A.C. and M.W. Button Farm (489 VT Rt. 110)
10	M16C	First Branch mainstem from 0.5 mi north of Edwards Rd to Chelsea-Williamstown Rd

Stream reaches including additional priority buffer establishment projects recommended for stand-alone implementation, roughly in order of recommended priority, include:

M09B	Augment buffer at edge of gravel pit across from Hanson Road. Incorporate design considerations to limit possibility of capture of pond but encourage access to floodplain downstream.
M09A	Augment or establish buffer; frequently flooded chute along Rte 110 downstream of Dickerman Brook has herbaceous vegetation, but trees and shrubs tolerant of inundation and ice would benefit shading of channel and physical dissipation of streampower, help with sediment retention in potential event of Bicknell Brook dam breach and storm surge capture of gravel pit pond in M09B.
T7.01E	Yard setting and likely altered wetland area in area along Edwards Rd where former barn was burned.
M04A	Augment or establish buffers in vicinity of and downstream of “the pink house” and Howe Twin Farms (Howe covered bridge).

M05A	Augment or establish buffers from Tunbridge Fairgrounds downstream. Frequently lined by box elder, adequate start for natural regeneration in many areas but numerous areas completely absent and would require establishment. Re-establish upstream of animal barns at fairgrounds; higher priority downstream of Cilley Bridge (Irene flood chute initiated off-channel headcut)
M07B	Plant to augment or establish buffer off left bank downstream of Foundry Rd bridge.
M13B	Augment, establish or re-establish buffer upstream of Chelsea wastewater treatment plant and Heath Field.
M04B	Area along Rte 110 at HoweAcres has had multiple plantings and is largely regenerating, not sure what protections are in place; active erosion has taken some buffers that could use replacement but might restrict access to upstream field portion - but is also approaching Rte 110. Bank stabilization hard to recommend due to high risk of failure, upstream drivers (straightening)

A more complete table of prioritized projects can be found in Section 6.2 (Project Prioritization) of this report. A “catalogue” of projects, with varying priorities, can be found for each reach with the reach descriptions in Section 6.1, and a consolidated catalogue is found in Appendix 6. A full list of assessed bridges and culverts, findings of the assessments, and potential for retrofitting culverts that impede passage for fish and other aquatic organisms can be found in Appendix 8. Primary analyses leading to the project recommendations are found in Section 5.1.3, Existing Sediment Regime Departure Analysis (summarized in tables at the end of the section), and Section 5.2, Sensitivity Analysis.

2.0 INTRODUCTION

When Tropical Storm Irene swept through Vermont in August 2011, large scale and rapid changes occurred in many portions of the state and incurred hundreds of millions of dollars in damages. While this was a particularly dramatic event, flooding is a major and natural driver in ongoing processes of stream channel evolution – one that both affects and is affected by the landscape in which the channel is located.

Estimates in Orange County, Vermont (where the First Branch is located) indicate that flooding from 1960-2012 accounted for only 5% of the total number of natural hazard events but nearly 78% of the reported monetary damages from those events (Hazards & Vulnerability Research Institute 2013).The data and planning processes presented here aim to broaden our understanding and help break an escalating cycle that requires an increasing level of investment to rebuild and/or protect property, livelihoods and ecosystems from damage and hazards caused by flooding, erosion and nutrient loading.

Large-scale changes involving rivers and streams (including land clearing, damming, dredging, straightening and filling of floodplains) have altered the balance of water and sediment in those systems, and many of the heightened erosion and flood impacts being felt in Vermont today are related to such changes. While streams eventually return to some sort of balance, the adjustment processes for that to happen are currently active in many areas and are often the drivers of impacts felt on a local level (though the reasons for the adjustment processes are often not evident at the local scale). These changes often unfold on a time-scale measured in decades, and many of the processes evident today are related to significant land and water use changes that occurred over the last 200 years.

Stream Geomorphic Assessment (SGA) is part of a science-based process that can help elucidate these relationships and make communities more flood resilient, and by "combining it with knowledge from local landowners, we can develop sound plans for restoring and protecting important streams while respecting the concerns and interests of the local community" (WRP 2013).

Fluvial geomorphology is the study of how water and sediment move within the landscape, both over distance and over time.

- Fluvial: of or related to rivers and streams (i.e., flowing waters)
- Geomorphology: Geo = earth; morphology = shape

Extensive experience and observation indicate that a stream with a balance of these inputs will erode its banks and change course to a relatively minor degree, even in flood situations. Impacts from Irene are one indicator of the degree to which the current state of streams in Vermont diverges from this type of equilibrium (Fig. 1).

Figure 1. This sediment plume entering Long Island Sound from the mouth of the Connecticut River was evident in satellite imagery nearly a week after Irene had moved through the state of Vermont, indicating the tremendous amounts of erosion in response to the storm. (*Photo credit: NASA 2011*)

The data and analyses presented here identify a range of top-priority issues to help achieve a goal of managing toward, protecting, and restoring the fluvial geomorphic equilibrium condition of Vermont's rivers and streams as a means to help resolve conflicts between human investments and river dynamics in an economically and ecologically sustainable manner (Kline 2010; VT-RMP Alternatives 2003). Objectives following from this goal include:

1. fluvial erosion hazard mitigation;
2. sediment and nutrient load reduction; and
3. aquatic and riparian habitat protection and restoration

The work reported here is based on protocols and guidelines developed by the Vermont River Management Program (VT-RMP 2009; Kline 2010), which are designed to guide assessments through a series of phases that integrate information from an overarching watershed context down to project-specific scales, with each previous stage informing the successors. By assessing underlying causes of channel instability at both watershed and localized scales, management efforts can be directed toward long-term solutions that help curb escalating costs and efforts directed toward resolving conflicts with ongoing stream processes.

Assessment results are summarized in this report, and preliminary analysis is presented through the use of stressor, departure, and sensitivity analysis maps to integrate the findings in a more understandable and intuitive manner. This analysis informs a process designed to identify, catalogue, and prioritize technically feasible projects that can help reduce flood and erosion hazards along stream corridors, improve water quality and aquatic habitat, and enhance recreational opportunities.

2.1 PROJECT OVERVIEW

In June 2012 the White River Partnership (WRP), as part of a project funded by the Vermont Agency of Natural Resources Ecosystem Restoration Grant Program, issued a request for proposals to conduct a Phase 2 Stream Geomorphic Assessment (SGA) on the White River's First Branch and the first reach of seven major tributaries in Tunbridge and Chelsea, and to produce a draft Phase 2 SGA report and final River Corridor Management Plan (RCMP).

The WRP is a community-based, non-profit organization whose mission is to bring together people and local communities to improve the long-term health of the White River and its watershed in central Vermont. The First Branch corridor planning project builds on fifteen years of community-based efforts undertaken by the WRP and partners throughout the White River watershed.

The 2002 White River Basin Plan (VT-ANR 2002) provides basic background on planning efforts preceding the work described in this report, paraphrased here:

> The Vermont Agency of Natural Resources initiated planning efforts to improve or maintain water quality at a watershed level in the 1960's….
>
> In the 1970s basin planning was conducted in Vermont to address point sources of pollution....The White River Basin Plan was completed in 1975, and contained several conclusions and recommendations…still relevant today…. (including) a

> recommendation for an assessment of stream bank erosion…and revegetation for disturbed stream bank areas….
>
> The collaborative process in the White River Basin began with the work of the White River Partnership. The Partnership formed in 1995 as a group of local citizens interested in preserving the quality of life in the White River Basin. It has become a forum for bringing together the community, local, State, and federal government agencies, and their resources to protect common interests.
>
> To identify common interests or concerns in the community, the Partnership held a series of public forums in 1996. The public forum results and public input during the basin planning process provided…primary concerns…as follows:
>
> • Stream channel instability and streambank erosion
>
> • Lack of awareness of water quality problems
>
> • Extent and quality of public access to recreational opportunities on the water
>
> • Impacts to fisheries

Many of the cooperators present at the 1996 forums have now been involved with restoration efforts in the watershed for more than a decade and a half, and the work of WRP "Stream Teams" and follow-up public forums and input from local landowners in 2007 indicated that these concerns have remained consistent over time. (The White River Basin Tactical Plan (VT-ANR WMD 2013) includes an extensive list of Watershed Partners, pp. 10-13). Cumulative experience has indicated that including upstream and downstream dynamics in the planning process is crucial to increasing the likelihood of successful project implementation as well as providing a means to optimize the benefits and minimize the costs of future projects. The White River Partnership has thus worked with the Vermont River Management Program to conduct stream geomorphic assessments and incorporate the results into River Corridor Plans.

Stream Geomorphic Assessment is divided into phases (phases of the geomorphic assessment process are further discussed in section 4, Methods, of this report). A Phase 1 assessment is a preliminary analysis through remotely sensed data such as aerial photographs, maps, and 'windshield survey' data collection. Phase 2 involves rapid assessment fieldwork. River Corridor Plans analyze the data from the Phase 1 and 2 assessments to inform project prioritization and methodology.

Phase 1 geomorphic assessment of the full White River watershed was conducted by River Scientist Shannon Pytlik and other members of the Vermont River Management Program, USDA Forest Service, and White River Partnership in 2001. Based on priorities derived from this phase of assessment (as well as other water quality assessments, VT-ANR WMD 2013, p. 16) Phase 2 assessments of portions of the overall White River basin have been continuing since that time.

In preparation for Phase 2 work, review of the original Phase 1 data for the First Branch was conducted in 2012 by the White River Partnership along with River Scientist Gretchen Alexander and other members of the Vermont River Management Program. This work prioritized 26 reaches (a reach is a relatively homogenous section of stream, based primarily on physical attributes such as valley confinement, slope, sinuosity, dominant bed material, and bed form) in the First Branch basin for inclusion in Phase 2

assessment. These 26 reaches included the entire First Branch mainstem plus the first reach of seven tributaries (two in Tunbridge, five in Chelsea). The First Branch assessment work followed listing of portions of the First Branch as "waters in need of further assessment" (Vermont Part C of the List of Priority Surface Waters outside the Scope of CWA Section 303(d), 2010) due to unidentified sources of elevated *E. coli* readings and concerns about elevated sediment loads and water temperatures due to soil and streambank erosion from Chelsea downstream to the mouth of the First Branch.

As of 2013 the White River Partnership listed the following completed River Corridor Plans based on Stream Geomorphic Assessments and knowledge from local landowners (WRP 2013):

Ayers Brook River Corridor Plan (2007)
Tweed River Corridor Plan (2008)
Upper White River Corridor Plan (2008)
Town of Sharon River Corridor Plan (2010)

The White River Tactical Plan (VT-ANR WMD 2013) notes that:

> Stream geomorphic assessments (SGA) provide the basis for stream alteration regulatory decisions, technical assistance for fluvial conflict resolution, stream corridor protection and restoration, flood hazard mitigation and water quality protection. The assessment data is critical to prioritization of riparian and fluvial process-related water quality restoration and protection projects, project design alternatives analyses, and project design criteria. SGA provides insight into the social, economic and ecological interrelationships between people and fluvial systems and as such, it is also a valuable educational tool.

With this background, tremendous thanks to all the cooperators who have contributed to development of this assessment and River Corridor Plan, and hopes for a lasting contribution to harmonious interaction with the complex relationships involved, Redstart's work on this is humbly offered here.

3.0 BACKGROUND INFORMATION

3.1 GEOGRAPHIC SETTING

3.1.1 Watershed description

The First Branch basin lies within the larger White River watershed and comprises roughly 104 square miles in a relatively narrow drainage elongated along its north-south axis, draining from the highest elevations along the ridge of Washington Heights (~2100 ft above sea level) on the northern edge to the confluence of the First Branch with the White mainstem in South Royalton (elev. 459 ft.; Fig. 2).

The First Branch is one of four major tributaries of the White: the First, Second and Third Branches (as well as the Upper White mainstem, upstream of the confluence with the Tweed) that are roughly parallel and similarly elongated on the north-south axis; the Tweed flows into the mainstem from the southwest portion of the overall White basin (Fig. 2).

3.1.2 Political jurisdictions

The First Branch basin is split primarily between the towns of Chelsea (north) and Tunbridge (south), with smaller portions lying in Washington (north) and Royalton (south; Fig. 2). The First Branch basin also includes much smaller portions of the towns of Williamstown, Brookfield and Randolph along its western flank as well as Corinth, Vershire, and Strafford on the eastern side. All of these towns are within Orange County with the exception of Royalton, which is part of Windsor County. All are served by the Two Rivers-Ottauquechee Regional Commission with the exception of Washington and Williamstown, which are served by the Central Vermont Regional Planning Commission.

3.1.3 Land use history and current general characteristics

The First Branch basin is roughly equally divided over the Northern and Southern Vermont Piedmont biophysical regions (Thompson and Sorenson 2000). It is primarily dominated by calcium-rich bedrock and soils derived from that basis, leading to characteristic “sweet soils” that support rich forests and other natural communities that thrive on these soils. Native American use of the area has included a long history of primarily non-intensive land use and travel ways linking the Connecticut River valley with points north and west, with more concentrated use along larger floodplains and a few lakes and ponds in the region (Thompson and Sorenson 2000; USFS 2001; Mavor and Dix 1989; pers. comm., Donna Roberts and John Moody, Winter Center for Indigenous Traditions, 1998). Lakes and ponds in the basin are primarily small in size.

Extensive clearing and heavy agricultural use following European settlement led to a diffuse pattern of development that remains characteristic of the First Branch basin today. This area is one of the most heavily roaded areas in Vermont, “a region with numerous small farms, forestlands mostly managed for timber production, and a dense network of roads and settlements that leave few large areas of wild nature” (Thompson and Sorenson 2000). The villages of the basin peaked in population during the 1800s and included relatively dense settlements clustered in the narrow valleys along the First Branch and its tributaries.

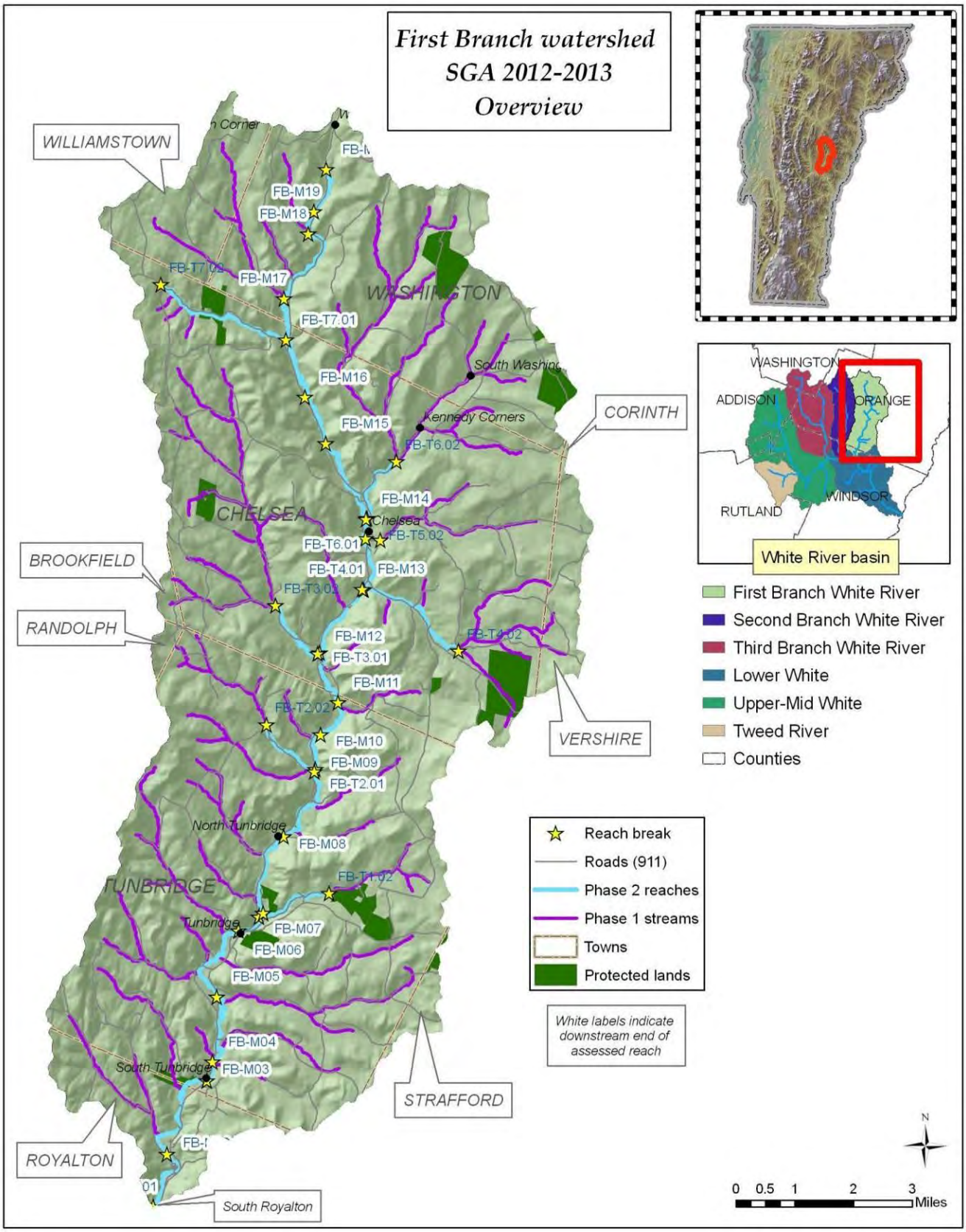


Figure 2. Overview map for First Branch 2012-13 stream geomorphic assessment and corridor planning.

Although the First Branch watershed has largely reverted to forest land (~82%) following extensive clearing for 19th century agricultural use, the aforementioned diffuse development remains (Fig. 3). The deeply dissected and hilly topography accommodates a smaller agricultural base than other portions of the state, with roughly 11% agricultural land in the watershed followed by ~5% "urban" land cover/ land use (Table 1; 1990s data). "Urban" in a four-class context (Fig 2) refers to not only densely developed areas, but roads, infrastructure, suburbs, and large-lot residential development as well; roads and infrastructure account for 4.7% of the 5.1% "urban" landuse in the First Branch basin (Table 1). Due to the increasingly diffuse settlement pattern of recent decades in combination with the extensive forest cover of the basin, it is likely that the Residential land use in the First Branch watershed is underestimated by the satellite imagery-derived basis of this data (though some of it is likely aggregated with the transportation corridors).

Protected lands comprise roughly 1953 acres (~3% of the land area) in the First Branch basin, with about half of this (997 ac., 51%) in private farm and forest lands (VCLD 2009). The other half (955 ac., 49%) is split between the Chelsea and Tunbridge municipal forests (682 ac) and a variety of state lands (forest, wildlife management and streambank access areas: 273 ac.). Protection mechanisms vary on these properties and not all are technically conserved (in terms of possibility for development).

Table 1. Land cover/land use data for the First Branch watershed derived from 1990s satellite imagery. Shading indicates groupings portrayed by four-class system (UVM-SAL 2002) in Fig. 3.

CONIFEROUS FOREST (generally evergreen)	17.79%	
MIXED CONIFEROUS-BROADLEAF FOREST	15.25%	
BROADLEAF FOREST (generally deciduous)	48.44%	
FORESTED WETLAND	0.41%	
BRUSH OR TRANSITIONAL BETWEEN OPEN AND FORESTED	0.16%	82.05%
Hay/rotation/permanent pasture	6.04%	
Row crops	4.68%	
OTHER AGRICULTURAL LAND	0.06%	10.78%
TRANSPORTATION, COMMUNICATION AND UTILITIES	4.67%	
RESIDENTIAL	0.31%	
INDUSTRIAL	0.01%	
COMMERCIAL, SERVICES AND INSTITUTIONAL	0.01%	
OUTDOOR AND OTHER URBAN AND BUILT-UP LAND	0.13%	5.13%
WATER	1.97%	
NON-FORESTED WETLAND*	0.08%	
	100.00%	

**non-forested wetland may be classed as urban, ag, or forest in the 4-class typing*

Hydric soils are displayed on the landuse/land cover map as a potential indicator of wetland conversion when these soils overlap with "urban" or agricultural land use. Such areas account for 4535 ac. in the basin, ~7% of the overall land area and ~43% of the "urban" and agricultural areas. This will be further discussed in Section 5.1.1, Hydrologic regime stressors.

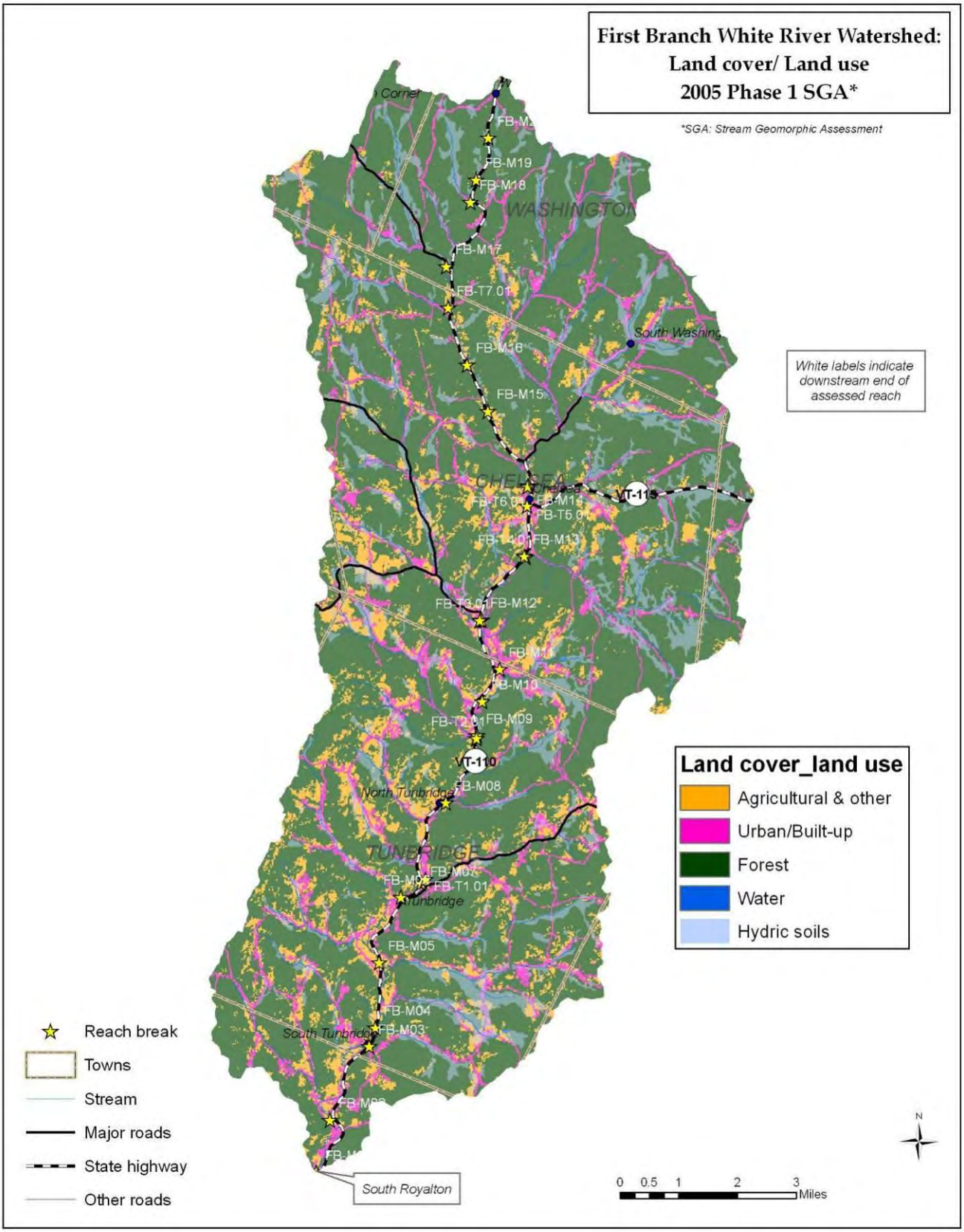


Figure 3. Four-class land cover/land use map (UVM-SAL 2002) for the First Branch watershed, with hydric soils (SSURGO 2005). Areas of "urban" and agricultural lands intersecting with hydric soils may indicate potential loss of historic wetlands.

Although the political boundaries include portions of neighboring towns, Chelsea, Tunbridge, and the villages of South Royalton and South Washington (within the larger towns of Royalton and Washington) comprise the large majority of land and activity in the watershed; the central towns and villages of each of the other surrounding towns lie well off into other watersheds.

The towns and villages in the First Branch basin are all relatively small in terms of population (2010 Census Bureau figures; Vermont Indicators Online):

Chelsea 1,298 Tunbridge 1,284 South Royalton 694 Washington 1,039*

* No separate figures available for the village of South Washington

There are eight villages dispersed within the First Branch watershed. With the exception of the tiny village of Washington Heights at the top (north end) of the watershed, these villages are all clustered along the streams of the basin. As in much of New England, stream power played a large role in the location and development of these villages, with the remains of at least fifteen different mill sites observed along the First Branch and its tributaries during the 2012-13 assessment work described in this report. Streams provided water power for sawmills, grist mills, manufacturing facilities and other uses (Walling 1858; Beers Atlas 1877; Farnham and McGuire 2011).

In the First Branch watershed today there are intact dams from the 'mill era' in South Royalton and Tunbridge (Fig. 4), as well as one small intact recreational dam and one small relatively intact mill dam/culvert in Chelsea (see Chapter 6.1 Reach Descriptions – Preliminary Project Identification, reaches M14 and T6.01). All of the other former dams have been breached or washed away, but many of the buildings associated with these sites have been converted to other uses in close proximity to streams and the periodic impacts of their floodwaters. These dams and mills have played a profound role in the history of the watershed, and their legacy is evident in geomorphic adjustment processes observed on the streams of the watershed today.

Figure 4. Intact dams in South Royalton (left) and Tunbridge (right) are representative of a First Branch legacy that includes at least fifteen old mill sites located on streams assessed in 2012-13 for this report.

The Hayward & Noble dam in Tunbridge is located just upstream of the Mill Bridge (Fig. 4), one of six covered bridges on the First Branch that are also part of its land use/historical legacy. The Mill Bridge was replaced in 2000 after being dislodged by an

ice jam, but the other covered bridges were all built in the 19th (or right at the beginning of the 20th) century.

Chelsea and South Royalton are the largest commercial districts in the First Branch basin but are limited in scope; Chelsea houses the Orange County Sherriff's Office and Courthouse, and South Royalton hosts the Vermont Law School. The primary economic centers are in the Barre/Montpelier area to the northwest and the Upper Valley (Connecticut River, VT/NH) to the southwest.

Residents living in the four major towns in the watershed report traveling an average of nearly half an hour for employment:

Town	Pct reporting work out of town	Avg commute (min)
Chelsea	62	26
Tunbridge	78	27
Royalton	68	26
Washington	86	30

(U.S. Census Bureau 2000; Vermont Indicators Online)

Agricultural enterprises in the First Branch basin have also incurred more travel in efforts to remain viable. Dairy farms comprise the predominant land-intensive agricultural use in the First Branch basin but horse, beef and sheep operations are similarly dependent on grass farming that has become more mechanized over time, leading to a smaller number of farmers utilizing the limited amount of prime farmland and 'soils of agricultural importance' available in the basin. Local farmers are frequently faced with having to spend significant amounts of time and energy hauling hay, silage, fertilizer and equipment over increasing distances (Fig. 5).

Figure 5. Stream ford at the Moxley Covered Bridge on the First Branch in Chelsea is utilized by farm equipment accessing an upstream hayfield as well as loaded town trucks, both of which face clearance issues and would likely place unsustainable strain on the historic bridge.

With this degree of mobility in the current economy of the watershed, roads are a focal point for residential concerns and municipal and state budgets. The deeply dissected

landscape of the First Branch basin leaves many roads and streams sharing narrow valleys that are hard pressed to accommodate both, leading to recurrent conflicts between infrastructure location and inevitable stream processes. Vermont Route 110 runs directly beside the First Branch mainstem for much of its length, and all of the tributaries assessed in 2012-13 are similarly located directly adjacent to roads for at least some significant proportion of their length.

3.2 GEOLOGIC SETTING

Although the overall basin is heavily dominated by glacial till, the geology of the mainstem of the First Branch roughly divides the watershed into "northern" and "southern" halves heavily influenced by the glacial history and surficial geology of the watershed, particularly the presence of glacial Lake Hitchcock. Southern portions of the First Branch mainstem are dominated by highly erodible sandy loams and gravels, with greater incision (downcutting) and more rapid channel evolution in response to changes over time; northern portions are dominated by coarser substrates and are less incised (Fig. 6). Tributaries are predominantly lined by glacial till with limited alluvium present in the valleys.

Figure 6. Glacial Lake Hitchcock influences on geology of the First Branch basin: finer loamy sands and pebbly gravels in the southern portions of the watershed (left), with coarser substrates in the northern portion (right).

Lake Hitchcock formed as an impoundment behind large volumes of glacial deposits in central Connecticut that dammed the Connecticut River valley. At its maximum extent, the lake body stretched from Rocky Hill, CT for 200 miles northward to the mouth of the Nulhegan River in Bloomfield, VT, and as far west as the Upper White mainstem in Pittsfield/Rochester and the Third Branch in Braintree. One of the "arms" of Lake Hitchcock extended up about half of the First Branch mainstem, into the southern part of Chelsea (Fig. 7 inset). The legacy of this presence is most visible in numerous pits (primarily loamy sands, with limited gravel deposits) visible along the margins of the valley in South Royalton and Tunbridge.

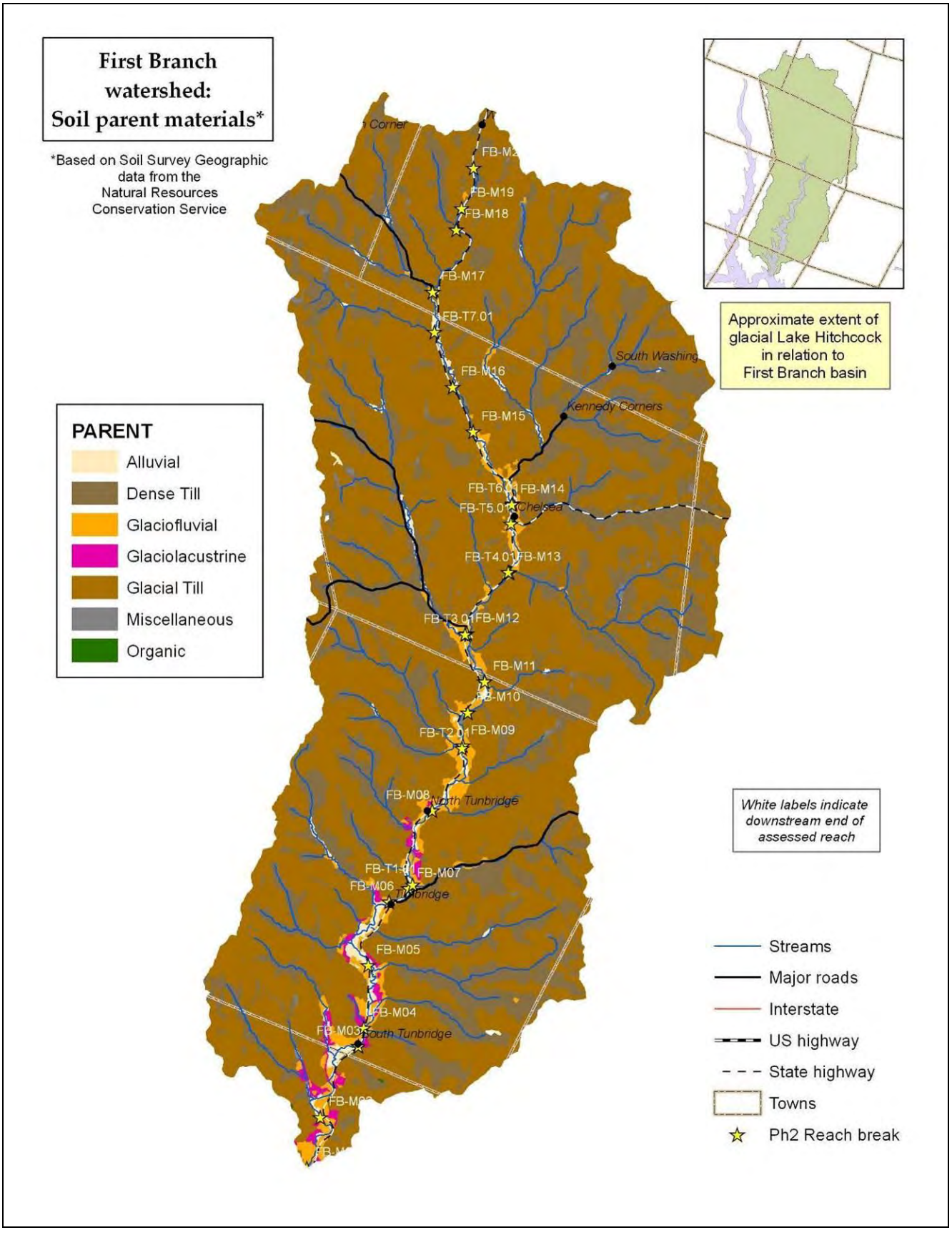


Figure 7. Soil parent materials in the First Branch watershed.

Glaciofluvial deposits at the edges of this glacial lake, along with alluvial soils that have deposited within the mainstem valley and just upstream of the lake edges over time, have left some of the more highly erodible sediments in the First Branch basin. Finer silts and clays settled in deeper waters of Lake Hitchcock to form the glaciolacustrine deposits concentrated in the lower (southern, downstream) reaches of the watershed (Fig. 8). Pebbly sand and gravel particles carried by meltwater streams (and their descendants, the numerous tributaries of today) were and are often deposited in small, localized deltaic or alluvial fan formations at the mouths of steep tributaries lining the valley walls.

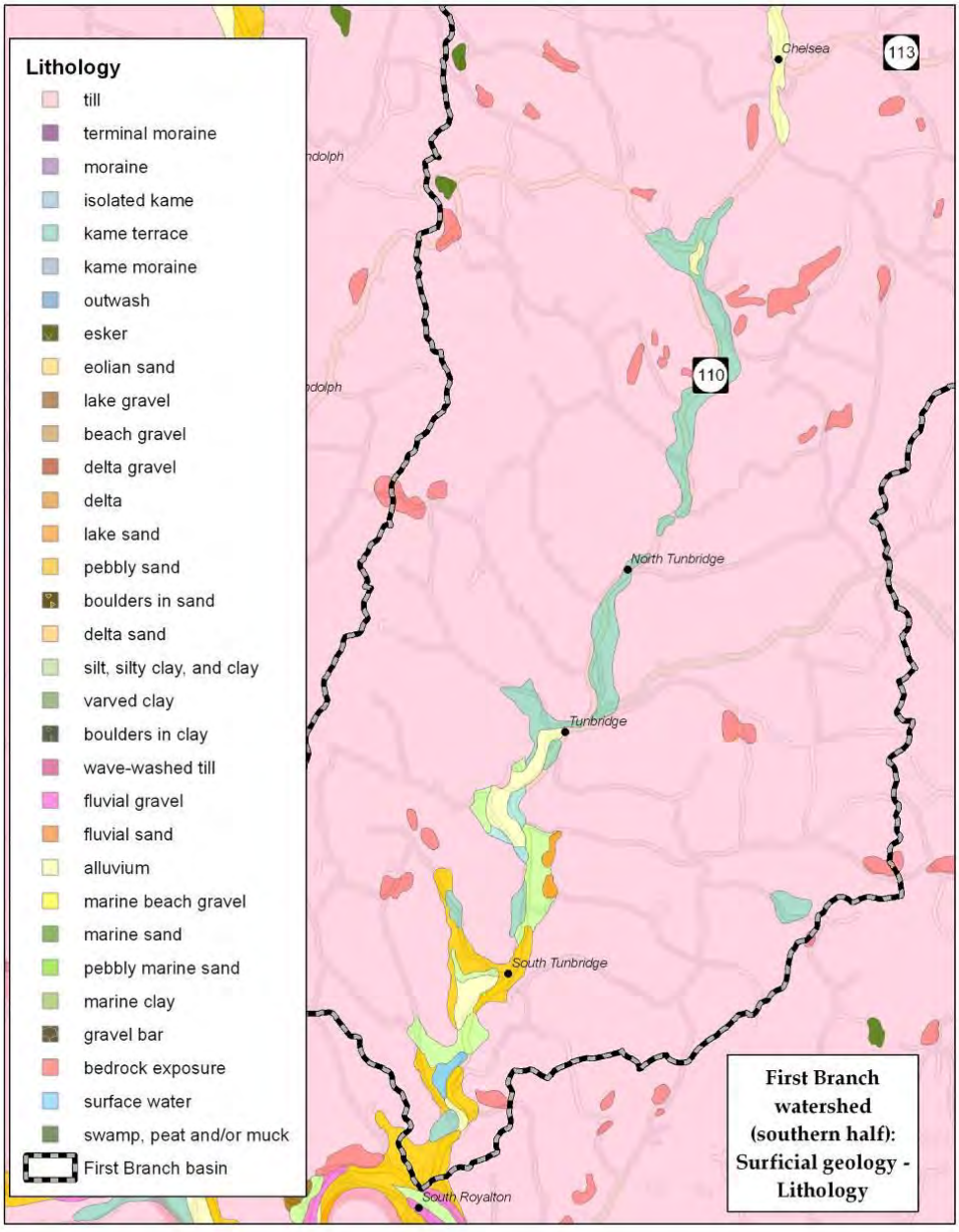


Figure 8. Surficial geology (lithology) in the southern half of the First Branch basin. Map courtesy ANR Natural Resource Atlas (VT-ANR 2013).

Loose glacial till composed of a mixture of larger cobbles and boulders along with the finer particles settled at lake margins as the glacial ice melted and receded. These "ice-contact" formations have given the upstream portions of the First Branch basin in particular a distinctive character frequently visible in the hilly hayfields lining the mainstem along Route 110 through Chelsea. Localized glacial deposits, small moraines and bedrock exposures along the stream channels (Fig. 9; Fig. 10) frequently form locally confining features that do not form continuous valley walls, but do constrain and amplify flows at lower-level flood stages. High-level flood flows appear to be able to access the floodplains surrounding these undulating post-glacial features.

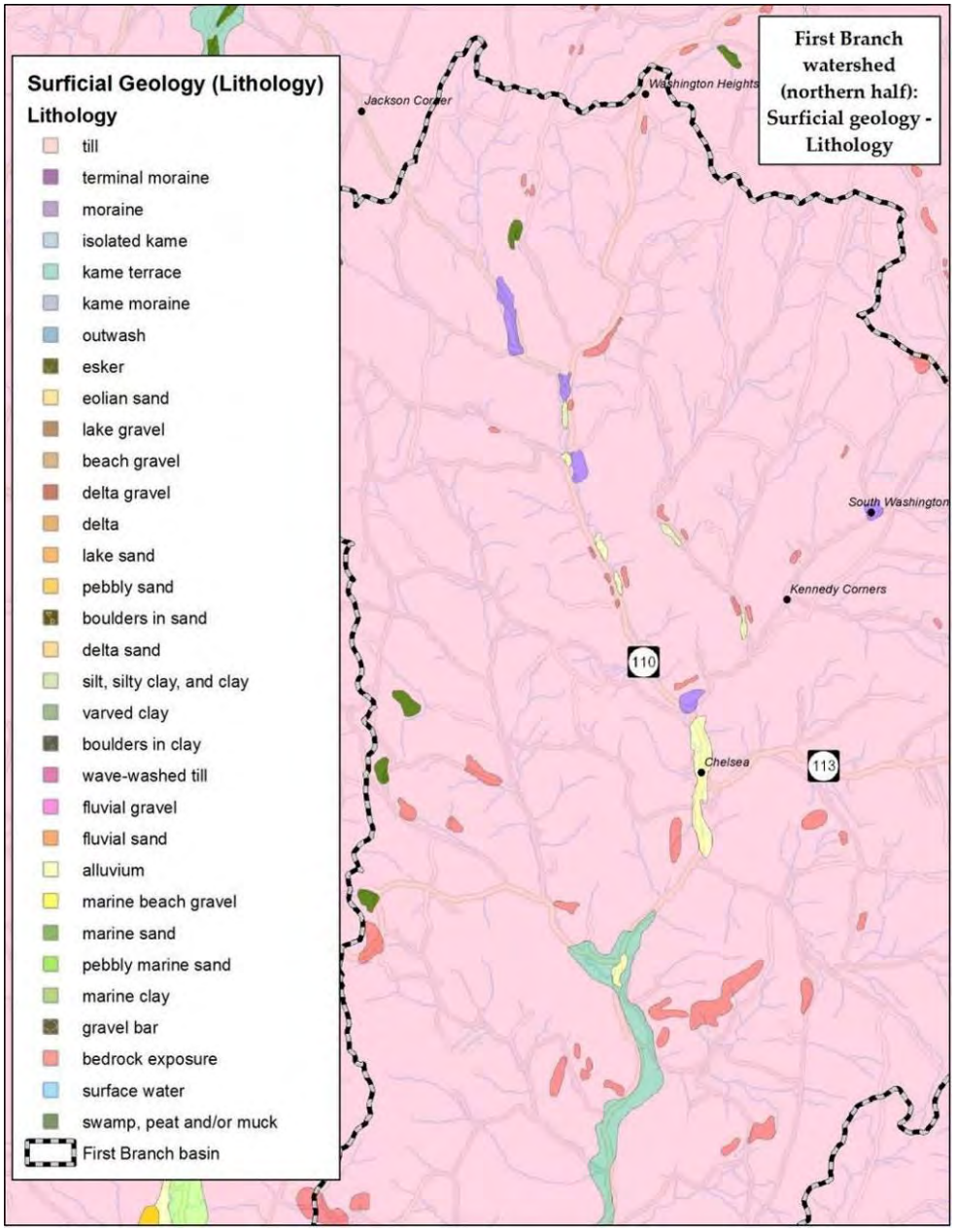


Figure 9. Surficial geology (lithology) in the northern half of the First Branch basin note glacial deposits and bedrock outcrops lining the First Branch along Rte. 110.

Figure 10. Small moraines, other localized glacial deposits and bedrock outcrops underlie the hilly terrain in the northern portion of the First Branch basin. These often can be confining in moderate floods (amplifying flows) but don't form a continuous valley wall, permitting some floodplain access in higher level floods.

Glacial till and ice-contact features also left the boulders and cobbles that were frequently used in the First Branch basin to construct the foundations of mills and other buildings and line the banks of the streams in numerous areas (Fig. 11). Where these large stones are present in the channel they do much to diffuse stream power and help provide some of the high-quality habitat noted in upstream portions of the mainstem and on some of the tributary streams in particular. In many areas they have been systematically removed from the channel, however, and it was noticeable in upstream portions of the watershed that much historic rip-rap and bank-toe stabilization is toppling back into the stream at this point in time. The extensive road encroachments of the basin still tend to use and re-use this material to armor banks in areas of frequent conflict between infrastructure and stream processes.

Figure 11. Much of the large stone in the northern portions of the watershed has been removed from the channel for use and reuse (after being toppled in by erosion) in building mill foundations and dams (left, in reach M16 south of the Chelsea-Williamstown Rd. bridge) or armoring banks (right).

The bedrock underlying the First Branch watershed is almost exclusively in the Waits River formation (Doll et al 1961), which is generally calcareous, carbonate-rich and relatively easily weathered to fertile soils (Thompson and Sorenson 2000). When the Vermont Legislature chose in 1985 to designate the Tunbridge Soil Series as the official State Soil it was noted that,

> ....It was selected from among more than 160 different soil series in the state. As it is a typical "hill farm" and "sugarbush" soil.... formed in loamy glacial till, it has good potential for agriculture and forestry.

.... "It's the soil that makes Vermont hills greener than those either in New Hampshire or New York."

(Office of the Secretary of State,Vermont Legislative Directory and State Manual 1993-1994, p. 16)

The strong predominance of this bedrock has much to do with the intensive agricultural and forestry history and “few large areas of wild nature” (Thompson and Sorenson 2000) in the First Branch basin.

3.3 GEOMORPHIC SETTING

3.3.1 Location of assessed reaches

For the purposes of geomorphic assessment and corridor planning, streams in the study area were divided into “reaches”. Reaches selected for Phase 2 assessment in 2012-13 (a prioritized subset of reaches included from Phase 1 assessment in 2005) included the entire First Branch mainstem and the first reach each of: tributaries T1 and T2 in Tunbridge (Unnamed trib along Strafford Rd. and Dickerman Brook, respectively) and tributaries T3-T7 in Chelsea (Cram Brook along the East Randolph Rd., Jenkins Brook, Jail Brook along Rte. 113 in Chelsea village, Hart Hollow Brook along Upper Village Rd., and Jones Pond Brook along Edwards Rd., in order). The overview map at the beginning of Section 3 of this report (Fig. 2) shows the location of the Phase 2 reaches in bright blue, while Phase 1 reaches are indicated in purple.

3.3.2 Longitudinal profile, alluvial fans, and natural grade controls

A longitudinal profile of the First Branch mainstem indicates lower gradients in the downstream reaches, roughly corresponding to the extent of glacial Lake Hitchcock in the basin (see Fig. x inset map in section 3.2, Geologic Setting, above), with the gradient increasing steadily and then rapidly in the upstream reaches (Fig. 12).

Tributaries included in the Phase 2 assessment in 2012-2013 tend toward the opposite of the mainstem profile: steepest portions are often located toward the downstream end of the stream as it approaches the confluence with the First Branch mainstem – essentially the locations of the reaches selected for inclusion in the Phase 2 study (Figs. 13-19). Overall gradients for the tributaries tend to be steeper than the mainstem, increasing the importance of even small pockets of floodplain for mitigating the impacts of high flows and retaining nutrients that are otherwise lost due to erosion and mass failures, with exported sediments often becoming a hazard or nuisance in downstream reaches.

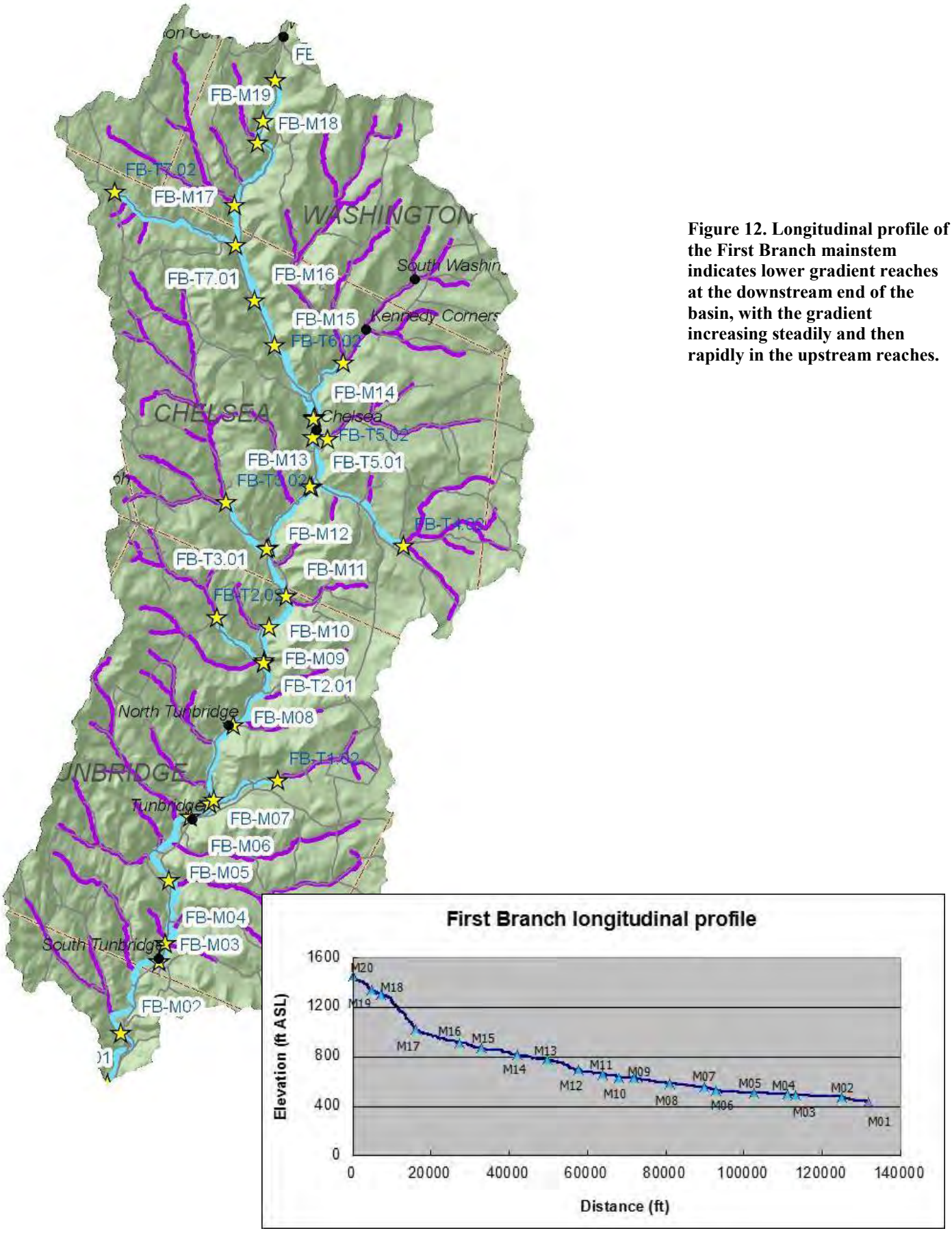


Figure 12. Longitudinal profile of the First Branch mainstem indicates lower gradient reaches at the downstream end of the basin, with the gradient increasing steadily and then rapidly in the upstream reaches.

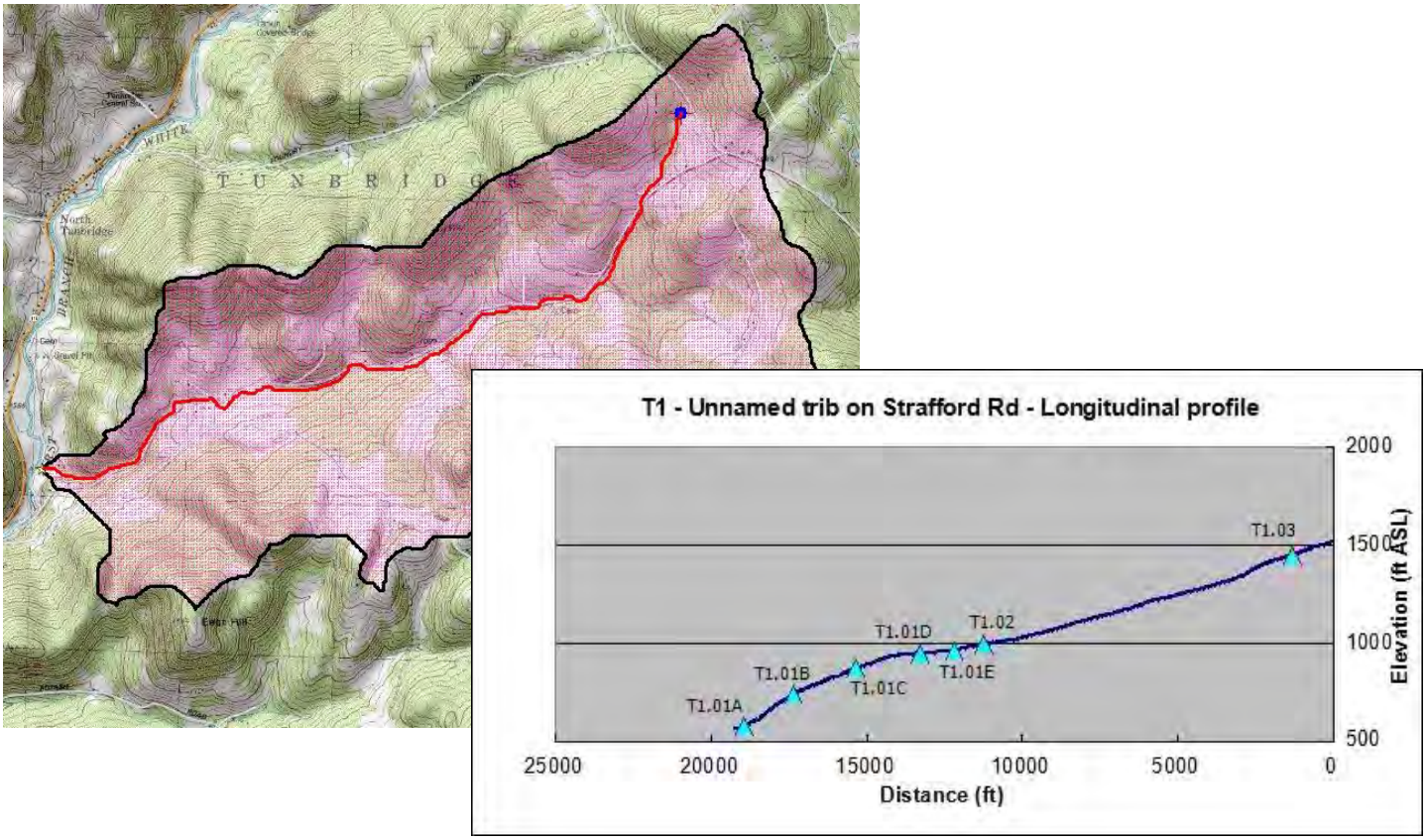


Figure 13. Longitudinal profile for tributary T1 (unnamed tributary on Strafford Rd.). Only the first reach of each tributary was included in Phase 2 assessments (i.e., T1.01, T2.01, etc.). The stream profiles show Phase 2 segment breaks for the first reach.

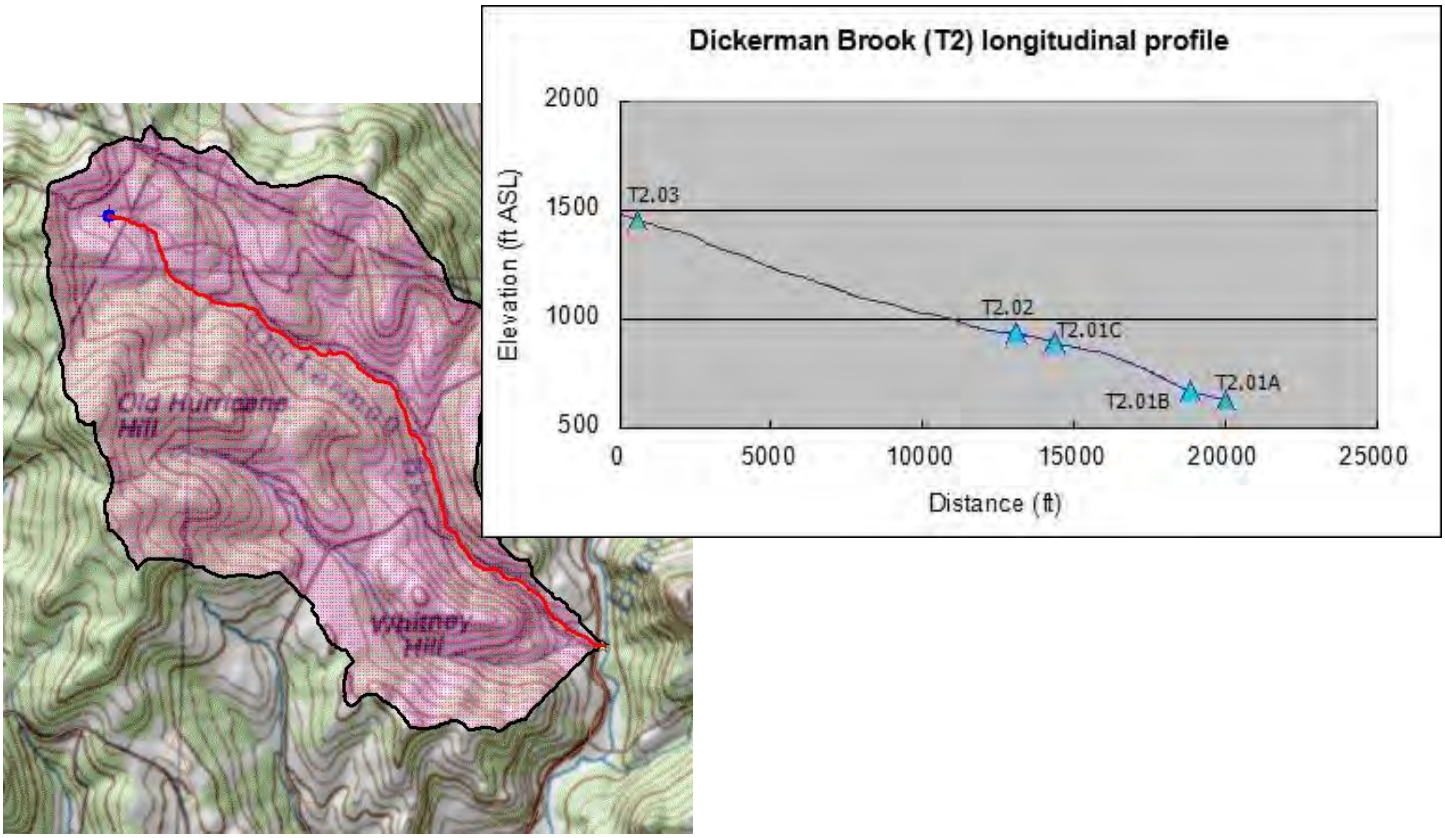


Figure 14. Longitudinal profile for tributary T2 (Dickerman Brook; graphics courtesy USGS StreamStats website).

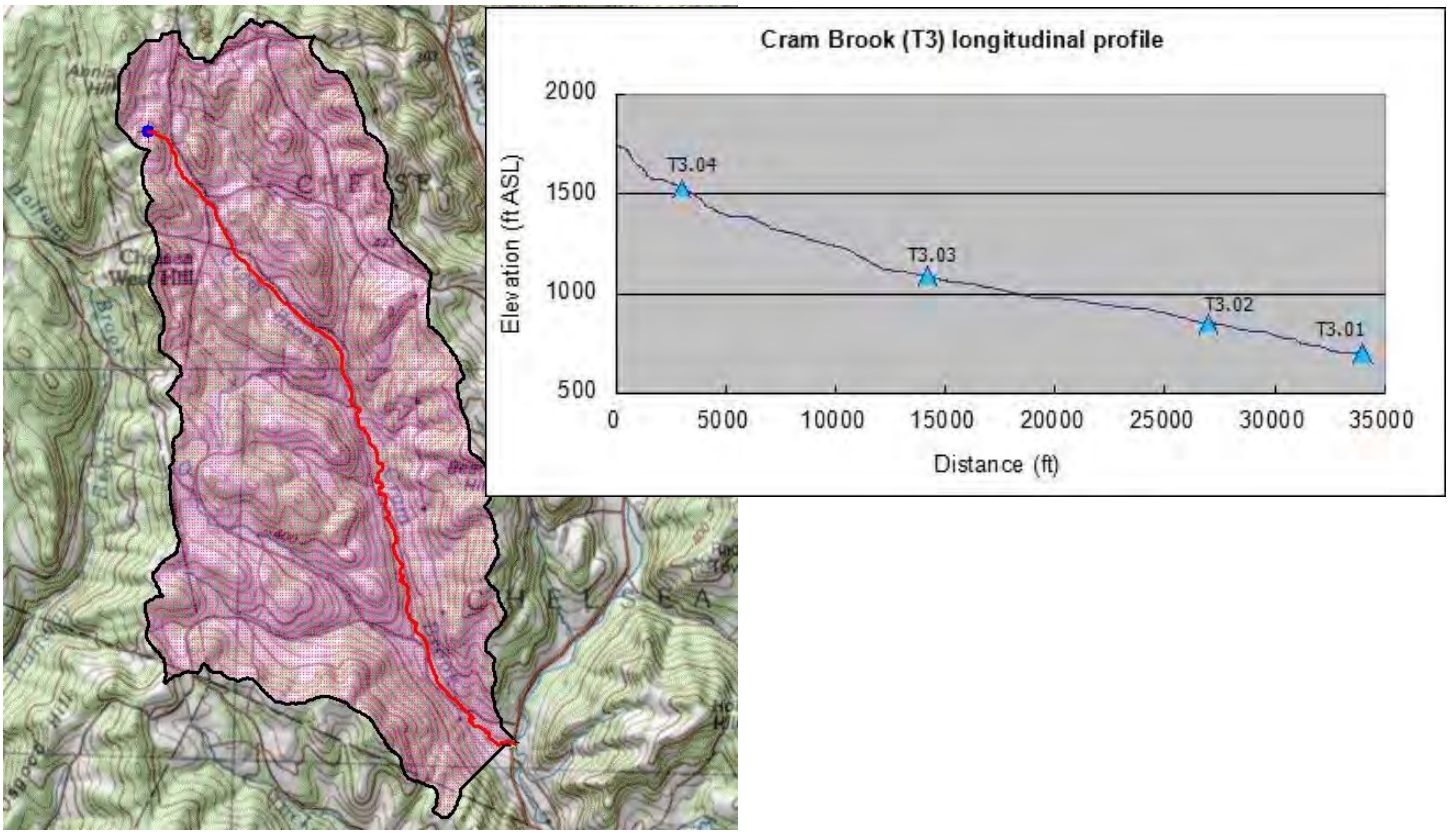


Figure 15. Longitudinal profile for tributary T3 (Cram Brook). Unlike the first reach of each of the other tributaries assessed in Phase 2, reach T3.01 was not segmented so no segment breaks are indicated. Note that distance (x-axis) is longer for this tributary.

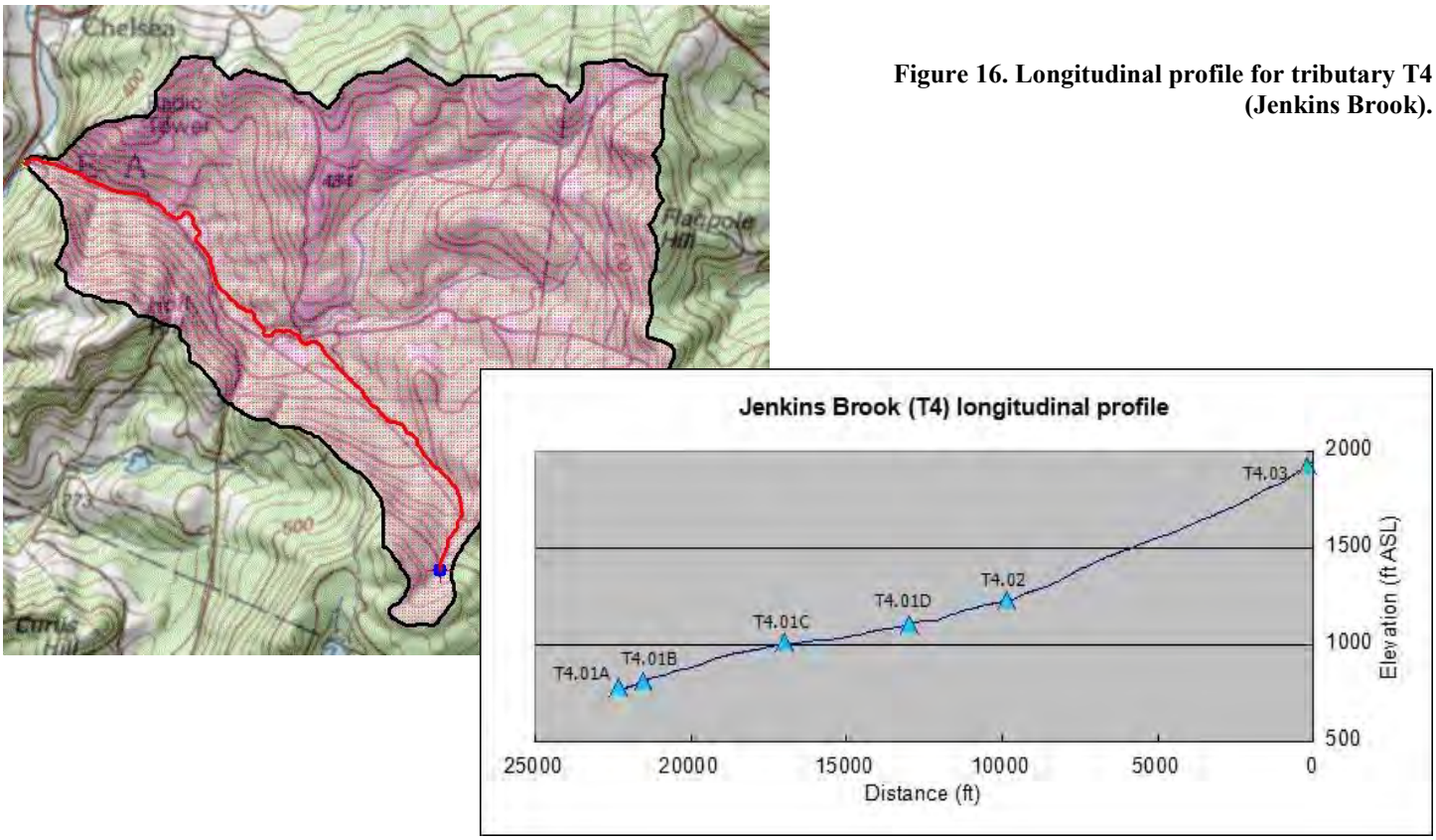
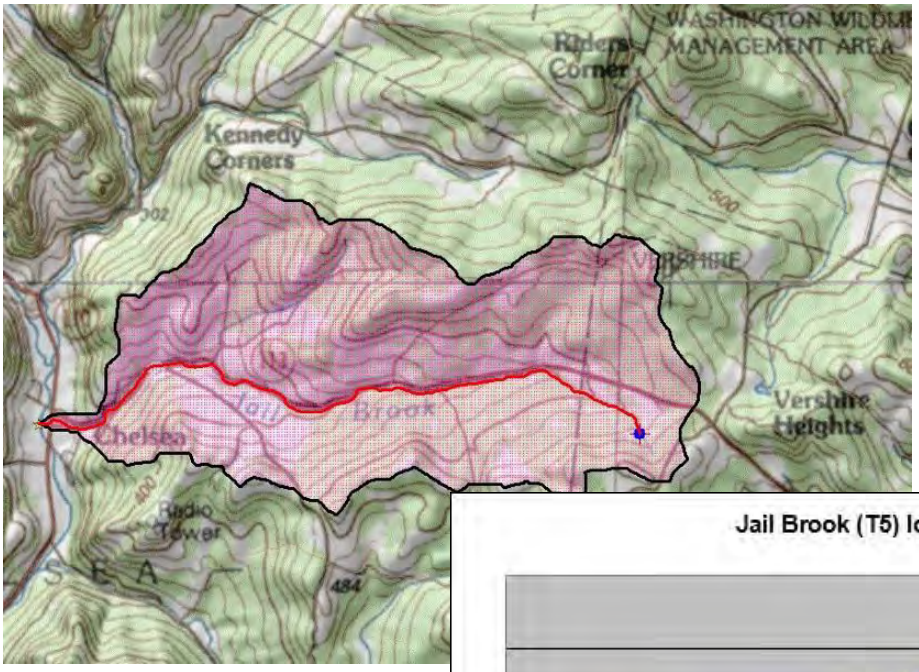


Figure 16. Longitudinal profile for tributary T4 (Jenkins Brook).



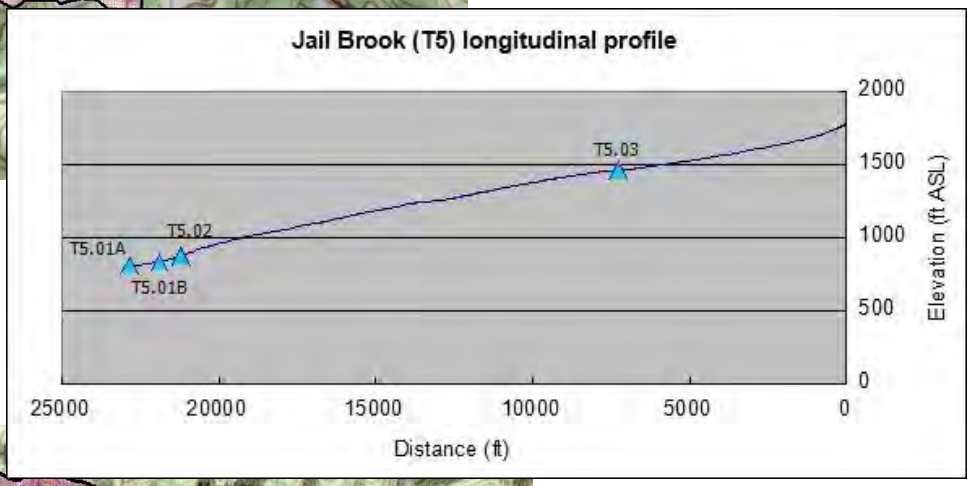
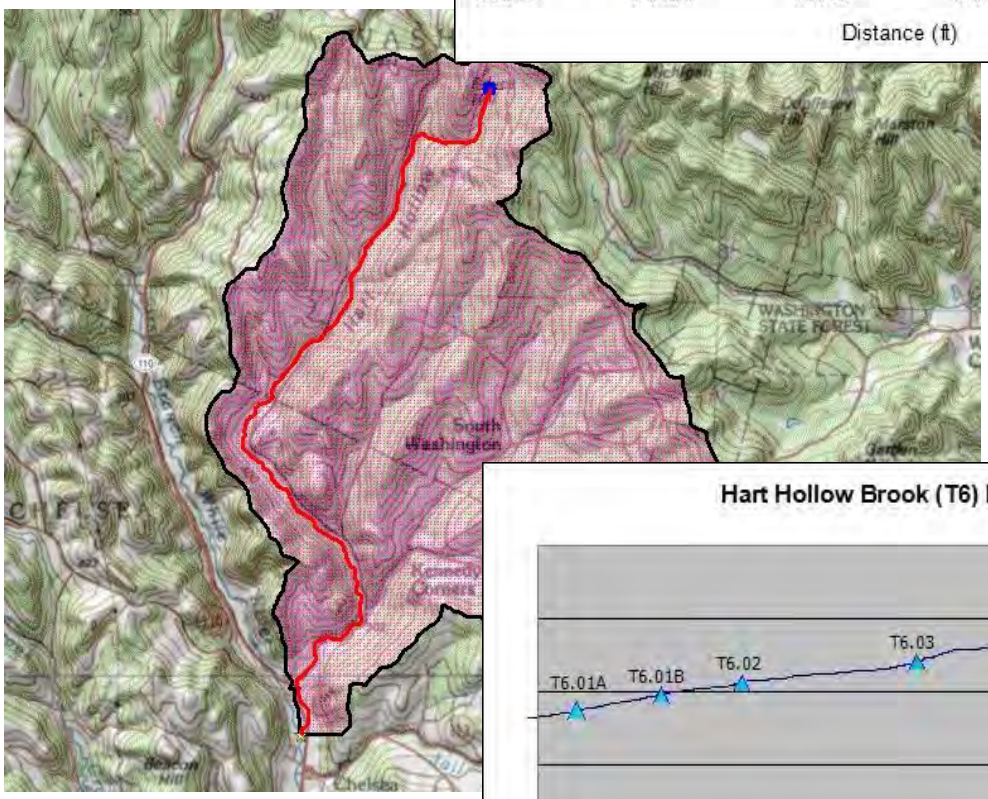


Figure 17. Longitudinal profile for tributary T5 (Jail Brook).



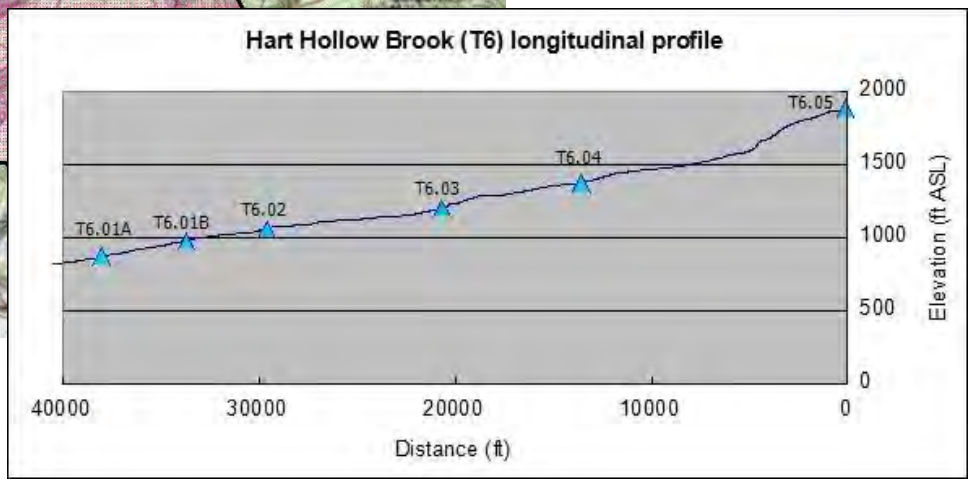


Figure 18. Longitudinal profile for tributary T6 (Hart Hollow Brook). Note that distance (x-axis) is longer for this tributary.

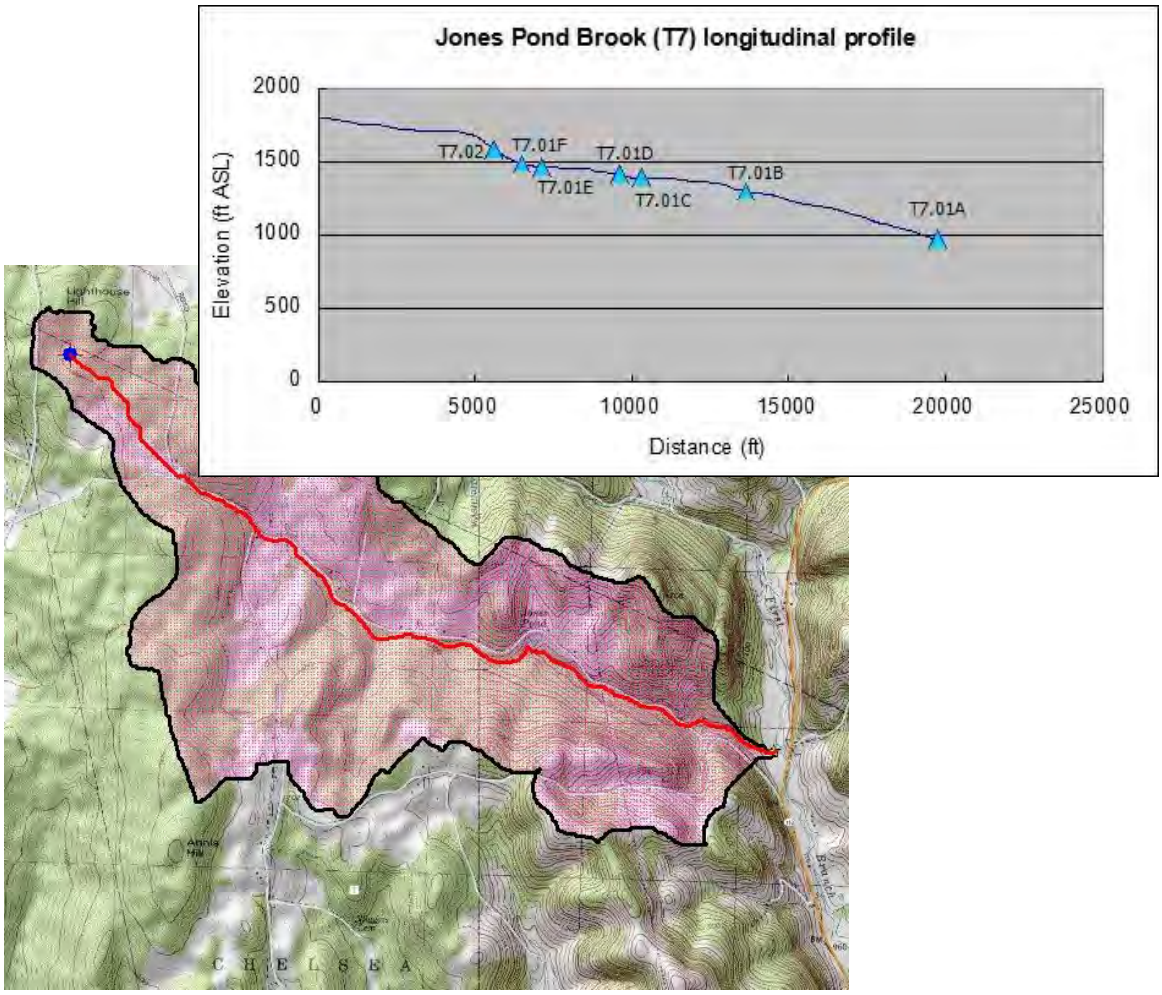


Figure 19. Longitudinal profile for tributary T7 (Jones Pond Brook, along Edwards Rd.).

Natural grade controls are channel-spanning features that can be present in the form of bedrock or ledge exposures, or as steeper cascades or waterfalls. Grade controls are important in providing vertical stability for a stream, ensuring that streams do not lose access to floodplains due to incision (downcutting) - frequently one of the effects of straightening and artificial confinement. If major floods or straightening and encroachment amplify the effects of erosion in upstream portions of the watershed, grade controls may mean that streams will aggrade (build up their beds) due to sediment inputs.

Grade controls are extensive in the First Branch watershed and helped ensure that floodplains were accessed during Tropical Storm Irene and other recent flash floods, lessening the impacts of flood flows further downstream. The tributary reaches included in Phase 2 assessment feature waterfalls on tributaries T1 and T2 in Tunbridge, and long sections of ledge grade controls (less steep than the waterfalls) on all other included tributaries (Fig. 20). The intact Eaton dam in reach M01 sits on top of a waterfall, and the mainstem includes ample lengths of ledge as well; reaches M04, M05 and M18 are the only reaches lacking such grade controls (though reach M02 has only one grade control in 11,000 ft. of stream; Fig. 20; Table 2).

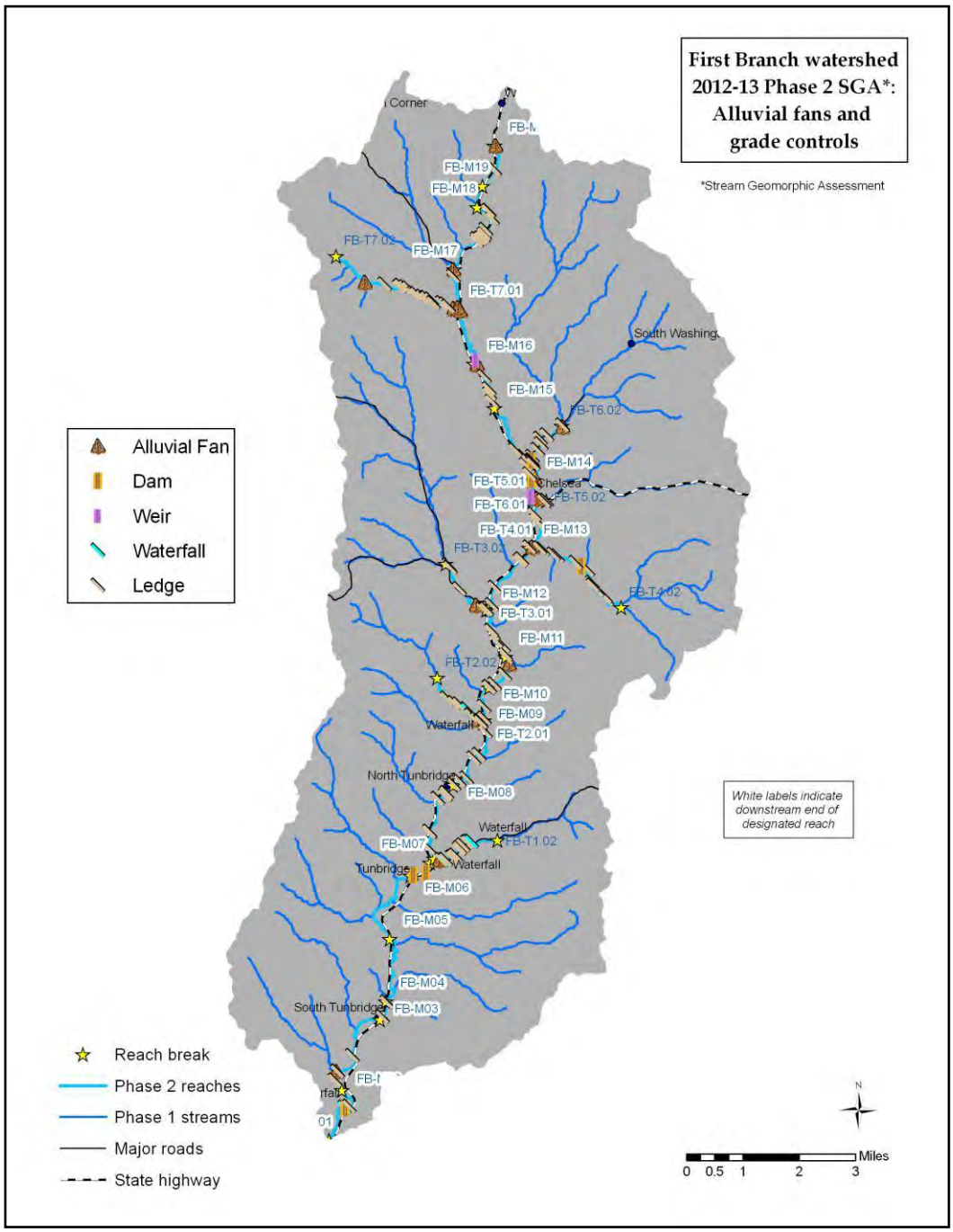


Figure 20. Grade controls and alluvial fans in the First Branch basin.

Alluvial fans, located at the base of a steep slope when the gradient suddenly flattens, are naturally high deposition zones and tend to be areas where streams move frequently across the horizontal plane, sometimes suddenly shifting channel locations or becoming braided before re-establishing a new channel location and planform. Alluvial fans in the First Branch basin appear to be present where glacial streams fed into the edges of glacial Lake Hitchcock in addition to areas at the base of modern-day streams, with the former sometimes forming "kame deltas" that comprise one type of highly erodible "ice-contact" feature.

Table 2. First Branch basin geology and soil parent materials from 2005 Phase 1 assessments) for reaches assessed in 2013 Phase 2 assessments, including alluvial fans and grade controls. Mainstem first page, tributaries second page.

RCHPTID	ALLUVIAL FAN	GRADE CONTROL	DOMINANT GEOLOGIC MATERIAL	PCT DOMINANT MATERIAL	SUBDOMINANT GEOLOGIC MATERIAL	PCT SUBDOMINANT MATERIAL
M01		Multiple	Ice-Contact	66	Glacial Lake	14
M02	Yes	Ledge	Alluvial	45	Ice-Contact	32
M03		Ledge	Ice-Contact	44	Glacial Lake	29
M04		None	Alluvial	51	Ice-Contact	36
M05		None	Alluvial	72	Ice-Contact	20
M06		Multiple	Ice-Contact	38	Till	37
M07		Ledge	Ice-Contact	47	Alluvial	30
M08		Ledge	Ice-Contact	67	Alluvial	32
M09		Ledge	Ice-Contact	64	Other	13
M10	Yes	Ledge	Ice-Contact	52	Alluvial	24
M11		Ledge	Ice-Contact	43	Till	23
M12		Ledge	Till	46	Ice-Contact	42
M13		Multiple	Alluvial	47	Ice-Contact	42
M14		Multiple	Alluvial	60	Ice-Contact	29
M15	Yes	Ledge	Till	81	Alluvial	14
M16	Yes	Multiple	Alluvial	67	Till	26
M17		Ledge	Till	97	Alluvial	3
M18		None	Till	100	-	-
M19	Yes	Ledge	Till	100	-	-

RCHPTID	ALLUVIAL FAN	GRADE CONTROL	DOMINANT GEOLOGIC MATERIAL	PCT DOMINANT MATERIAL	SUBDOMINANT GEOLOGIC MATERIAL	PCT SUBDOMINANT MATERIAL
T1.01	Yes	Multiple	Till	63	Ice-Contact	37
T2.01	Yes	Multiple	Till	74	Ice-Contact	23
T3.01	Yes	Ledge	Ice-Contact	42	Till	39
T4.01	Yes	Ledge	Till	88	Ice-Contact	11
T5.01	Yes	Ledge	Ice-Contact	93	Till	7
T6.01	Yes	Multiple	Ice-Contact	44	Till	43
T7.01	Yes	Multiple	Till	90	Alluvial	6

Segment T1.01A, the base of the unnamed tributary along Strafford Rd. that joins the First Branch by the Tunbridge Recreation field, has an 11-ft. waterfall (grade control) a short distance upstream of the rec field, with alluvial fans above and below the waterfall. At least 7 different major flood chutes are located on these alluvial fans, several of which were likely the active channel at different periods over time (Fig. 21).

Figure 21. Multiple channels in the alluvial fan at the base of reach T1.01 (unnamed tributary along Strafford Rd.). Active channel at left, old channel (now a flood chute) at right behind Althea; third channel is beyond hummock at right in photo (but inside house in background), and fourth channel is out of photo on left side.

With numerous mass failures upstream along the Strafford Rd., in conjunction with steep gradients and long runs of ledge grade controls, large volumes of sediment were transported and deposited at the base of the reach during Tropical Storm Irene in 2011. While these sediments quickly rebuilt access to the floodplain at the base of the reach and dissipated flows across the flatter slope, these sediments were dug out and channelized post-Irene to direct flows through the undersized culvert at the

base of the reach as well as to allow regrading of the access road at the rec field (Fig. 22).

Figure 22. Another floodchute and/or old channel in the alluvial fan at the base of reach T1.01, adjacent to the Tunbridge recreation field (active channel at left, floodchute at right). The floodchute was plugged with windrowed sediments on the upstream end post-Irene.

This berming and straightening, and the increased force of water as it is pushed through the culvert, appears to be amplifying erosive power on the opposite bank of the First Branch mainstem across from the culvert at the base of reach T1.01, with potential to eventually trigger a mass failure under Rte. 110. The berming and straightening may actually increase the chance of the culvert plugging with debris in the future if wood and sediment is not able to access the broader floodplain.

The combination of long runs of grade controls upstream and an alluvial fan below essentially ensure that there will be similar sediment dump-outs in future flood events and highlight the cost-effectiveness of adequately sized structures to permit both flows and sediment to pass, as well as indicating that a choice to channelize such areas (rather than preventing or removing encroachments in the floodplain) will require significant ongoing investments in maintenance and clean-up. Similar situations are particularly evident at the bases of Jail Brook (T5.01) and Hart Hollow Brook (T6.01) in Chelsea village, both repeat flooding/jam spots with numerous encroachments and development in close proximity to undersized stream crossing structures or dams.

3.3.3 Valley and reference stream types

A reach is a relatively homogenous section of stream, based primarily on physical attributes such as valley confinement, slope, sinuosity, dominant bed material, and bed form, as well as predicted morphology based on hydrologic characteristics and drainage basin size (methods are further discussed in Section 4.0 of this report). Primary classification parameters pertinent to establishing these reference stream types are listed in Table 3.

Table 3. Reference stream type summary indicating classification parameters pertinent to First Branch watershed reaches included for 2005-2013 fluvial geomorphic assessments (VT-RMP 2009, Phase 1 Protocols, p. 28).

Reference stream type	Confinement (Valley Type)	Slope
A	Confined (NC)	Very Steep: 4.0–6.5%
B	Confined or Semiconfined (NC, SC)	Steep: 3.0–4.0%
B	Confined, Semiconfined, or Narrow (NC, SC, NW)	Moderate–Steep: 2.0–3.0%
C or E	Unconfined (NW, BD, VB)	Moderate–Gentle: <2.0%

NC: Narrowly Confined; SC: Semi-Confined; NW: Narrow; BD: Broad; VB: Very Broad

Streams may diverge somewhat from these broad classifications, particularly in the area of slope. A reference "subslope class" is assigned to a reach that has a higher or lower slope than that typically associated with a reach of that type, and the class designation reflects the stream type normally associated with that slope (but in a lower case letter rather than upper case):

Subslope class	Slope
a	Very Steep: 4.0–6.5%
b	Moderate–Steep: 2.0–4.0%
c	Moderate–Gentle: <2.0%

A and B type streams (steeper slopes) are primarily expected to be sediment Transport reaches, as will be further discussed in Section 5.1.4 of this report.

- A and B type streams included 90 of 115 reaches accounting for 79% of total stream length included in Phase 1 assessment of the First Branch watershed (Table 4)

- B type streams included 6 of 26 reaches accounting for 25% of total stream length included in Phase 2 assessment; no A type streams were included.

Stream reaches with C and E reference types utilize their floodplains extensively in stream processes and would be expected to store sediment, high flows and nutrients within the watershed under reference conditions. "Stream Type Departures" identified in Phase 2 fieldwork frequently highlight loss of access to historic floodplains in these types of streams, increasing the impacts of flood flows in a more confined floodplain and/or converting them to "Transport" reaches.

- C and E type streams included 25 of 115 reaches accounting for 22% of total stream length included in Phase 1 assessment of the First Branch watershed (Table 4)

- C and E type streams included 20 of 26 reaches accounting for 75% of total stream length included in Phase 2 assessment of the First Branch watershed

Table 4. Reference Rosgen stream types included in Phase 1 and Phase 2 (a subset of Phase 1) geomorphic stream assessments in the First Branch basin

Phase 1 reaches

Stream Type	Reaches	Stream Length
A	58	45%
B	32	34%
C	19	17%
E	6	5%
Total	115	100%

Phase 2 reaches

Stream Type	Reaches	Stream Length
B	6	25%
C	17	66%
E	3	9%
Total	26	100%

Visual assessment of the distribution of these stream types in the watershed indicates a strong preponderance of the lower gradient stream types (C and E) along the First Branch mainstem, with much more limited opportunity for "attenuation" (storage of sediment, high flows and nutrients) on the tributary reaches of this watershed (Fig. 23). It should be noted that these are the "Reference" (i.e., Phase 1) conditions; Phase 2 assessments indicated that a number of these streams have departed from reference conditions and no longer fulfill the same functions in the landscape (discussed in detail in Section 5 "Results").

Reaches selected for Phase 2 assessment conducted in 2013-2013 (Table 4 above) included a clear preponderance of lower gradient C and E type streams, an efficient approach to gathering information for identifying key areas for protecting or restoring the critical functions of floodplains in the First Branch watershed. It is important to note, however, that tributary reaches T1.01 and T3.01 were reclassified for Reference stream type based on field assessment (each had originally been typed as a 'B' stream), and all of the tributaries assessed in Phase 2 were 'segmented' following field assessment - an indication that other stream types were present within what was originally aggregated as a single stream type. This is primarily a matter of scale, as the smaller streams have accordingly smaller lengths of lower gradient stream (and wider pockets of floodplain) interspersed over their length. While the Phase 2 work did much to identify the greatest opportunities for creating more stable conditions in the watershed (concentrated along the mainstem), it was limited in providing information for similar opportunities on steeper gradient streams that are prone to flash flooding and frequent, recurrent conflict between development, encroachment, and inevitable stream processes (particularly road damage) in this basin.

Further basic geomorphic information for the reaches that were included in the 2012-13 Phase 2 fieldwork is detailed in Table 5 after the map of reference stream types.

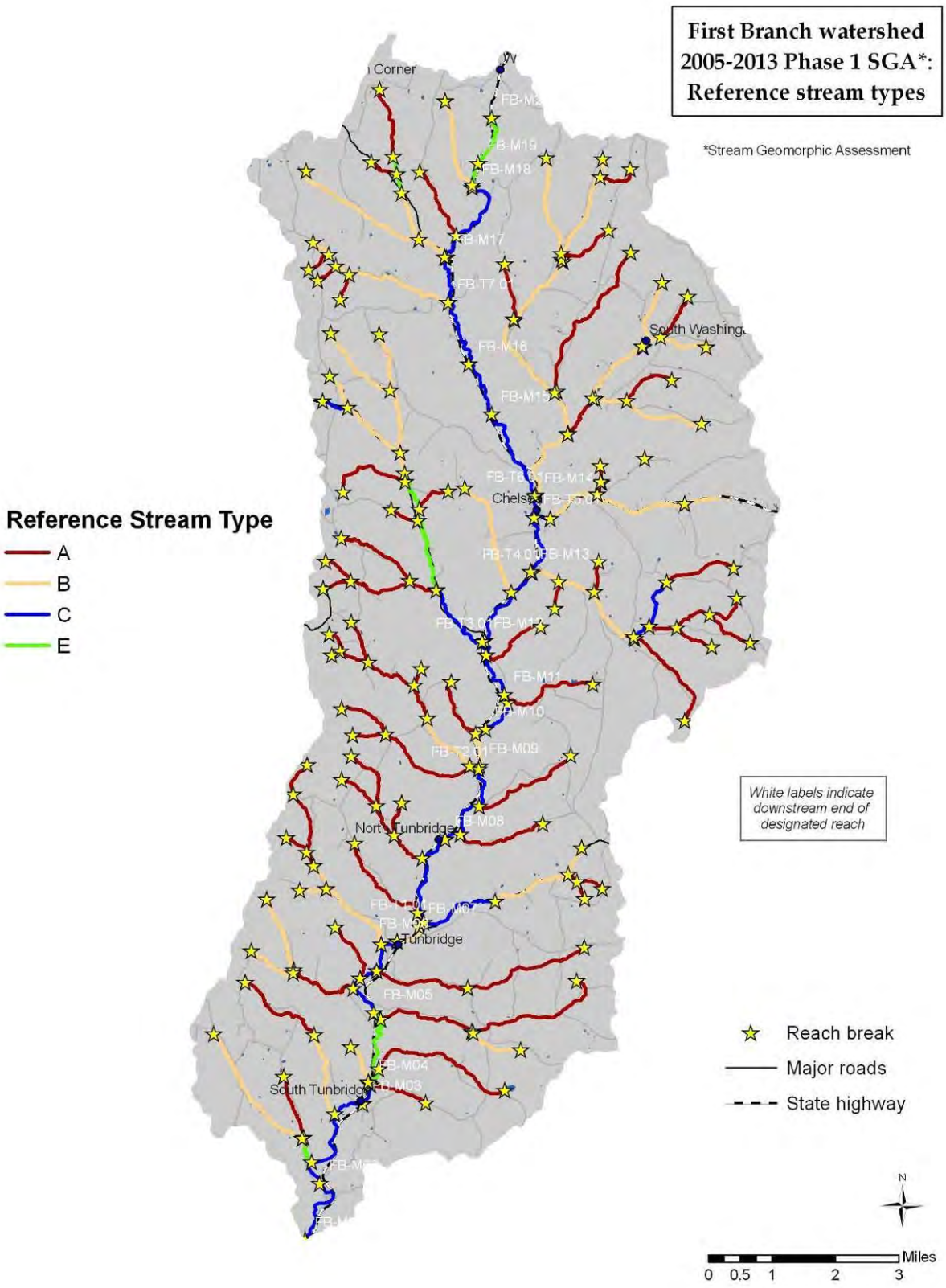


Figure 23. Spatial distribution of stream types in First Branch basin indicates primary opportunities for storage of sediment, high flows and nutrients are concentrated along the mainstem (blue and green reaches).

Table 5. Reference (i.e., Phase 1) geomorphic characteristics for reaches included in 2012-2013 Phase 2 assessments in the First Branch basin (First Branch mainstem reaches first page, tributaries second page).

Stream	ReachID	Drainage (sq mi)	Valley Type	Channel width (ft)	Channel length (mi)	Sinuosity ratio	Reference Stream Type	Channel SubSlope	Bedform	Bed Material
First Branch mainstem	M01	104.57	Semi-confined	101.3	1.30	1.08	C		Riffle-Pool	Gravel
	M02	103.78	Narrow	101.0	2.09	1.18	C		Riffle-Pool	Gravel
	M03	97.17	Semi-confined	98.1	0.36	1.00	C		Riffle-Pool	Gravel
	M04	95.03	Broad	97.2	1.64	1.50	E		Riffle-Pool	Sand
	M05	89.45	Broad	94.6	1.81	1.15	C		Riffle-Pool	Gravel
	M06	80.38	Semi-confined	90.3	0.52	1.06	B	c	Riffle-Pool	Cobble
	M07	80.05	Narrow	90.1	1.67	1.11	C		Riffle-Pool	Cobble
	M08	72.23	Narrow	86.1	1.64	1.16	C		Riffle-Pool	Cobble
	M09	63.84	Semi-confined	81.6	0.74	1.05	B	c	Plane Bed	Cobble
	M10	63.06	Broad	81.1	0.75	1.16	C		Riffle-Pool	Gravel
	M11	59.55	Narrow	79.1	1.16	1.18	C		Riffle-Pool	Gravel
	M12	47.57	Narrow	71.7	1.44	1.08	C		Plane Bed	Cobble
	M13	38.54	Broad	65.3	1.42	1.13	C		Riffle-Pool	Cobble
	M14	17.06	Broad	45.6	1.71	1.27	C		Riffle-Pool	Cobble
	M15	15.71	Narrow	44.0	1.01	1.15	C		Riffle-Pool	Cobble
	M16	14.62	Broad	42.6	2.11	1.16	C		Riffle-Pool	Cobble
	M17	4.77	Semi-confined	26.1	1.68	1.11	C	b	Step-Pool	Cobble
	M18	2.70	Very Broad	20.3	0.46	1.15	E		Dune-Ripple	Sand
	M19	1.50	Very Broad	15.7	0.93	1.14	E	b	Riffle-Pool	Sand

Stream	ReachID	Drainage (sq mi)	Valley Type	Channel width (ft)	Channel length (mi)	Sinuosity ratio	Reference Stream Type	Channel SubSlope	Bedform	Bed Material
Unnamed trib - Strafford Rd	T1.01	3.84	Semi-confined	23.7	1.38	1.01	C	b	Step-Pool	Cobble
Dickerman Brook	T2.01	4.72	Narrowly confined	25.9	1.26	1.01	B		Step-Pool	Cobble
Cram Brook	T3.01	10.92	Narrow	37.5	1.32	1.11	C	b	Step-Pool	Cobble
Jenkins Brook	T4.01	7.15	Semi-confined	31.1	2.27	1.09	B	a	Step-Pool	Cobble
Jail Brook	T5.01	4.80	Very Broad	26.1	0.27	1.33	C		Riffle-Pool	Gravel
Hart Hollow Brook	T6.01	15.49	Narrowly confined	43.7	1.40	1.05	B		Plane Bed	Cobble
Jones Pond Brook	T7.01	2.88	Semi-confined	20.9	2.64	1.05	B	a	Step-Pool	Cobble

Hydrology describes the movement and storage of water in and around the earth, which is subject to both natural fluctuations and human modification (Dunne and Leopold 1978). The information presented in this section deals briefly with the basis and interplay of natural fluctuations, while human modifications are discussed further in section 5.1.1, *Watershed-scale hydrologic regime stressors.*

There are no stream gages operated by the US Geological Survey in the First Branch drainage basin. The United States Geological Survey (USGS) administers a *StreamStats in Vermont* website, which is designed to help compute streamflow and drainage basin characteristics for ungaged sites (http://water.usgs.gov/osw/streamstats/Vermont.html). Drainage basin characteristics for the overall First Branch basin are indicated as follows:

Table 6. First Branch Basin Characteristics Report and estimated flows for different return frequencies(USGS Streamstats website).

Parameter	Value
Area in square miles	105
Mean annual precipitation, in inches	41.974
High Elevation Index - Percent of area with elevation > 1200 ft	68.4
Percent of area covered by lakes and ponds	0.0788

Statistic	Flow (ft^3/s)	90-Percent Prediction Interval	
		Minimum	Maximum
PK2	3060	1590	5880
PK5	4490	2370	8500
PK10	5540	2900	10600
PK25	7020	3650	13500
PK50	8200	4210	16000
PK100	9430	4730	18800
PK500	12600	5880	26800

"PKx" value (return period, or recurrence interval) of x years means magnitude is equaled or exceeded once, on average, every x years; reciprocal of the return period is the probability that the event is equaled or exceeded in any one year. For example, the 100-year flood has a probability of 0.01, or 1%, of being equaled or exceeded in any single year. Return period implies nothing about the actual timing of an event; the 100-year flood does not occur once every 100 years. On average, roughly ten 100-year floods can be expected in a 1,000 year period.

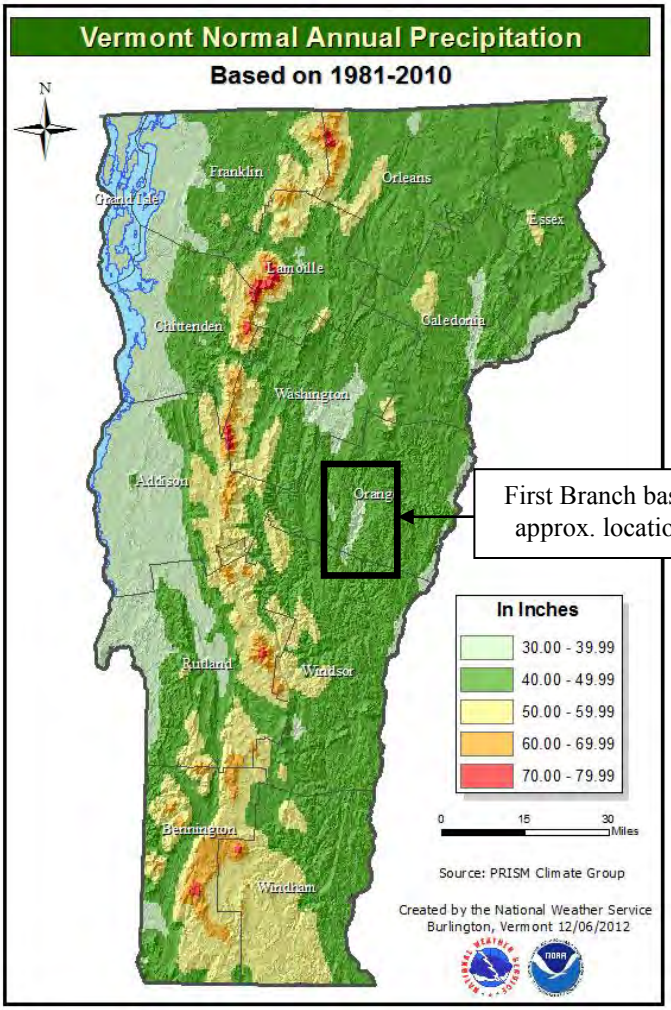


Figure 24. The First Branch basin is toward the low end of annual precipitation in Vermont.

While the mean precipitation indicated in Basin Characteristics on the StreamStats website is a bit over 40 inches, the downstream reaches of the First Branch basin are in a rain shadow in comparison with the hilltops ringing the basin, and overall the basin registers on the low end of annual precipitation levels in the state of Vermont (NWS-Burlington 2012; Fig. 24).

Lakes, ponds and wetlands can help store flow and sediment discharges in extreme weather events. With only ~0.7% of the watershed in lakes and ponds (Streamstats Basin Characteristics Table 6) and an additional 0.5% in wetlands (Table 1 in Sec. 3.1, Land Use), such buffering capacity within the First Branch basin is relatively minimal. Despite relatively low levels of annual precipitation this factor combines with the steep/dissected character of the topography, localized nature of intermittent storms, and cultural relationship to streams to predispose the First Branch basin to flash flooding. In fact, 34 years of flood data (1975-2009) in an area covering Vermont and portions of New Hampshire and upstate New York indicates that Orange and Essex County, VT (the First Branch basin is in Orange County) are toward the low end of total events but have the highest damage per flood event (Breitbach 2010).

3.4.2 First Branch basin flood history

The nearest USGS stream gages that are helpful for deriving some information concerning flood history in the vicinity of the First Branch are on the White River mainstem at West Hartford to the southeast, in the Ayers Brook (Randolph) watershed to the west, and in the East Orange Branch of the Waits watershed to the northeast (Figs. 25-26). None of these gages is affected by flow regulation (dams or other), but each of the other watersheds vary a good bit in size from the First Branch basin (Table 7, following the Annual Peak Flow charts).

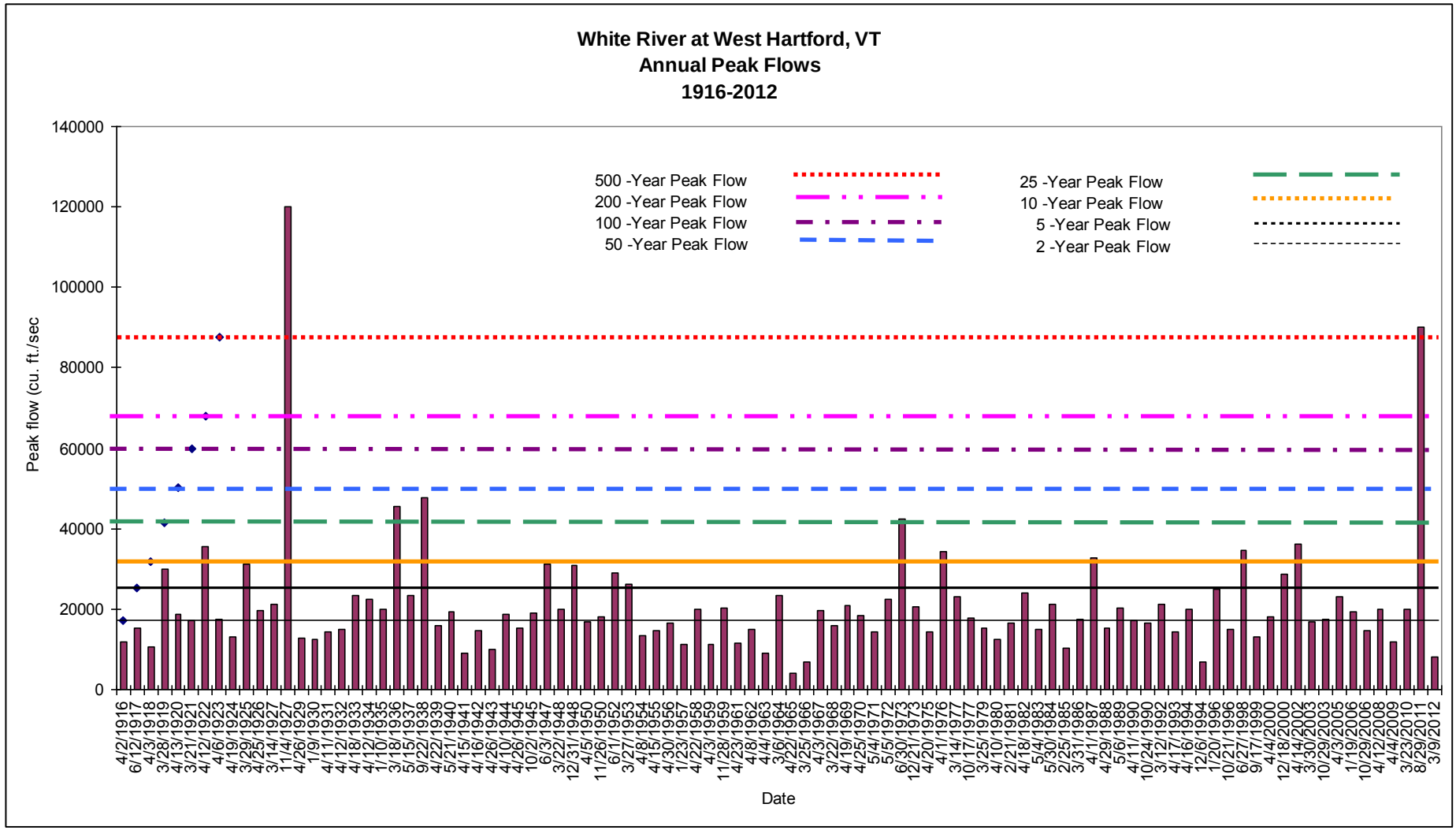
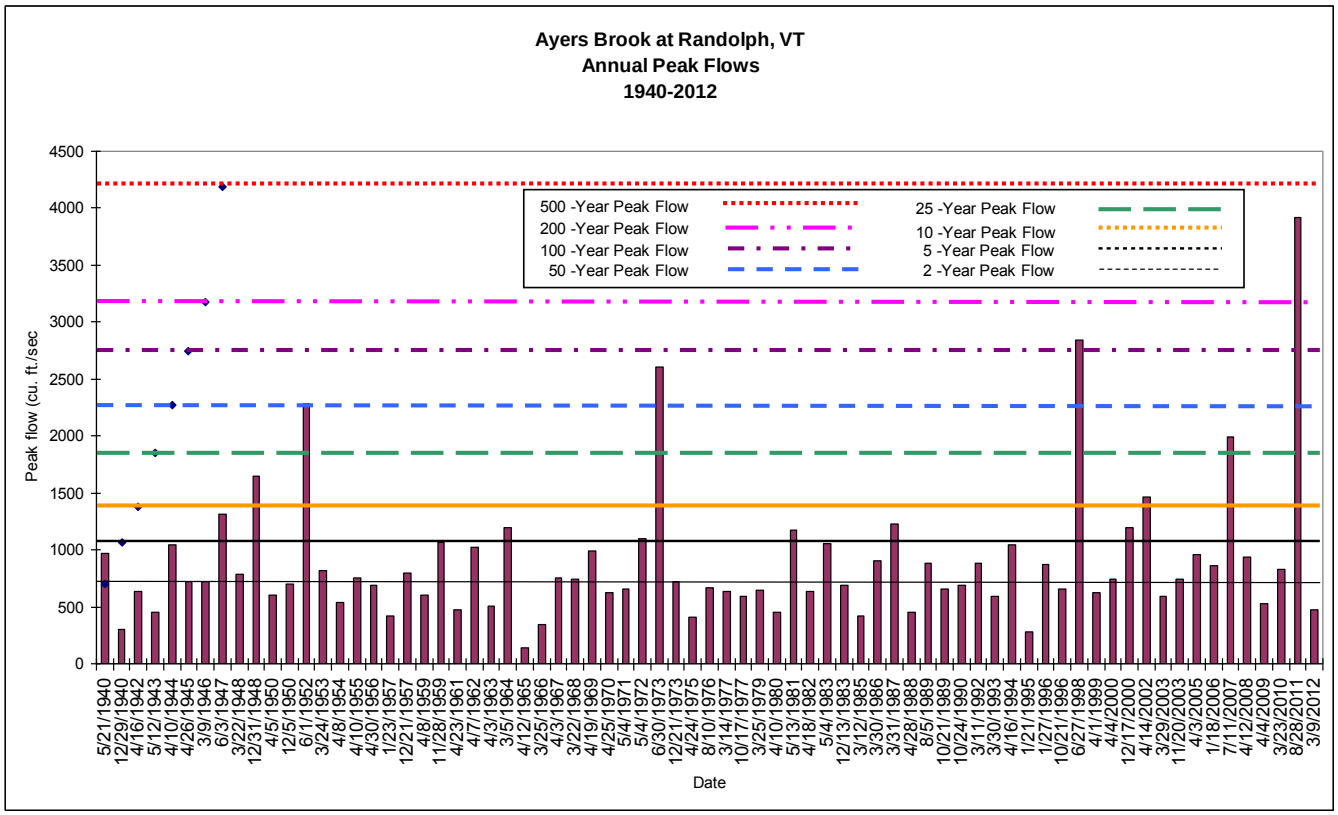


Figure 25. Annual peak flow chart for the USGS gage on the White River mainstem at West Hartford.

The gage on the White mainstem is the only one that has continuous records as far back as the region-wide 1927 flood of record for the state of Vermont (Fig. 25). That gage also recorded major floods in 1936 and 1938 that pre-date the period of record for the other gages; flooding associated with the 1938 Hurricane was a widespread regional event. The other gages (Fig. 26) indicate that the primary region-wide major floods were in 1973 and 1998; other major flood events are particular to each basin or commonly indicated at two of the gages, but not all three.



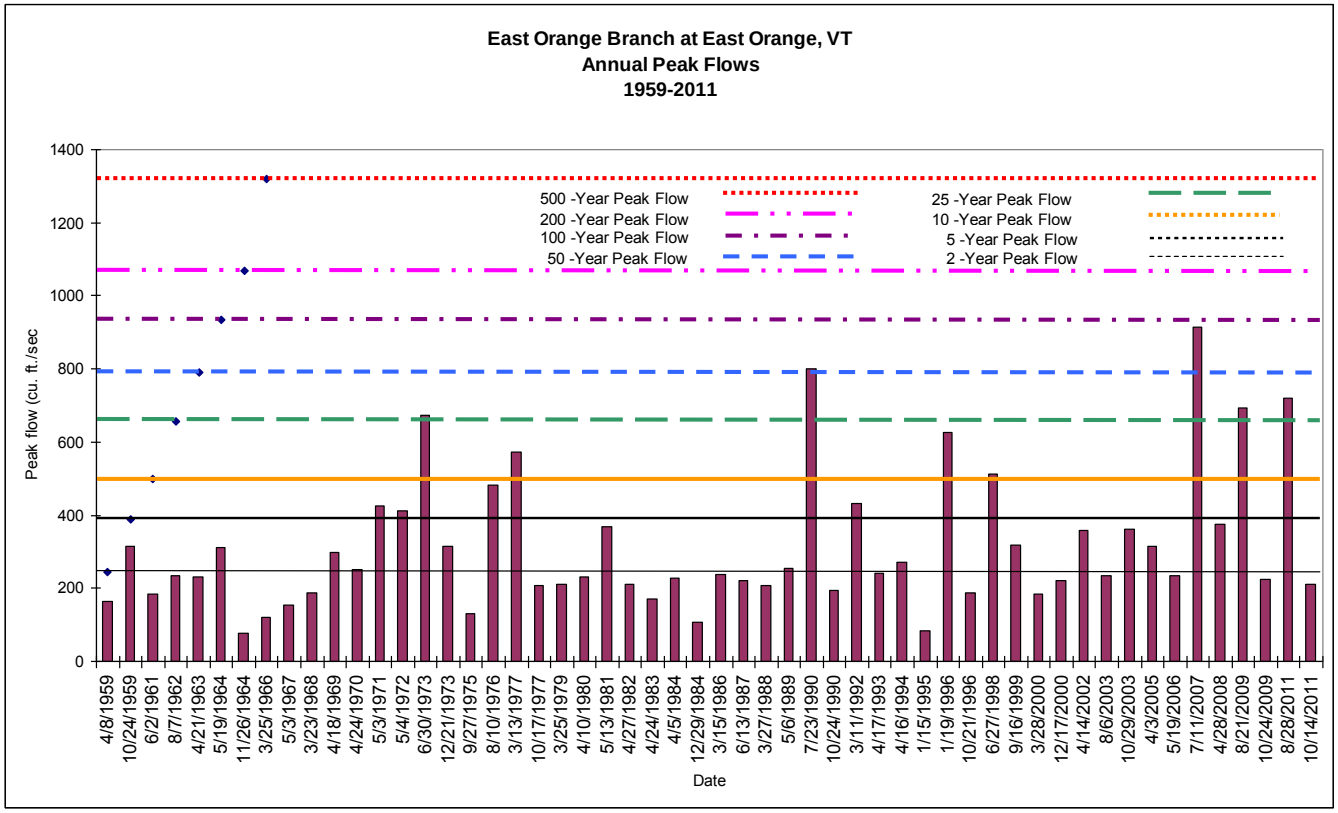


Figure 26. Annual peak flow charts for Ayers Brook and East Orange Branch basins.

Table 7. Comparison of select basin characteristics for First Branch and nearest gaged stream basins

	First Branch	*Ayers Brook*	*East Orange Branch*	*White River at West Hartford*	units
Contributing Drainage Area	105	30.5	8.95	690	square miles
Drainage Area	105	30.5	8.79	689	square miles
Main Channel Length	24.4	10.2	5.5	49.7	miles
Mean Basin Elevation	1355	1320	1780	1300	feet
Percent Forest	82	30	71	53	percent
Percent Lakes and Ponds	0.0788	0.1990	0.1620	0.1922	percent

A pattern of very localized flooding thus appears characteristic of the area, indicating the variable nature of precipitation events due in large part to orographic effects as well as a level of "flashiness" related to a variety of factors including steepness of slope, the relatively minimal buffering capacity of wetlands and other waterbodies, narrow valley widths and limited floodplain accessibility, and the effects of a variety of human influences.

Without the availability of gage information in the First Branch basin, documented flood events become highly valuable. Town records were not able to be researched thoroughly within the time and funding constraints of this corridor plan, but an excellent discussion of flood history for Orange County can be found in the Tunbridge Hazard Mitigation Plan (Tunbridge HazMit 2013), pp. 15-20. Not all of these events directly impacted the First Branch basin, as most of the data were aggregated at a county level (Orange County; only a very small portion of Windsor County – the northern portion of South Royalton - is located in reach M01 of the First Branch basin). The primary take-away from these data is that although flooding events accounted for between 5-14% of the number of total hazard events (depending on the source and time period), they accounted for 78-96% of the estimated losses from all hazard events.

Additional pertinent points from the flood data (Tunbridge HazMit 2013) are paraphrased or excerpted here:

FEMA (National Emergency Management Information System (NEMIS); Federal Emergency Management Agency):

Sixteen federally declared disasters occurred in Orange County between 1973-2011 (averaging one event every two years), all of which involved flooding to some degree. Tropical Storm Irene in 2011 had relatively minor impacts in the First Branch basin compared to surrounding communities, including heavy impacts for many in the larger White River basin. Irene eclipsed the 1998 flood as the flood of record for the gage on Ayers Brook; that 1998 flood had heavily impacted the First Branch basin as well.

SHELDUS (Spatial Hazard Events and Losses Database for the US; Hazards and Vulnerability Research Institute 2013):

Orange County flood hazard events from 1960-2012 are indicated in Table 8. April 1987 flooding, which exceeded 10-year peak flow at the White-West Hartford gage, was less than 5-year peak at the other 2 gages (Figs. 25-26). Flood damages in June 1984 were experienced further north of the First Branch basin in central Vermont.

Table 8. Orange County flood events from SHELDUS database, 1960-2012.

hazard_id	HAZARD_BEGIN	HAZARD_END	PROPERTY_DAMAGE	REMARKS
8532961	3/12/1962	3/13/1962	$3,571.43	SNOW, WIND, FLOODING
8548317	2/25/1965	2/25/1965	$35,714.29	WIND, RAIN, AND FLOODS, GLAZE, THUNDERSTORMS
8588150	5/18/1969	5/20/1969	$4,166.67	RAIN AND FLOODING
8626566	6/29/1973	6/30/1973	$3,571,430.00	FLOOD
8663829	5/29/1984	5/29/1984	$3,571,428.57	Rain/Flood
8664883	6/7/1984	6/7/1984	$12,500,000.00	Flood
8665671	7/16/1984	7/16/1984	$35,714.29	Rain/Flood/Lighting
8676841	3/7/1986	3/7/1986	$35,714.30	Flood
8684572	3/31/1987	3/31/1987	$35,714.29	Flood
8684991	4/4/1987	4/4/1987	$3,846,153.85	Flood
9084017	3/15/1989	3/15/1989	$35.71	Floods
9084054	3/30/1989	3/30/1989	$357.14	Floods
69093	3/11/1992	3/12/1992	$50,000.00	Flash Flood
9291476	4/22/1992	4/22/1992	$500.00	flood
65862	1/19/1996	1/20/1996	$233,333.33	FLOODS
51258	7/15/1997	7/16/1997	$500,000.00	FLOODS
117988	1/8/1998	1/9/1998	$5,000.00	FLOOD
118068	3/31/1998	3/31/1998	$10,000.00	FLOOD
118106	6/17/1998	6/17/1998	$10,000.00	FLASH FLOOD
118120	6/27/1998	6/27/1998	$2,000,000.00	FLASH FLOOD
38386	9/17/1999	9/17/1999	$1,000.00	FLOODS
24717	4/9/2000	4/9/2000	$1,000.00	FLOOD
24750	7/16/2000	7/17/2000	$75,000.00	FLASH FLOOD
190935	4/14/2002	4/14/2002	$40,000.00	
8806503	1/18/2006	1/19/2006	$2,000.00	Flood
8836597	3/15/2007	3/15/2007	$50,000.00	Flood
8837559	7/11/2007	7/11/2007	$750,000.00	Flash Flood
8948450	8/7/2008	8/7/2008	$50,000.00	Flash Flood
8948452	8/7/2008	8/7/2008	$25,000.00	Flash Flood
9036285	8/21/2009	8/21/2009	$350,000.00	Flash Flood
9242415	1/25/2010	1/26/2010	$10,000.00	
9247274	7/21/2010	7/21/2010	$100,000.00	
9254138	10/1/2010	10/1/2010	$50,000.00	
9312266	3/6/2011	3/7/2011	$5,000.00	
9318949	5/26/2011	5/27/2011	$150,000.00	
9327402	8/28/2011	8/28/2011	$32,500,000.00	
9327404	8/28/2011	8/29/2011	$5,000,000.00	

3.5 ECOLOGY

3.5.1 Distribution of instream, riparian and wetland habitats

Rapid Habitat Assessment (RHA) data collected during the Phase 2 assessments indicate a heavy preponderance of scores in the 'Fair' range in the First Branch basin, with none of the reaches included in 2012-2013 assessments scoring in the 'Reference' range (Appendix X RHA data). The most notable issues were sedimented or unstable bed substrates in much of the basin as well as overall low levels of instream woody debris (an important habitat feature as well as commonly contributing to sediment retention and pool and meander formation), and diminished buffers along mainstem reaches in the central portion of the basin in particular.

Existing floodplains in the First Branch basin include beaver-controlled areas that were not able to be fully assessed in Phase 2 as well as such areas in and along the margins of assessed reaches ("river-adjacent wetlands"). These areas help provide flood resiliency and permit a break from transfer of impacts to downstream reaches. In assessed portions of the First Branch basin beaver-controlled areas are all class 2 wetlands that are legally protected, including portions of segments M07A, M18A and B, M19B and C, and T7.01C (though motorized vehicles may be impacting the wetlands and/or buffers in M07A and T7.01C). Additional wetlands in the basin are relatively minimal in scope, but a large extent of hydric soils underlying agricultural areas and roads makes it difficult to determine the extent of wetlands that may have been altered over time.

The First Branch does not have any USGS water quality monitoring gages to help detect temperature fluctuations and other water quality parameters, but the White River Partnership has maintained a number of water quality sampling sites along the mainstem for more than a decade. Results from these sites have indicated notable spikes in *E. Coli* and turbidity readings following any heavy precipitation events. Qualitative observations on numerous different days during summer fieldwork in 2012 noted very rapid rises in water temperatures over the course of the day.

3.5.2 Aquatic Life

Habitat connectivity is fragmented in the basin by the influence of both dams and long runs of ledge. Anadromous fish populations are thus not present in the First Branch basin (the Eaton-1 dam in reach M01, near the base of the First Branch, is intact and situated on top of a natural waterfall), and other sport fish along the mainstem reaches are generally maintained by repeat stocking; native brook trout populations do seem to be self-sustaining in a good bit of the basin.

Reaches in the southern and northern portions of the basin scored higher on the woody cover and bed substrate parameters in particular, as did Dickerman Brook (T2.01) and Jones Pond Brook (T7.01 along Edwards Rd.). These parameters scored low for mainstem reaches between Tunbridge village and Edwards Rd. on the north end of Chelsea as well as on Jail Brook, Hart Hollow Brook (Upper Village Rd.), and (somewhat surprisingly) Jenkins Brook. This is undoubtedly a major contributing factor to Eastern Brook Trout Joint Venture (subwatershed (HUC12)-level assessment data) that indicates the Headwaters, northern half of the First Branch basin - split roughly along the Chelsea-Tunbridge town line - as having >90% intact native brook trout populations,

while the southern half of the watershed is noted as having 'Reduced' populations (Fig. 27).

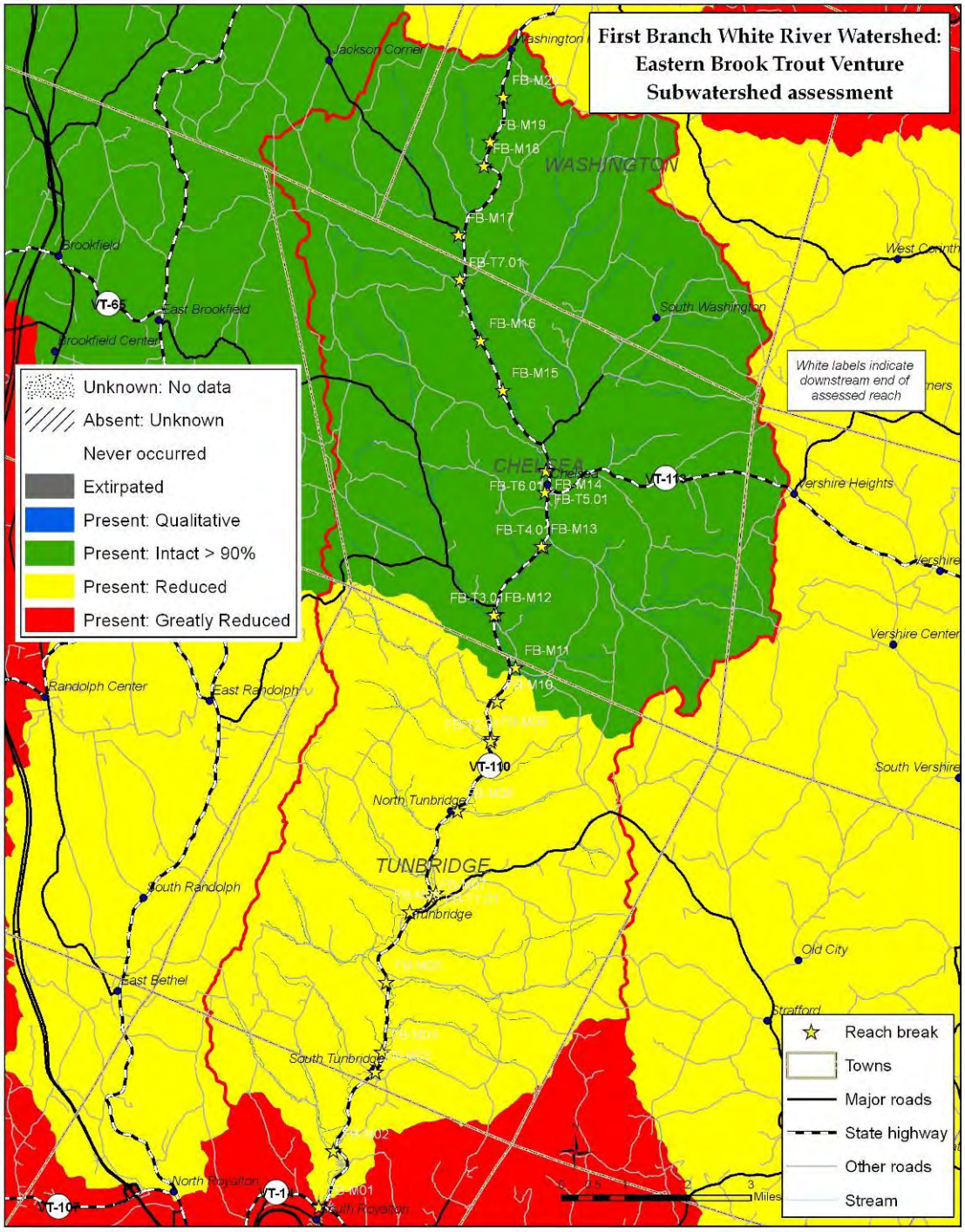


Figure 27. Eastern Brook Trout Joint Venture subwatershed-scale assessment for the First Branch basin.

3.5.3 Unique plant and animal communities

Given the sweet soils of the First Branch basin, it is telling that Sugar Maple-Ostrich Fern Riverine Floodplain Forest is lacking from Thompson and Sorenson's (2000) list of 'Natural Communities Best Expressed' in the Northern Vermont Piedmont Biophysical Region, with this habitat niche generally being occupied by residential and agricultural use.

In addition, rich fens and the plants and animals associated with them are one of the primary rare or uncommon features in the basin (4 occurrences basin-wide) yet very few river adjacent wetlands were noted. These features are important not only for the biological refugia they provide but as important features for attenuating flood impacts and increasing resiliency as well. A small beaver-influenced wetland in segment M07A near the Old Meetinghouse bridge in Tunbridge was of note on this front; it is included as a Class 2 wetland in the Vermont Significant Wetlands Inventory but is not listed as a significant or uncommon natural community or with any particular species of note. It is not clear if this is due to lack of presence or lack of assessment. This was also true of a similar area along Edwards Rd. (segment T7.01C) upstream of Old Schoolhouse (discontinued) and Maplewood Roads. More extensive beaver wetlands are present along Rte. 110 and the First Branch in upstream segments M18B and M19B.

Generally speaking the First Branch basin is relatively minimally impacted by invasive plants, with the primary exception of wild chervil that is common along roadways in much of the basin and has spread along watercourses away from the roads in several areas. This was of particular note on Jones Pond Brook (reach T7.01 along Edwards Rd.), where portions of the reach well away from roads (and noted with ample brook trout as well as bobcat, fisher and mink tracks) had incipient populations of chervil and Japanese knotweed that appeared to have been flushed downstream during Tropical Storm Irene. In addition, Norway maples lining a driveway installed along reach M09 upstream of the Foundry Rd. Bridge were the only significant tree-strata invasives noted in the 2012-2013 assessment area.

4.0 METHODS

4.1 STREAM GEOMORPHIC ASSESSMENT

In an effort to provide a sound basis for decision-making and project prioritization and implementation, the Vermont Agency of Natural Resources River Management Program (VT-RMP) has developed protocols for conducting geomorphic assessments of rivers. The results of these assessments provide the scientific background to inform planning in a manner that incorporates an overall view of watershed dynamics as well as reach-scale, or localized, dynamics. Incorporating upstream and downstream dynamics in the planning process can help increase the effectiveness of implemented projects by addressing the sources of river instability that are largely responsible for erosion conflicts, increased sediment and nutrient loading, and reduced river habitat quality (Kline 2010, p.1). Trainings have been held to provide consultants, regional planning commissions, and watershed groups with the knowledge and tools necessary to make accurate and consistent assessments of Vermont's rivers.

The stream geomorphic assessments are divided into phases. A Phase 1 assessment is a preliminary analysis of the condition of the stream through remotely sensed data such as aerial photographs, maps, and 'windshield survey' data collection. This phase of work identifies a 'reference' stream type for each reach assessed. A reach is a similar section of stream, primarily in terms of physical attributes such as valley confinement, slope, sinuosity, dominant bed material, and bed form, as well as predicted morphology based on hydrologic characteristics and drainage basin size.

Phase 2 involves rapid assessment fieldwork to inform a more detailed analysis of adjustment processes that may be taking place, whether the stream has departed from its reference conditions, and how the river might continue to evolve in the future. This sometimes requires further division of 'reaches' into 'segments' of stream, based on such field-identified parameters as presence of grade controls, change in channel dimensions or substrate size, bank and buffer conditions, or significant corridor encroachments. The data collected in Phase 2 also help identify the inherent sensitivity to changes in watershed inputs of a given stream segment, and these data can be used to map and classify Fluvial Erosion Hazard zones (VT-RMP FEH 2010; VT-RMP RCProtect 2008). River Corridor Plans analyze the data from the Phase 1 and 2 assessments to inform project prioritization and methodology. Phase 3 involves detailed fieldwork for projects requiring survey and engineering-level data for identification and implementation of management and restoration alternatives.

All Phase 1 and Phase 2 data were entered into the most current version of the VTANR Stream Geomorphic Assessment (SGA) Data Management System (DMS) (https://anrnode.anr.state.vt.us/ssl/sga/security/frmLogin.cfm), where they are available for public review. Phase 1 data were updated, where appropriate, using the field data from Phase 2 assessments; these changes were tracked and documented within the DMS. Spatial data for bank erosion, grade control structures, bank revetments, beaver dams, debris jams, depositional features, and other important features were documented within field-assessed segments and entered into the spatial component of the statewide data base using the Feature Indexing Tool of the Stream Geomorphic Assessment Tools (SGAT) ArcView extension, which permits geographic information systems implementation of the data. Using data from both Phase 1 and 2 assessments, maps displaying this information are being made available for public use as well, through the Vermont ANR Natural Resource Atlas (http://anrmaps.vermont.gov/websites/anra/).

4.2 QUALITY ASSURANCE, QUALITY CONTROL, AND DATA QUALIFICATIONS

VT-RMP is committed to providing watershed groups, towns, regional planning commissions, consultants and other interested parties with technical assistance and shares responsibility for a thorough quality assurance/quality control (QA/QC) procedure for data collected in geomorphic assessments. Checks were initially conducted by Redstart personnel utilizing the QA/QC tools developed by VTANR and implemented through the online Data Management System. Documentation of these quality control checks is maintained within the DMS as well. Further review by both RMP and Redstart personnel were cross-checked to verify integrity of the data, and this iterative process was completed in October 2013; further documentation of that process can be found in

Appendix 5. General questions about data collection methods can be answered by referencing the SGA Protocols (VT-RMP 2009).

Primary data qualifications for the First Branch 20102-2013 SGA concern representational cross-section data collected for stream segments in the assessment area, specifically regarding the "bankfull" and "recently abandoned floodplain" indicators used to calculate incision ratios.

Tropical Storm Irene moved through the basin (and the rest of Vermont) in August 2011, the year before the First Branch Phase 2 Stream Geomorphic Assessment (SGA) was initiated. Although the impacts of Irene were not as dramatic as in other portions of the state, high water levels clearly exceeded the levels of typical "bankfull flows" (the statistical "2-year peak flow" or "channel-forming flow"), and in some areas significantly obscured typical ground-based evidence of these flow levels (VT-RMP_ApxI 2009). Summer 2012 was very dry, and typical bankfull flows (which would re-establish these indicators in areas where they had been obscured) did not occur in the basin again until mid-summer 2013, after fieldwork for the First Branch Phase 2 SGA had been completed.

These impacts were mostly strongly felt in areas lacking woody buffers along streambank areas where x-sectional measurements were taken (especially lower mainstem reaches with highly erodible banks, primarily downstream of Chelsea village), as well as stream segments in areas that had formerly been impounded by beavers and the dams had been "blown out" in Irene (T7.01C on Jones Pond Brook along Edwards Rd. on Chelsea and M19C at the upstream end of the First Branch mainstem in Washington). All cross-sectional areas were thus checked against predicted bankfull widths derived from hydrologic curves (based primarily on watershed area draining to the point the cross-section was located, VT-RMP_ApxJ 2009; Olson 2002) and interpolated with the field-recorded measurements to help calculate incision ratios where clear indicators were lacking.

The timing of floodplain abandonment (as represented by incision ratios) in the First Branch basin is a related facet of this data qualification. High terraces along the sides of relatively narrow valleys are widespread in the basin and in many cases are related to geologic features formed during glacial retreat in "ice-contact" areas. Streams clearly have cut further through these highly erodible materials during the last 200 years, contributing to "historic incision", but the degree to which the abandonment of former floodplains on these high terraces is "historic" or "post-glacial" can be hard to determine with any surety. The highest incision ratios may be measured in relation to some of the post-glacial features.

In regards to these data qualifications, the primary values of the incision ratios reported here are as indicators of the degree to which the streams of the basin have lost access to former floodplains regardless of when the timing was. Ledge outcrops and bedrock exposures are extremely common and well-distributed throughout the basin, limiting any further incision or downcutting to limited stretches of stream and primarily manifesting as scour pools and transfer of fine sediments (and/or coarse sediments as well) to downstream reaches.

5.0 RESULTS

The following sections summarize pertinent results of Phase 1 and 2 SGA data collection in the First Branch watershed. Stressor, departure, and sensitivity maps are presented as a means to integrate data that have been collected and show the interplay of watershed and reach-scale dynamics. These maps should help identify practical restoration and protection actions that can move the river toward a healthy equilibrium (Kline 2010). Single page (8.5 x 11 in.) maps are included with the text for ease of reference in regards to the text; larger maps can be found in Appendix 7.

Alterations to watershed-scale hydrologic and sediment regimes can profoundly influence reach-scale dynamics, and greater understanding of these processes is vital to increasing the effectiveness of protection and restoration efforts at a reach level (Kline 2010). Section 5.1 presents an analysis of stream departure from reference conditions. Sections 5.1.1 and 5.1.2 summarize watershed-scale stressors contributing to current stream conditions. Two points are important to keep in mind in using these maps:

1) The watershed-scale maps attempt to convey patterns rather than details; more detailed impacts appear in the reach maps in section 6.0, *Project identification.*
2) A "zoomed in" map (such as the reach maps in section 6) is easier to read in some respects, but does not fully capture indications of watershed-scale alterations. Because fluvial geomorphic processes often unfold over decades, the "bigger picture" relationships are critical to understanding how upstream processes (either historic or current) affect what may be happening further upstream and/or downstream.

Sections 5.1.3–5.1.6 characterize reach-scale stressors. Section 5.1.7 characterizes the hydrologic and sediment regime departures for reaches included in Phase 2 assessment within the First Branch watershed. Section 5.2 presents a sensitivity analysis of these reaches, indicating the likelihood that a stream will respond to a watershed or local disturbance or stressor as well as an indication of the potential rate of subsequent channel evolution (VT-RMP 2009, Phase 2, Step 7.7; Kline 2010, Section 5.2).

Data used for the analyses can be found in the appendices. Reach/segment summary statistics and channel geometry data are found in Appendix 1. Phase 1 observations, assembled at a reach scale, are summarized in Appendix 2. Reach/segment scale data from Phase 2 fieldwork are provided as summary sheets in Appendix 3. Plots of channel cross sections are found in Appendix 4. Appendix 5 includes Quality Assurance review notes. Appendix 6 is a consolidated list of projects identified in Chapter 6. Appendix 7 contains 11x17 in. maps for analysis (Chapter 5 maps). Appendix 8 contains the results of bridge and culvert assessments for structures located on Phase 2 reaches.

5.1 DEPARTURE ANALYSIS

5.1.1 Hydrologic regime stressors

The hydrologic regime involves the timing, volume, and duration of flow events throughout the year and over time; as addressed in this section, the regime is characterized by the input and manipulation of water at the watershed scale. When the hydrologic regime has been significantly changed, stream channels will respond by undergoing a series of channel adjustments. Where hydrologic modifications are persistent, an impacted stream will adjust morphologically (e.g., enlarging through either downcutting or widening when stormwater peaks are consistently higher) and often result in significant changes in sediment loading and channel adjustments in downstream reaches (Kline 2010).

The net effect of hydrologic regime stressors in the First Branch basin tends toward an increase in "flashiness" through heightened amounts, rates and intensity of water discharges in heavy precipitation events, with limited access to floodplains amplifying these effects in all but the higher level flood events when historic floodplains do still seem to be accessed.

As in much of Vermont, the First Branch basin was heavily deforested during the 19th century, with "sweet" soils in this area leading to particularly heavy agricultural development (Thompson and Sorenson 2000, pp.18, 46). Historical documentation indicates that deforestation was extensive at the peak of sheep farming in the area, roughly 1840s-70s, but the steep hilly terrain may have kept the level of deforestation lower than overall estimations of 70% deforestation statewide (Thompson and Sorenson 2000; Cronon 1983) and the basin was reforested relatively rapidly in the 20th century (Farnham 1980).

Historical clearing initially contributed to higher runoff of both water and sediment (USDA-FS 2001). While this situation tended to diminish with reforestation, it is likely that the initial downcutting and transport of sediment out of uplands extended the stream network, initiating or furthering channel formation in areas that formerly had a broader absorptive base, and deposited thick layers of sediment in the valleys. Streams have cut back down through these sediments over time, restricting access to historic floodplains and requiring widening and planform adjustments to establish new floodplains at a lower elevation. In many areas of this basin, however, bedrock exposures and shallow depths to dense till limit the amount of downcutting that will occur and instead contribute to greater quantities and more rapid delivery of water from and to this extended, dissected stream network.

As noted in section 3.1.3 of this report, Land use and general characteristics, the First Branch watershed is roughly 82% forested today. Despite this relatively high degree of forest cover, however, there are other factors in the First Branch basin that further contribute to a high degree of "flashiness" in the watershed.

The Hydrologic Alterations map (Fig. 28) indicates three primary stressors commonly associated with stream channel adjustments (Kline 2010, pp. 26-27). The most contemporary issue is stormwater inputs, which are the predominant hydrologic stressor in the First Branch basin. Dams and diversions are a stressor to a lesser degree in this

basin, while flow regulations are a relatively minor contemporary contributor to changes in water inputs, as explained further below.

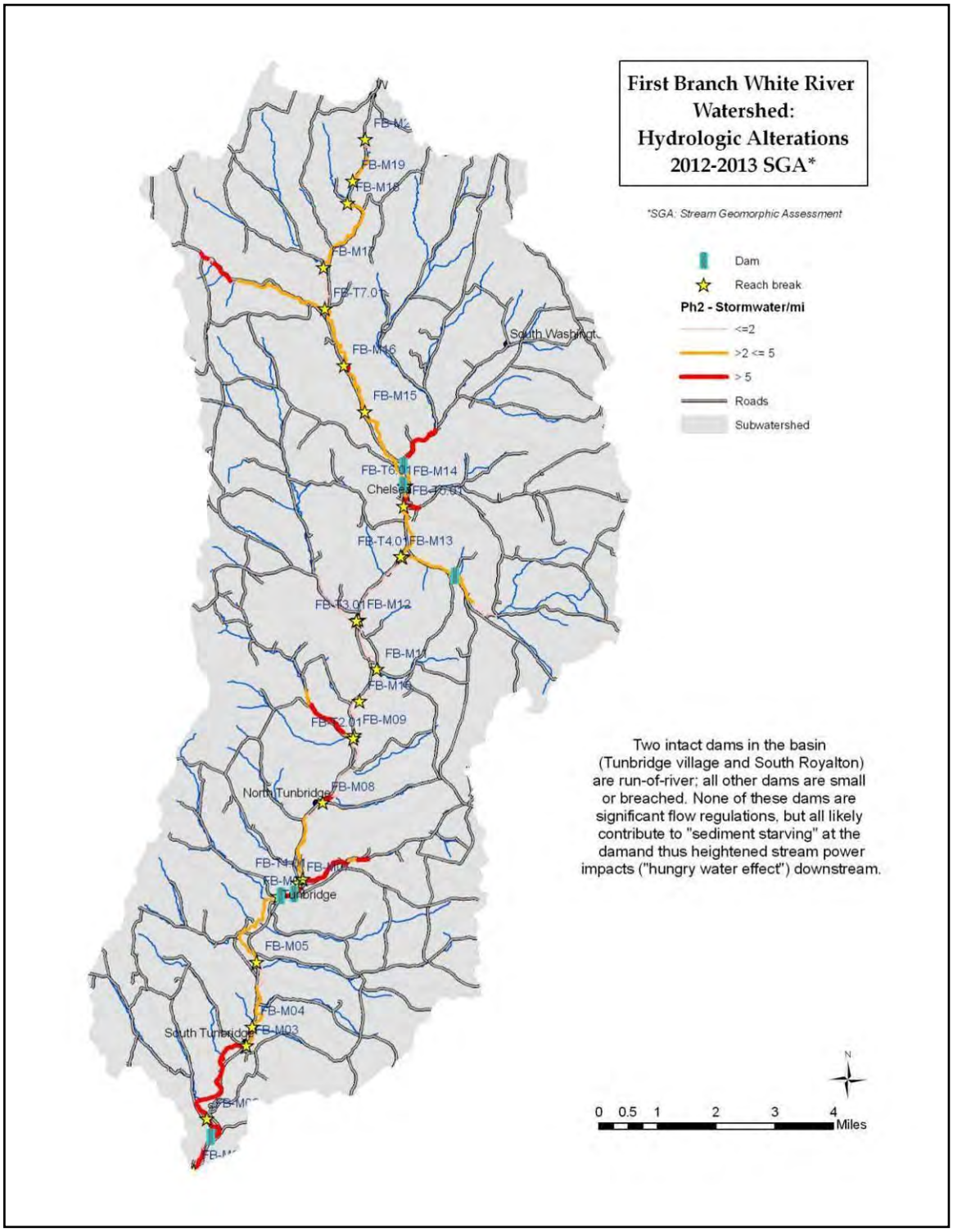


Figure 28. Hydrologic Alterations map for the First Branch watershed.

Although it appears quite rural due to diffuse settlement patterns, the Northern Vermont Piedmont biophysical region (which includes the First Branch watershed) is one of the

most densely "roaded" portions of Vermont (Thompson and Sorenson 2000, p. 47). Stormwater inputs from this road system are a significant contributor to hydrologic alterations on all of the tributary reaches assessed in Phase 2, with >5 stormwater inputs/ stream mile noted on most of the length of these reaches, as well as on portions of mainstem reaches M16 and M17 along Rte. 110 on either side of the Chelsea-Washington town line.

While it is likely that agricultural land use does not deliver water to the stream as quickly as impervious roads and "urban" land uses, it is notable that some of the worst road damages in 2009 flash flooding in Chelsea occurred at the outlet point of a hayfield swale as it entered and amplified in a road ditch, rather than being associated with an actual stream (Fig. 29). The field is located on hydric Cabot soils, shallow to a dense till layer that impedes more rapid percolation - a common scenario in the First Branch basin.

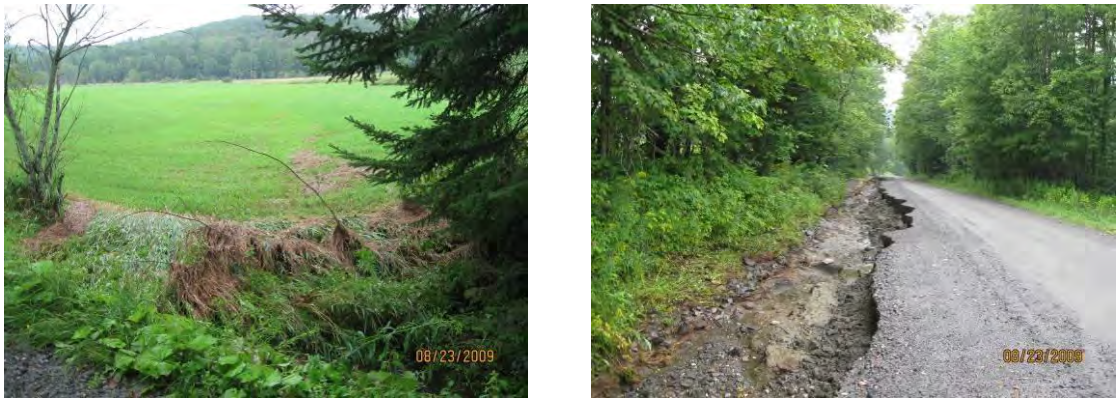


Figure 29. Rapid delivery of water from a hayfield to a road ditch in 2009 flash flooding in Chelsea (Corinth Rd., subwatershed T6.01-S1.01-t1.01) eventually led to undercutting and dislodging of a culvert at a stream crossing further down the road.

Similar to the example in Figure 29 above, many of the fields, roads and "urban" land uses in the stream corridors of the First Branch basin are accompanied by ditches. With the increasing ubiquity of heavy equipment, it has become more cost-effective to expand road ditching rather than continually repair roads from the damages of heavy frost heaving and washouts. Expanded ditching exacerbates the "flashy" nature of the basin by increasing the rate and intensity of water delivery to the streams. Careful attention to directing these surface water inputs to well vegetated surfaces can help mitigate the effects of direct surface water inputs to streams, but it is difficult to reduce the amount of water that is now entering these streams without percolating through soil first.

Stormwater inputs (primarily road ditch outlets) exceeded 5 inputs per stream mile on tributary reaches T1.01 (Strafford Rd), T2.01 (Dickerman Hill Rd.), T5.01 (Jail Branch along Rte. 113) and T6.01 (Hart Hollow Brook along Upper Village Rd.) as well as on mainstem reaches M01 and M02 (Rte. 110 in South Tunbridge and South Royalton) and segments M08A (Rte. 110 and Caron Rd. north of the Foundry Bridge in North Tunbridge), M13C (Chelsea village), and M15B (Nick Gilman farm, where the fields were historically drained and tiled) (Fig. 28). While >5 stormwater inputs were noted on these mainstem reaches, the much larger drainage areas feeding into these reaches reduce the relative significance of these stormwater impacts. In these areas land use - land cover changes are likely more significant contributors to alterations in the hydrologic regime.

Other hydrologic alterations in the First Branch basin are of less contemporary significance, though they do seem to have some contribution as hydrologic regime stressors.

Remains of at least fifteen mills were observed on reaches walked during Phase 2 assessment, and it is likely there were numerous others scattered along small streams elsewhere in the basin. Flow regulation included water storage and release for mill use that contributed to "pulse" flows. The combination of an intermittent increase in stream power and "sediment starving" at the dams (Fig. 30) has likely contributed to "hungry water", a phenomenon that helps explain a significant degree of channel incision (also referred to as downcutting or degradation of the channel) and/or channel widening.

Figure 30. Though this old mill dam near the Chelsea- Williamstown Rd. is largely breached and gone, aggradation behind the dam is still indicative of "sediment starving" leading to "hungry water" with increased erosive power downstream of dams; the stream channel just downstream of here showed significant channel incision and loss of access to historic floodplains.

These factors serve to increase stream power downstream of dams, which has likely contributed to some of the historic downcutting that has occurred on 25 of 26 reaches (50 of 61 segments) assessed in Phase 2. In the large majority of these cases this has meant a reduction in floodplain access rather than a full loss of access to historical floodplains, and almost all of the complete loss of historic floodplains has occurred on tributaries rather than the mainstem (7 of 61 segments with complete loss of historic floodplain, i.e. Incision ratio ≥ 2.0; 5 of these 7 were on the tributaries).

The large majority of these dams are breached or largely gone today, and the two intact dams on the mainstem (Eaton-1 in South Royalton and the Hayward and Noble Mill dam in Tunbridge) are run of the river dams whose primary effect on the hydrologic regime is a localized contribution to the "hungry water" phenomenon mentioned above.

It should also be noted that mill use of these streams often entailed removal of large woody debris from stream channels to prevent damage to infrastructure or intensify the passage of water. Large woody debris can be an important component of stream power diffusion, pool formation, and fine sediment retention, and frequently plays a large role in smaller headwater streams in particular (USDA-FS 2001). Beyond the role large woody debris plays in enhancing physical stability of the channel, it also is an important habitat feature utilized as cover for many stream dwelling fish and invertebrates.

The second primary contributor to hydrologic regime stressors is land use - land cover change, and visual aids to help identify primary stressors are depicted on the map in Figure 31.

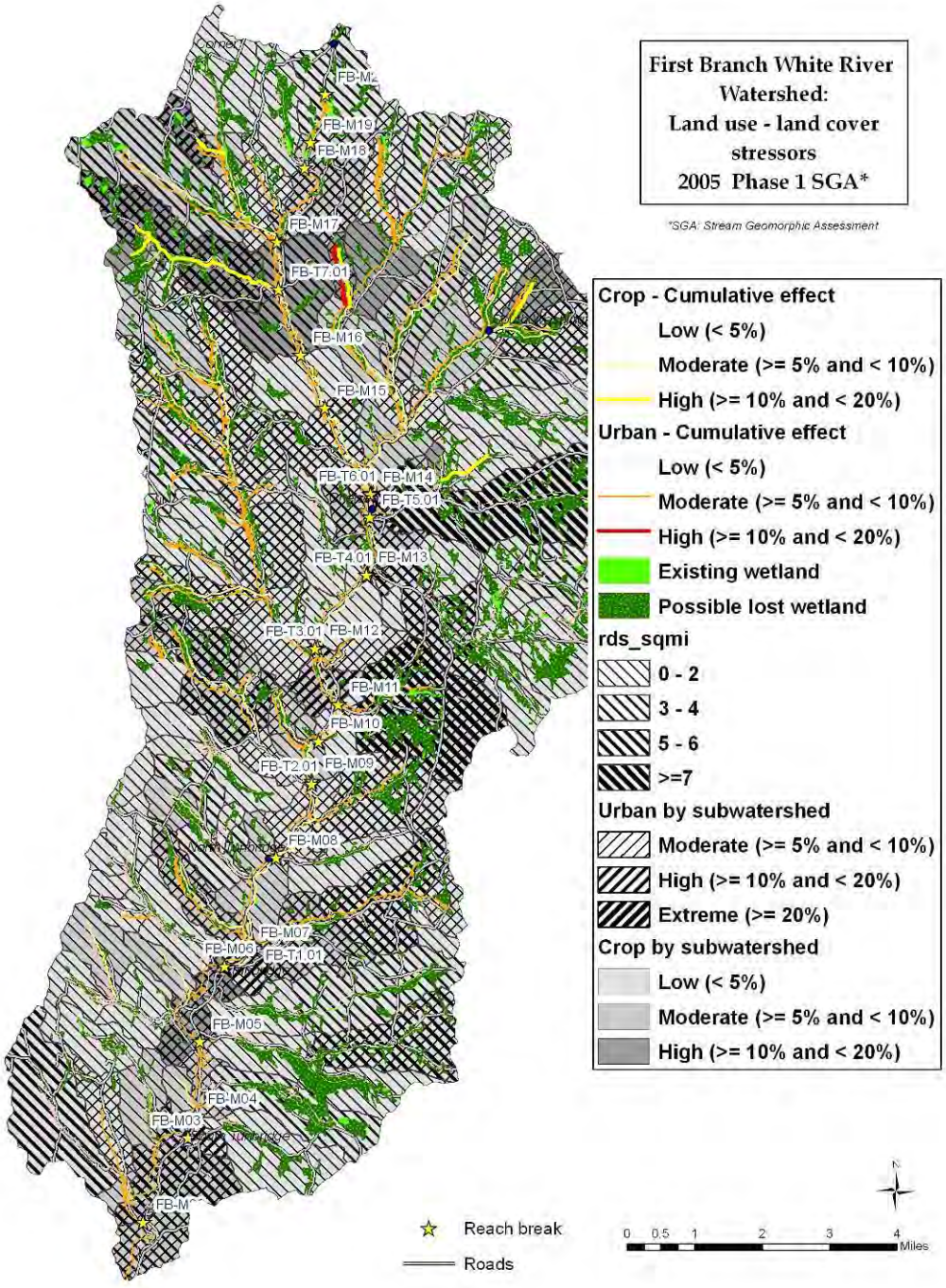


Figure 31. Land use-land cover contributions to hydrologic regime stressors in the First Branch basin.

Preliminary research has indicated that "urban" land use conversions approaching 10% of a subwatershed can be sufficient to be reflected in stream dynamics (Booth and Jackson 1997), and agricultural land use can strongly affect hydrology as well (Schilling and Wolter 2005). In the First Branch basin an additional factor likely warrants consideration: ~43% of the "urban" and agricultural land use areas are located on hydric (poorly or slowly drained) soils, amplifying the rate and quantity of water delivered to streams in heavy precipitation events.

In the First Branch basin only one small tributary subwatershed (T6.03S1.01, Doyle Rd in Chelsea) exceeds the 10% "urban" threshold, but this one is joined by 63 of 116 subwatersheds with 5-10% "urban" land use to account for more than half (56%) of the land area in the basin (Fig. 31 map). The same subwatershed (T6.03S1.01) also exceeds 10% agricultural land use, and is one of three subwatersheds (all headwaters streams in the northern portion of the watershed) exceeding 20% combined "urban" and agricultural land use in the basin ("extra dark" subwatersheds in Fig. 31 map due to overlapping symbology for various stressors).

T6.03S1.01 is in a portion of the First Branch basin that was particularly hard hit in 2009 flash flooding, and reach T6.01 at the downstream end of this area (Hart Hollow Brook entering Chelsea village along the Upper Village Rd.) appears to be aggrading (depositing more sediments, a process frequently connected to increased flows) over time. Reach T7.01 (Jones Pond Brook along Edwards Rd. in Chelsea), one of the other two subwatersheds with >20% combined "urban" and agricultural land use, was noted in Phase 2 field notes as having experienced some of the more significant Irene impacts on field-assessed reaches in the First Branch basin. The base of Jones Pond Brook appeared to have been windrowed at its confluence with the White mainstem post-Irene.

A total of 49 subwatersheds accounting for 42% of the total land area in the basin have combined "urban" and agricultural land use exceeding a 10% threshold.

Land use that contributes to more rapid delivery of water to the stream network is even more concentrated in the stream corridors of the First Branch basin. "Urban" land use exceeds 10% in 74 of 116 stream reach corridors accounting for 69% of the total corridor land area, and exceeds 20% in 42 of 116 reaches accounting for 35% of the total corridor land area.

Half (58 of 116) of the stream reach corridors accounting for 59% of the total corridor land area in the First Branch basin have greater than 20% combined "urban" and agricultural land use.

Subwatersheds draining historically deforested portions of the First Branch watershed, even given the relatively limited extent of "urban" and agricultural lands in this basin (and substantial reforestation), have thus experienced significant changes in land cover and land use that are contributing to channel adjustments. In this basin those dynamics are concentrated along the stream corridors and manifest primarily as flash flooding effects. With extensive areas of ledge grade controls and dense till soils limiting downcutting, responses to intensified discharges of water tend to manifest as channel widening, mass failures and extension of the stream network further and further upstream as sediments are recruited in response to erosion and subsequent sediment exports further downstream.

5.1.2 Sediment regime stressors

At a watershed scale, the First Branch basin does not appear to be a particularly high bed or wash load system, likely due in part to the high percentage of forest cover. Overall sediment load in the basin includes widespread distribution of relatively high levels of depositional features such as mid-channel bars, steep riffles, mid-channel bars and areas of "braiding". This distribution appears to primarily indicate the effects of channel widening and planform adjustments, with additional sediment contributions deriving from eroded roads and ditches and steep tributaries following flash flood events.

The following description of issues related to the sediment regime is taken from the most current version of the VT ANR River Corridor Planning Guide (VT ANR 2010):

> The sediment regime may be defined as the quantity, size, transport, sorting, and distribution of sediments….sediment erosion and deposition patterns, unique to the equilibrium conditions of a stream reach, create habitat. In all but the most dynamic areas (e.g., alluvial fans), they provide for relatively stable bed forms and bank conditions…
>
> ….During high flows, when sediment transport typically takes place, small sediments become suspended in the water column. These wash load materials are easily transported and typically deposit under the lowest velocity conditions, which exist on floodplains and the inside of meander bendways at the recession of a flood. When these features are missing or disconnected from the active channel, wash load materials may stay in transport until the low velocity conditions are encountered….This … unequal distribution of fine sediment has a profound effect on aquatic plant and animal life. Fine-grained wash load materials typically have the highest concentrations of organic material and nutrients.
>
> Bed load is comprised of larger sediments, which move and roll along the bed of the stream during floods…. The fact that it takes greater energy or stream power to move different sized sediment particles results in the differential transport and sorting of bed materials….When these patterns are disrupted, there are direct impacts to existing aquatic habitat, and the lack of equal distribution and sorting may result in abrupt changes in depth and slope leading to vertical instability, channel evolution processes, and a host of undesirable erosion hazard and water quality impacts.

Coarser deposition appears to be moving through the stream network in "sediment slugs" associated with impacts from flash flooding in 2009 as well as impacts from Irene in 2011, with sediment contributions commonly originating from mass failures along the steep valley walls in some of the narrower portions of the mainstem valley and more frequently from the steeper tributaries. Due to the geology of the basin (see section 3.2, Geologic Setting) coarser deposits and depositional features such as steep riffles were more common in upstream portions of the basin and along the tributaries (Fig. 32), but relatively high levels of depositional features were distributed throughout the stream network; >5 depositional features per stream mile were noted in 26 of 26 reaches (54 of 61 segments).

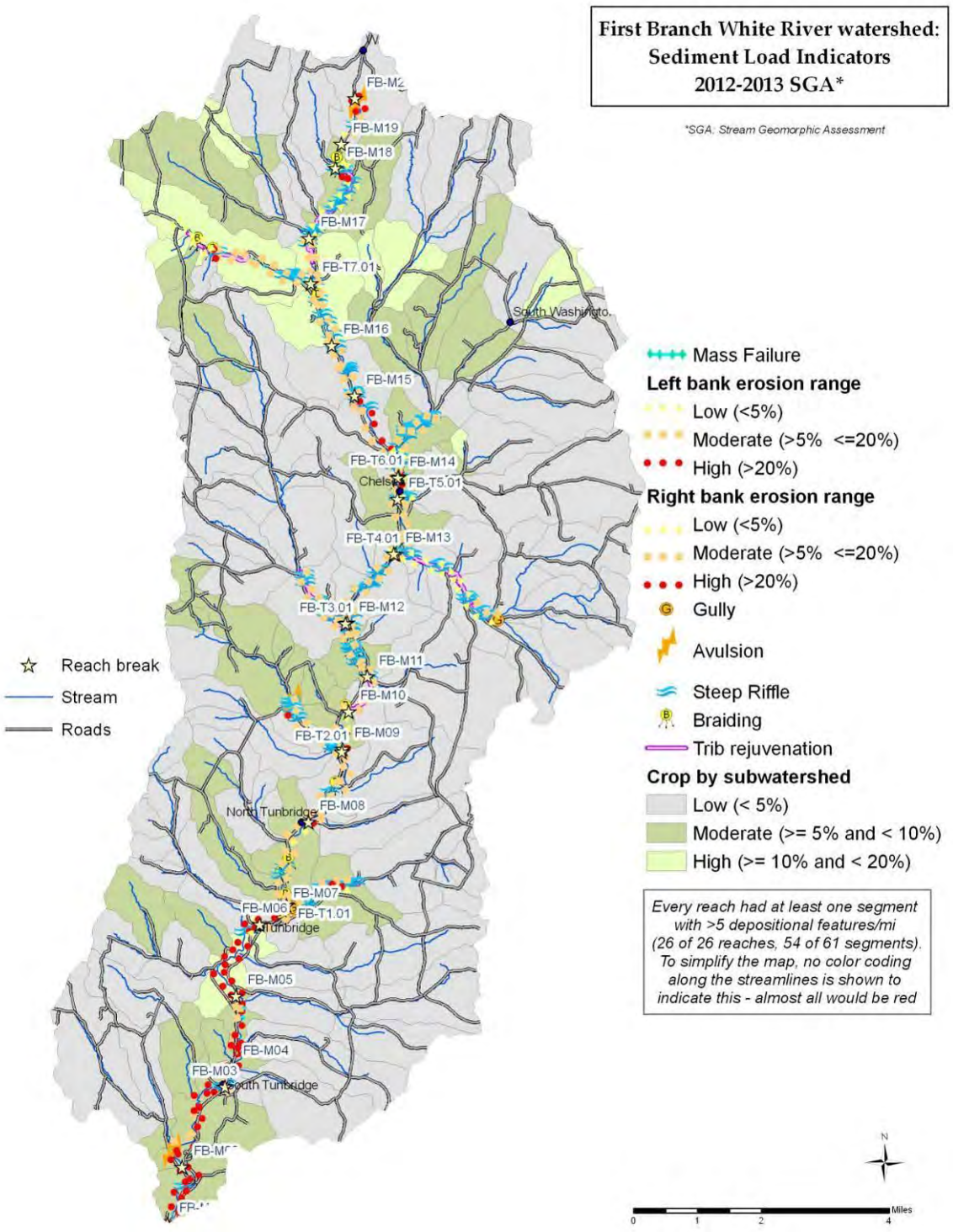


Figure 32. Sediment Load Indicators map for the First Branch basin.

The highly erodible soils of the downstream mainstem reaches contribute to higher levels of bank erosion and high turbidity levels (wash load) in heavy precipitation events (Fig. 32; Table 9), and there is significant aggradation of fines behind pairs of breached and intact dams in Tunbridge village (Hayward& Noble on Mill Rd. intact, Farnham Bros.

upstream of Rte 110 bridge and Strafford Rd. breached) and South Royalton (Eaton-1 downstream of Mill Rd. bridge intact, Eaton-2 upstream of Mill Rd. bridge breached). Bank erosion was common on mainstem reaches north of Chelsea village (reaches M13-14) as well, including many areas of failed riprap and bank toe stabilization.

Table 9. Phase 2 segments with significant levels of erosion during 2012-2013 Phase 2 assessment in the First Branch basin.

Stream segment	Left bank erosion (% of length)	Right bank erosion (% of length)
M01A	>20%	>20%
M01B	>20%	>20%
M01C	>20%	>20%
M02A	>20%	>20%
M02C	>20%	>20%
M04A	>20%	>20%
M05A	>20%	>20%
M19C	>20%	>20%
T1.01D	>20%	>20%
T7.01C	>20%	>20%
M02B	>5% <=20%	>20%
M04B	>5% <=20%	>20%
M08A	>5% <=20%	>20%
M09A	>5% <=20%	>20%
M13D	>5% <=20%	>20%
M14A	>5% <=20%	>20%
M14C	>5% <=20%	>20%
T1.01B	>5% <=20%	>20%
T2.01C	>20%	>5% <=20%
M06	>20%	>5% <=20%
M05B	>20%	<5%
M17B	>20%	<5%

Significant sediment loading from mass failures and gullies (>5 per stream mi.) was noted in tributary reaches T1.01 (Strafford Rd.), T2.01 (Dickerman Brook), and T7.01 (Jones Pond Brook along Edwards Rd.), as well as in the upstream portion of Jenkins Brook (segment T4.01D). Similar levels of sediment loading from mass failures and gullies was noted on mainstem reaches M01 (South Royalton) and M05 including along HoweAcres farm fields and just upstream of the Tunbridge Fairgrounds; upstream of the Fairgrounds appears to be a site of numerous mass failures historically (see discussion in section 6.1 Reach Descriptions for reach FB-M05).

Sediment recruitment from upland areas was evident in tributary rejuvenation noted on at least some portion of all the tributaries assessed except T5.01 (Jail Branch) and T6.01 (Hart Hollow Brook), which lacked any tributary confluences in the portions of these streams that were assessed in the 2012-2013 fieldwork. Mainstem reaches M10 (by the VTrans state highway garage and Wireform), M16 and M17 (upstream and downstream of the Chelsea-Williamstown Rd.) were also noted with tributary rejuvenation. In almost all of these instances the sediment recruitment was qualified in field notes as having likely derived from flash flooding impacts on the tributaries as opposed to being a response to downcutting of the mainstem (and subsequent increase of slope at the mouth

of the tributary). Steep riffles commonly found in reaches downstream of these areas are indicative of "sediment slugs" slowly moving downstream in subsequent high flows.

Sediment loads sufficient to split channel flows ("braiding") were most prevalent in reaches M06 and M07 upstream of the breached Farnham Bros. mill dam and the alluvial fan at the base of reach T1.01 (the unnamed tributary along Strafford Rd.), and appeared to be due in part to planform adjustments when the stream splits around a sheared bank that drops into the stream (Fig 33). This type of erosional deposition due to widening and planform adjustments appears to be contributing a large proportion of the sediment load in the First Branch basin, particularly in downstream reaches.

Figure 33. This "braiding" feature north of the Tunbridge Recreation field started to split flows after the bank was sheared off and dropped into the river. New deposition is visible on the upstream end of the new "island", and erosion on the hayfield-side bank has been escalating in high flows. Potential exists to cut back further toward the septic system visible as a light brown patch in the central portion of the hayfield, installed in 2011, or undercut Recreation Rd. on the opposite bank – the primary access to the Town garage.

It was notable in upstream portions of the basin that boulder and cobble material in large depositional features was frequently deriving from stretches of failed riprap (Fig. 34).

Figure 34. Boulder and cobble material from failed riprap is a frequent contributor to depositional features in the northern portions of the watershed.

The hydrologic and sediment load watershed-scale stressors described above form a hierarchical pretext for understanding the timing and degree to which reach-scale modifications are contributing to field-observed channel adjustments (Kline 2010). Modifications to the valley, floodplain, and channel, as well as boundary (bank and bed) conditions, can change the hydraulic geometry, and thus change the way sediment is

transported, sorted, and distributed (Table 10). Phase 1 and Phase 2 assessments provide semi-quantitative datasets for examining stressors and their effects on sediment regime when channel hydraulic geometry is modified.

Table 10. Reach level stressors: relationship of energy grade and boundary conditions in sediment transport regime (Kline 2010).

		Sediment Transport Increases	Sediment Transport Decreases
	Stream power as a function of:	**Stressors that lead to an increase in power**	**Stressors that lead to a decrease in power**
Energy Grade	**Slope**	• Channel straightening, • River corridor encroachments, • Localized reduction of sediment supply below grade controls or channel constrictions	• Upstream of dams, weirs, • Upstream of channel/floodplain constrictions, such as bridges and culverts
	Depth	• Dredging and berming, • Localized flow increases below stormwater and other outfalls	• Gravel mining, bar scalping, • Localized increases of sediment supply occurring at confluences and backwater areas
Boundary Conditions	**Resistance to power by the:**	**Stressors that lead to a decrease in resistance**	**Stressors that lead to an increase in resistance**
	Channel bed	Snagging, dredging, windrowing	Grade controls and bed armoring
	Stream bank and riparian	Removal of bank and riparian vegetation (influences sediment supply more directly than transport processes)	Bank armoring (influences sediment supply more directly than transport processes)

Channel Slope and Depth Modifier Maps (Sections 5.1.2a and b, respectively) can be used to determine whether stream power has been significantly increased or decreased. A Channel Boundary and Riparian Modifiers Map (Section 5.1.2c) can help explain whether the resistance to stream power has been increased or decreased. While the analysis here attempts to portray general trends in contributions these various features contribute to stream dynamics, the specific features are decidedly reach-scale, rather than watershed-scale stressors. Primary stressors in each reach are noted in sec. 6 for Project Identification.

5.1.2a Channel slope modifiers

Analysis of channel slope modifiers in the First Branch basin indicates that channel straightening is the predominant stressor in the basin, with indications of straightening observed in at least some portion of every reach and segment assessed in Phase 2 (Fig. 35).

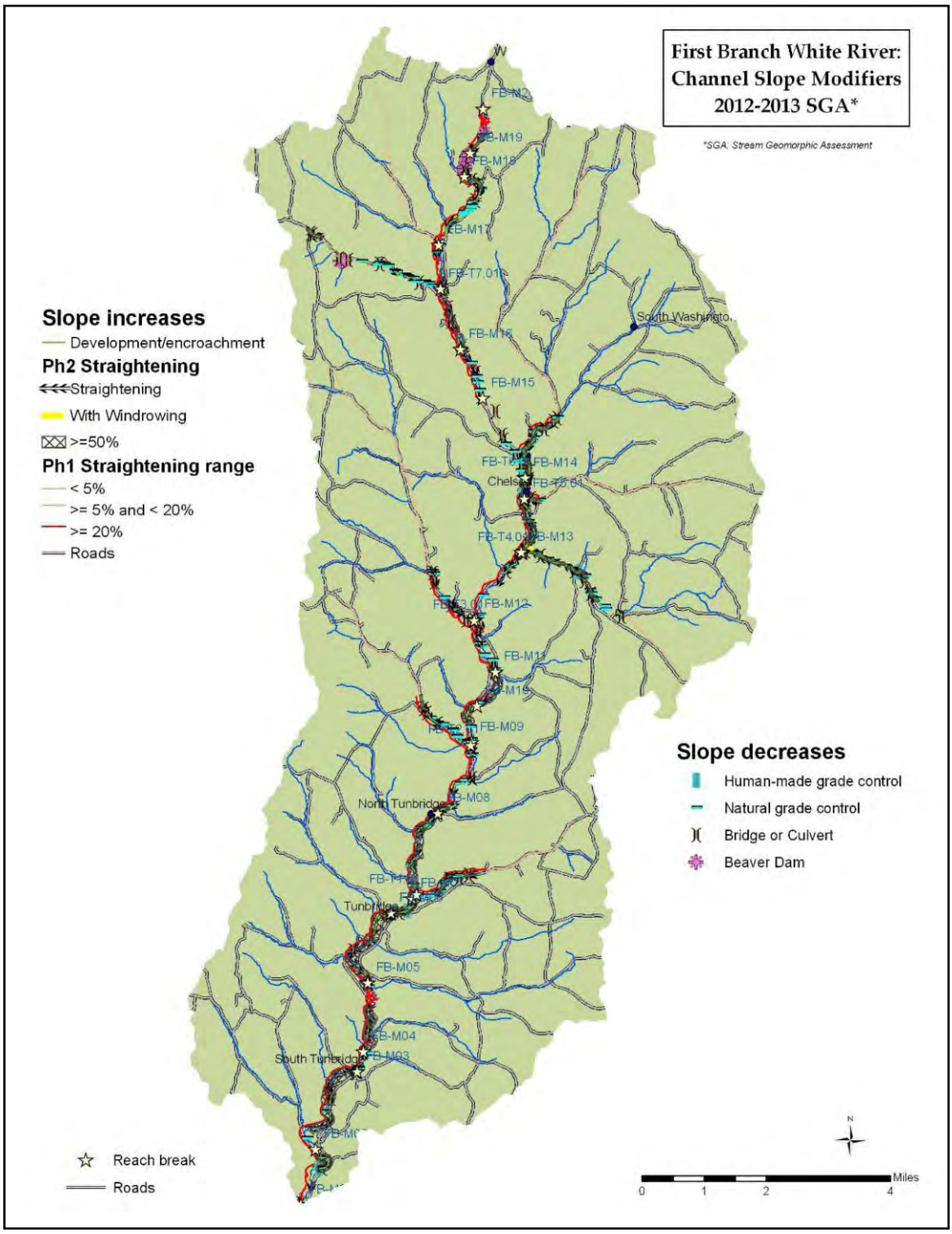


Figure 35. Channel Slope Modifiers map for the First Branch basin.

Channel straightening occurred historically through direct channel manipulation to supply mills on each of the assessed streams and likely other small tributaries of the watershed as well. In addition, straightening has occurred through a combination of incremental impacts including: road and development encroachments; structural

measures such as riprap and bank toe stabilization; less direct maintenance of the channel "in its place" through field cultivation and ditching; and remediation of flood damage through windrowing of stream sediments, removal of debris jams, and channel "clean-outs" in the areas of bridges and culverts damaged in floods and subsequently repaired or replaced.

Channel straightening can heighten stream power when slope increases occur as a stream loses its meanders (similar to putting a driveway straight up a steep slope rather than installing switchbacks). In areas with erodible bed materials, elevated stream power may contribute to bed downcutting (channel incision) that further enhances stream power and sediment transport capacity as a result of the increased slope and depth at flood stage. Due to the extensive presence of ledge grade controls widely distributed in the First Branch basin, this type of bed incision appeared to be largely limited to localized scouring in segments M05B (HoweAcres vicinity), M02B (near Vezina and Dodge Rd. bridges along Rte. 110 just south of the Tunbridge-Royalton town line) , a narrow but deep thalweg carved through heavy deposition of fines upstream of the Eaton dams in segment M01C, and rapid erosion of aggraded bed sediments behind beaver dams that were blown out by Irene in segments M19C (headwaters area at the base of Washington Heights along Rte. 110) and T7.01C (Jones Pond Brook along Edwards Rd. in Chelsea).

Beyond these very limited areas of bed incision, the large majority of the First Branch reaches and segments assessed in the 2012-2013 Phase 2 work largely experience the elevated streampower related to slope increases from channel straightening as increased bank pressure (erosion and mass failures) and intermittent channel migrations. The relatively extensive and widespread current distribution of sediments from these inputs leaves widespread areas shallow and subject to rapid temperature rises, particularly in areas lacking shade.

5.1.2b Channel depth modifiers

Common road encroachment within the predominantly narrow valleys of the First Branch means a general modification toward increased channel depth. This is frequently reinforced by development encroachments, especially in Chelsea, North Tunbridge and Tunbridge villages (Fig. 36), and further augmented by widespread high levels of stormwater inputs. Almost all of the bridges and culverts assessed in the First Branch basin were sized significantly below floodprone width and frequently less than channel bankfull width, so high level flows tend to increased depths when being funneled through these areas.

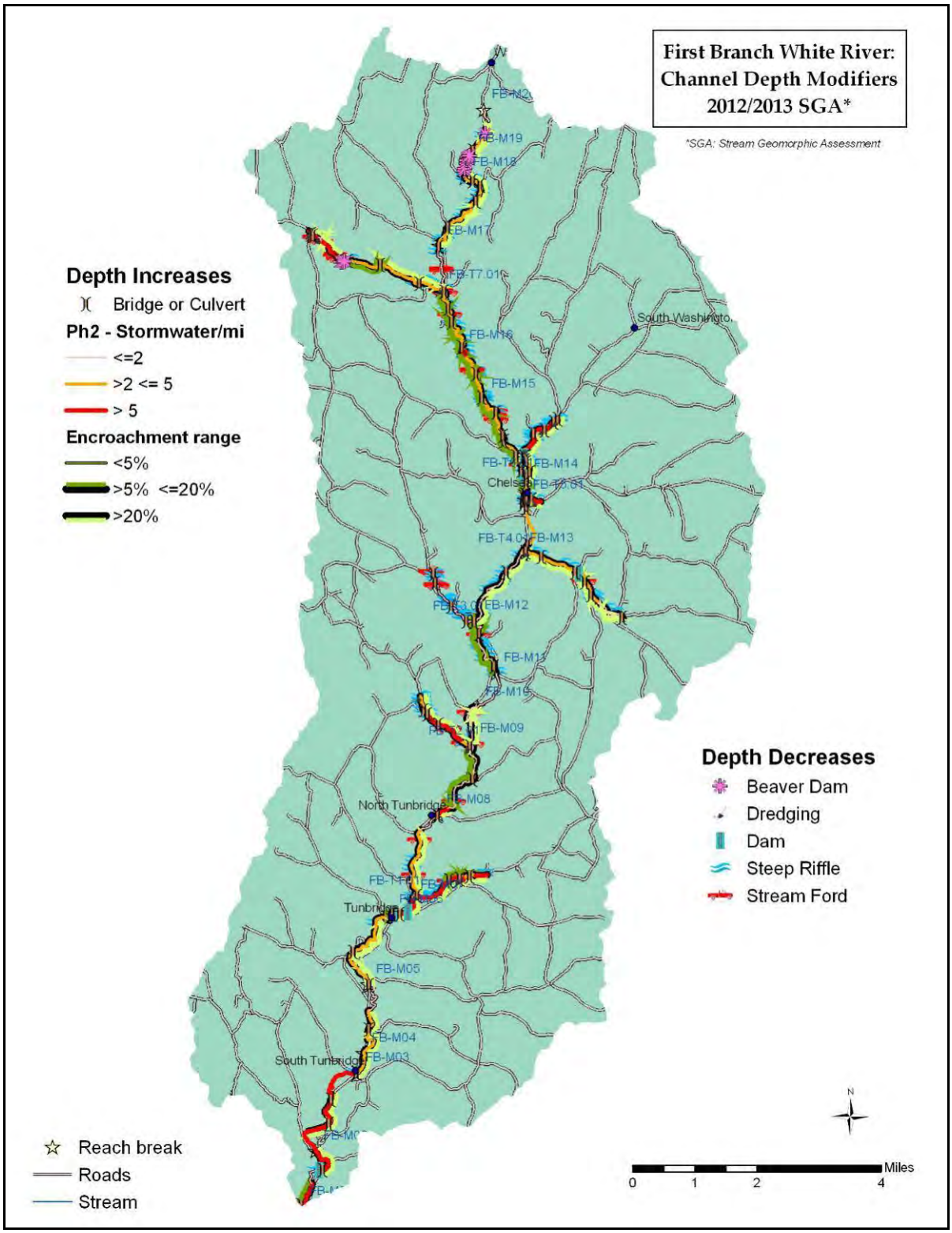


Figure 36. Channel Depth Modifiers map for the First Branch basin.

The far less frequent modifiers toward decreased channel depths in the First Branch basin were found in areas of beaver activity, or associated with widely distributed delta and backwater deposits formed upstream of channel constrictions (primarily dam remains, undersized bridges and culverts or old abutments) or alluvial fans at the bases of steep tributaries. Beaver dams on Jones Pond Brook (segment T7.01C) and the upper portions of the First Branch mainstem (M19C) were breached in Irene and rapid incision through these sediments was currently offsetting some of these depth decreases. This is likely to be a temporary situation as beavers will likely re-occupy these areas.

Depositional features were rarely found exceeding a "high" threshold of depth equal to half the channel width, so overall depth decreases were minimal in comparison with the tendencies toward increased channel depths. Stream fords, though relatively common in the basin, were contributors to rather localized depth decreases and attendant channel widening; limited dredging in the basin was conducted primarily at ford locations. Deposits at the base of reach T1.01 near the Tunbridge Recreation field and reach T7.01 where it joins the First Branch just north of Edwards Rd. were removed from the stream, offsetting these depth decreases, and the windrowing of these sediments at the recreation field significantly modified the channel toward greater depths. Numerous bridges and culverts in the assessment area appeared to have been similarly "cleaned out" and windrowed over time, amplifying the increased depth modifications of the structures themselves.

Although there are instances where roads are at the same grade as the surrounding terrain, elevated roads within the river corridor increase the depth of flood flows and thus increase stream power. Phase 1 and 2 data collection indicate encroachments (primarily from roads) exceeding 20% of the length of the stream segment on 35 of 61 segments (in 21 of 26 reaches assessed in Phase 2) in the First Branch basin. An additional 11 segments have encroachments along 5-20% of the segment length, leaving 15 segments in 12 reaches without significant road encroachments in the stream corridor.

"High" stormwater input levels exceeding five inputs per stream mile tend to impact smaller tributary streams and upstream portions of the mainstem more heavily than the larger downstream portions of the channel. Field assessments found "high" levels of stormwater inputs in 19 of 61 segments in 11 of 26 reaches in the First Branch basin, with an additional 23 segments registering "moderate" levels of 2-5 stormwater inputs per stream mile (total of 42 of 61 segments in 20 of 26 reaches impacted to some degree).

5.1.2c Boundary condition and riparian modifiers

Stream boundaries include bed and banks, and are strongly affected by the underlying geology and the state of buffer vegetation in the riparian corridor. Root systems from woody vegetation (and, to a lesser extent, herbaceous vegetation) help bind stream bank soils and diffuse stream power.

Coarse bed substrates (often including ledge grade controls) were present in at least part of every reach assessed in Phase 2 (Fig. 37), indicating that the vast majority of erosional processes and similar effects of heightened streampower will be evidenced on stream banks, greatly increasing the importance of stream buffers with adequate woody vegetation to stabilize banks.

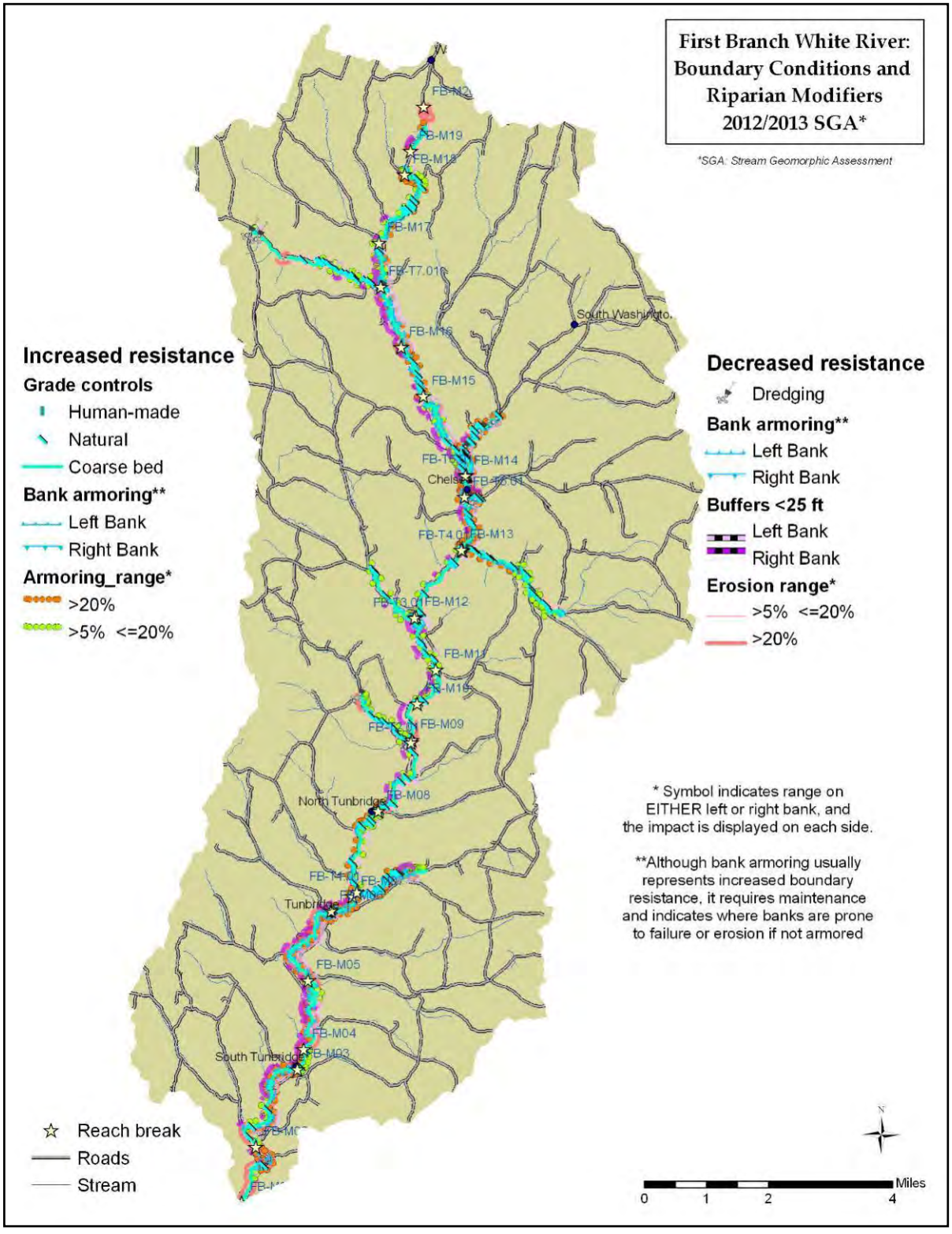


Figure 37. Boundary Conditions and Riparian Modifiers map for the First Branch basin.

While bank armoring and revetments have commonly been used in the basin to attempt bank stabilization in areas lacking buffers, these structures require maintenance and are prone to failure over time as erosional processes work behind them; many areas exhibited strong evidence of increasing failure and/or deferred maintenance. The costs of this type of maintenance continues to escalate and has largely transferred impacts to downstream reaches and heightened the effects.

Beyond beaver-controlled areas, only 4 stream segments lacked coarse bed substrates: M01C upstream of the Eaton dams in South Royalton; M14A behind the Brookhaven School in Chelsea, which includes a small dam on the First Branch that creates a recreational swimming area; T1.01C in the relatively open hayfields along the Strafford Rd. roughly one mile uphill from the First Branch mainstem; and T7.01E in what was likely the old barnyard (and open fields) of a barn along Edwards Rd. that was burned in a fire department training drill in late 2011 or early 2012. Buffers are lacking in all of these areas and stream health would benefit from establishment and maintenance of woody vegetation, but in the event that this kind of project is implemented in these areas the bed elevations may need to be monitored to ensure that bed erosion does not begin to escalate to the extent of diminishing access to floodplain.

Although geologic materials in the northern portion of the First Branch basin are less erodible than the downstream portions highly influenced by glacial Lake Hitchcock sediments, no truly naturally cohesive banks were noted in assessed portions of the basin. With much of the channel length scoured to ledge over time, it is thus not surprising that 22 of 61 segments in 14 of 26 assessed reaches evidenced high levels of erosion (>20% of the segment length) on at least on of its two banks, and 51 of 61 segments in 24 of 26 assessed reaches showed at least moderate levels of erosion (>5% of the segment length) on at least one of the banks.

These erosion levels tell only part of the story in the First Branch basin, however. “High” levels of bank armoring (>20% of the segment length) were found on at least one of the banks on 32 of 61 segments in 18 of 26 assessed reaches, and “moderate” or higher levels of bank armoring (>5% of the segment length) were found on 52 of 61 segments in 25 of 26 assessed reaches. With much of this bank armoring showing signs of deferred maintenance or active erosion, it is clear that fluvial erosion hazards are a primary concern in the basin. Although bank armoring represents temporarily increased boundary resistance, it requires maintenance and usually indicates where banks are prone to failure or erosion if not armored. In addition, bank armoring frequently represents a hindering of channel evolution processes and a transfer of impacts (notably elevated stream power) to areas further downstream.

Wooded buffers along the streams are good in many areas, but are lacking a width of 25 feet in at least a portion of 46 of 61 assessed segments including some portion of every reach. Dominant buffer widths of <25 ft on at least one bank exist on 26 of 61 segments in 16 of 26 reaches, and including subdominant buffer widths of <25 ft on either bank brings this tally to 43 of 61 segments in 24 of 26 reaches. Some of these areas are due to road encroachments that present difficult planting conditions or conflicts with maintenance of infrastructure, but establishing and maintaining good wooded buffers generally can help slow the intensity and rate of water entering the stream, stabilize stream banks, physically diffuse stream power in high flows, and reduce maintenance

costs or needs for armoring and similar practices. Large woody debris located in the stream channel originating from wooded buffers can also help retain fine sediments within the watershed, maintain or rebuild access to floodplain, and moderate slope changes (Fig. 38), and was playing a notable role in doing this in portions of tributary reaches T.101 (along Strafford Rd. In Tunbridge), T2.01 (Dickerman Brook), T3.01 (Cram Brook along the East Randolph Rd. in Chelsea) and T4.01 (Jenkins Brook). Woody debris functioning in this role was notably absent on tributary reaches T6.01 (Hart Hollow Brook along the Upper Village Rd. in Chelsea), T5.01 (Jail Brook along Rte. 113 in Chelsea), and much of the First Branch mainstem.

Figure 38. Large woody debris visible in the background of this photo taken near the top of Jenkins Brook segment T4.01D plays an important role in retaining fine sediments within the basin as well as rebuilding access to floodplain in areas where the channel has cut down over time.

5.1.3 Sediment regime departure, constraints to sediment transport, and attenuation assets

Within a reach, the principals of stream equilibrium dictate that stream power and sediment will tend to distribute evenly over time (Leopold 1994). Changes or modifications to watershed inputs and hydraulic geometry create disequilibrium in the balance of these forces and lead to an uneven distribution of power and sediment (Fig. 39). Whether a project works with or against the physical processes at play in a watershed is primarily determined by examining the source, volumes, and attenuation of flood flows and sediment loads from one reach to the next within the stream network. If increasing loads are transported through the network to a sensitive reach, where conflicts with human investments are creating a management expectation, little success can be expected unless the restoration design accommodates the increased load or finds a way to attenuate the loads upstream (Kline 2010).

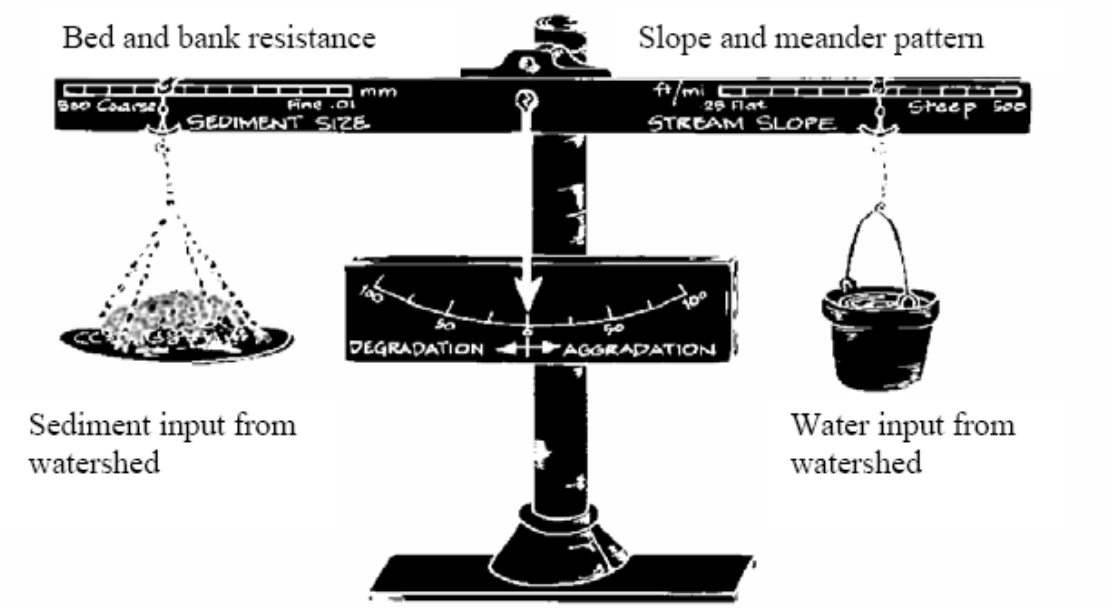


Figure 39. The channel balance indicates how changes in watershed inputs influence channel adjustment processes (Lane 1955).

When stream power and sediment are relatively balanced, the streams located in narrower valleys on steeper gradients in a watershed (primarily A- and some B-type streams) tend to exhibit a "Transport" sediment regime, contributing minor amounts of various sized sediments to downstream reaches but not storing many sediments. Streams in wider valleys with lower slope gradients (primarily C- and E- type streams) provide for sediment storage in a dynamic balance with water moving through the system (in = out: i.e., stream power, which is produced as a result of channel gradient and hydraulic radius, is balanced by the sediment load, sediment size, and channel boundary resistance). Under reference conditions, these streams would provide for coarse particle equilibrium and fine sediment deposition at annual flood flows, largely on the floodplains and at bendways and meanders (Coarse Equilibrium and Fine Deposition sediment regime, Fig. 40; Kline 2010, p.43).

Sediment Regime	Narrative Description
Transport	Steeper bedrock and boulder/cobble cascade and step-pool stream types; typically in more confined valleys, do not supply appreciable quantities of sediments to downstream reaches on an annual basis; little or no mass wasting; storage of fine sediment is negligible due to high transport capacity derived from both the high gradient and/or natural entrenchment of the channel.
Coarse Equilibrium (in = out) & Fine Deposition	Sand, gravel, or cobble streams with equilibrium bed forms; at least one side of the channel is unconfined by valley walls; these streams transport and deposit coarse sediment in equilibrium (stream power—produce as a result of channel gradient and hydraulic radius—is balanced by the sediment load, sediment size, and channel boundary resistance); and store a relatively large volume of fine sediment due to the access of high frequency (annual) floods to the floodplain. Look for unconfined streams, which are not incised or entrenched, have boundary resistance (woody buffers), minimal bank erosion, and vegetated bars. These streams are Stage I, late Stage IV, and Stage V.

Figure 40. Pertinent characteristics for Phase 1 classification of reference sediment regimes on First Branch basin reaches.

Based primarily on valley slope and confinement, Phase 1 assessments in the First Branch basin classified just 4 of the 26 reaches assessed in Phase 2 with Transport sediment regimes under reference conditions (Fig. 40); all of these are tributaries to the First Branch.

The remaining 22 reaches assessed in Phase 1 would be expected to have Coarse Equilibirium and Fine Deposition (CEFD) sediment regimes under reference conditions.

Sediment regime departure

Phase 2 sediment regimes (which help identify current departures from reference conditions) are determined based on a number of parameters measured in rapid field assessments (Kline 2010, p. 44). These include signs of active adjustment processes indicating that streams are in a state of disequilibrium, including a likely stage of channel evolution (Fig. 41; criteria listed left to right in order of relative importance).

Sediment Regime	Delimiting criteria related to sediment supply, transport, and storage	Stage of Channel Evolution Geomorphic Condition	Common Existing Stream Type	Natural Valley Type
Confined Source and Transport	Incision ratio > 1.3	Stage II-IV Fair-Good	A3, B3*	NC, SC, NW
	Incision ratio > 1.3	Stage II-IV Fair-Good	A4, A5 B4*, B5*	Any Type
Unconfined Source & Transport	Bank armor > 50% Straightening > 50% W/d < 30 Incision ratio > 1.3	Stage II - III Poor-Fair	G3, G4, G5 F3, F4, F5	NW, BD, VB
		Stage II - III Poor-Fair	E3, E4, E5 C3, C4, C5 B3c, B4c, B5c	NW, BD, VB
Fine Source & Transport and Coarse Deposition	Bank armor < 50% W/d > 30** Incision ratio > 1.3	Stage II-IV Poor-Fair	E3, E4, E5 C3, C4, C5 B3c, B4c, B5c F3, F4, F5	NW, BD, VB
	Bank armor < 50% Incision ratio > 1.3	Stage II-IV Poor-Fair	D3, D4, D5	NW, BD, VB
Coarse Equilibrium (in = out) & Fine Deposition	Incision ratio < 1.3	Stage I -V Fair-Good-Ref	D3, D4, D5	NW, BD, VB
	W/d < 30 Incision ratio < 1.3	Stage I -V Fair-Good-Ref	C2, C3, E3	NW, BD, VB
	W/d < 30 Incision ratio < 1.3	Stage I -V Fair-Good-Ref	C4, C5 E4, E5	NW, BD, VB

Figure 41. Pertinent parameters for characterizing existing sediment regime using Phase 2 data.
*B streams with the slope of a C stream, or a Bc stream type, in an unconfined valley setting (NW, BD, VB) may be classed as either "unconfined source and transport" or "fine source and transport & coarse deposition" depending on other delimiting criteria.
** Depositional Features may include multiple channel avulsions and multiple chute cut-offs

The only stream segment noted in a stable stage (I or V) of channel evolution during 2012-13 assessments was First Branch mainstem segment M18A just south of Tilton Rd. in Washington.

Once a stream has entered a state of disequilibrium, it will begin a series of channel adjustments or evolutions to fulfill the physical mandates of restoring equilibrium. Schumm (1977 and 1984) has described five stages of channel evolution for reaches where the stream has a bed and banks that are sufficiently erodible to be shaped by the stream over time ("F-model" evolution; Fig. 42). The five stages of channel evolution for F-model evolution are paraphrased from the SGA protocols (VT-RMP_ApxC 2007) as follows:

I. Stable — In regime, reference to good condition. Insignificant to minimal adjustment; planform is moderately to highly sinuous.

II. Incision — Fair to poor condition, major to extreme channel degradation. High flow events are contained in the channel, and channel slope is typically increased.

III. Widening/Migration — Fair to poor condition, major to extreme widening and aggradation. (An incised, entrenched and widened channel is an "F-type stream", hence F-model evolution)

IV. Stabilizing — Fair to good condition, major reducing to minor aggradation, widening and planform adjustments

V. Stable — In regime, reference to good condition. Insignificant to minimal adjustment.

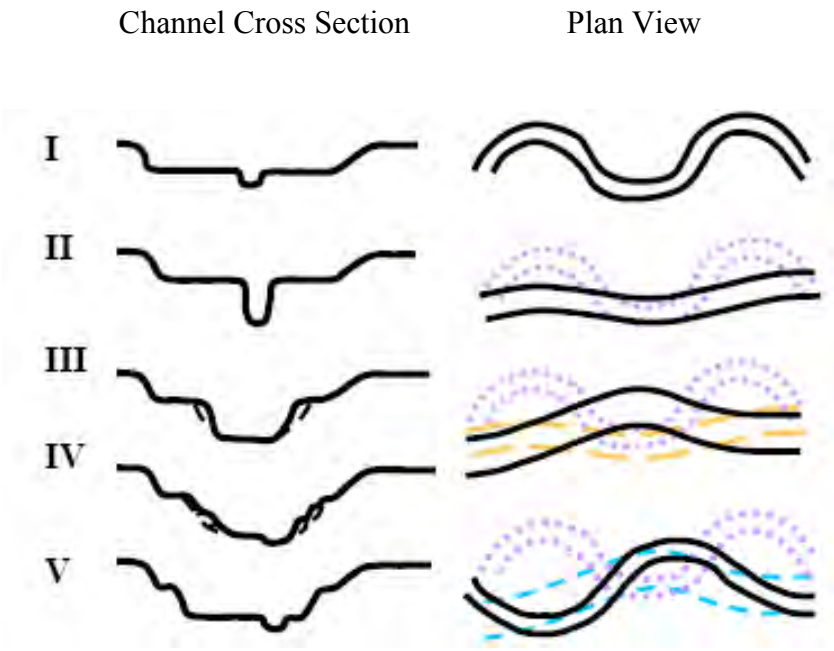


Figure 42. Channel evolution process showing channel downcutting or incision in Stage II (cross section), widening through Stages III and IV, and floodplain reestablishment in Stage V. Stages I and V represent equilibrium conditions. Plan view shows straightening and meander redevelopment that accompany cross-section changes, a primarily flood-driven process often taking place over decades (VT-RMP_ApxC 2007).

One stream segment in the First Branch basin, T7.01E (in what was likely the old barnyard and open fields of a former barn along Edwards Rd. in Chelsea), exhibited a

second model of channel evolution ("D-model" evolution) that is more typical in areas where stream banks are more erodible than the bed. Under these conditions the stream does not significantly incise and instead evolves primarily through widening and/or lateral movement. The three stages for D-model channel evolution are paraphrased from the SGA protocols (VT-RMP geoassesspro 2007, Appendix C) as follows:

> **I. Stable** — in regime, reference to good condition. Insignificant to minimal adjustment; planform is moderately to highly sinuous.

Then either of the following Stage II scenarios may occur:

> **Stage IIc. Widening/Migration** — Widening and migrating laterally through bank erosion caused by increased stream power. The balance between stream power and boundary materials is re-established when the slope flattens after a process of channel lengthening and increased sinuosity.
>
> **Stage IId. Braiding** — Extreme deposition and braiding, with water flowing in multiple channels at low flow stage ("D" stream type). Channel width narrows through aggradation and the development of bar features. Main channel may shift back and forth through different channels and chute cut-offs, continuing to erode banks or terraces.

Stage III. Stable — Channel adjustment process is complete (back to a B, C or E stream type).

With field-assessed measures such as bank armoring, straightening, channel incision, and stage of channel evolution accounted, Phase 2 assessment helps identify an existing sediment regime for each stream segment. Comparing reference sediment regimes (Phase 1 assessments) side by side with field-assessed existing sediment regimes (Fig. 43) gives a sense of sediment regime departure within the watershed.

Phase 2 assessments in the First Branch basin indicated that, in contrast to 22 Phase 1 reaches that would function as Coarse Equilibrium and Fine Deposition (CEFD) areas under reference conditions, only 11 of 61 segments in 8 reaches currently function with CEFD sediment regimes. While this indicates greatly diminished functions for sediment, nutrient and floodwater storage within the watershed, the fact that the 11 segments are intermittently spaced through the watershed (Fig. 43) is helpful in terms of overall stream functions and health. In addition, extensive and widely distributed ledge grade controls in the basin have limited channel incision to an extent such that key floodplains are still accessed in high level flows (such as Irene and the flash floods that hit the upstream portions of the watershed in 2009). The large majority of assessed reaches in the basin have been converted to some sort of transport sediment regime, however, and the impacts of high flows and fine sediment transport in particular are being transferred downstream, to the pronounced detriment of streamside properties and instream habitats.

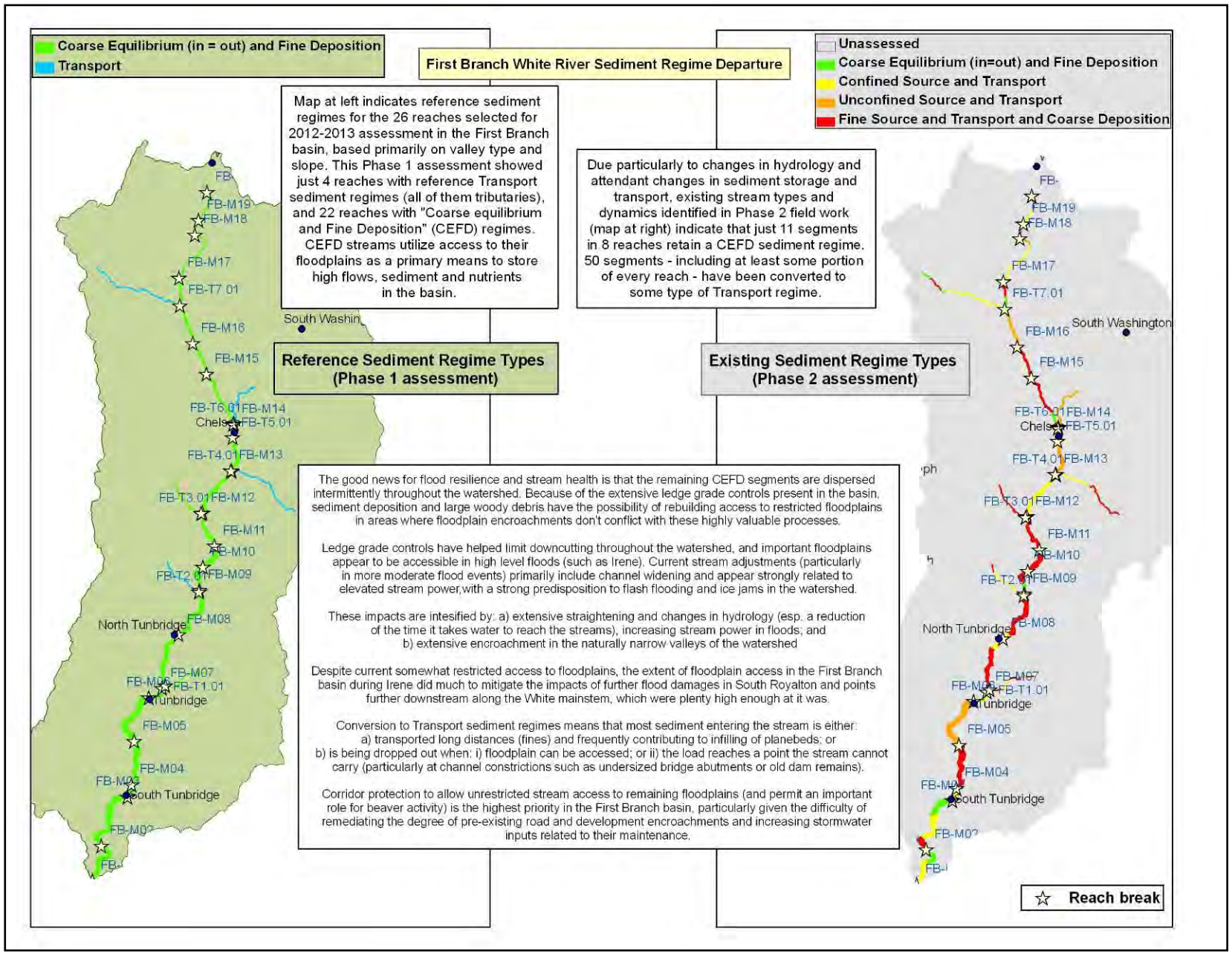


Figure 43. Sediment Regime Departure map for the First Branch basin.

Due to the significant conversion of CEFD sediment regimes to various transport sediment regimes in Phase 2 reaches, fine grained "washload" materials are frequently being transported long distances through the First Branch basin and into the White River mainstem, dropping out primarily when low velocity conditions are encountered and frequently contributing to infilling of planebeds (sedimented areas of the stream with no major elevations or depressions) throughout the basin but especially in downstream reaches. Coarser "bedload" sediments appear to be:

- primarily moving through the stream network in sediment "slugs" discharged in flash flood events and then slowly moved through the system or incorporated into planform changes as the stream evolves in lower level, annual or bi-annual flood events (i.e., "channel-forming" or "bankfull" flows; Fig. 44);
- accruing at overwidened sections of stream or channel constrictions such as undersized bridges or culverts, dam remains or old abutments (Fig. 45); or
- disrupted from setting up stable bed features by more flash flooding, gravel removal, or to "clean out" the stream above constrictions (particularly following flood events; see picture and discussion in Chapter 6.1 Reach description for reach T1.01)

Figure 44. This "sediment slug" in reach M04B is one of several connected with erosion and mass failures in 1998 and 2002 flash flooding near the HoweAcres farm fields along the east side of Rte. 110; these have slowly redistributed and/or reconfigured in subsequent flood events and "bankfull flows".

Figure 45. Deposition upstream of the breached historic Farnham Bros. Mill dam is contributing to planform change that increases the risk for a mass failure beneath the Strafford Rd. just downslope of Recreation Rd., the main access to the Tunbridge Town Garage.

Fine Source and Transport and Coarse Deposition regimes (coded red in Fig. 43) now exist in 22 stream segments that lack extensive bank armoring and are characterized by channel widening, elevated levels of erosion and concentrated deposition at channel constrictions (including upstream of undersized bridges and culverts, current and

breached dams, and old abutments), tributary mouths, and overwidened sections of the stream. These segments are widely distributed throughout the basin on both mainstem and tributary reaches.

Unconfined Source and Transport sediment regimes (coded orange in Fig. 43) currently exist in 11 segments, primarily located on mainstem reaches but also including likely alluvial fan areas and/or deltaic formations at the base of Jenkins and Jail Brooks (T4.01A and T5.01A) and along Hart Hollow Brook (T6.01A and B). Many of these areas appear to have repeat dredging or "clean-out" areas upstream of undersized structures or to have been ditched historically, and large stone removed from the channel has frequently been used to line the banks in these areas either through windrowing or more deliberate riprapping and bank toe stabilization. The primary exception to this appears to be in reach M05, which includes the area downstream of the intact Hayward & Noble dam and the area in the vicinity of the Tunbridge Fairgrounds; these areas appear to have had stone brought in to line the banks both historically and in more recent times. While these areas would have floodplain access and storage under reference conditions, historic and current channel management practices leave little ability to store sediments or high flows and thus transfer impacts to downstream reaches.

Confined Source and Transport sediment regimes (coded yellow in Fig. 43) currently exist in 16 segments in the narrower valleys of the First Branch basin, which are prone to mass failures and erosion along the valley walls that contribute sediment discharges that quickly transfer to downstream reaches due to elevated stream power in these narrow valleys. While these segments are commonly in the deeply dissected tributary and mainstem headwaters valleys that share space with extensive road encroachments, often pinning the stream between road embankments and steep valley walls, they are somewhat surprisingly common along the lower reaches of the First Branch mainstem as well. This appears to be a legacy of glacial Lake Hitchcock influence, which left behind narrow valleys post-glacially when the Lake drained or incised deeply over time through these highly erodible sediments. Although more recent historic incision has given these segments relatively low incision ratios that indicate access to restricted floodplains is not that far above the current level of the stream channel, much higher terraces (often multiple terraces) are frequently visible along these valley walls, indicating successive floodplain abandonment and former access to much broader floodplains. Rte. 110 commonly encroaches on one side of these segments, and several of these segments are further "locked in" by another road on the opposite valley wall.

With flash flooding playing a prominent role in the dynamics and sediment regime of the First Branch basin, as well as the extensive stretches of ledge grade controls in the basin, restricted access to historic floodplains (noted on 50 of 61segments assessed in Phase 2) and consequent heightened stream power play a large role in disrupting sediments from setting up stable bed features and pools. Windrowing of coarse materials (i.e., pulling or pushing them to the edges of the stream, a common response to sediment slugs following flash floods) and bank armoring are likely to greatly curtail the rate of channel evolution and exacerbate the impacts of increased stream power on downstream reaches. This is particularly true in the northern portions of the basin and on tributary reaches due to the less erodible geologic materials present outside the downstream (south of Chelsea) and riparian extent of glacial Lake Hitchcock.

Channel adjustments due to increased flows can be difficult to remediate in downstream reaches (Booth and Jackson 1997), potentially prolonging the stages of disequilibrium in these streams and leaving them open to heightened flood impacts in future events. This places a premium on attenuation of high flows and sediment discharges in the shortest distance downstream possible, and increases the importance of:

a) protecting and maintaining floodplain access even on small streams high in the watershed, including current beaver-controlled areas;

b) limiting development and encroachments within stream corridors;

c) establishing and maintaining woody buffers in riparian corridors and

d) managing stormwater inputs to minimize direct discharges to streams.

Constraints to channel evolution

As noted frequently in this report, ledge outcrops that help prevent further bed incision (thus providing limits to vertical channel evolution) are common and widely distributed in the First Branch basin. Due in large part to the extensive presence of ledge grade controls, widening and planform adjustments are the dominant phase of channel evolution in the First Branch basin (57 of 61 segments including portions of every reach are in Stage III channel evolution). These lateral adjustments are indicative of the primary channel evolution needed to move streams toward more stable conditions.

Only two segments in the assessment area were listed with the lateral constraint of dominantly cohesive banks: T5.01B, the upstream portion of Jail Brook along Rte. 113 in Chelsea village; and T7.01A, the downstream portion of Jones Pond Brook which is further away from Edwards Rd. than upstream portions of this tributary and contains some nice cascade series in a hemlock-northern hardwood ravine. There are also relatively few, largely localized, natural constraints to lateral adjustment processes, with just four bedrock constrictions listed in the entire assessed area: one in the aforementioned segment T7.01A, one along the Strafford Rd in segment T1.01A, and two along the Upper Village Rd. in Chelsea in segment T6.01B.

Given this low level of natural lateral constraints, reference conditions in the First Branch basin would largely feature unrestricted lateral movement and floodplain access to achieve the adjustment processes and channel evolution that maintain channel equilibrium. Human-constructed constraints to lateral channel evolution are thus considered primary stressors in the basin, and settlement patterns in the watershed have featured extensive road encroachment and concentrated development in a number of villages situated in close proximity to the stream (Fig. 46).

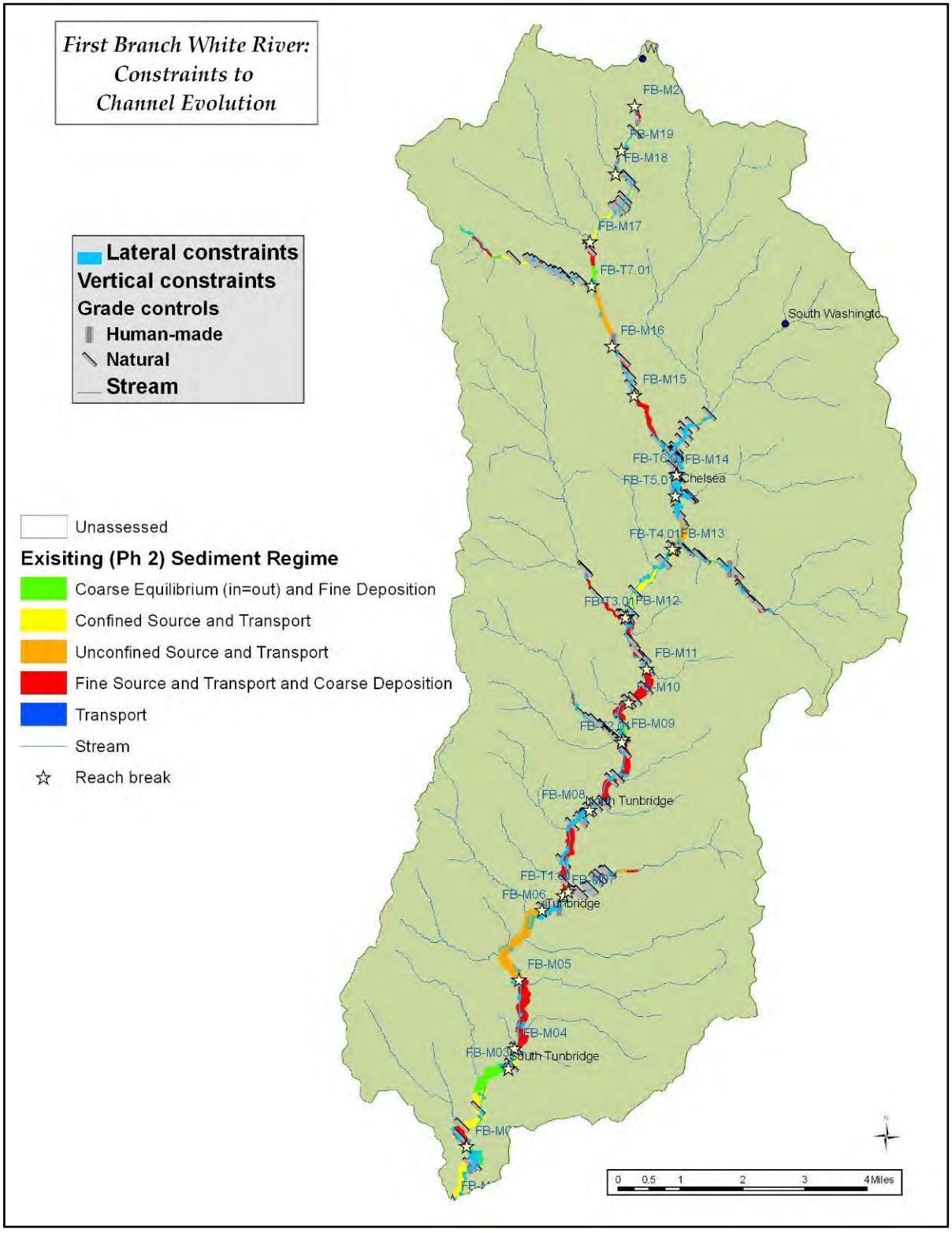


Figure 46. Map of existing sediment regime in conjunction with vertical and lateral constraints to channel evolution in the First Branch basin.

With few natural constraints to widening and planform adjustments, the physical mandates of stream adjustments to flash floods and other events (and changes that have amplified the impacts of these types of events - particularly straightening, encroachments and increased stormwater inputs) are likely to impact human-constructed lateral constraints and/or present recurrent management conflicts. This implies escalating costs and effort to remediate conflicts with human-constructed lateral constraints already established in stream corridors within the basin, and emphasizes the value of minimizing future conflicts by limiting introduction of new lateral constraints. Minimizing these costs and efforts regarding existing encroachments will greatly benefit from careful attention to protecting existing floodplain access as well as seeking opportunities to remove or minimize constraints that have restricted floodplain access, both of which will help reduce the impacts of heightened stream power.

The few areas that lack ledge grade controls (notably localized portions of segment M01C upstream of the Eaton dams, M02B along Rte. 110 in the vicinity of the Vezina and Dodge Rd. Bridges, and M04B along some of the HoweAcres fields) evidence significant scouring and long and/or deep runs that indicate a dynamic of bed erosion that might be far more common in the basin were these ledge grade controls not so extensive. In Chelsea village downstream of the walled-in segment M13C that was the location of the historic Chelsea Mills, placement of check dams in segment M13B (Fig. 47) are an acknowledgment of possibilities for downcutting. The possibilities for incision are amplified by the extensive bank armoring just upstream, which limits the possibilities for widening and planform adjustments as an alternative response to heightened stream power. These wooden check dams require maintenance to prevent downcutting, but can limit further loss of floodplain access that would further intensify the effects of heightened stream power. Their presence in conjunction with the walled segment upstream means the impacts of elevated stream power are largely transferred further downstream however; extensive erosion further downstream along the banks by the Heath Recreation Field and the town treatment plant evidence some of the effects of this transfer.

Figure 47. This wooden check dam (foreground) is one of two placed to limit bed incision downstream of Maple Ave. and the walled-in segment M13C that was the site of the historic Chelsea Mills.

Attenuation assets

Given a significant degree of lateral constraints in the First Branch basin, protection of existing floodplains as "attenuation assets" will play a critical role in mitigating flood impacts by accommodating and diffusing high flows and storing sediments and nutrients rather than transferring these impacts downstream. Although all of the mainstem reaches would be attenuation assets to some degree under reference conditions, the current configuration of vertical and lateral constraints converts many portions of these reaches to transport segments and reduces the value of many stream segments as attenuation assets (Tables 11-13).

Table 11. Departure Analysis Table for the First Branch mainstem south of Chelsea, indicating where river segments are constrained from adjustment, converted to transport streams, and/or have existing or future potential as a place to attenuate sediment load.

	Constraints		Transport		Attenuation (storage)		
River Segment	**Vertical**	**Lateral**	**Natural**	**Converted**	**Natural**	**Increased**	**Asset**
First Branch Mainstem - south of Chelsea (approx. extent of glacial Lake Hitchcock)							
M01-A	none	human		x			
M01-B	none	human		x			limited
M01-C	natural- human	human				x	limited
M02-A	natural	human		x	x	x	x
M02-B	natural	human		x			
M02-C	none	human (limited)					x
M03-0	natural	human		x			
M04-A	none	human		x		x	x
M04-B	none	human (limited)		x	x	x	x
M05-A	none	human		x			limited, DS end
M05-B	none	human (limited)		x		x	
M06-0	natural-human	human		x		x	
M07-A	natural	human		x	x	x	x
M07-B	natural	human		x			
M08-A	natural	human		x			
M08-B	natural	human		x			
M09-A	natural	human			limited	x	x
M09-B	natural	human		x	limited	x	limited
M10-0	natural	none		x	x	x	x
M11-0	natural	human (limited)		x	x	x	x

Table 12. Departure Analysis Table for the First Branch mainstem from Chelsea north, indicating where river segments are constrained from adjustment, converted to transport streams, and/or have existing or future potential as a place to attenuate sediment load.

	Constraints		Transport		Attenuation (storage)		
River Segment	**Vertical**	**Lateral**	**Natural**	**Converted**	**Natural**	**Increased**	**Asset**
First Branch Mainstem - Chelsea north							
M12-0	natural	human		x	x		
M13-A	natural	human		x	x		
M13-B	natural-human	human		x	x		
M13-C	none	human				x	
M13-D	natural	human			x		limited
M14-A	natural-human	none		x		x	x
M14-B	natural	human					limited, DS end
M14-C	natural	human (limited)		x		x	limited, mid-upper
M15-A	natural	human		x		x	
M15-B	none	human		x	x		
M16-A	human	human (limited)		x	x		limited geologically
M16-B	none	human (limited)			x		limited - bridge
M16-C	human	human (limited)		x	x	x	x
M17-A	natural	human		x	x		
M17-B	nautral	human		x	x		limited
M18-A	none	human (limited)					limited
M18-B	none	human (limited)			x	x	x
M19-A	natural	human		x			
M19-B	none	none			x	x	x
M19-C	none	human		x	x	x	x

Table 13. Departure Analysis Table for reaches on select tributaries to the First Branch (T1.01 and T2.01 in Tunbridge, remainder in Chelsea).

	Constraints		Transport		Attenuation (storage)		
River Segment	**Vertical**	**Lateral**	**Natural**	**Converted**	**Natural**	**Increased**	**Asset**
Unnamed tributary along Strafford Rd							
T1.01-A	natural	human		x	x	x	x
T1.01-B	natural	human		x			
T1.01-C	natural	human		x	x	x	x
T1.01-D	none	human (limited)		x	x		x
T1.01-E	none	human (limited)		x	x	x	x
Dickerman Brook							
T2.01-A	natural	human		x	x	x	
T2.01-B	natural	human (limited)		x		x	x
T2.01-C	none	human		x		x	x
Cram Brook							
T3.01-0	natural	human (limited)		x	x	x	limited
Jenkins Brook							
T4.01-A	none	none		x	x		limited
T4.01-B	natural	human		x			
T4.01-C	natural-human	human		x	x	x	limited
T4.01-D	natural	human (limited)		x	x	x	limited
Jail Brook							
T5.01-A	none	human		x	x		
T5.01-B	natural	human		x			
Hart Hollow Brook							
T6.01-A	natural-human	none		x	x	x	?
T6.01-B	natural	human		x	x	x	
Jones Pond Brook							
T7.01-A	natural	human		x	limited		limited, DS end
T7.01-B	natural	human (limited)		x		x	
T7.01-C	none	none			x		x
T7.01-D	none	human		x		x	limited
T7.01-E	none	human			x		x
T7.01-F	none	human			limited		limited

5.2 SENSITIVITY ANALYSIS

The preceding departure analysis identifies the watershed and reach-scale stressors that help explain current sediment regime departure in the 2012-13 Phase 2 assessment area of the First Branch basin. Designing stream corridor protection and restoration projects that are compatible with channel evolution processes, and prioritizing them at the watershed scale, also require an understanding of stream sensitivity.

Sensitivity refers to the likelihood that a stream will respond to a watershed or local disturbance or stressor, and an indication as to the potential rate of channel evolution (VT-RMP 2009, Phase 2, Step 7.7; Kline 2010, Section 5.1.3). While every stream changes in time, a sensitivity rating indicates that some streams, due to their setting and location within the watershed, are more likely to be in an episodic, rapid, and/or measurable state of change or adjustment.

None of the stream segments assessed in Phase 2 in the First Branch basin were rated with Moderate or Low sensitivity. All fully assessed stream segments in the basin are Highly to Extremely sensitive to disturbance and stressors, and thus also capable of a relatively rapid response (channel evolution to reestablish equilibrium conditions) if stressors are addressed (Fig. 48). This is in part due to the selection of primarily C- (and a few E-type) streams for Phase 2 assessment, which are by nature relatively sensitive and capable of recovery to equilibrium conditions in response to restoration efforts (Rosgen 1994). The entire mainstem of the First Branch would consist of these types of streams under reference conditions.

Stream sensitivity in the basin is strongly correlated with the extent of glacial Lake Hitchcock; only one mainstem segment and portions of the three tributaries (T1.01, T2.01 and T3.01) in the southern portion of the watershed corresponding with the extent of that Lake are rated with High (as opposed to Very High or Extreme) sensitivity to changes in watershed inputs. In all, there were 19 segments with High sensitivity; 33 with Very High; and 9 segments with Extreme sensitivity.

Due to the extensive ledge grade controls in the basin, primary adjustments are lateral (widening and/or planform changes); 58 of 61 assessed segments indicate lateral adjustments, with 33 of these 58 showing signs of aggradation contributing to these lateral adjustments.

The relatively high sensitivity of streams throughout the Phase 2–assessed area indicates good possibilities for success of passive geomorphic projects, which would allow the river to utilize its own energy and watershed inputs to reestablish meanders, fuller access to floodplains, and self maintaining equilibrium conditions over time. The widespread nature of this assessment indicates that the most effective approach to restoring balanced conditions along the streams of the First Branch basin can happen through municipal approaches that would limit further encroachments along stream corridors, permitting these processes to proceed unimpeded. Due to the widespread and cumulative nature of the primary stressors in the basin (particularly changes to hydrology due to road density, encroachment, and drainage and stormwater management associated with diffuse settlement patterns and the maintenance of a dense road network) such an approach is in fact strongly indicated for increasing the possibilities of success on projects implemented on a parcel by parcel basis.

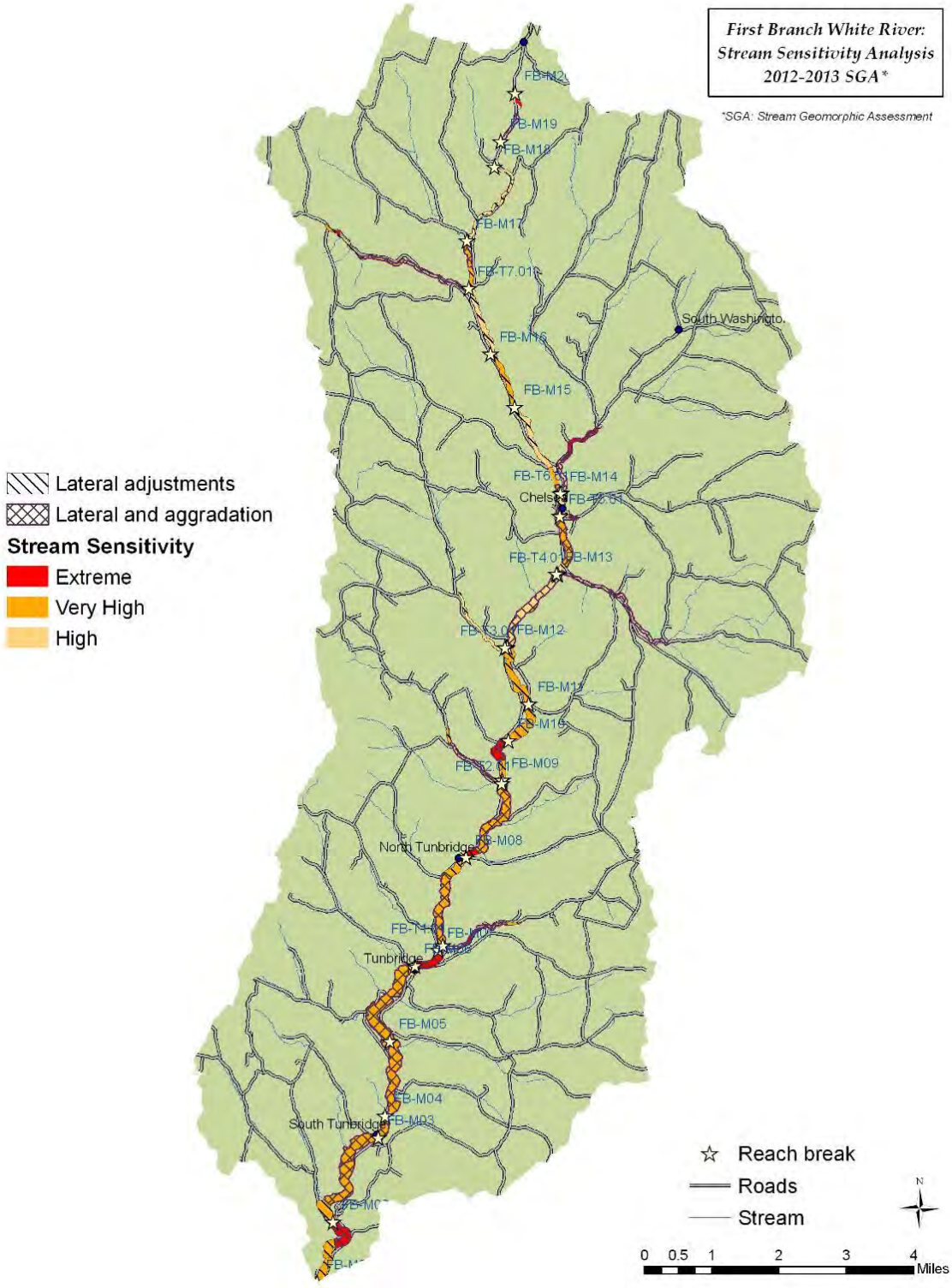


Figure 48. Stream sensitivity and current adjustments map for the First Branch basin.

The widespread distribution of sensitive reaches means that the design and success of downstream restoration projects will frequently be affected by discharge and sediment loads in adjoining upstream reaches. Important stretches of beaver-controlled segments exist on the First Branch mainstem in reaches M19 and M18 as well as on Jones Pond Brook in segment T7.01C, and these areas are important to protect for their role in these dynamics as they generally mean that impacts upstream of these areas are deterred from passing further downstream.

In addition, concentration of the most highly sensitive reaches in the downstream portions of the basin (due to the lake Hitchcock influence) means that response to restoration efforts will be slower in upstream portions, and impacts that continue to be passed downstream (such as increased flows) will tend to drive instability and rapid responses downstream. A similar dynamic is in play in the northern portions of the basin as well, since all of the Very High and Extreme sensitivity segments are situated downstream of stream segments that are either less sensitive or were not assessed in the Phase 2 study but were indicated with significant hydrologic input and land use-land cover changes during the Phase 1 assessment.

6.0 PROJECT IDENTIFICATION

6.1 REACH DESCRIPTIONS—PRELIMINARY PROJECT IDENTIFICATION

Within the context of the overarching considerations discussed in previous sections of this report, reach descriptions highlighting factors leading to preliminary project identification are presented on a reach-by-reach basis in the following pages. “Left bank” and “right bank” in the reach descriptions are referenced looking downstream.

Single page maps are included with the text for ease of reference in regards to the text. Background imagery for these maps is from 2012 natural color orthoimagery with a source scale of 1:5000 (VCGI orthos 2012). For more detail and flexibility in choosing areas of interest, readers are highly encouraged to utilize the online interactive Natural Resource Atlas hosted by the Vermont Agency of Natural Resources, where data from these assessments can be viewed within the ‘Rivers Management Theme’ (VT-ANR 2013; Fig. 49).

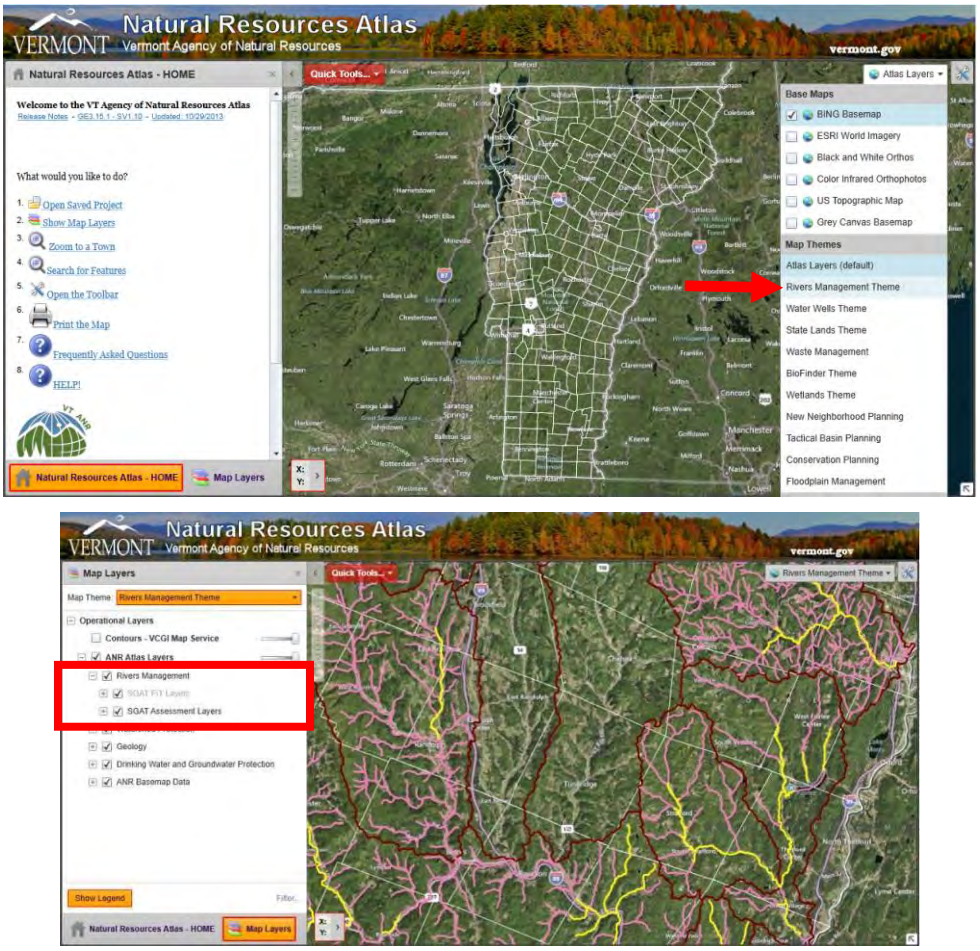


Figure 49. Data from Stream Geomorphic Assessments can now be viewed on the online interactive Natural Resource Atlas (VT ANR 2013).

Reach maps in this report include a Phase 1 preliminary "belt width corridor" drawn on either side of the stream. The width of this corridor (generally a minimum of 3-4 times the stream channel width) is based on over 30 years of research and data collected from hundreds of streams around the world, and approximates the extent of lateral adjustments likely to occur over time in a meandering stream type (VT ANR 2009 Protocols, Appendix H). "Human investments within the belt width inevitably result in structural constraints placed on the channel adjustment process to protect those investments and address associated threats to public safety. These threats will be largely avoided by recognizing the hazards created by development, incompatible with channel adjustments, within the critical belt width" (VT ANR 2009 Phase 2 Protocols, p.17). Segments M18-B and M19-B were excluded from full geomorphic assessments due to impoundment by beavers, and do not include project identification. Features that were assessed are briefly discussed for these segments.

6.1 Reach FB-M01 – First Branch mainstem from confluence with the White mainstem (Rtes. 14 and 110 in South Royalton) upstream to north end of Branch View Cemetery

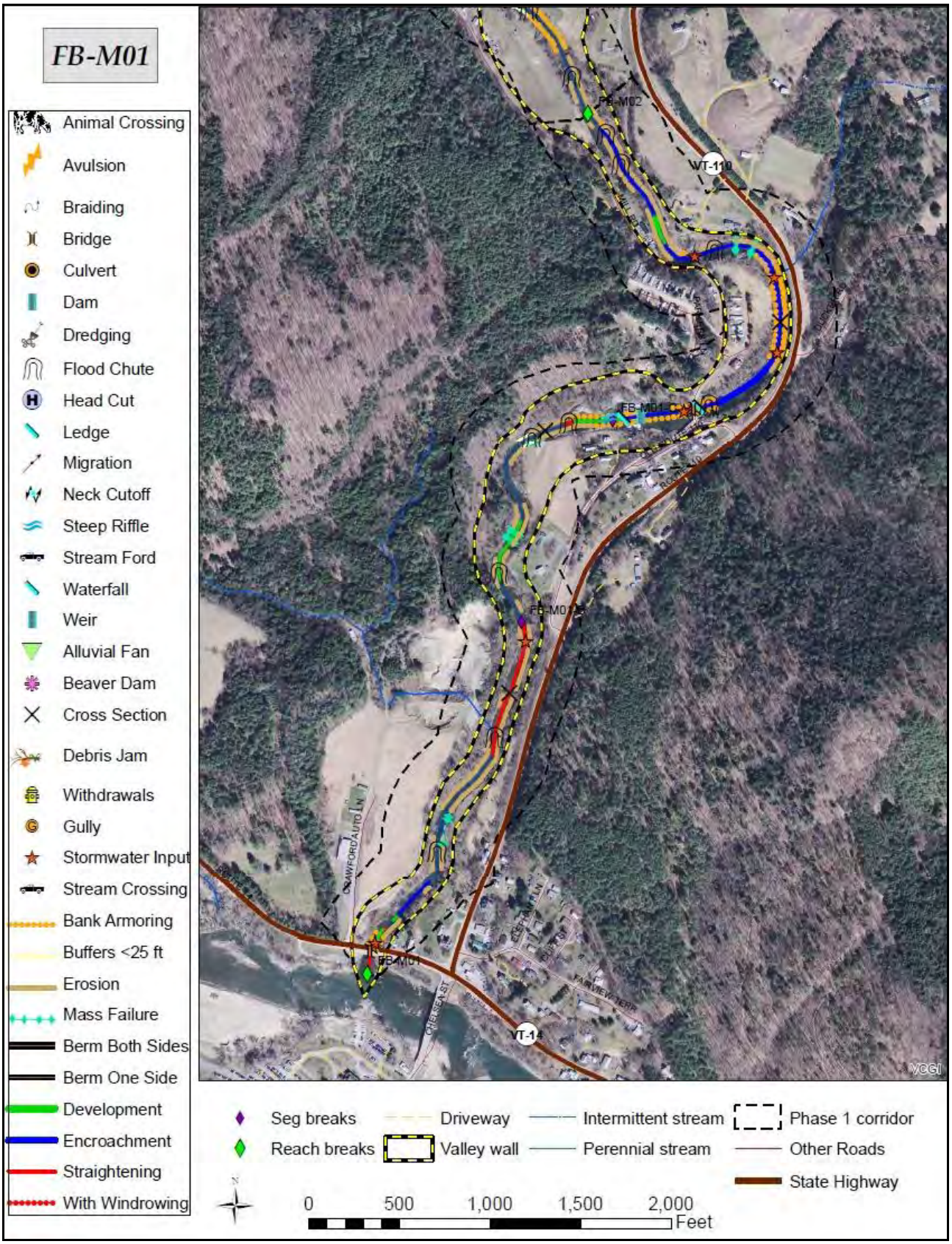


Figure 50. FB-M01Reach map - First Branch mainstem.

Reach M01 extends from the confluence of the First Branch with the White mainstem (just downstream of the Rte 14 bridge west of Rte 110) and extends upstream past the Lower Eaton (intact) and Upper Eaton (breached) dams (Fig. 50) to a point west of Lover's Lane, where the First Branch valley begins to widen to the north and the river becomes less bound by roads on both sides (Fig. 51).

Figure 51. Upper Eaton (breached, left) and Lower Eaton (intact, right) dams in reach FB-M01.Reach M01 was segmented into three sections during Phase 2 assessment due primarily to changes in valley width and the influences of the dams. Downstream segment M01-A is deeply entrenched below the west side of Rte 110, M01-B is a short length of depositional area below the dams, and M01-C is a narrow and heavily sedimented channel upstream of the dams.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M01	6,355	C	none	Gravel	Riffle- pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M01-A	2,207	B	c	Gravel	Plane- bed	Narrowly Confined
FB-M01-B	1,631	B	c	Gravel	Riffle- pool	Semi-Confined
FB-M01-C	3,017	E	none	Sand	Plane- bed	Semi-Confined

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M01-A	Fair	Very High	1.50	III	F	C to B
FB-M01-B	Fair	Very High	1.50	III	F	C to B
FB-M01-C	Poor	Extreme	1.20	III	F	C to E

Reach M01 is quite confined in comparison with upstream portions of the First Branch, effectively squeezing the river through a fire hose as it enters the White mainstem at South Royalton. The two downstream segments have lost access to former floodplains and were classed as stream type departures due to incision, while the upstream segment (M01-C) has also lost access to former floodplains but was classed with a stream type departure primarily due to significant aggradation and a highly straightened planform upstream of the dams. Geologic materials include highly erodible lake sediments from Glacial Lake Hitchcock, and the river has deeply incised through these sediments both in glacial times and post-glacially (relatively low incision ratios indicate the more recent downcutting which exacerbates the deep entrenchment of the longer-term incision). Valley walls remain highly erodible as evidenced by mass failures present in all three segments, amplifying fluvial erosion hazards for development and encroachments along the valley walls. Although topographic maps indicate a broad floodplain off the right bank at the downstream end of the reach, the Rte. 14 bridge there had Irene debris lodged into girders 18' above the height of the stream while it did not appear that the terrace on the right bank (former Crawford Autoland) had been accessed by floodwaters; Rte. 110 is roughly 35 ft. above the stream off the left bank. With little large woody debris or large sediment in the channel it appears that the river lacks raw materials needed to rebuild access to former floodplains, and the value of protecting upstream floodplains for dissipating stream energy dramatically increases. The village of South Royalton bears the brunt of floodwaters that are not able to be dissipated further upstream.

Primary Stressors:

- Legacy of historic mill influence
- Confinement of valley by deep historic incision and current road embankments
- Straightening (>50% of segment length) beginning with constriction and redirection by old bridge abutments at upstream end of reach, exacerbated by virtue of extensive encroachment from both development and roads
- Legacy of dam presence: sedimentation upstream and heightened incision downstream of two dams in the reach

Table 14. FB-M01 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M01A	Watershed Strategies to restore incised reach	Low	Medium	N	High priority protection on White mainstem reaches in South Royalton; FEMA maps already updated for Windsor County; include encroachments in Pre-disaster Mitigation Planning, consider FEH overlay; drainage and stormwater management in US reaches
M01A	Stream Buffers	Low	Low	Y	Create/protect buffer; LB is Rte 110 embankment; Blanketed by honeysuckle - convert to native vegetation
M01B	Stream Buffers	High	Low	Y	Create/protect buffer, then allow natural regeneration if (exclude from mowing); recommend Royalton NFIP Floodway map for minimum width (~100 ft), clarify stable planform (FEH zone) is even further out; treat honeysuckle
M01B	Watershed Strategies to restore incised reach	Medium	High	Y	FEMA maps already updated for Windsor County; include encroachments in Pre-disaster Mitigation Planning, consider FEH overlay; drainage and stormwater management in US reaches

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M01C	Stream Buffers	Low	Low	Y	Create/protect buffer, then probably enough currently existing to allow natural regeneration if excluded from mowing; recommend Royalton NFIP Floodway map for minimum width (additional 65 ft; recommend 100 ft min), clarify stable planform (FEH zone) is even further out; treat honeysuckle
M01C	Watershed Strategies to restore incised reach	High	High	N	Removal of bridge abutment on US end and two dams at DS end would all be likely to affect development within corridor; removal of Lower Eaton dam has been extensively discussed in the past - social constraints (landowner priorities, Historic Register); constraints increase value of floodplain and corridor protection in US reaches

6.1 Reach FB-M02 - First Branch mainstem from north end of Branch View Cemetery to Rte. 110 bridge at Russell Rd.

Reach M02 extends from ~0.1 mi. south of the Lover's Ln./Rte. 110 intersection (near the north end of Branch View Cemetery) past the rugby fields behind Log Landing Rd, through a valley pinch point near TH92/Vezina Rd and on to the Rte. 110 bridge at Russell Rd. (Fig. 52). The reach was segmented into three sections during Phase 2 assessment due primarily to changes in valley width. Although the true valley wall on the west side of the river upstream of TH93/Dodge Rd is probably further back from the river, a high terrace left by the emptying of glacial Lake Hitchcock wraps north of the farm buildings on that road and toward Rte. 110 and might only be topped in extreme floods; this terrace is an unusual feature visible from Rte. 110 and causes the effective valley to pinch dramatically north of TH93.

The First Branch is highly straightened in reach M02, beginning with the influence of the Rte. 110 bridge (historic site of the South Tunbridge Shingle Mill and now the site of breached dam remains) that routes the river toward the west side of the valley at the top of the reach and continuing with extensive areas of bank toe stabilization/riprap throughout. Flooding in 1998 routed through the fields in the upstream portion of the reach to the east of the current channel location, and headcutting in that flood chute left a large depression that is now an alder-dominated scrub-shrub wetland that is visible on aerial photography (Fig. 52; pers. comm. Tunbridge dairy farmer Gary Mullen, Nov. 2012). The channel straightening is amplified by Rte. 110 encroachment and routing through two bridges in mid-portions of the reach (segment M02-B). The mid portions of the reach were almost exclusively long runs and deep scour pools with very little shallow water or riffle formation, and a ledge grade control in the middle of segment M02-B is likely critical to preventing further incision. Much of the former floodplain in downstream segment M02-A (a likely alluvial fan formed by glaciofluvial deposits originating from the tributary entering from the west side of the valley and emptying into glacial Lake Hitchcock at the downstream end of M02-B) is no longer accessed and has multiple high terraces visible above the level of the current restricted floodplain.

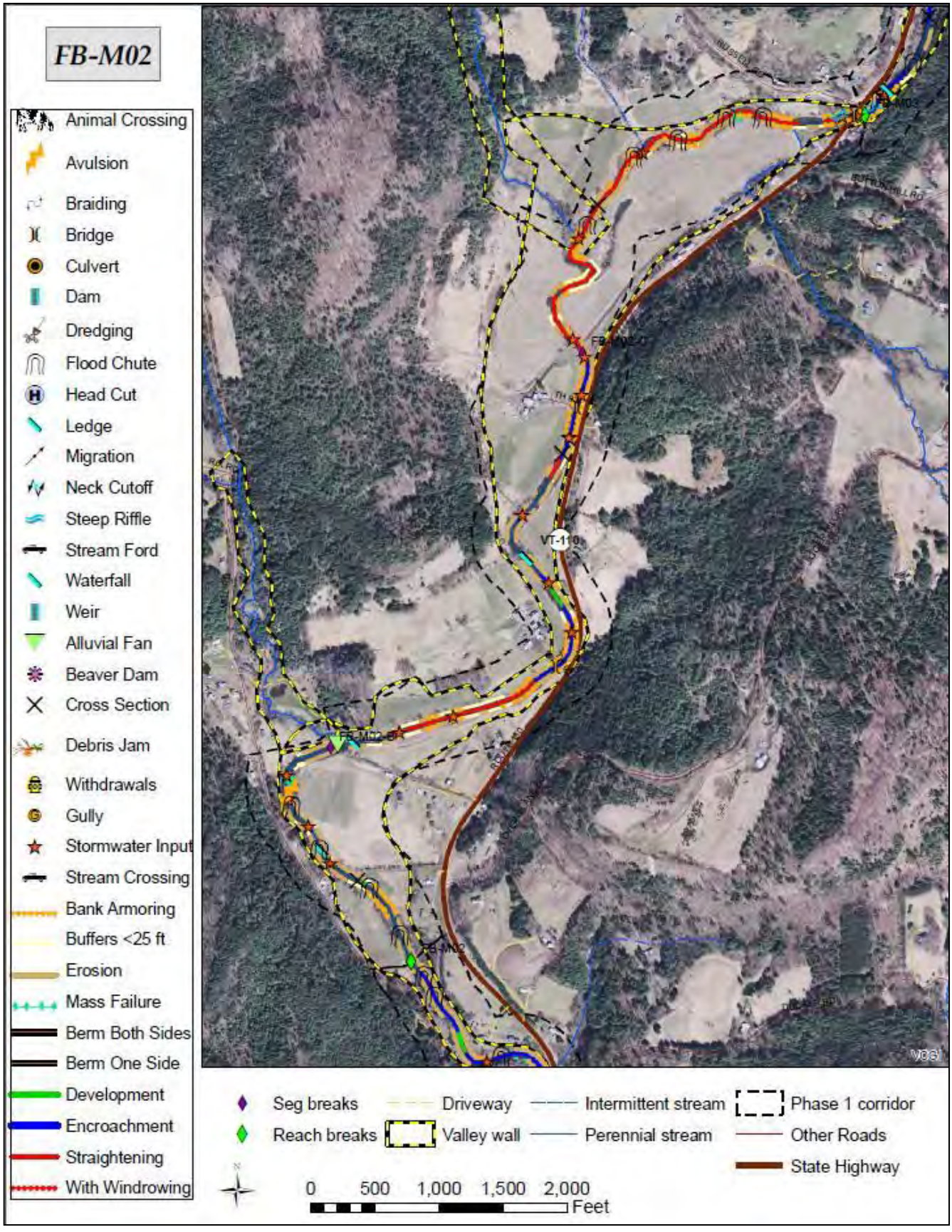


Figure 52. FB-M02 Reach map - First Branch mainstem.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M02	11,038	C	none	Gravel	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M02-A	2,261	C	none	Gravel	Riffle-pool	Broad
FB-M02-B	4,724	C	none	Gravel	Plane-bed	Semi-Confined
FB-M02-C	4,055	C	none	Gravel	Riffle-pool	Very Broad
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M02-A	Fair	Very High	1.4	III	F	none
FB-M02-B	Fair	Very High	1.3	III	F	none
FB-M02-C	Fair	Very High	1.2	III	F	none

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive encroachments, both development and (especially) roads
- Lack of buffers, highly erodible banks (sand)
- Stormwater inputs, drainage systems, impervious surfaces
- Undersized bridges at Vezina and Dodge Rds. (TH92 and TH93), Rte. 110 by Russell Rd.
- Restriction of access to historic floodplains (incision ratios 1.2 - 1.4)

Table 15. FB-M02 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M02A	Protect River Corridors	Very High	High	N	FEH and/or Easement - Attenuation asset US of South Royalton and DS of trib delta and converted transport mainstem reach transferring sediments; rugby fields and some minor recreational development in Floodway; high value, may be worth exploring despite lateral instability; development pressure, Floodway does not correspond to FEH
M02A	Stream Buffers	High	High	Y	Create/protect buffer, then probably enough currently existing to allow natural regen if excluded from mowing (avoid high-cost stock due to depositional zone and Very High sensitivity); recommend at least 100 ft; clarify stable planform (FEH zone) is even further out; treat honeysuckle
M02B	Stream Buffers	Medium	High	N	Create/protect buffer; will likely need active establishment, recommend low-cost stock due to vertical and lateral instability; priority would be higher with increased stability
M02B	Remove/ Replace Structures	Medium	Medium	Y	Replace: both Vezina and Dodge Rd (TH 92 and TH 93) bridges undersized, limiting floodplain access, showing structural problems due to scour, and contributing to straightening, confinement, conversion to Transport reach
M02B	Watershed Strategies to restore incised reach	High	High	N	FEH; drainage and stormwater management; prioritization of structure replacement and capital budget planning, buffer establishment to help with erosion control

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M02C	Stream Buffers	High	High	N	Create/protect buffer; will likely need active establishment, recommend low-cost stock only due to vertical and lateral instability; lower priority until US impacts are addressed
M02C	Remove/ Replace Structures	High	High	Y	Remove: old abutment upstream of current Rte. 110 bridge, some of wall DS of bridge; needs careful evaluation of possible impacts to houses and barn off LB Replace: Rte. 110 bridge prone to plugging due to pier, limiting floodplain access, contributing to straightening, confinement, conversion to Transport reach (may be reduced by removal above)
M02C	Watershed Strategies to restore incised reach	High	High	N	FEH, corridor easement (farm fields) to limit bank armoring and permit meanders, buffer establishment to help with erosion control, prioritization of structure replacement and capital budget planning

6.1 Reach FB-M03 - First Branch mainstem from Rte. 110 bridge at Russell Rd. to ledge grade controls at upstream end of South Tunbridge village (~0.4 mi. north of Russell Rd.)

Reach M03 is a short reach north of the old South Tunbridge shingle mill site and essentially comprises the current extent of South Tunbridge village, with a small run of ledge grade controls on the north end of the reach (Fig. 53). The village was more populous in the mid- to late-1800s, and it is not clear if the buildings there are placed on fill or on a former terrace; regardless of the distinction the elevated area (and the fact that it is developed) reduces the effective floodplain sufficiently to constitute a C to B stream type departure. The reach was not segmented for Phase 2 assessment. Rte. 110 encroachment throughout the length of the segment is within the mapped floodplain for Tunbridge (SCS 1991) and is known as a flooding spot that frequently leaves the road impassable.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M03	1,893	C	none	Gravel	Riffle-Pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M03-0	1,893	B	c	Gravel	Riffle-Pool	Semi-Confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Fair	Very High	1.4	III	F	C to B

Primary Stressors:

- Straightening primarily by virtue of extensive encroachment, both development and roads
- Old abutment and Rte 110 bridge constriction at DS end of reach
- Restriction of access to historic floodplains (incision ratio 1.4)
- Sediment loading from unnamed tributary along Button Hill Rd

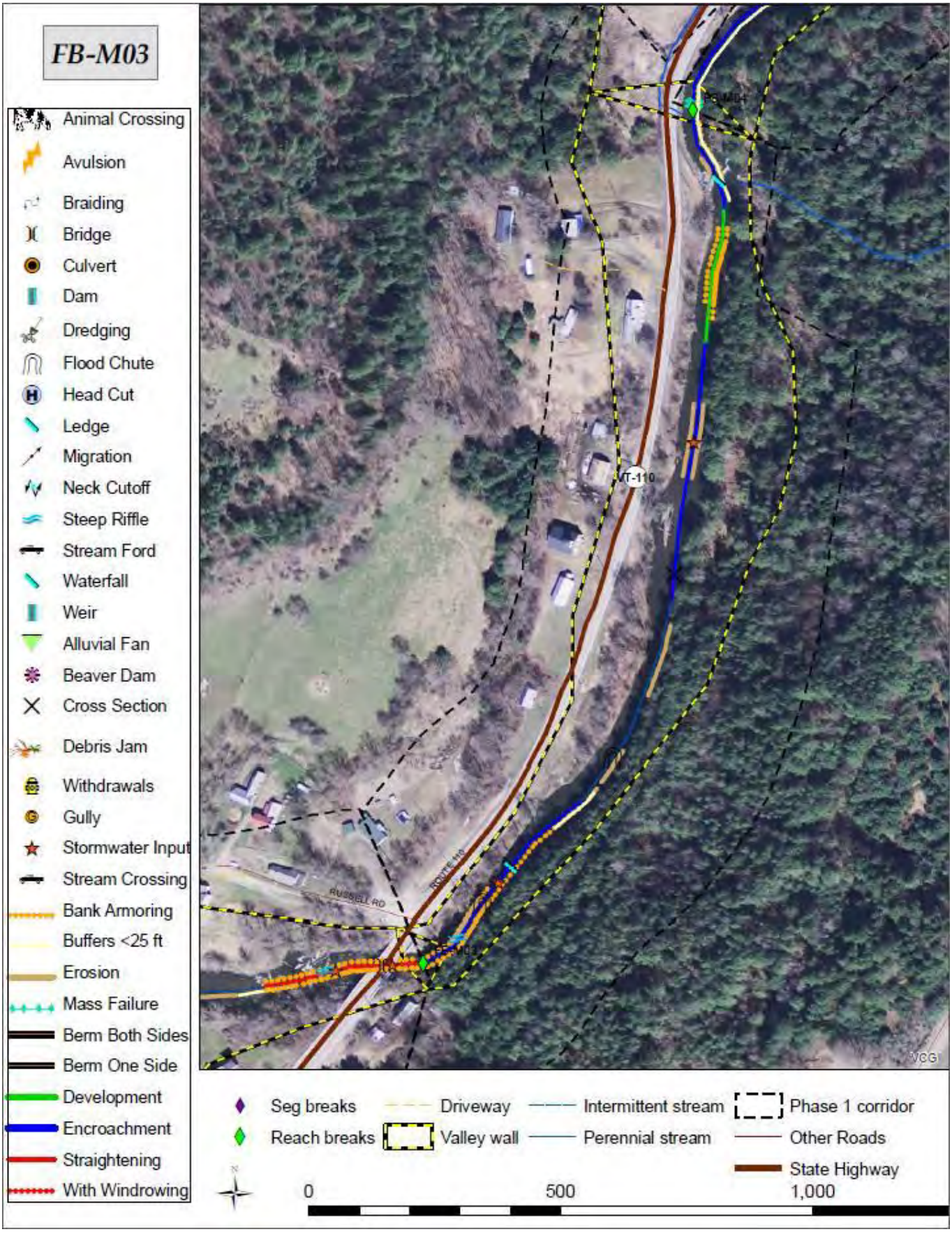


Figure 53. FB-M03 Reach map - First Branch mainstem.

Table 16. FB-M03 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M03-0	Stream Buffers	Medium	Low	N	Create/protect existing buffer, augment RB buffer; recommend low-cost shrub stock due to vertical and lateral instability, location largely along Rte 110
M03-0	Watershed Strategies to restore incised reach	Low	Low	N	FEH and/or corridor easement upstream, buffer establishment to help erosion control, prioritization of structure replacement and capital budget planning

6.1 Reach FB-M04 - First Branch mainstem from north end of South Tunbridge village to Rte. 110 bridge south of Town Farm Rd.

Reach M04 comprises a large proportion of a picturesque main travel corridor south of the Tunbridge Fairgrounds. The reach strongly bears the legacy of glacial Lake Hitchcock (including lake edge terraces) and is almost entirely lined by fine to very fine sand loams, with resultant longstanding intensive agricultural use. The reach was broken into two segments during Phase 2 assessment, primarily due to degree of straightening and encroachments as well as differences in wooded buffer widths (Fig. 54). Geologic materials and planform suggest the reach would likely be an E-type stream under reference conditions, but both segments were noted with E to C stream type departures primarily due to widening and planform adjustments in response to straightening.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M04	8,664	E	none	Sand	Riffle-Pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M04-A	4,804	C	none	Gravel	Riffle-pool	Broad
FB-M04-B	3,860	C	none	Gravel	Riffle-pool	Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M01-A	Fair	Very High	1.6	III	F	E to C
FB-M01-B	Fair	Very High	1.8	III	F	E to C

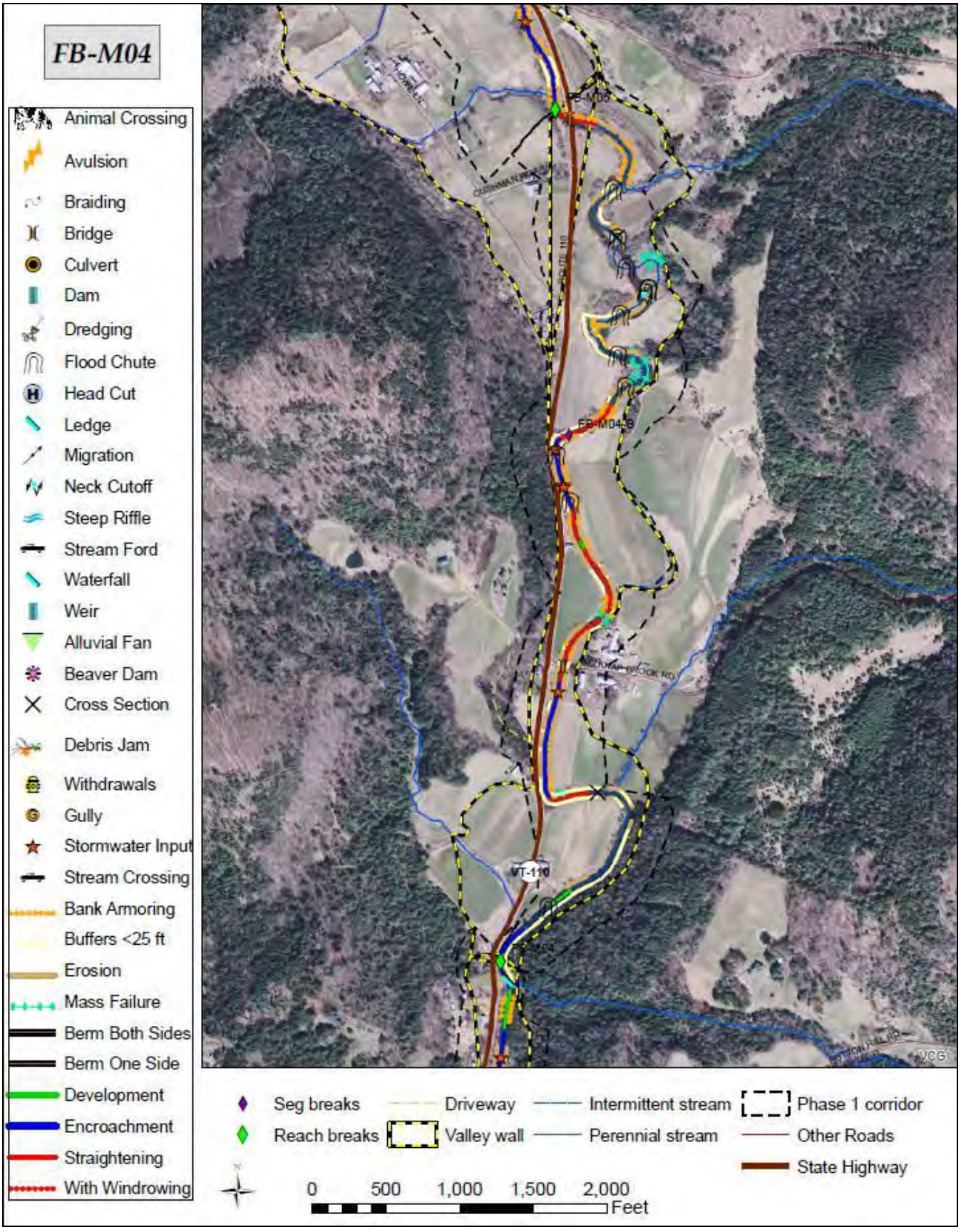


Figure 54. FB-M04 Reach map - First Branch mainstem.

Downstream segment M04A is more heavily encroached upon by Rte. 110, is almost entirely straightened due primarily to that influence, and is dominated by cropland associated with the "Howe Twin Farms" that are located on either side of the Howe covered bridge spanning the First Branch at Belknap Brook Road (Fig. 55). Buffers are minimal in this segment except along the most downstream quarter where the left valley wall becomes continuous with the left bank of the river.

Figure 55. Howe covered bridge and Howe Twin Farms

Upstream segment M04B is less encroached upon by roads and is dominated by cropland associated with Howeacres Farm, with several flood chutes lined by early-successional floodplain forest dominated by young box elder that were thriving bird habitat at the time of assessment. Several restoration projects have been implemented in this segment by the landowners, White River Partnership and several other cooperators, including buffer plantings and installation of log vanes; deep pools were noted forming around the log vanes. The wide floodplains of this valley were accessed during Irene and several more localized floods between 2007 and 2010 and have greatly reduced damages resulting from these storms (Fig. 56).

Figure 56. HoweAcres Farm surrounded by floodwaters that dissipated across the valley floor in reach M04 during Tropical Storm Irene. ***Photo credit: Robert Dunkle.***

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive encroachments - mostly Rte 110, some other bank toe stabilization; also Howe covered bridge
- Restriction of access to historic floodplains (incision ratio 1.6-1.8)
- Howe covered bridge and Rte 110 bridge both contribute to straightening and increased streampower
- Highly erodible banks (sand)

Table 17. FB-M04 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M04A	Stream Buffers	High	High	Y	Create/protect buffer; will likely need active establishment, recommend low-cost stock only due to vertical and lateral instability; NFIP Floodway is 85 ft at narrowest point; recommend at least 100 ft, clarify stable planform accommodation (FEH zone) is even further out; may need fencing also
M04A	Remove/ Replace Structures	Low	Medium	Y	Replace: Howe covered bridge undersized, contributes to straightening; low priority due to valley pinch point anyway, only partial floodplain constriction, strong social constraints (Historic Register)
M04A	Watershed Strategies to restore incised reach	Medium	High	N	FEH and/or corridor easement to limit bank armoring and permit meander development, buffer establishment to help with erosion control, prioritization of structure replacement and capital budget planning

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M04B	Protect River Corridors	High	High	Y	Explore easement status or possibilities - Attenuation asset US of converted transport reaches with limited attenuation assets, multiple previous projects
M04B	Stream Buffers	Medium	Medium	Y	Create/protect buffer; has had multiple plantings and is largely regenerating, not sure what protections are in place; active erosion has taken some buffers that could be replaced but are high risk for loss, might restrict access to most US field portion - but bank failure is also approaching Rte 110
M04B	Remove/ Replace Structures	High	Medium	Y	Replace: Rte 110 bridge sized OK but alignment reduces effective width, increases straightening and erosion downstream. Primary issue: complete restriction of floodplain access; difficult to remedy - feasible to lower abutments? Structurally sound
M04B	Watershed Strategies to restore incised reach	High	High	N	FEH and/or corridor easement to limit bank armoring and permit meanders US, buffer establishment to help with erosion control

6.1 Reach FB-M05 - First Branch mainstem from Rte. 110 bridge south of Town Farm Rd. to Mill covered bridge at Spring Rd.

Reach M05 includes the upstream portion of a scenic main travel corridor approaching the Tunbridge Fairgrounds, as well as the Fairgrounds themselves, and ends just shy of the Mill Bridge (covered bridge aka Hayward & Noble Bridge or the Spring Rd. Bridge; Fig. 58). The reach was segmented during Phase 2 assessment due to differences in substrate size, with a short segment on the north end of the reach (below the falls of the intact Hayward & Noble Mill Dam in reach M06) filled with large stones that are largely the remains of years of failed riprap in the area.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M05	8,576	C	none	Gravel	Riffle-pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M05-A	4,804	C	none	Gravel	Riffle-pool	Broad
FB-M05-B	3,860	C	none	Gravel	Riffle-pool	Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M05-A	Fair	Very High	1.4	III	F	None
FB-M05-B	Fair	High	1.4	III	F	None

The southern end of reach M05 is lined by the hayfields of Howeacres and Howevale Farms. Although buffers are minimal, box elder does dominate the banks through this area and these trees were critical to limiting erosion in Irene. With floodplain access much more limited in Tunbridge and North Tunbridge villages upstream of this area, it is clear that the broad and minimally-developed floodplains in this vicinity were vital in moderating the impacts of Irene through and downstream of this reach (Fig. 57).

Figure 57. Irene floodwaters dissipated across some of the HoweVale fields in the vicinity of the Cilley covered bridge at the south end of Tucker Barn Rd. in reach M05 (photo looking west along Howe Ln.) ***Photo credit: Robert Dunkle.***

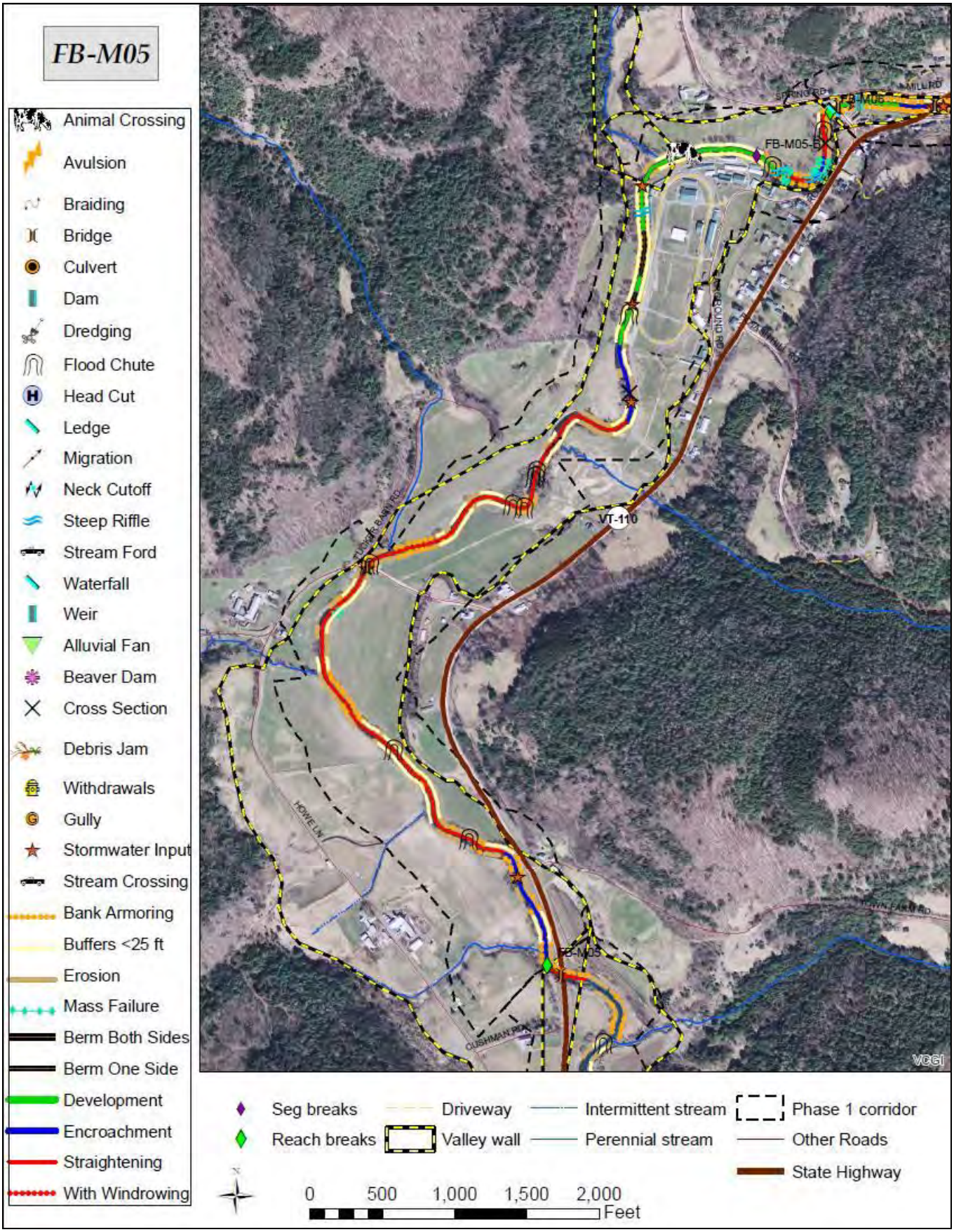


Figure 58. FB-M05 Reach map - First Branch mainstem.

On the north end of segment M05-A, the "Tunbridge World's Fair" (dubbed as such since 1868 publicity seized on the phrase coined by a former Lieutenant Governor of Vermont who referred to it as "a little World's Fair") has operated in the same location in the floodplain of the First Branch since 1875 and is a significant component of the local economy. The location has been flooded a number of times, both through inundation and ice jam related flows, and the doors of the animal barns have been opened to allow floodwaters to pass through on several occasions. The four-day annual fair held every September can attract as many as 30,000 visitors in a day, and the fairgrounds have hosted an increasing number of other events in recent years (Tunbridge HazMit 2013).

On the upstream end of the fairgrounds, just south of the Mill Covered Bridge at Spring Road, the First Branch is pinned to the left valley wall under a roughly 35 foot drop from Rte. 110, the primary thoroughfare through the center of town. Due in part to water being funneled through the valley pinch point upstream in reach M06, the stretch from the Mill Bridge to the Fairgrounds has been the site of long-standing conflicts between river dynamics and development and infrastructure encroachments, and more than one building has been undercut and removed over time (Farnham 1980; Wright 1941). Following Irene (August 28, 2011) Rte. 110 was severely undercut, and a wall of riprap was placed to attempt to secure the bank across from the Tunbridge Village store (Fig. 59).

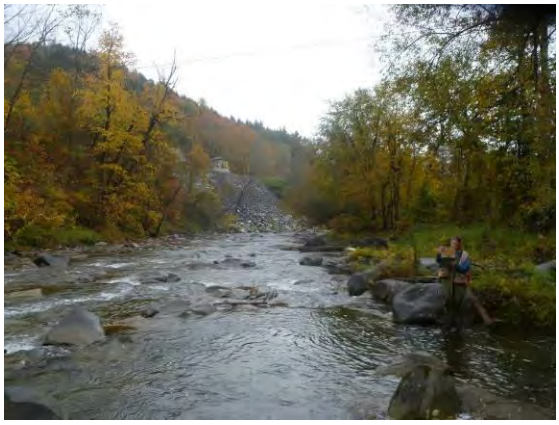


Figure 59. Wall of riprap placed beneath Rte. 110 across from the Tunbridge Village Store post-Irene.

A short distance downstream Irene had also triggered a mass failure near the Fairgrounds office building. With the wall of stone placed upstream under Rte. 110, a thunderstorm downpour on August 9, 2013 (~1.8 inches of rain within one hour; NWS Burlington 2013) accelerated sufficiently to trigger a further mass failure that cut back banks to within a very short distance of the Fairgrounds office. Another wall of stone was used to armor the bank beneath the Fairgrounds office, and the downstream taper of this riprap may leave the animal barns at the Fairgrounds exposed to the force of flows accelerated by both of these stretches of stone in the future (Figs. 60-61).

Figure 60. Downstream taper of riprap placed in August 2013 may leave the animal barns at the Fairgrounds exposed to the force of flows accelerated by two upstream stretches of stone.

Figure 61. Mass failure beneath the Tunbridge Fairgrounds office (first two pix October 2012; amplified Aug. 9, 2013 by water accelerated by the wall of stone placed beneath Rte. 110 post-Irene) was ripapped and may leave the animal barns exposed to future flood flows downstream of two large stretches of stone armoring.

In the long run it would be highly beneficial to restore floodplain function to the north end of the Fairgrounds ("Sherlock Field" parking area), in the vicinity of the mass failure pictured above, but it appears at this time that this would require an active restoration with an extremely high risk of failure due to impacts being passed from upstream reaches. Without such an accommodation of river processes, however, riprap placed on the opposite bank (including that along Rte. 110 across from the Village Store as well as by the animal barns as pictured above) will be at high risk of failure in future floods. The Union Agricultural Society may want to look at the bank stabilization conducted in 2012-2013, post-Irene, at Hurricane Flats Farm in Royalton as an alternative to stone riprap for extending the downstream taper of stone by the animal barns. This "toe-wood" approach may stand up better to the nearly inevitable further erosion, undercutting and heightened streampower impacts that are likely to occur at this 'S-curve' downstream of the Mill Bridge. This type of project is not included with the overall recommendations for this report at this time due to the impacts being passed from upstream, apparent lack of floodplain access off the right bank at this site, and unencumbered room for accommodation of inevitable river processes - all lending to an extremely high degree of risk for a potentially costly project (though it may be competitive with prices for further rock). These factors place a high value on restoring and protecting floodplain function and accommodating meander development in reaches upstream of here, particularly segments M07A and M08B.

Primary Stressors:

- Straightening (>50% of reach length) by virtue of encroachments and extensive bank toe stabilization
- Extensive straightening, valley wall pinch point, intact dam, and heavy riprap upstream
- Restriction of access to historic floodplains (incision ratio 1.4)
- Highly erodible banks (sand), heavily armored

Table 18. FB-M05 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M05A	Stream Buffers	High	High	Y	Create/protect buffer; frequently lined by box elder, adequate start for natural regeneration in many areas but numerous areas completely absent and would require establishment; low-cost due to vertical and lateral instability; may need fencing and some knotweed control. Establish near animal barns at fairground; higher priority DS Cilley Bridge.
M05A	Remove/ Replace Structures	Low	Medium	Y	Replace: Cilley covered bridge undersized, contributes to straightening; low priority due to only partial floodplain constriction, strong social constraints (Historic Register)
M05A	Watershed Strategies to restore incised reach	High	High	N	FEH, corridor easement here (DS end of reach) and US (reach M07), buffer establishment to help with erosion control

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M05B	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer, allow natural regeneration for augmentation and re-establish by fairgrounds animal barns; low-cost due to vertical and lateral instability; riprapped areas very difficult planting conditions; may need some knotweed control; frequent ice jam area
M05B	Remove Berms	High	Medium	Y	Needs further investigation; not clear there is actually a berm, but riprap just downstream of Mill Bridge is elevated, tapers quickly; seems like this area should have better floodplain access in high flow events than it seems to (why repeat mass failures downstream?). May require too much disturbance, but priority increased due to extent of recent streambank armoring.
M05B	Remove/ Replace Structures	Low	Medium	Y	Replace: Hayward & Noble (Mill) covered bridge undersized, contributes to straightening; low priority due to only partial floodplain constriction, strong social constraints (Historic Register); was replaced in 2000
M05B	Stabilize Stream Bank	High	Low	N	Extend downstream end of riprap placed in 2013 with design similar to Hurricane Flats; animal barns at high risk due to taper of current riprap. High-profile educational opportunity for alternatives to riprap, but high risk due to lateral and vertical instability and wall of riprap along Rte 110 upstream. High priority to corridor protection and floodplain restoration in reach M07 to reduce risks.
M05B	Watershed Strategies to restore incised reach	High	High	N	Project implementation highly influenced by upstream impacts; high priority to corridor protection and floodplain restoration in reach M07

6.1 Reach FB-M06 - First Branch mainstem from Mill covered bridge at Spring Rd. to Tunbridge Recreation Field

Reach M06 was not segmented during Phase 2 assessment. It runs through a relatively densely settled portion of Tunbridge village on upstream and downstream ends of the Rte. 110 bridge at the junction with the Strafford Road (Fig. 62).

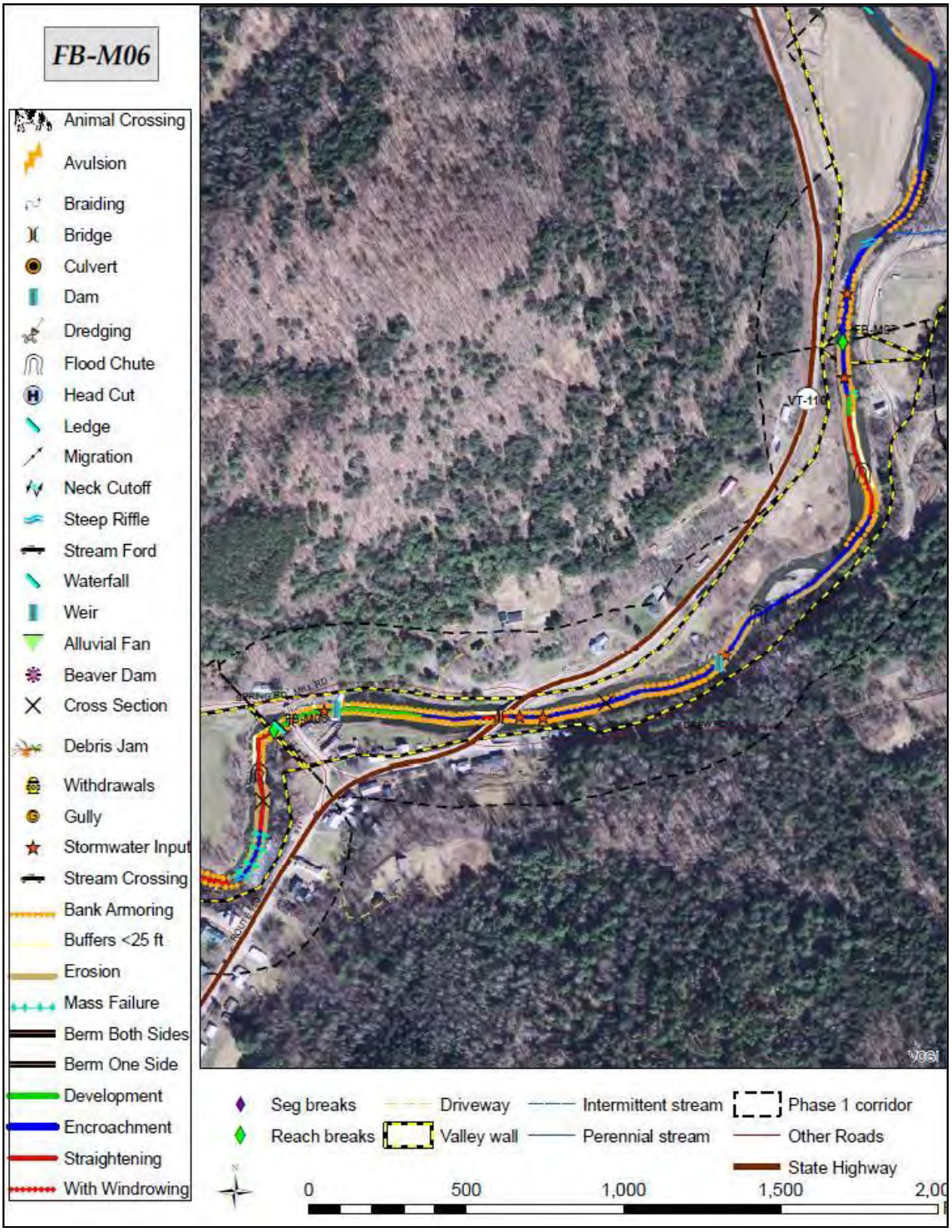


Figure 62. FB-M06 Reach map - First Branch mainstem.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M06	2,720	B	c	Cobble	Riffle-pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M06-0	2,720	F	None	Gravel	Riffle-pool	Semi-Confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Poor	Extreme	1.8	III	F	B to F

Reach M06 contains one intact dam on the downstream end (Hayward & Noble mill dam just upstream of the Mill covered bridge at Spring Rd.) and one largely breached dam (Farnham Brothers mill dam, aka Gay Brothers mill dam; Fig. 63) roughly one-quarter mile upstream (between the Strafford Rd. junctions with Drew Rd. and Recreation Rd.). The Mill covered bridge was replaced in 2000 after being pushed off its abutments by an ice jam that backed up from further downstream behind the Fairgrounds in March 1999 (Farnham and Higgins 1999). The Spring Rd. abutment (right bank looking downstream) was raised two feet at that time, which may have restricted some access to the hayfield floodplain north of the Fairgrounds in the "Sherlock Field"' used as a Fair parking area.

Figure 63. Reach M06 contains the intact Hayward & Noble mill dam just upstream of the Mill covered bridge (left) and the breached Farnham Bros. mill dam (right).

Reach M06 faces escalating conflicts likely due at least in part to incremental development further upstream in reach M07. Though the area was most heavily settled in the late 1800s, current conflicts with river dynamics increased when Recreation Rd. was upgraded in the 1960s as an alternative means of accessing the "back side" of the river after a bridge located in reach M07 (upstream of the Town Garage by Meetinghouse Cemetery and the site of the original Tunbridge Meetinghouse) was destroyed by flooding for the third time (pers. communication, Tunbridge town historian Euclid Farnham Feb. 2012). The valley pinches naturally in reach M06 (a large part of the reason for the location of the mill dams here), and the effects of this narrowing have been gradually amplified by straightening and filling upstream on the mainstem and on the tributary that joins the First Branch at the recreation field (these impacts are further discussed in the reach M07 and T1.01 description and project identification sections of this report). Though the floodplain in reach M07 has still been accessed in larger-scale floods, straightening and the containment of bankfull and moderate flood flows has likely contributed to the substantial erosion (and subsequent bank armoring) noted on both banks in reach M06 and may be contributing to the mass failures at the top of reach M05 (across from the Tunbridge Village Store and beneath the Fairgrounds offices) as well. Tunbridge Planning Commission members have voiced concerns over increasing erosion forces on the valley wall supporting the Strafford Road downstream of its junction with Recreation Road, and a former camp converted to a year-round residence just downstream of the recreation field may be at greater risk with straightening upstream.

Primary Stressors:

- Legacy of historic mill influence
- Straightening (>50% of segment length) primarily by virtue of extensive encroachments, both development and roads, with extensive straightening upstream as well
- Confinement of valley by elevated road embankments, which increases natural confinement
- One intact dam, one breached; both have significant aggradation above
- Restriction of access to historic floodplains (incision ratio 1.8)
- Highly erodible banks (sand), heavily armored

Table 19. FB-M06 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M06-0	Stream Buffers	Medium	Medium	Y	Create/protect buffer; generally OK - allow natural regeneration in missing areas
M06-0	Watershed Strategies	Low	High	N	Project implementation highly influenced by upstream impacts; high priority to corridor protection and floodplain restoration in reach M07. Dam removal at breached Farnham Bros. mill would require analysis of impacts on upstream camp converted to house as well as Recreation Rd and houses at Hayward & Noble dam; could have significant channel bed elevation changes. Discuss elevation and buyout options now available from FEMA with owners in floodplain.

6.1 Reach FB-M07 - First Branch mainstem from Tunbridge Recreation Field to Foundry Rd. bridge

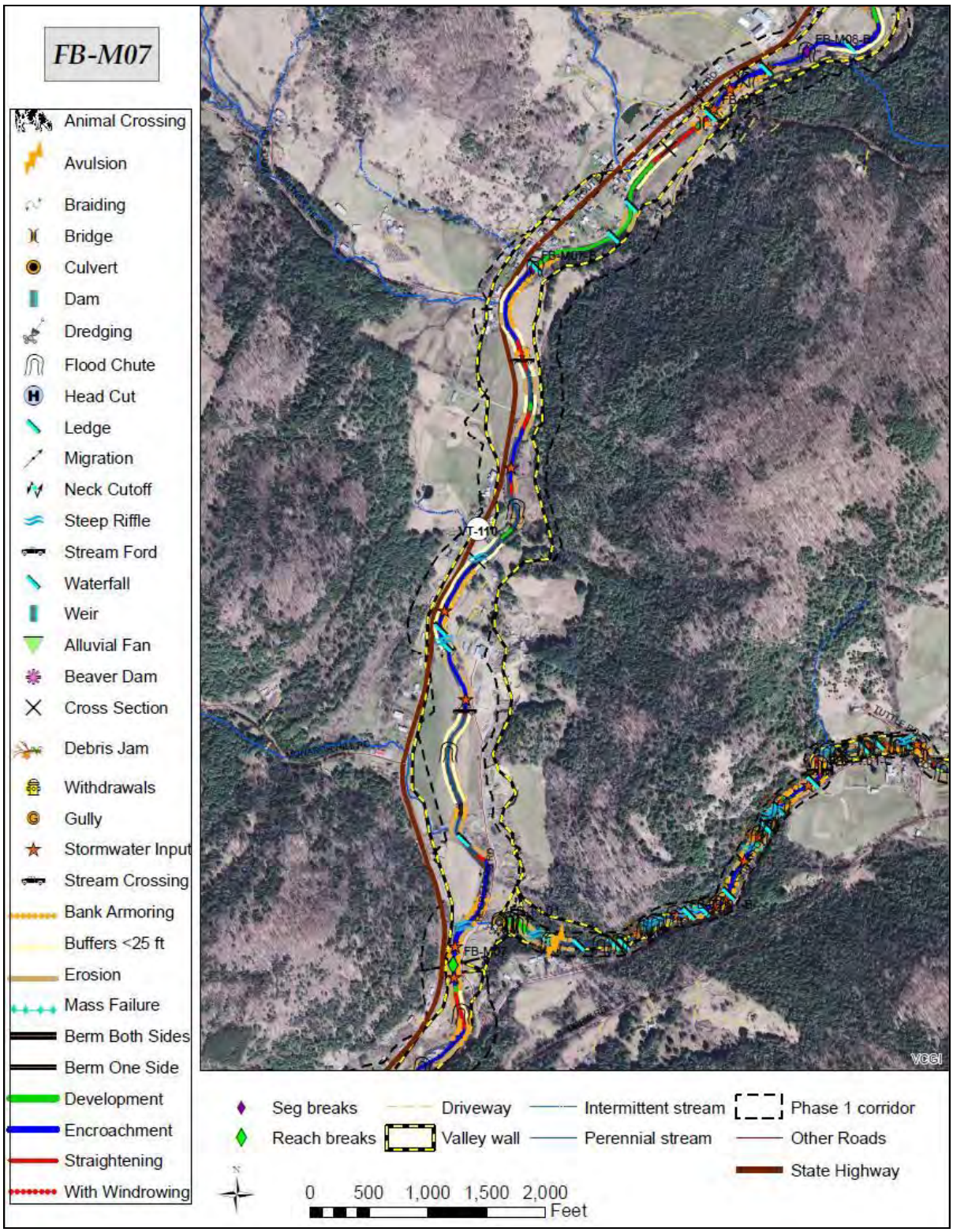


Figure 64. FB-M07 Reach map - First Branch mainstem.

Reach M07 primarily comprises a broader section ('Narrow' as opposed to 'Semi-confined') of the First Branch valley upstream of the most densely settled portion of Tunbridge Village and extends upstream to North Tunbridge village, where the valley again becomes Semi-confined, and beyond to the Foundry Rd. bridge (Fig. 64). The reach was split into two segments for Phase 2 assessment primarily due to these differences in valley width (downstream segment M07-A: Narrow; M07-B: Semi-confined).

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M07	6,641	C	none	Cobble	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M07-A	6,641	C	none	Gravel	Riffle-pool	Narrow
FB-M07-B	2,160	C	none	Gravel	Riffle-pool	Semi-confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M07-A	Fair	Very High	1.5	III	F	None
FB-M07-B	Fair	Very High	1.8	III	F	None

As alluded to in the reach M06 description, incremental development in reach M07 is contributing to straightening and valley constriction that may be amplifying flood impacts further downstream as well as increasing erosion on the highly erodible banks within reach M07. The old abutment from the original Tunbridge Meetinghouse bridge (at ledges ~1000 ft. upstream of Monarch Hill Rd., Fig. 64) pushes the river to the left bank and restricts access to a hayfield in the floodplain on the right bank at the base of Monarch Hill. Although the Tunbridge Town Garage (left bank just downstream of this old bridge abutment) is at a higher elevation than the accessible floodplain on the west side of the river, the primary access to the Garage along Recreation Rd is vulnerable to erosion impacts and has the potential to be cut off in a major flood event - particularly given the location of this area on a kame terrace comprised primarily of highly erodible loamy sands and similarly fine soil materials. Equipment from the Garage was moved into Tunbridge Village previous to the onset of Tropical Storm Irene.

Buffers along the hayfield downstream of the Old Meetinghouse bridge are minimal and the steep banks are eroding rapidly in several areas. In one of these areas a large mid-channel bar (formed in part by the right bank being sheared off by high flows) is

starting to split flows, amplifying the erosion of the adjacent banks in the vicinity of a septic system leach field installed in 2010 directly adjacent to the edge of the mapped floodway off the right bank (the installation met the design specifications of the approved permit). The leach field was part of a septic system for a proposed house to be built on fill that was placed on the west edge of the valley (Fig. 65), trucked from a short distance downstream when the Rte. 110 bridge at the base of the Strafford Rd. was replaced in 2007.

A short distance upstream of the leach field installed close to the river on the right bank is a flood chute visibly active on the left bank in 1996 aerial photography (easily visible in Google Earth historical imagery). This flood chute has been largely blocked off by a variety of materials stockpiled along the banks of the river, effectively reducing the ability of flood flows to be dissipated along this side of the river (Fig. 65). These materials are difficult to see from a distance because of the sumac and other shrubby and tall herbaceous materials that have grown up in the same area.

Figure 65. Encroachment, straightening and narrowing impacts at downstream end of reach M07 near the recreation field (courtesy VT ANR Natural Resource Atlas).

The cumulative impacts of this straightening and constriction of the floodplain hold the potential to trigger a mass failure underneath Rte. 110 across from the recreation field, expose the leach field, damage the now year-round house in the floodplain, or take out portions of Recreation Road. Bank armoring to protect any of these investments will pass the elevated impacts of flood flows further downstream where the extensive erosion and/or bank armoring in reach M06 already evidence the effects of the constricted valley there, and further downstream to reach M05 where the recent mass failures under Rte. 110 and the Fairgrounds offices show similar effects.

On the upstream end of reach (segment M07-B) North Tunbridge village was settled in close proximity to the First Branch, with a mill and a foundry that utilized power generated at two dams located at stretches of ledge grade controls on the First Branch. Little remains of either dam, as both were constructed primarily of log cribbing (Farnham 1980; Farnham and McGuire 2012).

The Swan Mill was located just upstream of the base of Whitney Hill Road, and buildings encroaching closely on the First Branch in that location include relatively new buildings and parking areas as well as older buildings formerly associated with the mill (Fig. 66).

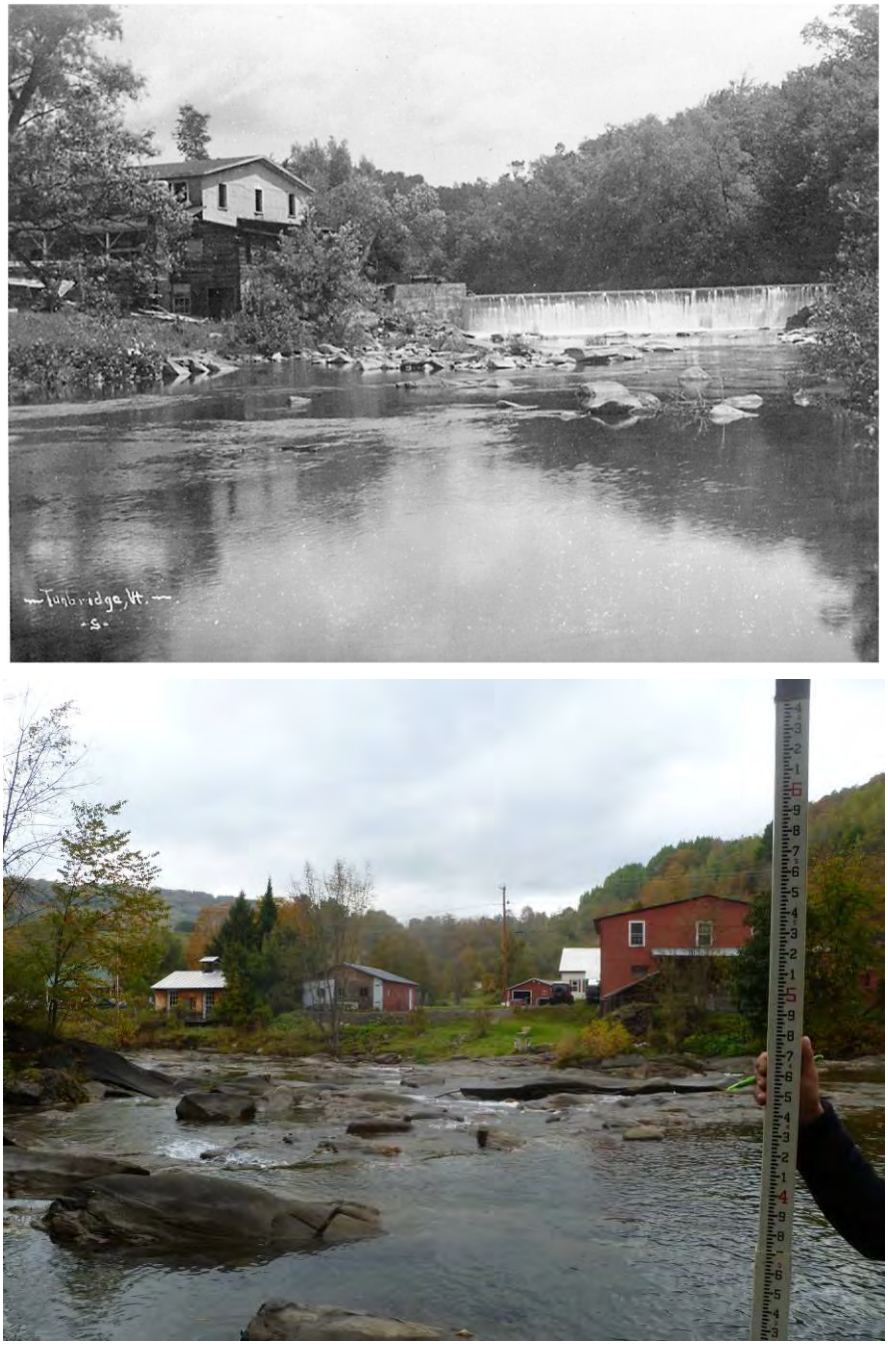
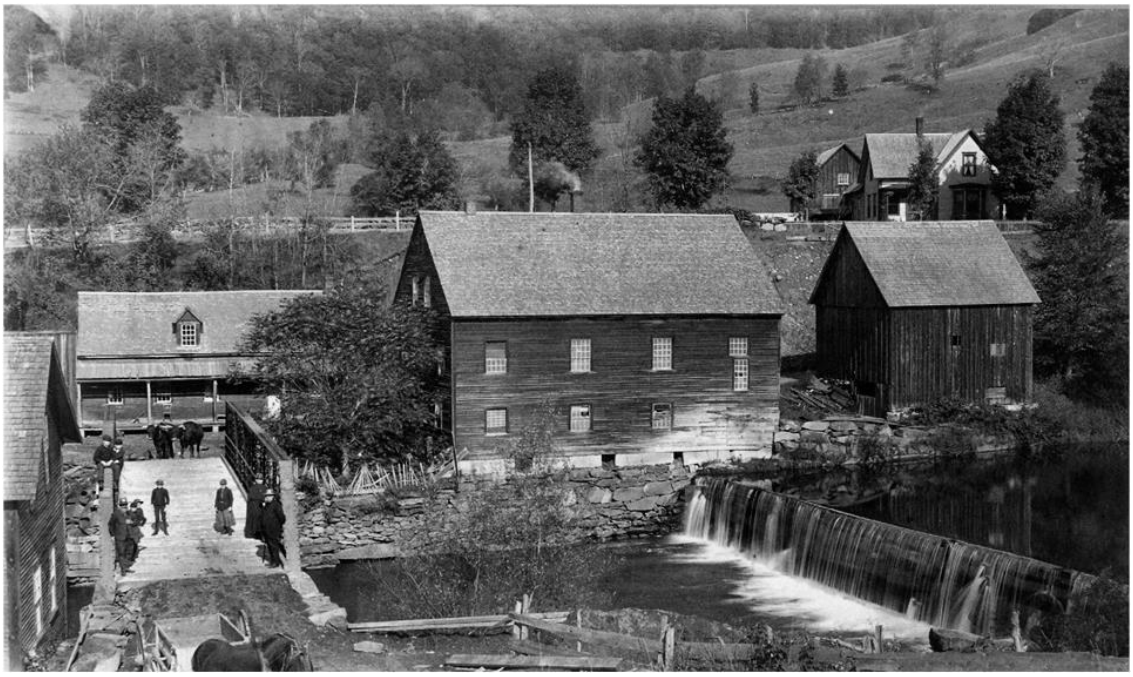


Figure 66. Buildings located close to the First Branch in the vicinity of the old Swan Mill (just upstream of the base of Whitney Hill Rd. in North Tunbridge) include newer structures in addition to ones associated with the former mill. The studio at left in bottom photo is just outside the edge of the mapped 500-year floodplain according to "A Floodplain Management Study for the Town of Tunbridge (SCS 1991), while the older buildings are located in the 500-year flood area according to those maps. (*Historic photo courtesy of Euclid Farnham and Mick McGuire*)

Another dam was located just upstream of the Foundry Road bridge, and among other uses provided power for the Smith Brothers foundry that manufactured cast iron stoves; buildings still located right on the stream on either side of the bridge were formerly associated with these industrial uses of the river (Fig. 67).

Figure 67. Buildings flanking both sides of the Foundry Rd. bridge were formerly associated with a complex of buildings that utilized power from a dam located just upstream of the bridge. With the dam gone, segments M07-B and M08-A upstream of the bridge show signs of being deeply incised and entrenched; the valley wall beneath Rte. 110 (at left in top photo) is wooded but prone to mass failure. (*Historic photo courtesy of Euclid Farnham and Mick McGuire*)



Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive encroachments, both development and roads
- Increased confinement of valley by elevated road embankments (increased use of Recreation Rd. to access “back side”of river after Old Meetinghouse bridge was not rebuilt), old bridge abutments, plugged floodchute along left bank, fill on right valley wall, gradual widening of parking area by rec field, entrenchment in vicinity Foundry Rd bridge
- Increased force of water through undersized culvert at rec field due to post-Irene windrowing and straightening on tributary
- Restriction of access to historic floodplains (incision ratio 1.5-1.8)
- Highly erodible banks (sand)
- Minimal to no buffers in several areas
- Encroachment on class 2 river-adjacent wetland (beaver-controlled area off left bank upstream Old Meetinghouse cemetery)

Table 20. FB-M07 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M07A	Protect River Corridors	Very High	Very High	Y	Explore easement possibilities (across river from Town Garage plus just downstream on same side as garage) - Attenuation asset US of converted transport reaches with limited attenuation assets and dense development; increasing encroachment and access to Town garage on opposite bank; class 2 wetland US of cemetery; explore removal of materials restricting access to plugged flood chute; all worth exploring despite instability
M07A	Stream Buffers	High	High	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; may need fencing in some areas
M07A	Remove Structure	High	High	N	Remove Old Meetinghouse bridge abutment; buffer establishment and corridor protection important downstream
M07A	Watershed Strategies to restore incised reach	High	Very High	N	Reach-scale restoration: removal of Old Meetinghouse bridge abutments, Floodplain and River Corridor Protection and Planning (FEH, NFIP, discuss elevation/buyout options now available through FEMA for former camp now house by rec field); Buffer Establishment and protection. High priority segment, heavy social constraints for project implementation.

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M07B	Protect River Corridors	High	Very High	Y	Explore possibility of relocating driveway entrance east of Foundry bridge further upslope. Structures on either end of bridge and outbuildings further downstream: discuss buyout/elevation options now available through FEMA
M07B	Stream Buffers	High	High	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; frequent ice jam area
M07B	Remove/ Replace Structures	Low	Low	Y	Replace: Foundry Rd bridge undersized, contributes to straightening; low priority - flanked by houses on both sides, replaced in 2011, strong social constraints (Historic Register)
M07B	Watershed Strategies to restore incised reach	High	High	N	FEH, Floodplain and River Corridor Protection and Planning, priority for attenuation asset in M08B (US of school); discuss elevation/buyout options now available through FEMA for other houses; stream buffers

6.1 Reach FB-M08 - First Branch mainstem from Foundry Rd. bridge to confluence with Dickerman Brook

Reach M08 was broken into two segments for phase 2 assessment. The overall topography roughly mirrors reach M07, with downstream segment M08-A continuing the Semi-confined valley found in segment M07-B while the valley broadens again to a Narrow confinement type in upstream segment M08-B (Fig. 68 map).

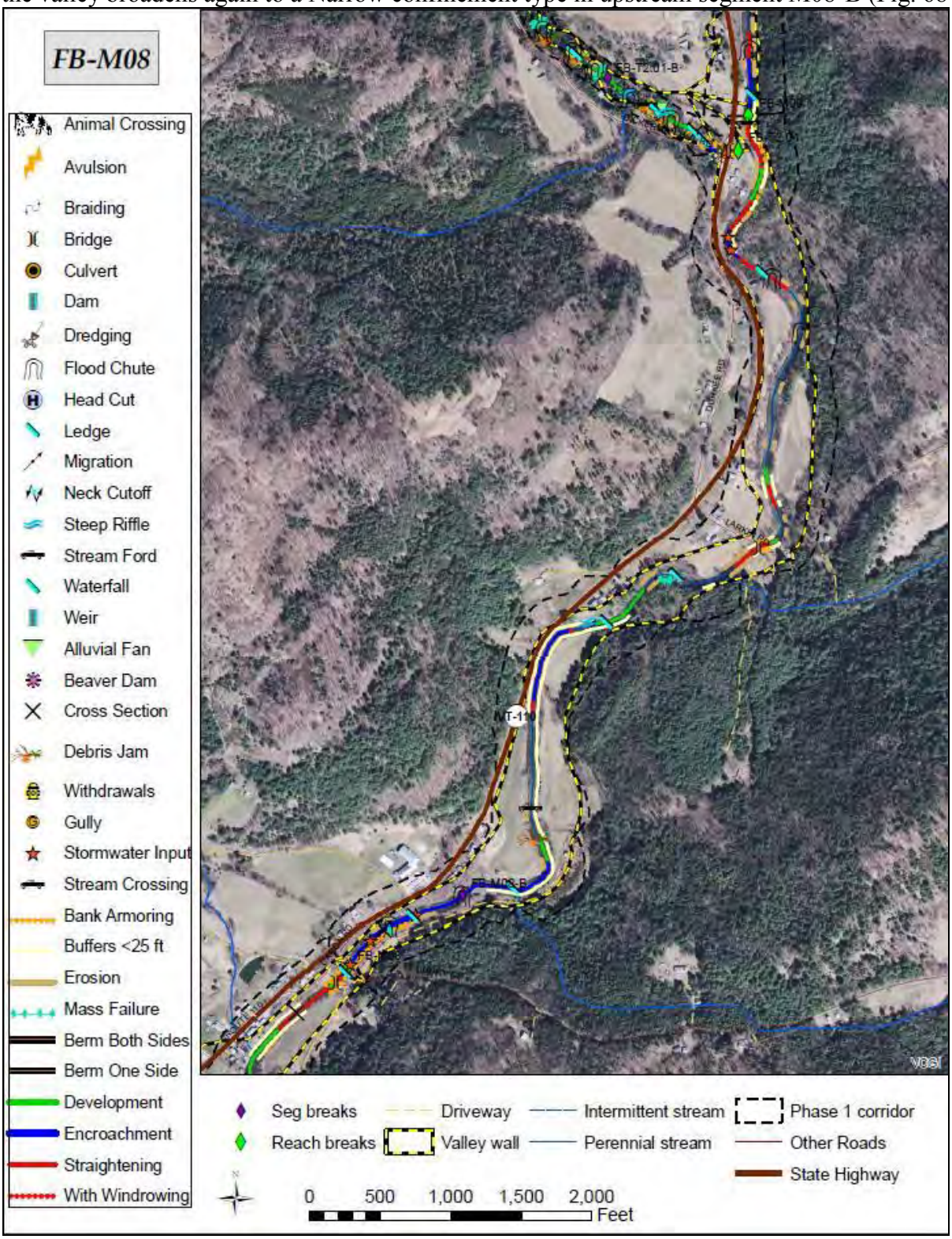


Figure 68. FB-M08 Reach map - First Branch mainstem.

The deep entrenchment of segment M08-A certainly influenced the former location of the dam at Foundry Road (Fig. 67), but it appears the entrenchment may have been largely driven by glacial processes. Regardless of its formation, the nearly vertical right bank valley wall beneath Rte. 110 upstream of the bridge shows evidence of at least one mass failure in the past (with elevated possibility for similar events in the future). It is also not clear how much a driveway installed along the left bank in the last 30 years contributed to the entrenchment, but the driveway showed signs of heavy scour along most of its length (essentially the length of segment M08-A) following Tropical Storm Irene.

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M08	8,664	C	none	Cobble	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M08-A	998	F	none	Gravel	Riffle-pool	Semi-confined
FB-M08-B	7,666	C	none	Gravel	Riffle-pool	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M08-A	Poor	Extreme	2.4	III	F	C to F
FB-M08-B	Fair	Very High	1.4	III	F	None

Upstream segment M08-B is less entrenched than the downstream segment, typically having access to some floodplain on one bank or the other, though some historic incision is notable throughout and floodplain access is more restricted in some localized areas. Heightened flood impacts due to reduced floodplain access are a concern in reaches M07 and M08 where development encroachments are relatively common (Fig. 69). A small camp that has been flooded twice in recent years just upstream of the Larkin bridge is at the confluence of a tributary that is incorrectly mapped in the Vermont Hydrography Dataset and on USGS topographic maps, which indicate the tributary joining the mainstem further downstream of the covered bridge. It is not clear if that stream was altered or changed its course along the complex contours upslope of this area.

Figure 69. A camp visible through the trees off the left bank just upstream of the Larkin covered bridge has been flooded twice in recent years by the tributary that enters from a culvert visible in the left center portion of this photo. The tributary enters at an angle opposing the main flow of the First Branch at this corner.

Localized restriction of floodplain access is particularly noticeable near the location of the covered bridge at Larkin Rd. and old bridge abutments roughly 400 ft upstream of that bridge, as well as in the vicinity of the largely breached dam at the former Gile/Camp/Grant mill site. The dam is visible along the east side of Rte. 110 roughly 700 ft. (0.1 mi) downstream of Dickerman Hill Road, and a building recently renovated for housing roughly 200 ft. downstream of the dam (at an elevation of roughly 5 ft height above water noted during fieldwork) appears to be the house from the original homestead that had sawmill buildings formerly located closer to the dam (Fig. 70).

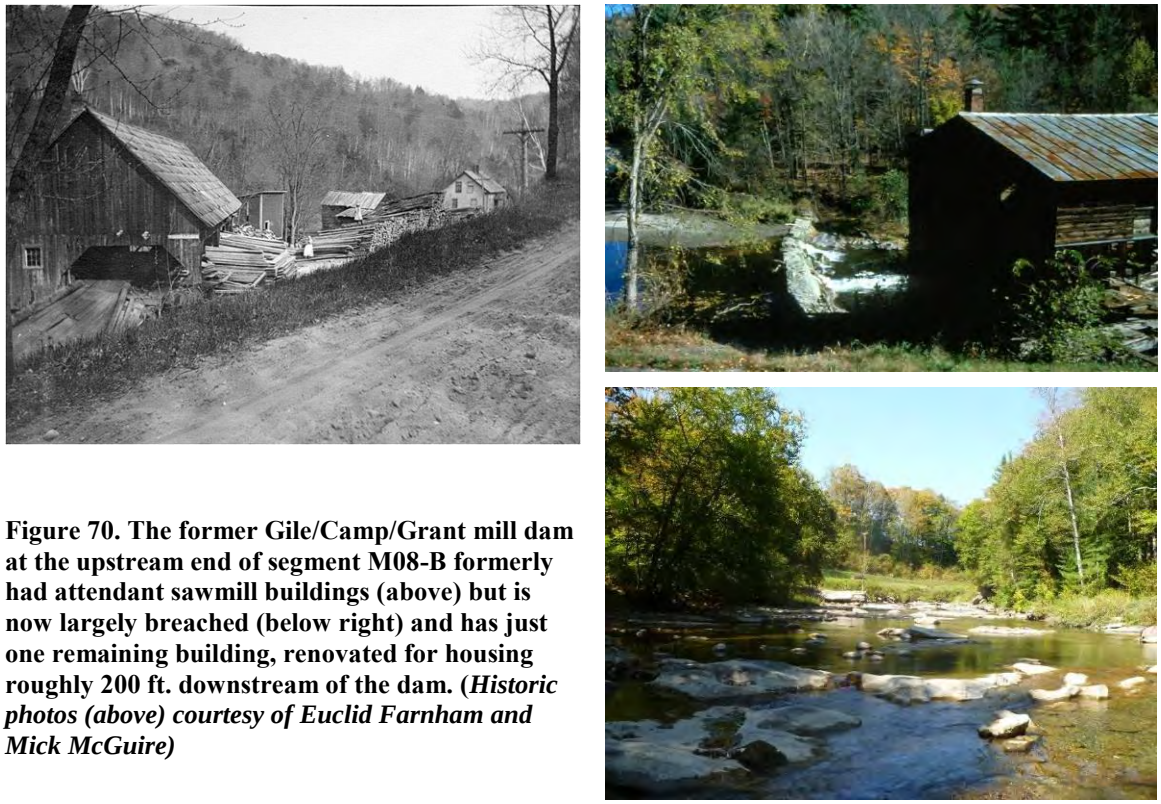


Figure 70. The former Gile/Camp/Grant mill dam at the upstream end of segment M08-B formerly had attendant sawmill buildings (above) but is now largely breached (below right) and has just one remaining building, renovated for housing roughly 200 ft. downstream of the dam. (*Historic photos (above) courtesy of Euclid Farnham and Mick McGuire)*

Primary Stressors:

- Legacy of historic mill influence
- Straightening (20-50% of segment length) in large part due to encroachments, but also hayfield access upstream of school, old abutments 400 ft upstream of Larkin covered bridge, and at breached dam site south of Dickerman Hill Rd
- Encroachments on Larkin Road compounded by backwater effects of tributary
- Confinement of valley by elevated road embankments
- Restriction or loss of access to historic floodplains (incision ratio 1.4 - 2.4)
- Aggradation refilling overwidened area by ford and windrowing, in conjunction with encroachment, upstream end of reach

Table 21. FB-M08 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M08A	Watershed Strategies to restore incised reach	Medium	High	N	FEH, Floodplain and River Corridor Protection-priority for attenuation asset in M08B (US of school), stream buffers

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M08B	Protect River Corridors	High	Very High	Y	Explore easement (US of school) - Attenuation asset US of converted transport reaches with limited attenuation assets (N. Tunbridge village); US of Larkin bridge lower priority - part of watershed strategies. Explore driveway relocation on US end east side of bridge (M08A-B). Discuss FEMA elevation/ buyout options for house DS of breached dam; house at head of reach not in mapped floodplain, thus not eligible.
M08B	Stream Buffers	High	High	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock - lateral and vertical instability; ice jam area
M08B	Remove/ Replace Structures	High-Medium	High-Medium	N	Remove: Explore moving hayfield access US of school further downstream, to permit better floodplain access on RB - include potential impacts to Rte 110 and house on opposite bank. Lower priority: assessment of abutments and breached dam at upstream end of reach have barn now converted to house just downstream that would be at risk with removal. Old abutments ~400 ft upstream Larkin Bridge need further investigation as its not clear how much floodplain access would be gained and how covered bridge would be affected. Replace: Larkin covered bridge undersized, contributes to straightening; low priority - strong social constraints (Historic Register)
M08B	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP, discuss elevation/buyout options now available through FEMA for houses at upstream end of reach, relocation discussion with camp owner upstream of Larkin bridge); stream buffers. Priority attenuation asset in this segment (US of school); assess possible floodplain gain from abutment removal upstream Larkin bridge. Attenuation asset DS of Bicknell Brook (M10) and gravel pit (M09B).

6.1 Reach FB-M09 - First Branch mainstem from confluence with Dickerman Brook to upstream end of sand and gravel pit across from Hanson Rd.

Reach M09 comprises a relatively short reach that includes an infrequently active sand and gravel pit off the left bank (Fig. 71 map). The reach was broken into two segments for Phase 2 assessment, primarily on the basis of differences in valley width. Downstream segment M09-A is situated in a Narrow valley downstream of the pit, while upstream segment M09-B is located in a Broad valley that includes the pit. Due to the excavation of the pit it is difficult to know what the original elevations of the surrounding terrain were like, and whether the valley was Broad in the vicinity of the pit prior to excavation; historic topographic maps from 1949 indicate the original valley may have been significantly narrower (UNH Dimond 2013). Aerial photography from 1998 shows the gravel pit and pond clearly in the present location.

The First Branch is straightened and forced toward Rte. 110 by a berm at the upstream end of the reach, which prevents flood flows from capturing the pond located in the central portion of the pit in M09-B. The pond appears to be either at the same, or perhaps even a lower, elevation than that of the First Branch itself. The potential damage from flood flows capturing the pond may prioritize maintenance of this berm, but the shift of elevated flows to the opposite bank in the vicinity of this berm has likely contributed to potential for a mass failure close to a historic schoolhouse located near the top of the reach, across Vermont Rte. 110 upstream from the base of Hanson Road.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M09	3,891	C	none	Cobble	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M09-A	1,577	C	none	Gravel	Riffle-pool	Narrow
FB-M09-B	2,315	F	none	Gravel	Riffle-pool	Broad
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M09-A	Fair	Very High	1.2	III	F	None
FB-M09-B	Fair	Extreme	1.4	III	F	C to F

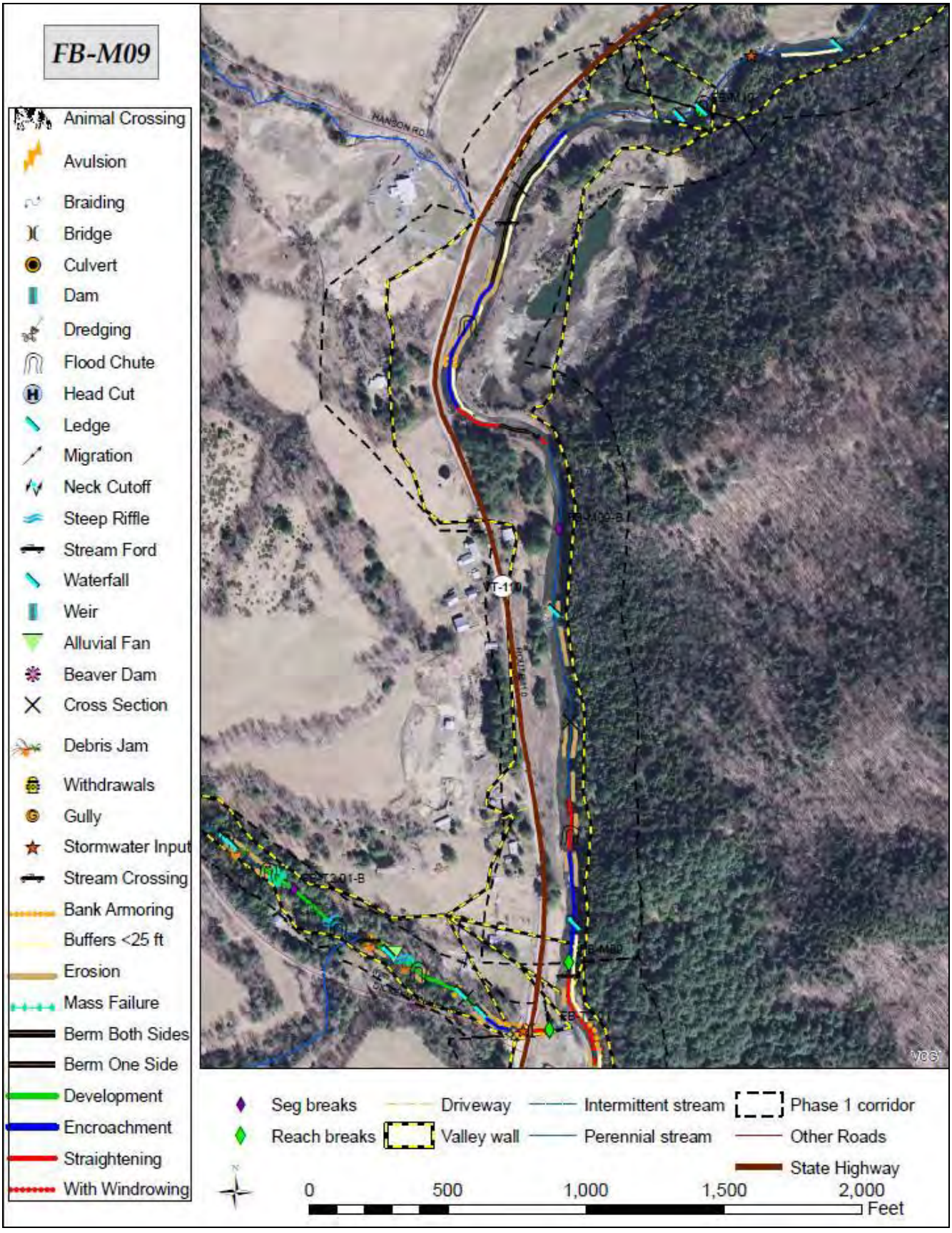


Figure 71. FB-M09 Reach map - First Branch mainstem.

With sections of ledge grade control exposed in the stream bed on both the upstream and downstream ends of reach M09, this reach appears to epitomize the situation of much of the First Branch insofar as demonstrating historic incision that has restricted access to historic or post-glacial floodplains (sandpits are evident off the right bank of segment M09-A in a shared floodplain with the base of Dickerman Brook) while more recent and more restricted floodplains have established at a lower elevation – easily viewed along the east side of Rte. 110 in segment M09-A.

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of road encroachments and berm at upstream end to prevent capture of pond in center of gravel pit area
- Confinement of valley by elevated road embankments in lower level floods
- Restriction of access to historic floodplains (incision ratio 1.2-1.4)
- Highly erodible banks (sand)

Table 22. FB-M09 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M09A	Stream Buffers	Medium	Medium	Y	Create/protect buffer; plant to augment or establish buffer; frequently flooded chute along Rte 110 has herbaceous vegetation, trees tolerant of inundation and ice would benefit shading of channel and physical dissipation of streampower; low cost due to lateral instability
M09A	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH; corridor is all in SFHA); stream buffers
M09B	Stream Buffers	Very High	High	Y	Create/protect buffer; incorporate design considerations to limit possibility of capture of pond but encourage access to floodplain downstream in event of a breached dam surge from Bicknell Brook; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; knotweed control at pit access rd - frequent inundation point - relatively small population currently, high potential for dispersal
M09B	Watershed Strategies to restore incised reach	High	High	N	Assess floodplain access on downstream end, whether opportunities for floodplain access are outweighed by possibility of stream capturing pond in middle of gravel pit, and potential risk of that capture under current configuration. Highly recommend establishment of buffer at downstream end of Bicknell Brook (reach M10) as precursor. Need more detailed survey (not sure if this already exists); 1991 SCS study indicates 500-yr flood at river-side edge of pond.

6.1 Reach FB-M10 - First Branch mainstem from upstream end of sand and gravel pit across from Hanson Rd. to ledge grade controls downstream of Flint Covered Bridge (north end of Hunt Cemetery on Rte. 110)

Reach M10 is situated in a broader portion of the First Branch valley near some of Tunbridge's only 'industrial' sites (on Rte. 110), the Wireform building located in the former Workspace warehouse and its next-door neighbor the Vermont Agency of Transportation State Highway Maintenance Garage. The reach was not segmented during Phase 2 assessment.

Although the dominant substrate of the reach is gravel, numerous bedrock exposures give a subdominant bedrock substrate. The historic Gates Mill was located just upstream in Reach M11 in an area of ledge grade controls just downstream of the Flint Covered bridge that carries Bicknell Hill Rd. across the First Branch (Farnham and McGuire 2011). Reach M10's location downstream of this mill area, as well as riprap and bank toe stabilization, have contributed to straightening that has pinned the river to the left valley wall, which is steep and mostly well forested. The broader floodplain off the right bank is maintained as active hayfields and has only minimal buffers.

Although the floodplain in the vicinity of the State Garage and Wireform plant appears relatively broad, the minimal buffer directly across from the mouth of Bicknell Brook (the location of an alluvial fan, Fig. 72) is recommended as a high priority area for buffer enhancement (further plantings) due to the location of a High Hazard dam (VT DEC 2009) located upstream on Bicknell Brook (Tunbridge HazMit 2013) and the pond located in the gravel pit in the next reach downstream.

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M10	3,975	C	None	Gravel	Riffle-pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M10-0	3,975	C	None	Gravel	Riffle-pool	Broad
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Fair	Very High	1.7	III	F	None

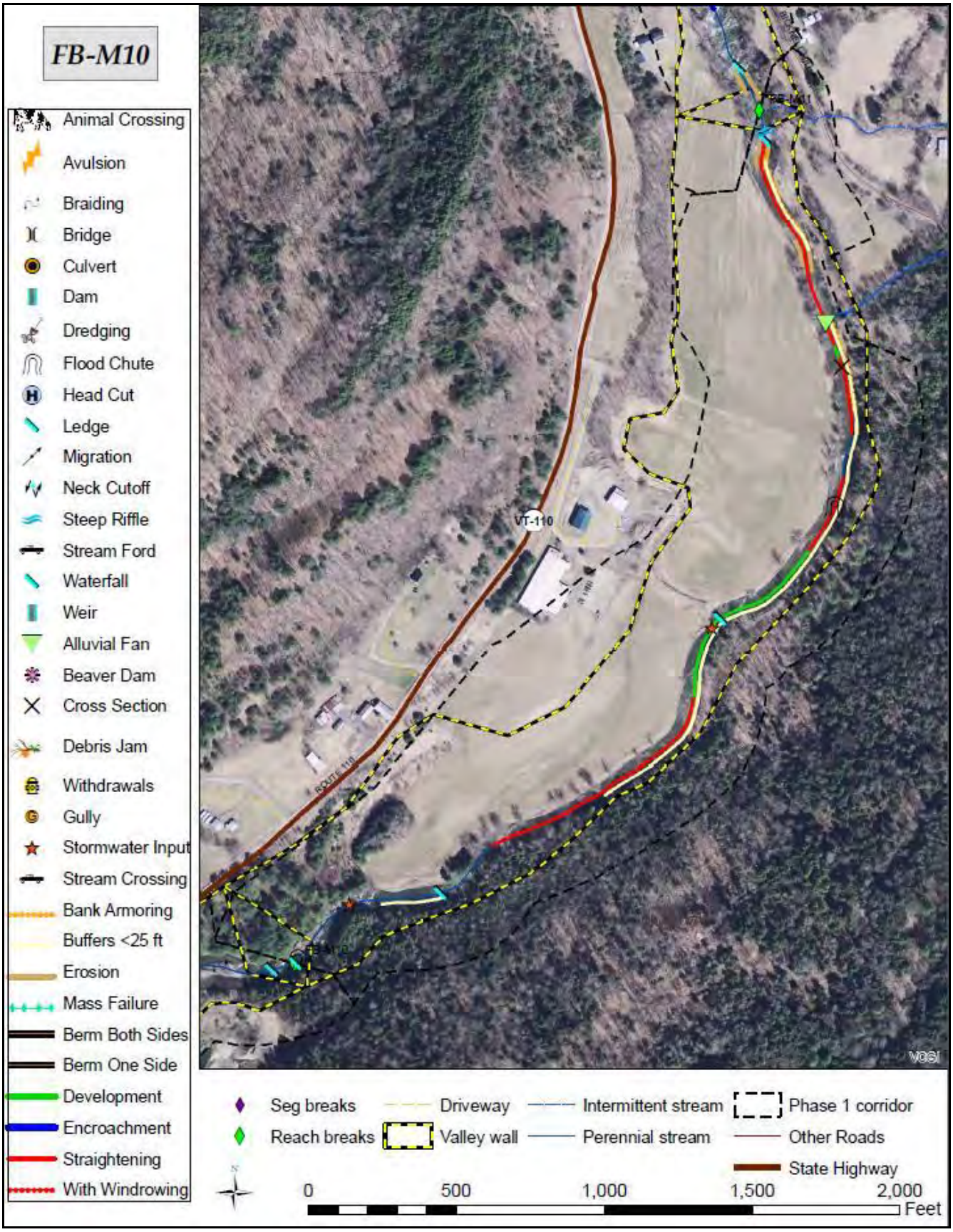


Figure 72. FB-M10 Reach map - First Branch mainstem.

Primary Stressors:

- Straightening (>50% of segment length) primarily by virtue of location downstream of historic Gates Mill and Flint covered bridge, historically maintained incised against valley wall with insufficient woody debris or sediment aggradation to rebuild significant access to floodplain
- Lack of buffers
- Restriction of access to historic floodplains (incision ratio 1.7)
- Highly erodible banks (sand)

Table 23. FB-M10 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M10-0	Protect River Corridors	High	High	Y	Attenuation asset downstream of High Hazard dam (Bicknell Brook) and US of pond in gravel pit; still stage III channel evolution so needs watershed strategies, but still recommended as priority
M10-0	Stream Buffers	Very High	Very High	N	Create/protect buffer, plant; few signs of active erosion, vertically stable, so could use mixed stock but still signs of lateral instability: tend toward low-cost
M10-0	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; corridor is all in SFHA); stream buffers low-hanging fruit but very important

6.1 Reach FB-M11 - First Branch mainstem from ledge grade controls downstream of Flint Covered Bridge (north end of Hunt Cemetery on Rte. 110) to confluence with Cram Brook (700 ft downstream of East Randolph Rd.)

Reach M11 straddles the town line between Tunbridge and Chelsea. It was not segmented for Phase 2 assessment. The reach is quite similar to reach M10, with a gravel substrate accompanied by significant bedrock exposures in the bed along much of the reach, but is situated in a bit more confined valley than M10 (overall Narrow confinement type for M11 as opposed to Broad for M10). As noted previously, the Gates Mill was located historically at the downstream end of the reach near the Larkin Covered Bridge (Bicknell Hill Rd.; Farnham and McGuire 2011); nothing remains of the former dam and infrastructure. This valley is comprised of kame terraces near the upstream limits of the First Branch "arm" of glacial Lake Hitchcock, and it appears there may have been some former farm- and/or town-scale sand and/or gravel pits along the left bank; none of these areas are open at this point and all are vegetated (primarily herbaceous, with some saplings and trees). A major electrical transmission line crosses and runs along the First Branch mid-reach (Fig. 73).

Figure 73. Reach M11 is situated in a Narrow valley consisting of kame terraces (now largely hayfields) near the upstream extent of the First Branch "arm" of glacial Lake Hitchcock, and has a major transmission crossing and running along the stream mid-reach.

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M11	6,122	C	None	Gravel	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M11-0	6,122	C	None	Gravel	Riffle-pool	Narrow
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Fair	Very High	1.5	III	F	None

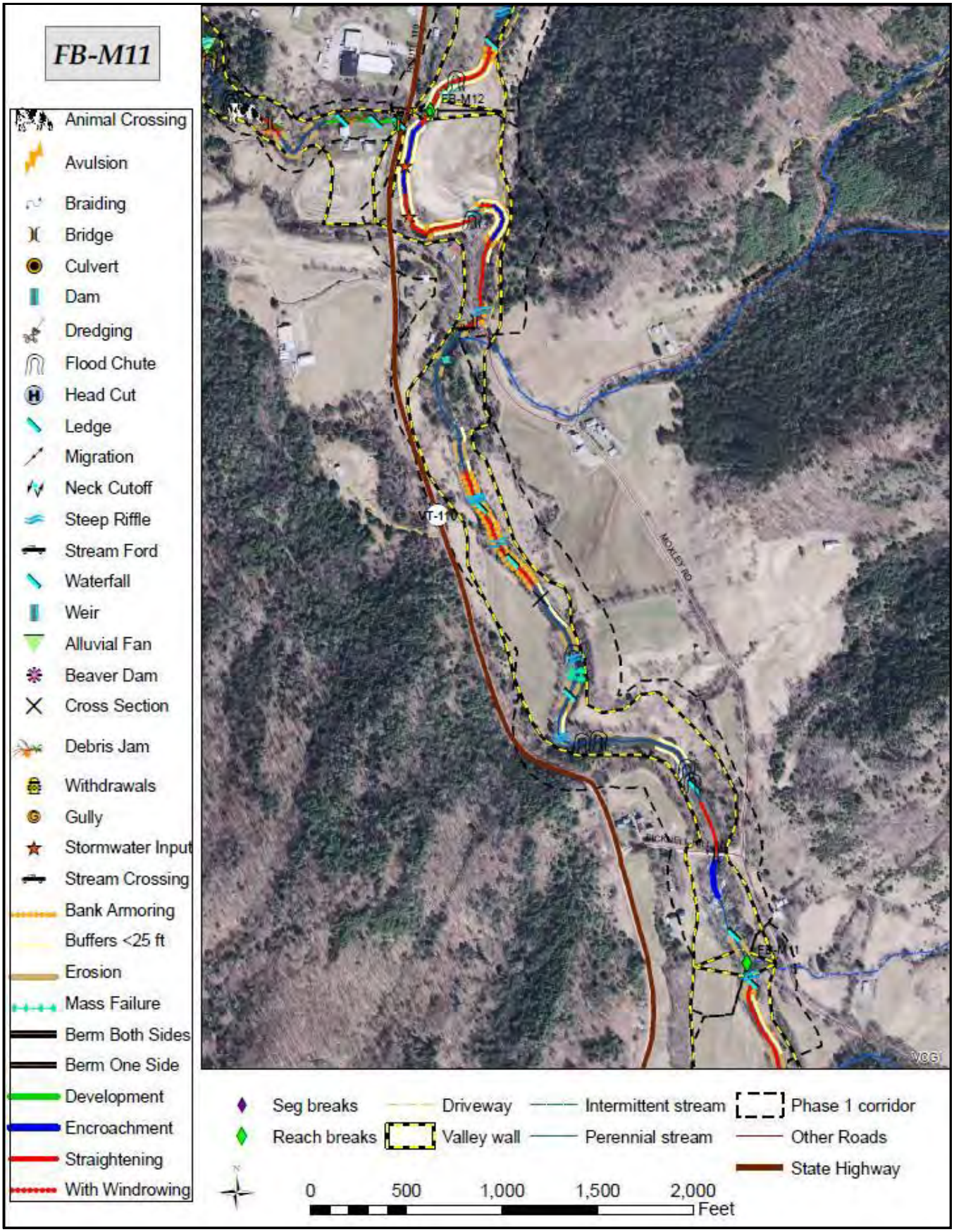


Figure 74. FB-M11 Reach map - First Branch mainstem.

With Prime farmland situated on both sides of the First Branch in M11, the stream has been significantly straightened and maintained in a relatively fixed position over time through a combination of riprap and bank toe stabilization (Fig. 74). Further straightening was noted in the vicinity of covered bridges on both ends of the reach, with the Moxley Bridge upstream and the Larkin Bridge downstream. An active ford near bedrock outcrops just downstream of the Moxley Bridge appears to be utilized by both farm and Town highway equipment, reportedly due to weight limitations on the covered bridge (unverified pers. comm. from local residents; Fig. 75). It is not known if this includes hauling manure that could be contributing to elevated *E. coli* readings that have been reported following moderate to heavy rain events in the White River Partnership's water quality testing program.

Figure 75. An active ford located near bedrock outcrops just downstream of the Moxley Covered Bridge in reach M11 is reportedly used due to weight limitations on the bridge.

Primary Stressors:

- Straightening (20-50% of reach length) primarily by virtue of bank armoring at key junctures, bridge abutments and historic mill influences
- Flint covered bridge (DS end of reach) blocks floodplain entirely but is sized close to channel width; Moxley covered bridge is channel constriction (half bankfull width) but only partial floodplain constriction; both contribute to straightening
- Ford at Moxley Bridge appears to be used frequently due to weight or size limitations on covered bridge
- Restriction of access to historic floodplains (incision ratio 1.5)
- Lacking buffers in numerous areas
- Highly erodible banks (sand)

Table 24. FB-M11 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M11-0	Stream Buffers	Medium	High	N	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous vegetation is intact in numerous areas and might facilitate some larger stock for outside edge of belt-width
M11-0	Remove/ Replace Structures	Low	Medium	Y	Replace: Flint covered bridge (DS end of reach) blocks floodplain entirely but is sized close to channel width; Moxley covered bridge is channel constriction (half bankfull width) but only partial floodplain constriction; both contribute to straightening; low priority due to social constraints (National Register)
M11-0	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; SFHA is significantly smaller than FEH in this reach); stream buffers low-hanging fruit but important

6.1 Reach FB-M12 - First Branch mainstem from confluence with Cram Brook (700 ft downstream of East Randolph Rd.) to confluence with Jenkins Brook

Reach M12 was not segmented for Phase 2 assessment. Although the channel confinement of this reach in the south-central portion of Chelsea has been increased in some areas by human activity, it appears that the valley would be a Semi-confined type even under reference (undisturbed) conditions. Even narrower sections of the valley exist at "pinch points" in areas where ledge grade controls were found, and bedrock outcrops were commonly noted along the left bank throughout the reach. The First Branch was noticeably overwidened at valley pinch points, and ice scour and tree damage were common.

The composition of streamside geologic materials indicates the northern limits of a glacial Lake Hitchcock 'arm' tapers out in the midsection of reach M12 (Doll et al 1970; VT-ANR 2013), and the significantly narrower valley (compared to downstream reaches) and change in soils along the stream (from kame terraces to glacial till moving upstream; SSURGO 2008) are reflected in the much reduced agricultural use of the corridor along reach M12 (Fig. 77).

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M12	7,605	C	None	Cobble	Plane bed	Semi-confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M12-0	7,605	C	None	Cobble	Plane bed	Semi-confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Fair	High	1.7	III	F	None

The remains of a former mill dam can be found mid-reach in M12 (Fig. 76) and Beers Atlas of 1877 notes the "J. Waterson Wool Carding Fact." at this location.

Figure 76. Remains of the former mill dam at the J. Waterson Wool Carding Factory in reach M12.

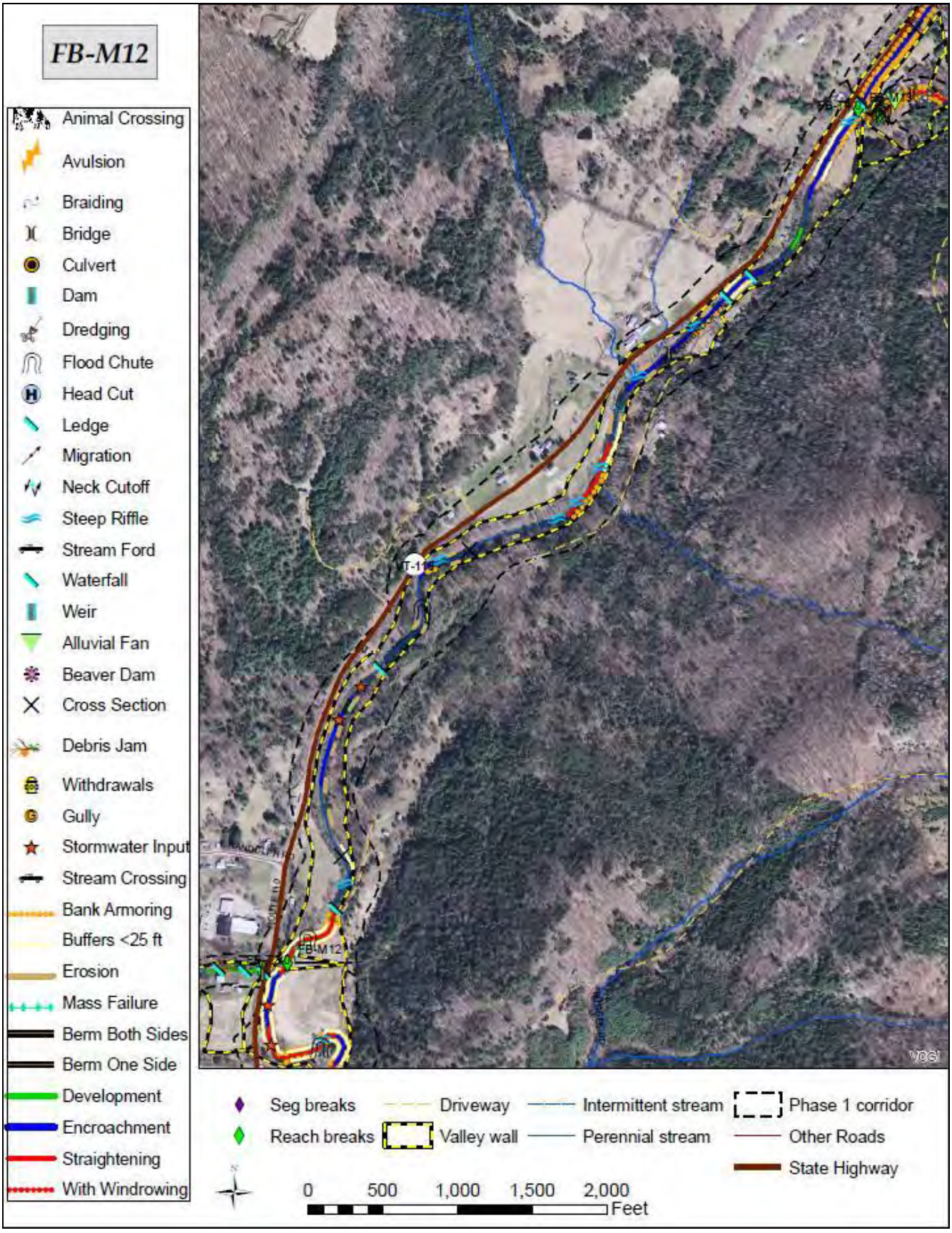


Figure 77. FB-M12 Reach map - First Branch mainstem.

Primary Stressors:

- Straightening (20-50% of reach length) by combination of extensive encroachments, both development and roads, and bank armoring at key junctures; riprap recently installed at downstream end of reach (close to E. Randolph Rd) has potential to further activate mass failure beneath barn upstream of Rte 110 pull-out across from Wireform; berm off LB in vicinity of old bridge abutments ~1000 ft upstream of E. Randolph Rd may have contributed to mass failures along Rt. 110
- Restriction of access to historic floodplains (incision ratio 1.7)
- Confinement of portions of valley by road embankments at all but high flows
- Undersized bridge at Meadowbrook Ln. and old abutments at breached dam remains from old J. Waterson Carding Factory contributing to straightening; dam remains also restrict some access to floodplain though valley is naturally pinched here and floodplain gain through removal would be minimal. Old bridge abutment further downstream is mid-channel and appears to be minimal constriction for either channel or floodplain, but see note above about berm off LB here

Table 25. FB-M12 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M12-0	Stream Buffers	High	Low	N	Create/protect buffer, plant; likely could be largely natural regeneration from existing buffers with some low-cost supplementation; field at downstream end of reach, largely riprapped, is higher priority (riprap will likely be prone to failure due to stream adjustments) - low-cost due to lateral and vertical instability; willow stakes at toe of mass failure across from this to give time for natural seeding of bank above
M12-0	Remove Berms	High	Medium	Y	Berm off left bank in wooded area with no apparent further encroachments, ~1000 ft US of E Randolph Rd., likely associated with former bridge (road across river on 1944 and 1949 USGS topos); is opposite recent mass failures along Rte 110; watershed priority lower because stream would still be incised, but would like to see this site re-evaluated considering impacts further downstream

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M12-0	Remove/ Replace Structures	High	Medium	Y	Remove: old abutments at breached dam remains from J. Waterson Carding Factory - high priority for reach, low for watershed - full floodprone constriction but removal would only free up a small amount of floodplain - but would permit better meander formation. Remove: old bridge abutment further downstream - low priority - mid-channel abutment is minimal channel constriction, does not constrict floodplain. Replace: Meadowbrook Ln bridge is undersized and contributes to straightening - medium priority - channel constriction but only partial floodplain contriction, substantial concrete structure more likely to overtop than undercut Rte 110 if it outflanks
M12-0	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; FEH generally smaller in this reach)

6.1 Reach FB-M13 - First Branch mainstem in Chelsea village, from confluence with Jenkins Brook to Old Chelsea Cemetery

Reach M13 spans a majority of the most densely settled portions of Chelsea village. The reach was split into four segments during Phase 2 assessment, largely due to the location and effects of human infrastructure.

Downstream segment M13-A is a short segment south (downstream) of the Jenkins Brook Road bridge, and features a bed strewn with large boulders and cobbles; some of these are likely failed riprap but may have originally been windrowed from the stream. The stream is surrounded by till-derived soils in this segment, as opposed to the upstream remainder of the reach that is located within recent alluvial soils dominated by sandy loams.

Segment M13-B extends alongside the Heath Recreation field, Chelsea wastewater treatment plant and town sand stockpile on the downstream end and was segmented just downstream of the Maple Avenue bridge on the upstream end, where it transitions to the largely walled-in section (historic Chelsea Mills area) comprising segment M13-C (Fig. 78).

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M13	7,481	C	none	Cobble	Riffle-pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M13-A	936	C	none	Cobble	Riffle-pool	Broad
FB-M13-B	4,875	C	none	Gravel	Riffle-pool	Broad
FB-M13-C	508	E	none	Gravel	Plane-bed	Semi-Confined
FB-M13-D	1,164	C	none	Cobble	Riffle-pool	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M13-A	Fair	High	1.4	III	F	none
FB-M13-B	Fair	Very High	1.7	III	F	none
FB-M13-C	Fair	Very High	1.1	III	F	C to E
FB-M13-D	Fair	High	1.3	III	F	none

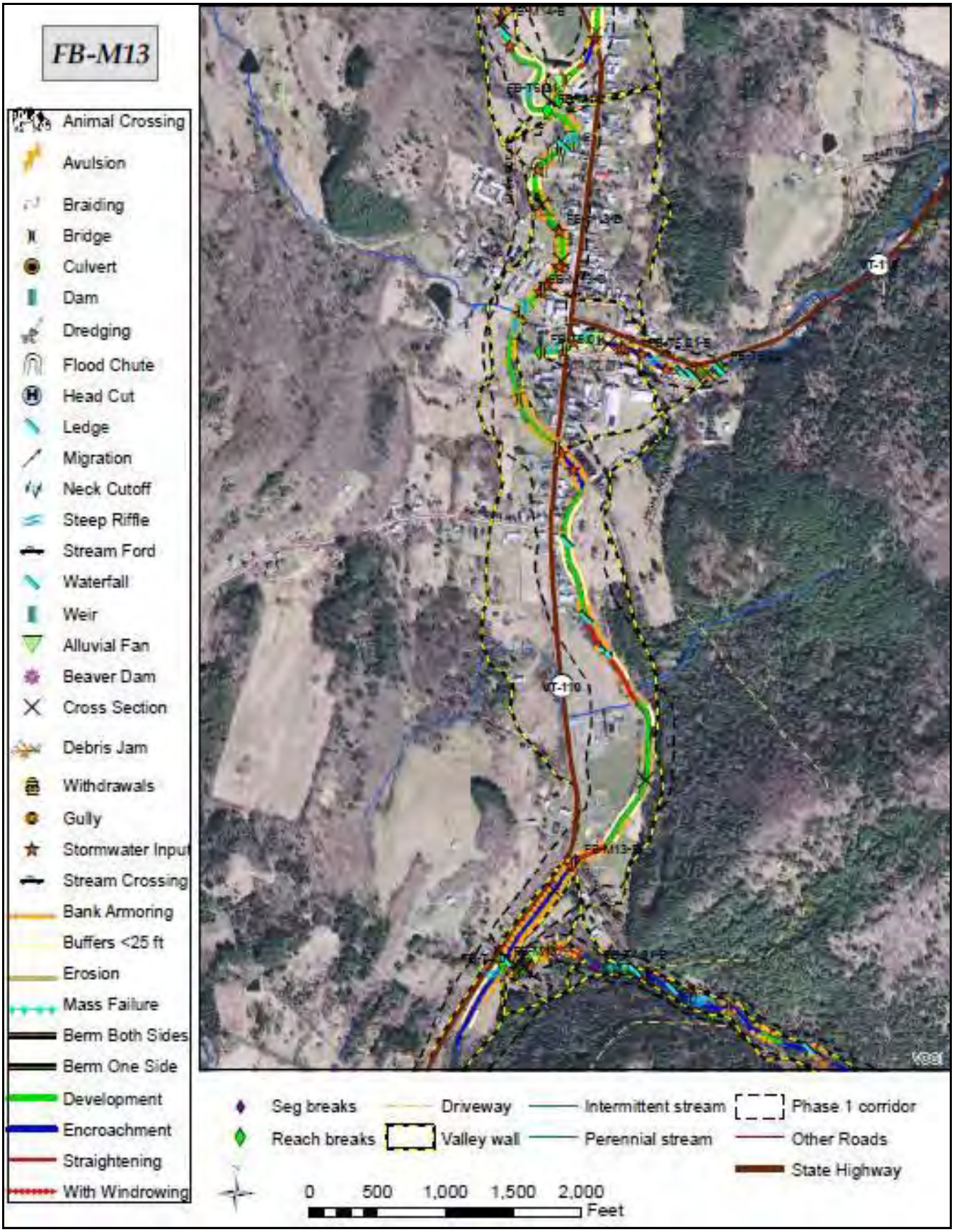


Figure 78. FB-M13 Reach map - First Branch mainstem.

Chelsea voted in October 2013 to move their 1927 Town Garage to a site on a terrace above Cram Brook along the East Randolph Road, a move that should also see the sandpile and other equipment removed from the floodplain of the First Branch in M13-B (Conarck 2013). There are no plans to move the wastewater treatment plant, which is located in the zone A ("100-year") floodplain in segment M13-B (FEMA 1980).

Upstream segment M13-D is slightly less encroached upon by structures but is still in close proximity to a mixed commercial and residential area on Rte. 110 along the left bank, with a small footbridge spanning the First Branch at an old dam site (Fig. 79) leading to the Old Chelsea Cemetery, which occupies much of the right bank in this segment (Fig. 78). Replacement of this footbridge post-Irene included elevation of the left bank abutment in a manner that restricts access to a small amount of floodplain (without development situated in it) that is a rare resource in this reach. The reach terminates at the confluence with Hart Hollow Brook (aka South Washington Branch) behind the Chelsea Pizza shop and just downstream of the Brookhaven School.

Figure 79. Post-Irene replacement of the footbridge leading to the Old Chelsea Cemetery elevated the left bank abutment in a way that restricts access to a valuable small pocket of undeveloped floodplain.

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive encroachments, primarily development but also roads, in conjunction with extensive bank armoring (especially "walled-in" section of historic Chelsea Mills)
- Road density and "urban" land use - relatively high degree of impervious surfaces, stormwater inputs
- Restriction of access to historic floodplains (incision ratio 1.1-1.7)
- Four undersized bridges, all channel constrictions and contributing to straightening, but all only partial floodplain constrictions
- Highly erodible banks (sand)
- Buffers lacking in numerous areas

Table 26. FB-M13 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M13A	Remove/ Replace Structures	High	High	Y	Replace: Jenkins Brook Rd bridge appears to be area needing repeat clean-outs, windrows or riprap have toppled into stream; outflanking may impact adjacent development, capture small downstream pond, impact house built in floodway DS
M13A	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers upstream
M13B	Stream Buffers	High	High	N	Create/protect buffer, plant; low-cost due to lateral and vertical instability though herbaceous vegetation is intact in numerous areas and might facilitate some larger stock for outside edge of belt-width
M13B	Remove/ Replace Structures	Medium	Low	Y	Replace: Footbridge behind old Shire Inn and VAST bridge downstream of Maple Ave. are both channel constrictions contributing to straightening but are not significant floodplain constrictions. Rte. 110 bridge at south end of Chelsea village is 96% bankfull width (a bit less due to sloped embankments inside structure) and also only a partial floodplain constriction. Periodic maintenance of check dams downstream of Maple Ave to limit incision
M13B	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH); discuss elevation/ buyout options now available through FEMA; stream buffers

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M13C	Remove/ Replace Structures	High	High	Y	Replace: Maple Ave bridge is undersized, contributes to straightening, and has significant signs of scour, but is only a partial floodplain constriction
M13C	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; critical to prevent floodplain encroachment downstream of Maple Ave; discuss elevation/buyout options now available through FEMA (TRORC)
M13D	Stream Buffers	High	Medium	Y	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous veg is intact and would facilitate some larger stock for outside edge of belt-width; priority increases if trying to implement footbridge project
M13D	Remove/ Replace Structures	High	Medium	N	Replace or remove: footbridge to Cemetery restricts access to pocket of high-value floodplain in repeat flooding area with few other attenuation assets; needs careful evaluation of potential impacts to encroachments downstream as well as social constraints
M13D	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; critical to prevent floodplain encroachment downstream of Maple Ave; discuss elevation/buyout options now available through FEMA

6.1 Reach FB-M14 - First Branch mainstem from Old Chelsea Cemetery to old A.C. and M.W. Button Farm (489 VT Rt. 110)

Reach M14 transitions from the northern extent of the most densely settled portions of Chelsea village into the more agricultural First Branch valley extending to the north. The reach was broken into 3 segments for Phase 2 assessment, primarily on the basis of valley width due to a transition from a Very Broad valley at the north end of the village (segment M14-A - a shared floodplain with Hart Hollow Brook), through a Narrow segment M14-B (location of the former Bobbinshop mill and dam) and then into a Broad valley dotted by farms and residences along Rte. 110 north of a frontal moraine that lies between Bobbinshop Road and the Upper Village Road (Fig. 80).

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M14	9,029	C	none	Cobble	Riffle-pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M14-A	956	C	none	Sand	Riffle-pool	Very Broad
FB-M14-B	1,610	C	none	Gravel	Riffle-pool	Narrow
FB-M14-C	6,465	C	none	Cobble	Riffle-pool	Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M14-A	Fair	Very High	1.7	III	F	none
FB-M14-B	Fair	Very High	1.0	IV	F	none
FB-M14-C	Fair	Very High	1.6	III	F	none

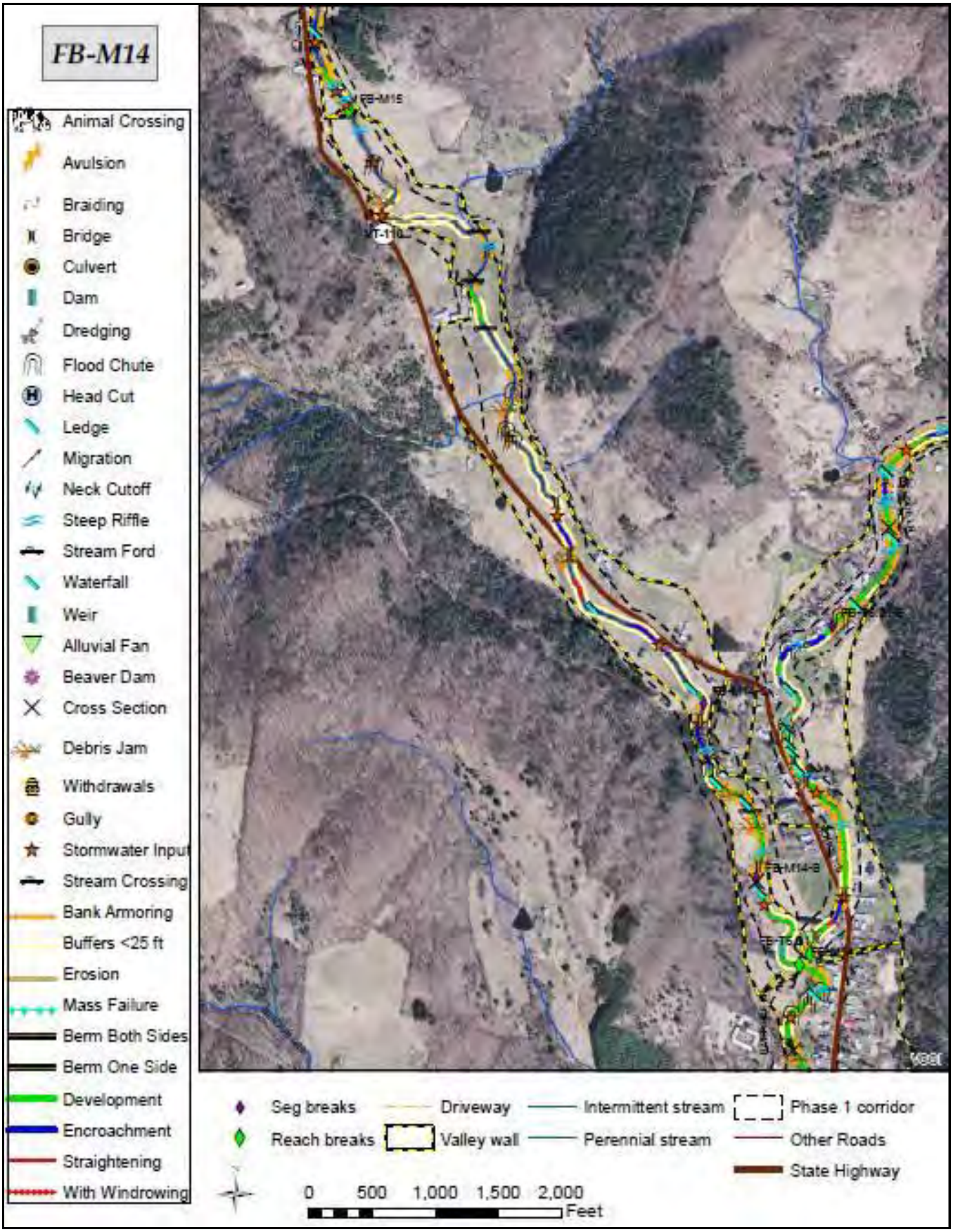


Figure 80. FB-M14 Reach map - First Branch mainstem.

Downstream segment M14-A contains a small primarily recreational dam (pool for swimming and other activities) behind the Brookhaven school (Fig. 81), with a flash board used to manipulate water levels (removed seasonally). The dam is not listed in the Vermont Dam Inventory (VT DEC 2009). The First Branch is heavily sedimented with fines upstream of the dam (due in part to the nature of the surrounding soils - very fine sandy loams), and the stream is largely a near-continuous pool upstream of the dam as well.

Figure 81. Small dam behind the Brookhaven School in M14-A uses a flashboard to regulate flow levels.

Segment M14-B is noted on a historic Chelsea Business Directory map (Walling 1858) as the site of a grist mill and a sawmill; little remains today of the former dam or infrastructure (Fig. 82). Little downcutting was noted in this segment (unlike the other segments of the reach), but it could be that the lack of evidence was primarily due to alterations for road placements along both sides of this narrow valley. With bedrock exposed in the bed, future stream adjustments will primarily manifest as widening and planform changes that may pose risk to the roads and nearby structures (town road on the left bank, farm road/snowmobile trail on the right bank).

Figure 82. Ledge grade controls at the old Bobbinshop site in M14-B, which in 1858 was also the site of a grist mill and sawmill.

Upstream segment M14-C is situated in a Broad valley but has several areas of ice-contact geologic features, appearing similar to lateral moraines or drumlins, which can be locally confining in all but the highest flood flows. Confinement by these features appears to contribute to localized areas of increased stream power and heightened erosion, and buffers are minimal in a number of these areas. The banks of the stream in this segment appear to have had extensive areas of large stone placed historically for bank toe stabilization, but much of this stone has toppled or is toppling into the stream at this point.

Primary Stressors:

- Lack of buffers
- Confinement of valley by old Bobbinshop (likely glacial origin but amplified by bridge at upstream end and road encroachment on both sides), as well as more localized confinement by lateral or ground moraine features (rolling topography) in upstream portions
- Backwater effects of impoundment behind Brookhaven contributes to bank instability and sedimentation; seasonal flashboard removal/replacement contributes to pulse flows and aggradation/degradation cycling
- Restriction of access to historic floodplains (incision ratio 1.6-1.7)

Table 27. FB-M14 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M14A	Protect River Corridors	Very High	Very High	Y	Explore easement status and possibilities, relationship to WHPA. Attenuation asset US of Chelsea village area, which has limited attenuation assets and concentrated development; also location of recent town well project, includes both zone 1 and 2 groundwater source protection areas
M14A	Stream Buffers	Very High	Very High	Y	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous vegetation is intact and would facilitate some larger stock for outside edge of belt-width; explore possibility of moving trail between hayfields off right bank further away from stream
M14A	Remove/ Replace Structures	High	Very High	Y	Consider dam removal with full recognition of social constraints and need to evaluate potential impacts to downstream encroachments in corridor (sedimented above, likelihood of bed elevation changes)
M14A	Watershed Strategies to restore incised reach	Very High	Very High	N	Floodplain and River Corridor Protection and Planning (WHPA, FEH, NFIP), stream buffers; consider dam removal with full recognition of social constraints and need to evaluate potential impacts to downstream encroachments in corridor (sedimented above, likelihood of bed elevation changes)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M14B	Stream Buffers	Very High	Very High	Y	Plant buffer with native woody vegetation; 1 of only 2 relatively stable segments in entire study area. Conditions challenging along Bobbinshop parking area, consider shrubs and low-cost smaller trees
M14B	Remove/ Replace Structures	High	Very High	Y	Replace or remove (if other access is feasible): footbridge (or VAST?) at north end of Brookhaven soccer field and new Town well structure contributes to straightening but is relatively minimal floodplain constriction; priority increased by location in priority restoration reach. Replace: Bobbinshop bridge undersized, blocks floodplain entirely
M14B	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; relatively stable segment US of high-priority attenuation asset
M14C	Stream Buffers	High	Very High	Y	Create/protect buffer, inquire about watering system for horses at Braman Farm (not clear if there is free access); plant in limited areas where banks are stable (much is still widening - stage III); low-cost due to lateral instability; may need fencing; priority increased by location in priority restoration reach

6.1 Reach FB-M15 - First Branch mainstem from old A.C. and M.W. Button farm (489 VT Rt. 110) to Nick Gilman farm (558 VT Rt. 110)

Corridor land use in reach M15 strongly resembles the northern portion of reach M14, but through most of the reach the First Branch sits in a historically incised valley that is significantly narrower than reach M14. Picturesque agricultural fields and intermittent residences occupy much of the land on both sides of the First Branch and VT Rte. 110, which lie in close proximity through most of the reach (Fig. 83). Throughout the reach it appears that banks were historically lined with large stone, likely removed from the stream or brought from nearby. Much of this riprap has failed over time, but large stones that have toppled into the stream play a prominent role in current stream dynamics by diffusing stream power in high flows, creating localized scour pools and small refugia, and occasionally amplifying localized bank erosion. Due to the size of the basin upstream, it is in the vicinity of this reach along the mainstem (and points further upstream) that the influence of stormwater inputs starts to play a more significant role on stream dynamics and channel morphology.

M15 was broken into two segments for Phase 2 assessment, with a short segment at the upstream end (M15-B) being assessed separately due to its likely location on an alluvial fan in a Very Broad section of the valley. This fan is situated at the bases of what are now intermittent tributaries on opposite sides of the valley. Historically the First Branch in segment M15-B has been maintained against the left valley wall, and the fields were drained and tiled. A horticultural streamside planting in this segment includes some Asiatic bittersweet, an invasive plant that is not widespread in the First Branch basin.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M15	5,336	C	none	Cobble	Riffle-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M15-A	4,654	C	none	Gravel	Riffle-pool	Narrow
FB-M15-B	683	F	none	Gravel	Riffle-pool	Very Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M15-A	Fair	Very High	1.7	III	F	None
FB-M15-B	Fair	Very High	1.4	III	F	None

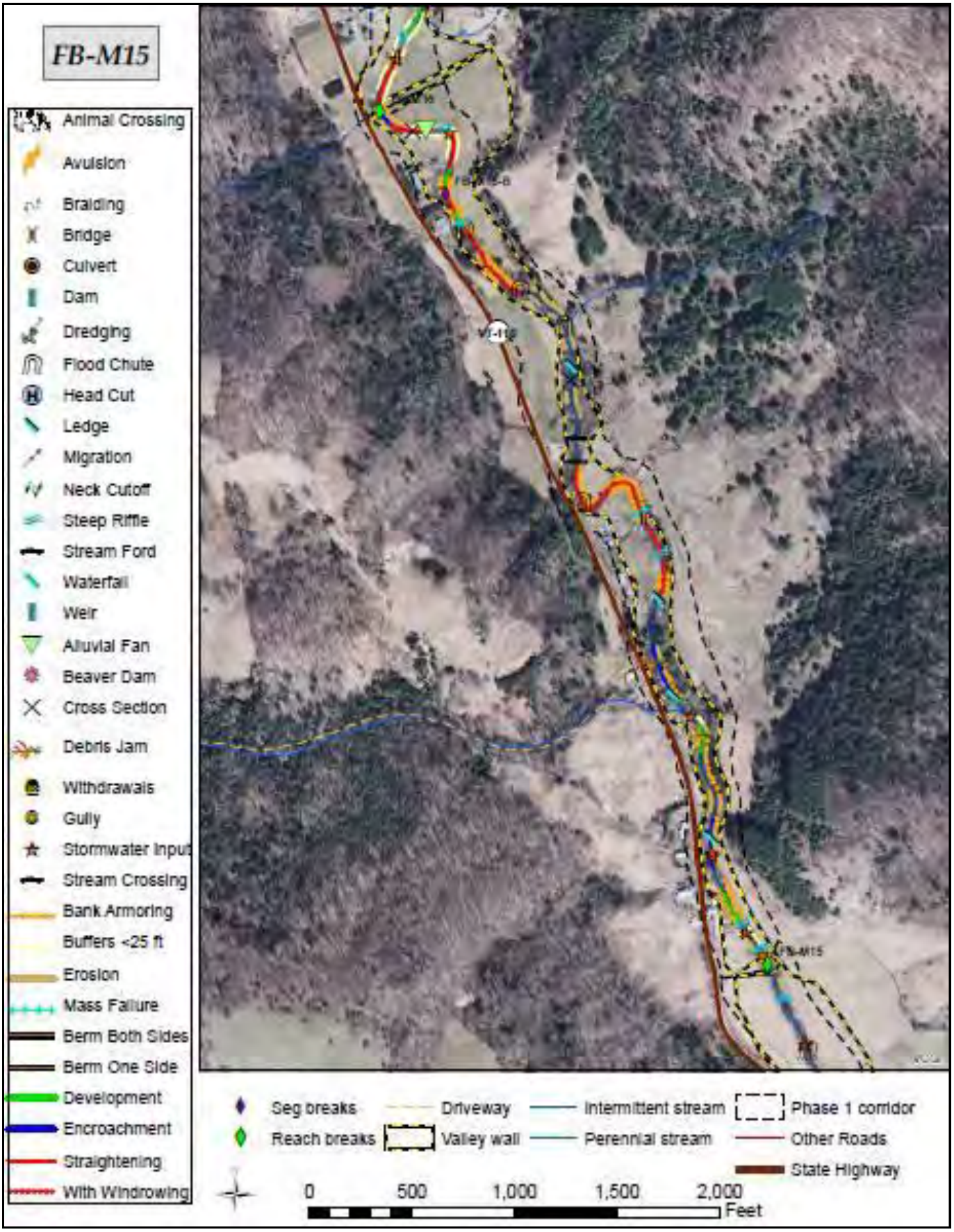


Figure 83. FB-M15 Reach map - First Branch mainstem.

Primary Stressors:

- Straightening (20-50% of reach length) largely by virtue of extensive bank toe armoring and riprap (much now failing), but also development and roads, maintenance against valley wall
- Localized confinement by lateral or ground moraine features (rolling topography)
- Old bridge abutments US of old AC and MW Button farm are channel and full floodplain constriction; two undersized farm bridges contribute to straightening, but both are only partial floodplain constrictions
- Ditching and tiling in US portion
- Restriction of access to historic floodplains (incision ratio 1.4-1.7)
- Stormwater inputs (4 road ditches, 2 tile drains; 'moderate' level stressor)

Table 28. FB-M15 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M15A	Stream Buffers	Medium	Medium	Y	Create/protect buffer; may be largely passive as limited buffers exist in much of corridor - may need fencing, and invasives control is highly recommended in vicinity of old AC and MW Button farm
M15A	Remove/ Replace Structures	High	Medium	N	Remove (higher priority): old bridge abutments upstream of old AC and MW Button farm (489 VT Rte 110) appear no longer in use - should have corridor protection in place first as rapid adjustments are feasible; Replace (lower priority): two farm bridges both undersized, contribute to straightening and show signs of scour on abutments, but both are only partial floodplain constrictions
M15A	Watershed Strategies to restore incised reach	Medium	Medium	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale; higher priority in M14 due to broader valley and likelihood of more floodplain protection), stream buffers
M15B	Stream Buffers	Medium	Medium	Y	Create/protect buffer; low cost or passive as stream has possibility of rapid widening and planform adjustments
M15B	Watershed Strategies to restore incised reach	High	High	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale; higher priority here than M15A due to alluvial fan and value as attenuation asset downstream of M16B, where there is potential for rapid widening, and string of converted transport reaches), stream buffers. May be social constraints due to high degree of streamside horticultural plantings. Recommend bittersweet control due to low current presence and high potential for dispersal.

6.1 Reach FB-M16 - First Branch mainstem from Nick Gilman farm (558 VT Rte. 110) to Chelsea-Williamstown Road

Reach M16 continues a scenic mix of agricultural fields and interspersed residences along the First Branch valley north of Chelsea and across the town line into Washington. The reach was broken into three segments for Phase 2 assessment, based primarily on changes in valley width (Fig. 84). The entire reach is geologically complex, with glacial deposits including moraines interspersed with post-glacial alluvium - especially in wider portions of the valley that comprise the confluences of both glacial and post-glacial tributaries. Remains of a dam and historic mill site can be found in segment M16-C downstream of the Chelsea-Williamstown Road (Fig. 30 in Sec. 5.1.1 of this report). Pulse flows associated with store and release regimes at this mill likely amplified erosional force in the finer alluvial sediments downstream of this site historically.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M16	11,145	C	none	Cobble	Riffle-pool	Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M16-A	6,593	C	none	Cobble	Riffle-pool	Broad
FB-M16-B	2,022	C	none	Gravel	Riffle-pool	Very Broad
FB-M16-C	2,532	C	none	Gravel	Riffle-pool	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M16-A	Fair	High	1.3	III	F	none
FB-M16-B	Fair	Very High	1.3	III	F	none
FB-M16-C	Poor	Very High	2.0	III	F	none

The geological complexity of reach M16 contributes to overall slower rates of channel evolution; adjustment responses can be anticipated to take decades to unfold. Where "ice-contact" glacial deposits such as lateral moraines are present these features can be locally confining in all but the highest flood flows, effectively increasing stream power by restricting the available floodplain over which stream power can be dissipated. In wider portions of the valleys at confluences of tributaries (glacial or post-glacial), finer alluvial sediments tend to be more erodible and have led to higher incision rates historically, which has also reduced access to floodplain.

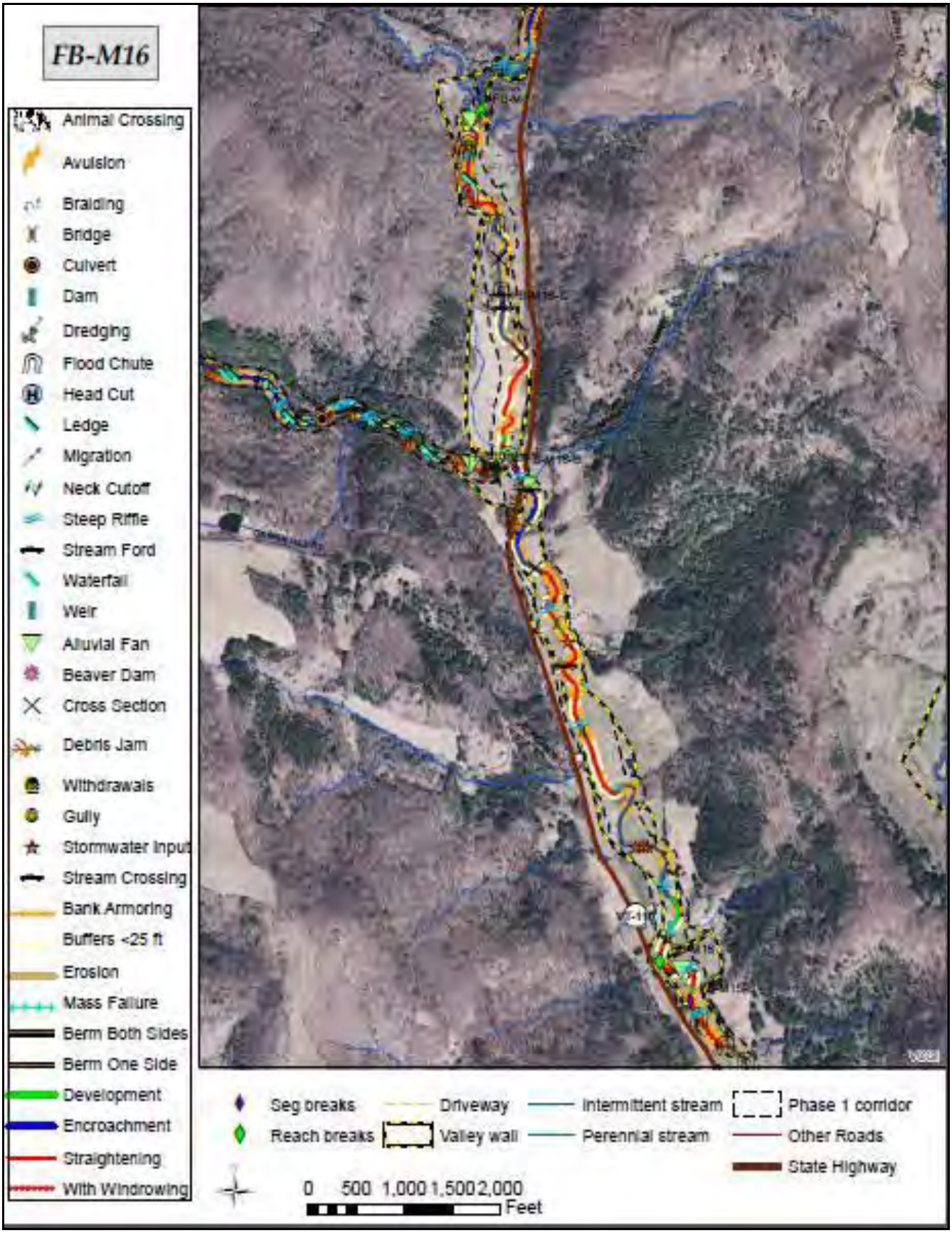


Figure 84. FB-M16 Reach map - First Branch mainstem.

In upstream segment M16-C there is evidence of historic incision in the vicinity of an old mill, and the First Branch has lost access to historic floodplain off the right bank in all but high-level flood flows. Though the entrenchment ratio in this segment still indicates a C-type stream with access to a decent amount of floodplain, moderate flood flows are more confined and likely to increase force through this segment. The net effect has been straightening and confinement throughout the reach, amplifying the impacts of flood flows on downstream areas.

In segment M16-B tree buffers have been systematically removed, as the landowner feels this practice prevents problems with large woody debris in the stream (perception of trees at risk for tipping in is accurate due to stage III widening). While erosion rates along this segment were surprisingly low, and shrub cover dense (especially dogwood), there was also evidence of recent failure of much bank toe armoring. With most trees along the banks now cut, this segment could undergo rapid widening in future storms; establishing trees at the outside edge of the fluvial erosion hazard corridor would greatly benefit not only this segment but the overall reach dynamics. Due to the presence of an alluvial fan in this segment, with high sand and gravel content, elevated bank erosion would likely contribute a good deal to fine sediment washloads but might also provide coarser materials important to establishing stable bed features.

Typical adjustments on smaller streams such as this portion of the First Branch often occur at debris jams and might include bed elevation through sediment retention (helping re-establish access to floodplains), or channel avulsions creating new meanders or establishing new channel locations at a higher elevation. Lack of large woody debris in the channel area, through either "snagging" (removal of wood) or lack of recruitment if woody buffers are missing, can retard the rate of these adjustments and prolong the impacts of heightened stream power.

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive bank toe armoring and riprap, though much is now failing
- Restriction of access to historic floodplains (incision ratio 1.3-2.0)
- Confinement of valley at all but highest flows by combination of elevated road embankments and abandoned floodplains
- Five bridges (one state, one town, one driveway and two farm), all undersized and contributing to straightening and impacts of heightened stream power; furthest downstream has check dam installed to limit downcutting above it, indicative of impacts of elevated streampower. None show signs of imminent failure but all show signs of erosion, toppling bank armoring and scour; state and town bridges are substantial concrete structures likely to be outflanked and hold while road gets damaged
- Highly erodible banks (sand and gravel) in localized areas at US end of M16A and M16B as well as much of M16C
- Stormwater inputs (2 road ditches, 1 field ditch, 4 tile drains; 'moderate' level stressor)

Table 29. FB-M16 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M16A	Stream Buffers	High	High	Y	Create/protect buffer; May be largely passive: limited buffers exist in much of corridor, though several areas completely lacking; may need fencing. Passive or low-cost as channel is actively widening - localized erosion can be rapid around toppled riprap but overall sensitivity High (not Very High or Extreme) due to geology; establish at outside edge of belt-width where possible
M16A	Remove/ Replace Structures	High	High	N	Replace: four bridges in this segment, all undersized, channel constrictions contributing to straightening/ elevated streampower. Most downstream farm bridge is not a significant floodplain constriction but has a check dam installed upstream of it, indicative of effects of straightening/heightened streampower - monitor and MAINTAIN if necessary - current IR 1.3 in comparison with IR 2.0 in M16C. Driveway bridge is only partial floodplain but also channel constriction. State structure effective width reduced by angle of alignment, private driveway structure half bankfull width and entirely blocks floodplain access. None appear to pose high risk to nearby structures or infrastructure due to replacement
M16A	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; reach-scale: high priority reach due to alluvial fans, value as attenuation asset downstream of M16B, where there is potential for rapid widening, and location at base of Jones Pond Brook), stream buffers (high priority planting area).
M16B	Protect River Corridors	High	High	Y	Explore easement possibilities - Attenuation asset DS of moraine and alluvial fan at trib confluence at end of Chelsea-Williamstown Rd, where stream has lost historic floodplain access in vicinity of old mill

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M16B	Stream Buffers	High	High	Y	Create/protect buffer; trees along banks have been systematically cut due to concerns about toppling into stream. Low-cost as channel is actively widening; establish trees at outside edge of belt-width
M16B	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; reach-scale: consider easement here; high priority reach due to alluvial fans, loss of floodplain access in M16C; Stream Buffers (priority planting area).
M16C	Protect River Corridors	High	High	Y	Explore easement possibilities - Segment is on moraine and alluvial fan at trib confluence at end of Chelsea-Williamstown Rd; stream has lost historic floodplain access in vicinity of old mill, has some aggradation, may be able to rebuild access off right bank with large woody debris and more aggradation. Priority increased by location on priority reach, reduced by degree of incision and lower sensitivity
M16C	Stream Buffers	Medium	High	Y	Create/protect buffer; should be part of corridor planning, can be mostly passive as buffers are generally in existence but can use augmentation as stream is widening and re-establishing floodplain access
M16C	Remove/ Replace Structures	High	High	Y	Replace: Chelsea-Williamstown Rd bridge is sized at 38 pct bankfull width, further reduced by angle of alignment, is located on moraine just upstream of tributary confluence, and has trib that has been rerouted to enter above structure rather than below it - all increase risk of failure. Priority increased by location on priority reach but reduced by degree of incision, lower sensitivity and absence of nearby structures.
M16C	Watershed Strategies to restore incised reach	Medium	High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; reach-scale; high priority reach due to moraine and alluvial fan, loss of floodplain access but potential to rebuild it (particularly off right bank); Stream Buffers (largely passive)

6.1 Reach FB-M17 - Chelsea-Williamstown Road to Tilton Road

Reach M17 sits in a much narrower portion of the First Branch valley. The reach was broken into two segments for Phase 2 assessment, with downstream segment M17-A occupying a Semi-confined portion of the reach that lies in close proximity to Rte. 110 (Fig. 85).

Segment M17-B, upstream of Sky Acres Road, is less heavily encroached upon by the road and occupies a Narrow as opposed to Semi-confined valley.

Both segments have multiple ledge grade controls that account for much of the slope change through the reach; these are more numerous in M17-A. Flash floods in this portion of the watershed in 2009, 2010, and 2011 have moved a lot of large particles within the First Branch, with additional recruitment from tributaries. More confinement and higher slope have helped to establish more step-pool features in M17-A.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M17	8,874	C	b	Cobble	Step-pool	Semi-confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M17-A	6,917	C	b	Cobble	Step-pool	Semi-confined
FB-M17-B	1,958	C	b	Cobble	Riffle-pool	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M17-A	Fair	High	1.4	III	F	None
FB-M17-B	Fair	High	1.7	III	F	None

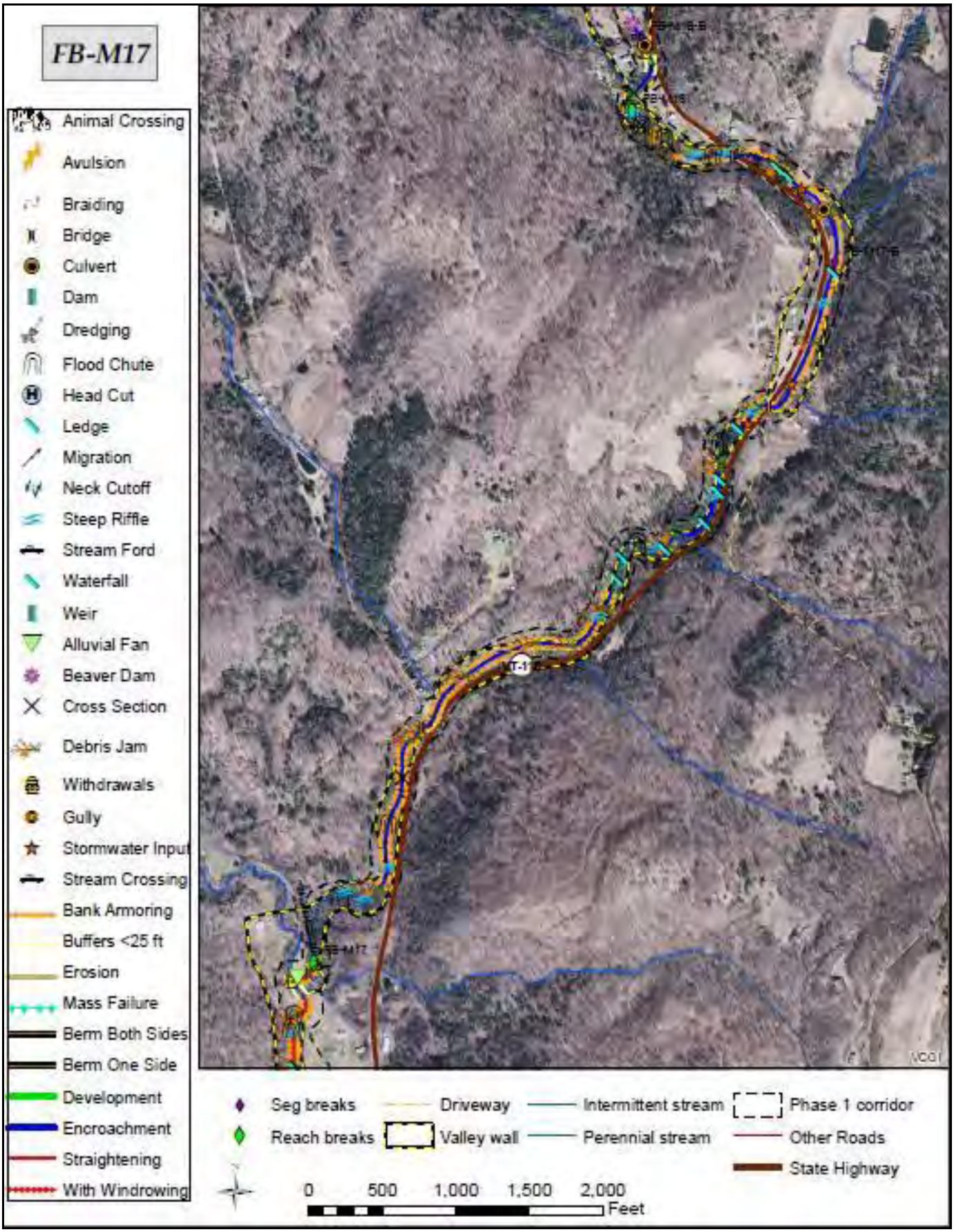


Figure 85. FB-M17 Reach map - First Branch mainstem.

Current width/depth ratios in downstream segment M17-A were very low. With numerous ledge grade controls present (meaning future adjustments will primarily involve widening and planform change) and heavy road encroachment from Rte. 110, conflicts between stream processes and infrastructure are likely to be recurrent. Traditional riprap installations are likely to be prone to failure over time (water working in behind the stone and eventually toppling it in), and flood damages downstream can be heightened by water accelerated by the surface of stone. Existing buffers that have managed to seed into riprapped areas (Fig. 86) will be important to retain when possible, and alternative armoring techniques that include vegetation to help diffuse stream power would be worth investigation. In addition, the 1920s bridges present in this area are significantly undersized and prone to failure; planning for upgrading the size of these bridges would be well worthwhile.

Figure 86. With heavy road encroachment from Rte. 110 in M17-A, attention to retaining and augmenting woody buffers can be an important step in reducing flood damages.

Primary Stressors:

- Straightening (20-50% of reach length) primarily by virtue of extensive road encroachments
- Confinement of valley by elevated road embankments at all but highest flows
- Two undersized bridges (town- Poor Farm Rd; state – Rte 110 at Pray Rd) contributing to straightening impacts, restricting floodplain access
- Restriction of access to historic floodplains (incision ratio 1.4-1.7)
- Six stormwater inputs – all road ditches (‘moderate’ level stressor)

Table 30. FB-M17 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M17A	Stream Buffers	Medium	High	Y	Create/protect buffer; part of corridor planning, can be mostly passive as buffers are generally in existence - mostly a matter of protecting existing buffers as missing areas are largely roadside and difficult to establish
M17A	Remove/ Replace Structures	High	Medium	N	Replace: State bridge on Rte. 110 and town bridge on Poor Farm Rd are typical of a series of 1920s bridges in this area of watershed, sized at ~half bankfull with low clearance, significant signs of scour, check dams placed at downstream end; Poor Farm Rd bridge is partial floodplain constriction, Rte 110 at Pray Rd bridge entirely blocks floodplain access
M17A	Watershed Strategies to restore incised reach	High	High	N	FEH, Drainage and Stormwater Management, Road-Stream Crossing Retrofits and Replacements
M17B	Stream Buffers	Medium	Low	Y	Create/protect buffer; augment buffer upstream of Sky Acres culvert (passive, let existing seed out)
M17B	Remove/ Replace Structures	High	Medium	N	Replace: Sky Acres Rd culvert at Rte 110 is sized at 27 pct bankfull, entirely blocks floodplain, is perched and appeared to have plugged upstream and been cleaned out - high priority replacement (ideally bridge). Rte. 110 bridge south of Tilton Rd sized at 50 pct bankfull, effective width significantly reduced due to alignment; signs of scour, partial floodplain restriction
M17B	Watershed Strategies to restore incised reach	High	High	N	FEH, Drainage and Stormwater Management, Road-Stream Crossing Retrofits and Replacements, Stream Buffers

6.1 Reach FB-M18 - Tilton Road to the next VT Rte. 110 bridge upstream

Reach M18 comprises a Very Broad valley upstream of Tilton Road and a short segment in a Broad valley downstream of the Tilton Road culvert (Fig. 87). Upstream segment M18-B is occupied by beavers and was precluded from geomorphic assessment due to these influences. No incision was noted in this reach, and the floodplain appears to be accessible; it is possible that aggradation (visible at the mouth of a tributary in segment M18-A) has offset any historic downcutting, or that human activity (Rte. 110 on the left bank, development on the right bank) has masked any signs of incision.

The culvert at Tilton Road is significantly undersized (26% of bankfull width). A large sediment deposit splits the stream a short distance downstream and appeared to indicate either past failure of the culvert or at least significant impacts from flooding when beaver dams upstream may have been blown out by the localized downpours that caused flooding in this area in 2009 and 2010, as well as the more widespread impacts of Irene in 2011.

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M18	2,453	E	none	Sand	Dune-Ripple	Very Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M18-A	550	C	none	Cobble	Riffle-pool	Broad
FB-M18-B	1,904	Not assessed	none	NA	NA	Very Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M18-A	Good	High	1.0	V	F	None
FB-M18-B	Not assessed	NA	NA	NA	NA	NA

Primary Stressors:

- Undersized culvert at Tilton Rd is sized at 26 pct bankfull width and entirely block floodplain access
- Straightening (20% of segment length) primarily by virtue of culvert influence and some development encroachment
- Confinement of valley by elevated road embankments at all but highest flows

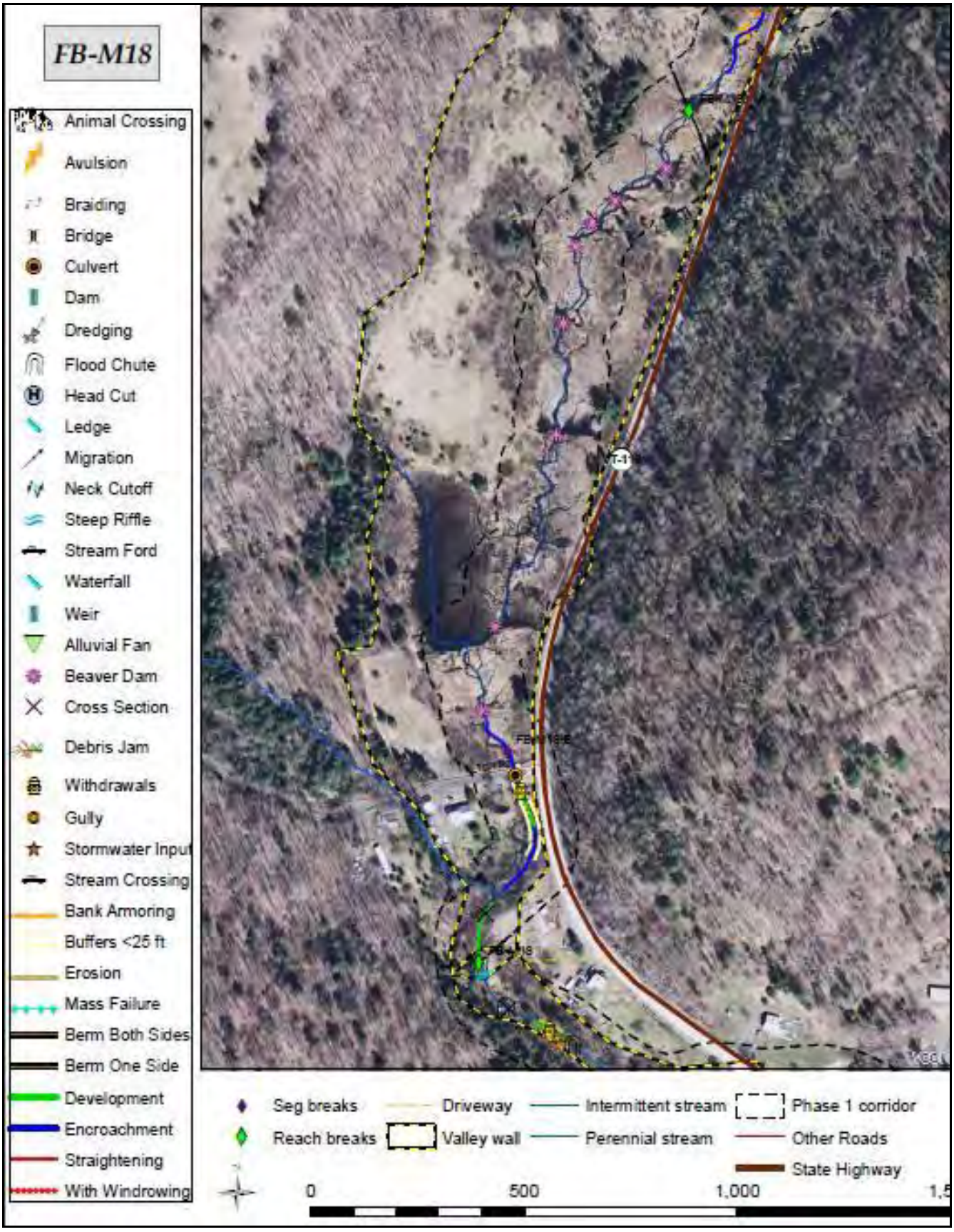


Figure 87. FB-M18 Reach map - First Branch mainstem.

Table 31. FB-M18 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M18A	Watershed Strategies to restore incised reach	Medium	High	N	Road-Stream Crossing Retrofits and Replacements; Floodplain and River Corridor Protection and Planning (FEH; protection here only given lower priority because it's largely mapped Class 2 wetland and technically protected already)
M18B	Watershed Strategies to restore incised reach	Medium	High	N	Not assessed - beaver controlled; high priority protection area (mapped Class 2 wetland)

6.1 Reach FB-M19 - Bridge by driveway entrance to 6410 VT Rte. 110 upstream to culvert that brings tributary from west side of Rte. 110 into beaver-dominated wetlands visible on the east side of Rte. 110 (base of Washington Heights)

Reach M19 comprises a small stream in an unusual bowl (and visible landmark) off the eastern side of VT Rte. 110 at the base of Washington Heights (visible on USGS topographic maps), along with the drainage departing the downstream end of that bowl.

The reach was divided into three segments during Phase 2 assessment. The drainage departing the bowl, downstream segment M-19A, is deeply entrenched due to historic incision related to being pinned between a steep left valley wall and VT Rte. 110 along a good portion off the right bank (Fig. 88).

Segment M19-B is the location of several active small beaver dams, and the segment was excluded from geomorphic assessment due to these influences (habitat data were collected).

M19-C is a short segment upstream of the active beaver dams and is a small stream (predicted reference width of 10 feet based on drainage area) undergoing rapid incision through fine sediments retained behind blown beaver dams in this section.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-M19	4,925	E	b	Sand	Riffle-pool	Very Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-M19-A	2,698	B	none	Gravel	Step-pool	Semi-confined
FB-M19-B	912	Not assessed	NA	NA	NA	Very Broad
FB-M19-C	1,316	E	b	Sand	Riffle-pool	Very Broad
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-M19-A	Fair	High	1.4	III	F	C to B
FB-M19-B	Not assessed	NA	NA	NA	NA	NA
FB-M19-C	Fair	Extreme	1.5	II	F	none

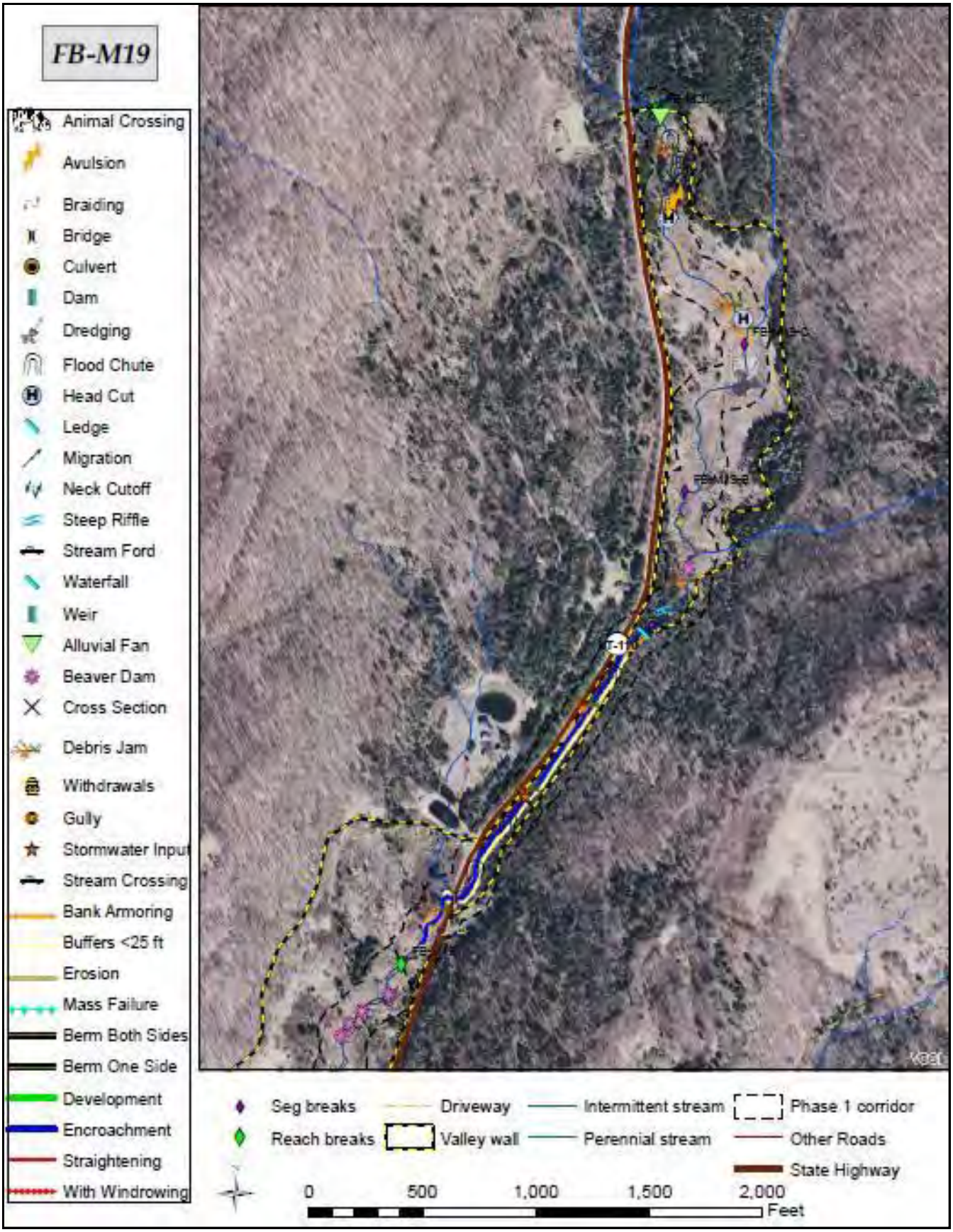


Figure 88. FB-M19 Reach map - First Branch mainstem.

The unusual nature of Reach M19 is reflected in the Phase 1 assessment as an E type stream with a b-subslope (2-4%); typically E-type streams tend to be situated in flat valleys. The Phase 1 assessment held up under field review, however, as one of the more distinguishing features of the reach was a series of transitory, stepped beaver ponds on the upstream end with evidence of recent blow-outs and ensuing rapid incision through aggraded sediments retained behind the dams (Fig. 89). Some of the wooden structures formerly damming the stream appeared to be human-constructed, but numerous local residents with long-term knowledge of the area knew nothing of any structures located along the stream (although much of the area was farmed). While loss of floodplain access due to incision is typically a high priority for remediation, the lack of surrounding infrastructure and transitory nature of the beaver ponds in this area make this of less concern in this area; beavers have already impounded some small ponds downstream of these headcuts and there is evidence of sediment inputs from upstream "washing out" these impacts.

Figure 89. Headcut migrating upstream through sediments retained behind blown beaver dams in M19-C

In downstream segment M19-A the valley is relatively narrow (and suspected to be semi-confined naturally), even without the heavy encroachment of Rte 110. However, it is the encroachment and consequent incision that restrict floodplain access enough to push the stream to a C to B stream type departure. With floodplain access largely restricted, conflicts between road infrastructure and stream processes are likely to be recurrent. Gravel substrate and frequent riffle-pool type sediment deposits in this segment are likely due to inputs from recent breaches of upstream beaver dams as well as gravel inputs from heavy road encroachment, with the sedimentation infilling a suspected cobble step-pool reference stream type.

Primary Stressors:

- Straightening (>50% of segment length in downstream segment M19A) primarily by virtue of extensive road encroachments
- Confinement of valley by elevated road embankments
- Recent (post-Irene, 2011) beaver-dam blow-outs
- Rte 110 roadside gravel and fill inputs (from heavy ditching when road was rebuilt)
- Bridge on Rte 110 upstream of Tilton Rd sized at 62 pct bankfull width, contributes to straightening and increased depth at high flows, impacts of heightened stream power, entirely blocks access to floodplain
- Restriction of access to historic floodplains (incision ratio 1.4-1.5)

Table 32. FB-M19 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
M19A	Remove/ Replace Structures	High	Low	N	Replace: Rte 110 bridge 62 pct bankfull width, contributes to straightening,increased depth at high flows, impacts of heightened stream power, entirely blocks floodplain
M19C	Protect River Corridors	Medium	High	Y	Had a house before - no signs of it now - and property used to be farmed; beaver occupation mitigates sediment and peak discharges from headwaters streams. Floodplain and River Corridor Protection and Planning (priority protection area here only given lower priority because it's largely mapped Class 2 wetland and technically protected)
M19C	Watershed Strategies to restore incised reach	High	High	N	FEH, Drainage and Stormwater Management (upstream especially), Floodplain and River Corridor Planning and Protection, Buffer Establishment and protection (maintain existing, passive reseeding)

6.1 Reach FB-T1.01 - Unnamed tributary along Strafford Road -Tunbridge Recreation Field to approach of stream to road above woods-field edge 1.7 mi up Strafford Road

Reach T1.01 is a diverse reach that runs in close proximity to the Strafford Road through most of its length (Fig. 90). The reach was divided into five segments during Phase 2 assessment, primarily due to differences in planform and slope in the downstream segments and differences in bank and buffer conditions on the upstream end.

The two most downstream segments, T1.01-A and B, are relatively steep with an "a" subslope (>4% slope). Downstream segment T1.01-A is located in a Very Broad valley and has alluvial fans both above and below a 14-foot waterfall, leading to a lot of movement of the stream back and forth across the valley over time. Segment T1.01-B is highly entrenched and pinned between the Strafford Rd and a very steep valley wall on the opposite bank.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T1.01	7,289	C	b	Cobble	Step-pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T1.01-A	1,670	C	a	Cobble	Step-pool	Very Broad
FB-T1.01-B	1,802	F	a	Cobble	Step-pool	Semi-Confined
FB-T1.01-C	1,808	C	b	Gravel	Step-pool	Broad
FB-T1.01-D	1,042	E	none	Sand	Riffle-pool	Very Broad
FB-T1.01-E	969	C	b	Gravel	Riffle-pool	Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T1.01-A	Fair	High	1.6	III	F	None
FB-T1.01-B	Poor	Extreme	2.8	III	F	B to F
FB-T1.01-C	Fair	Very High	1.9	III	F	None
FB-T1.01-D	Fair	Very High	1.7	III	F	None
FB-T1.01-E	Fair	Very High	1.8	III	F	None

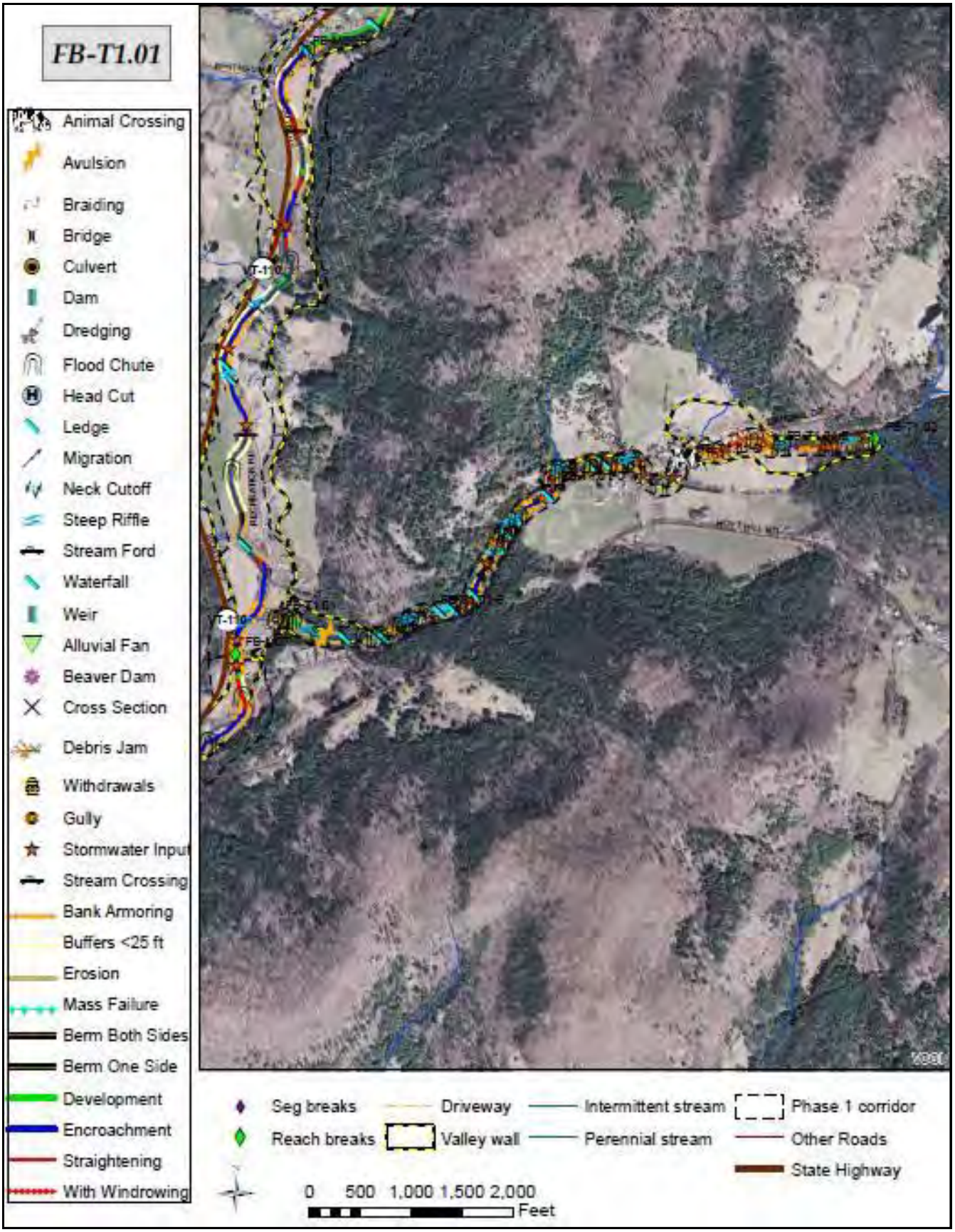


Figure 90. FB-T1.01 Reach map - unnamed tributary along Strafford Road.

The stream gradient of reach T1.01 moderates to a “b” subslope (2-4% slope) or gentler above a private bridge roughly 0.15 miles downstream of Tuttle and Hoyt Hill Roads. The three upstream segments include two sections of C-type streams (sufficient floodplain access to fit two channel widths within the floodplain, allowing pronounced meander development and attendant depositional features) surrounding an E-type stream in the open fields upstream of Hoyt Hill and Tuttle Roads.

The low width/depth ratio of the E-type stream in segment T1.01-D may reflect historical ditching of these hayfields, as a majority of the surrounding soils are hydric soils with a high seasonal water table. While the low width/depth ratio of this segment is characteristic of an E-type stream, the low sinuosity of this segment is not.

Upstream segment T1.01-E is more sinuous and closer to the Strafford Road than indicated by the Vermont Hydrography Dataset, which is the streamline portrayed on the maps in this report (Fig. 90) and on the Vermont ANR Natural Resource Atlas.With alluvial fans both above and below the waterfall, downstream segment T1.01-A has at least 7 different major flood chutes - several of which may have been the active channel over time. There are at least five chutes in the current valley below the waterfall, with at least two more chutes in a 'higher valley' coming off an alluvial fan above the falls.

A house off the right bank below the falls in T1.01-A appears to occupy one of the historic channels from the ‘higher valley’; it now appears elevated above the stream but is likely still at risk due to the nature of the stream processes in this segment. Incision can occur rapidly when a flood chute is accessed or a new channel is cut, followed by aggradation until a channel is plugged and the stream jumps to a new channel. Debris jams have likely contributed to sudden shifts in channel location over time as well, and plugged channels and debris jams can send the stream to the opposite side of the valley where it might remain for decades before another sudden shift occurs. These processes could potentially impact infrastructure in the Town Pool and Town Recreation field areas downstream as well, suggesting strategies for minimizing investments or at least placing them as far away from the stream as possible would be prudent.

Figure 91. Post-Irene straightening and windrowing at the downstream end of segment T1.01-A.

Valley width increases toward the base of the slope in T1.01-A, where the stream enters a shared floodplain with the First Branch (in reach M07). Post-Irene windrowing, berming and straightening in this area (Fig. 91) was conducted in conjunction with removal of a collapsed outbuilding and reconfiguration of driveway access to the Tunbridge Recreation Field and "Town Pool" (a constructed pond that is filled by diverting water from reach T1.01). This straightening (plus funneling through an undersized culvert at the base of the reach) appears to be elevating stream power, as evidenced by amplified erosion on the opposite bank of the First Branch across from the culvert where there is potential to trigger a mass failure under Rte. 110. The windrowing also appears to increase the chance of the culvert plugging with debris, as the reach upstream has ample wood and the channelization impedes wood from being moved onto the adjacent floodplain in high flows.

Segment T1.01-B is jammed against the Strafford Road throughout its length. Narrowing of the valley via the presence of the road (present directly along the stream in USGS topos as far back as 1896; UNH Dimond 2013) significantly increases the force of water moving through this confined channel, with large boulders being moved in floods. Many of these large stones have been utilized to attempt bank stabilization under the Strafford Rd. over time, and there appeared to be numerous areas where the stone has toppled back in. With the stream historically incised to bedrock, flood flows have nowhere to go but out and Strafford Road is likely to be a chronic, perennial trouble spot for conflicts between infrastructure and stream processes. While the prospect may seem daunting, cost/benefit analysis of upgrading Drew Road, which runs parallel to the Strafford Road in this area but is located further upslope, may be worth consideration.

In segment T1.01-C, pulse flows and straightening from a historic sawmill noted on historic maps (Walling 1858) may have contributed to the degree of incision experienced in T1.01-B downstream. Some of the stonework from the mill can still be seen in between Tuttle Road and the Strafford Road .

Further upstream, additional historic stonework was used to create the culvert underneath the Strafford Road at its junction with Hoyt Hill Rd and Tuttle Roads (Fig. 92).

Figure 92. Stone culvert beneath the Strafford Rd. at the junction with Hoyt Hill and Tuttle Roads.

This stone culvert is 5'x5' (21% of reference bankfull width based on watershed size draining to this point), with a bend in the middle, and it plugged and backed up in Irene (field observation) as

well as historically (1998, 1973; anecdotal from multiple town residents). The stonework for this bridge has been repeatedly rebuilt, and the road foreman believes there may be constraints on replacement because the structure is historic (pers. comm. Rodney Hoyt, November 2012). The stream was dredged in the rebuild of this culvert post-Irene.

Buffers in the hayfields of segment T1.01-D are minimal, and erosion rates and bank armoring were more extensive than in T1.01-E (upstream) where buffers have significant tree cover and impacts from Irene (despite evidence of relatively high amounts of precipitation in this portion of the watershed) were primarily limited to bank scour rather than active erosion. The sand substrate noted in T1.01-D was somewhat unexpected and likely due at least in part to post-Irene sedimentation from erosion of the surrounding fine sandy loams. The nature of these soils also suggests that a larger buffer between the stream and a horse shed and paddock at the downstream end of the segment would be beneficial to water quality.

Primary Stressors:

- Restriction or loss of access to historic floodplains (incision ratio 1.6-2.8)
- Straightening (20-50% of reach length) primarily by virtue of road encroachment along the Strafford Rd
- Confinement of valley by elevated road embankments
- One stone culvert and one steel corrugated culvert, two bridges (one private driveway, one VAST) - all channel constrictions contributing to straightening; culverts also contribute to heightened stream power due to entire filling of floodplain access
- Nineteen stormwater inputs (15 road ditches, 4 field ditches, 1 overland flow)

Table 33. FB-T1.01 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T1.01A	Stream Buffers	Medium	Medium	N	Create/protect buffer; passive augmentation, let existing seed out but would benefit from removal of windrows and corridor protection
T1.01A	Remove Berms	High	High	Y	Upstream of culvert; ideally part of reach-scale restoration
T1.01A	Remove/ Replace Structures	High	High	N	Replace: Culvert by Rec field (25 pct bankfull, entirely blocks floodplain, perched, potential to trigger mass failure beneath Rte. 110). Town Garage access.
T1.01A	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Planning and Protection (FEH, NFIP, explore moving Recreation Rd further back from First Branch), Buffer Establishment and protection, Road-Stream Crossing Retrofits and Replacements (replace culvert with bridge), Drainage and Stormwater Management (overland flow as much as erosion). High priority segment with heavy social constraints for project implementation.
T1.01B	Watershed Strategies to restore incised reach	High	Medium	N	Consider upgrading road further upslope; try to mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (high priority to attenuation assets US), Buffer Establishment and protection

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T1.01C	Stream Buffers	Very High	High	N	Create/protect buffer; explore moving horse paddock and shed further back from stream; passive augmentation, let existing seed out or low cost due to both widening and aggrading; may need fencing. Reach and watershed priority increased by *E. coli* readings with Town Pool downstream, heavy social constraints for project implementation in T1.01A and M07A plus Strafford Rd issues downstream.
T1.01C	Remove/ Replace Structures	High	Medium	N	Replace: Highest priority is stone culvert on Strafford Rd (sized at 21 pct bankfull, entirely blocks floodplain; repeat failures, high likelihood for future failure as well). Private bridge lower priority: 80 pct bankfull, partial floodplain constriction; structure looks relatively new and is substantial enough that outflanking and driveway failure is more likely than structure failure
T1.01C	Watershed Strategies to restore incised reach	High	Medium	N	Mitigate peak flow impacts: Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (high priority to attenuation assets US), Buffer Establishment and protection

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T1.01D	Stream Buffers	Very High	Very High	N	Create/protect buffer; low cost: both widening and aggrading, may need fencing; trees to outside edge of belt width in anticipation of widening. Reach and watershed priority increased by *E. coli* readings with Town Pool downstream, heavy social constraints for project implementation in T1.01A and M07A plus Strafford Rd issues downstream.
T1.01D	Remove/ Replace Structures	Low	Low	N	Replace: VAST bridge is 83 pct of bankfull but not a significant floopdplain constriction, contributes to straightening largely due to bank armoring up and downstream
T1.01D	Watershed Strategies to restore incised reach	Very High	Very High	N	Floodplain, Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and protection, Drainage and Stormwater Management (overland flow, erosion; mitigate peak flow impacts). Reach and watershed priority increased by *E. coli* readings downstream, constraints for project implementation in T1.01A and M07A, Strafford Rd issues.
T1.01E	Watershed Strategies to restore incised reach	Medium	Medium	N	Mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and protection

6.1 Reach FB-T2.01 - Dickerman Brook - Confluence with First Branch at VT Rte. 110 to roughly 400 feet downstream of 129 Dickerman Hill Road

Reach T2.01 runs in close proximity to Dickerman Hill Road throughout its length and empties into reach M08 on the First Branch mainstem just downstream of the M09 reachbreak (Fig. 93). T2.01 was broken into three segments for Phase 2 assessment, primarily due to differences in planform and slope: two segments of C-type riffle-pool stream (floodplain will accommodate more than 2.2 channel widths) on either end of a section of steeper B-type step-pool stream (1.4 - 2.2 channel widths fit in the floodplain).

The valley widths also vary for the three segments, accentuating the differences in planform. In T1.01-B extensive road encroachments occasionally widen the valley in the vicinity of the stream, but more often further confine the effective valley.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T2.01	6,642	B	None	Cobble	Step-pool	Narrowly confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T2.01-A	1,086	C	b	Gravel	Riffle-Pool	Narrow
FB-T2.01-B	4,350	B	None	Cobble	Step-pool	Semi-confined
FB-T2.01-C	1,208	C	b	Gravel	Riffle-Pool	Broad

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T2.01-A	Fair	Very High	1.4	III	F	None
FB-T2.01-B	Fair	High	1.4	III	F	None
FB-T2.01-C	Fair	Very High	1.5	III	F	None

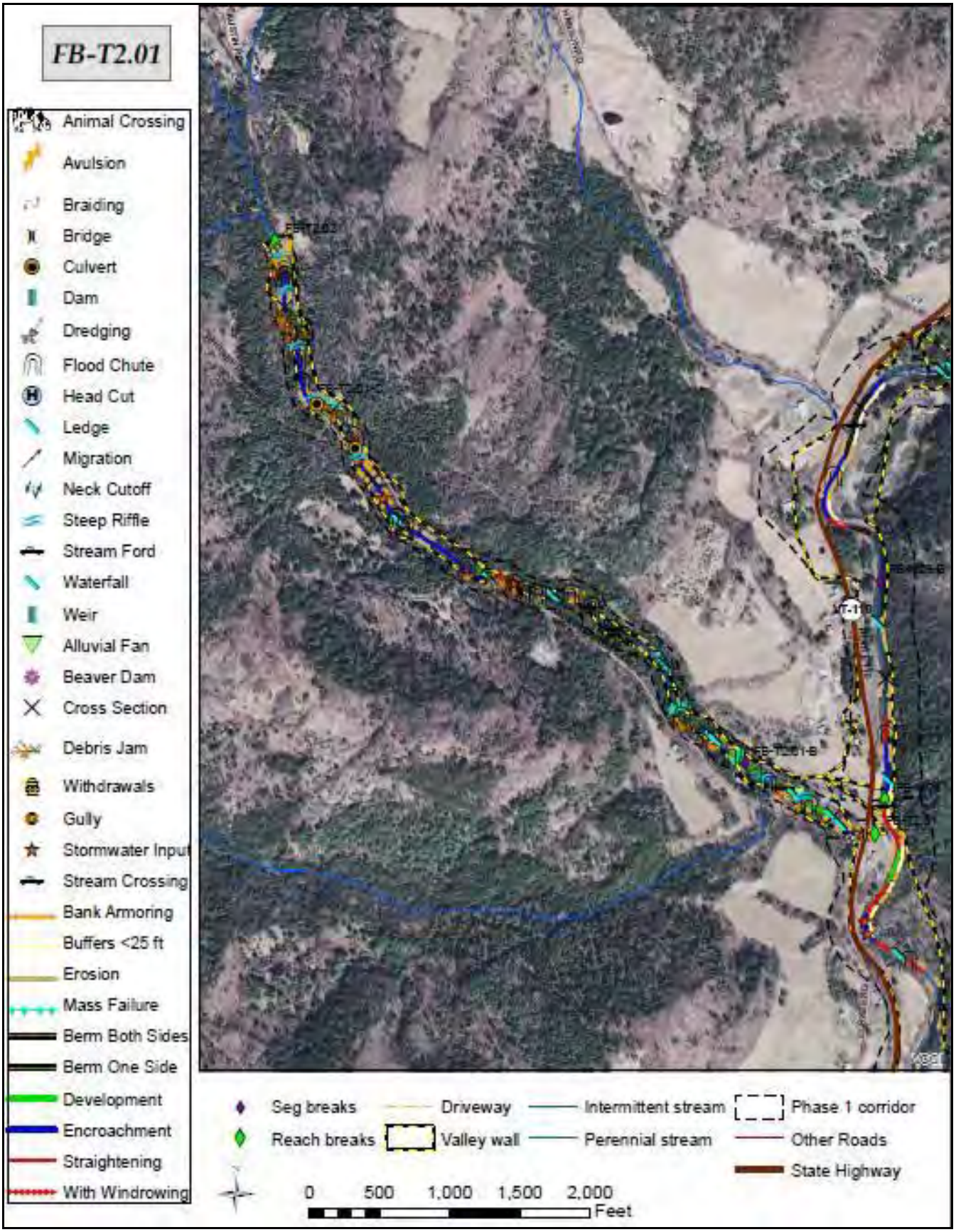


Figure 93. FB-T2.01 Reach map - Dickerman Broo

Downstream segment T2.01-A is situated on a kame terrace (ice contact outwash sediments; VT ANR 2013) shared with the First Branch, evidenced by the gravel substrate in the stream as well as the presence of a nearby sand pit just north. These are highly erodible materials along the edges of glacial Lake Hitchcock, and the stream is entrenched in a valley cut through the surrounding materials. It is likely that at least some of this downcutting occurred during glacial recession, but the high degree of straightening upstream related to road encroachment and numerous bridge and culvert crossings, plus long runs of ledge, has also increased the erosive power of the stream working on these materials. With three ledge grade controls exposed in segment T2.01-A, it is apparent that the stream has cut down about as far as it can and further adjustments will primarily involve widening and planform adjustments.

Widening and planform adjustments are evident at the downstream end of Dickerman Hill Road where a fifteen foot wall of rip-rap was placed after flash flooding in 2009 (Fig. 94); the Rte. 110 bridge area was also likely "cleaned out" at that time. The base of reach T2.01 at the confluence with the First Branch mainstem was also windrowed post-Irene (2011). The net effect of the entrenchment of the valley and cumulative straightening is the transfer of heightened stream power to downstream areas, including the bridge. Maintenance of wooded corridors in the upstream buffers is critical to mitigating these effects. In the long run it may be cost effective for the downstream end of Dickerman Hill Road to be routed further south, away from the stream, but this could increase flood risk to a house at the confluence of Dickerman Brook and the First Branch.

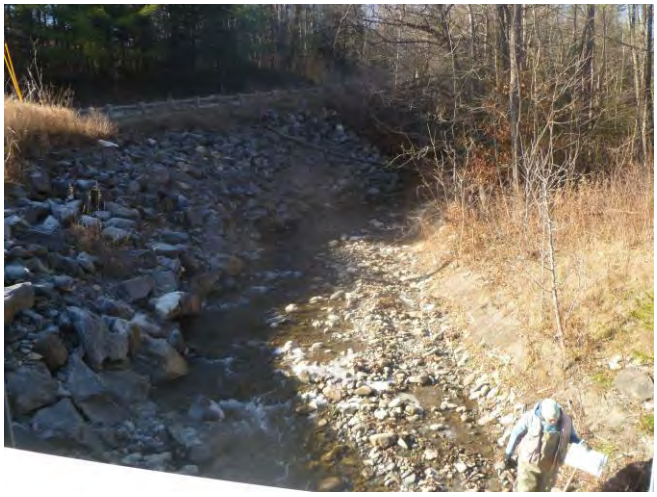


Figure 94. Fifteen foot wall of riprap placed just above Rte. 110 bridge at base of Dickerman Hill Road following 2009 flash flooding.

Segment T2.01-B is in a naturally Semi-confined valley, but extensive road encroachment increases channel confinement and will likely remain a source of ongoing conflicts between stream processes and infrastructure. Riprap and road gravel are dropping into the stream in numerous areas and there are ample opportunities for implementing Better Back Roads project practices with possibilities for funding incentives (VT AOT 2013).

Two culverts and one bridge in T2.01-B all appear to have been replaced relatively recently but remain undersized. Post-Irene scour was evident downstream of both the squash-tube culverts and may have contributed to a mass failure that has started to collapse the valley wall toward a house located relatively close to the stream at 98

Dickerman Hill. The bridge is the most undersized, with an unusual design (placed on bedrock) that includes a bend in the middle that reduces the effective width to roughly 30% of reference bankfull width (based on watershed size draining to this point; Fig. 95). The substantial amount of concrete makes outflanking more likely than bridge failure.

Figure 95. Unusual design of bridge ~0.3 mi. downstream of the Whitney Hill Road (Hardscabble) junction with Dickerman Hill Road reduces the effective width to roughly 30% of bankfull stream width.

Upstream segment T2.01-C is relatively well buffered with woods except in areas of road encroachment. Due to a recent channel avulsion in the upstream portion of the segment (probably during Irene), the stream actually flows further away from the road and the old channel running alongside the road is now dry. Limited opportunistic dredging occurred in the upstream portion of this segment post-Irene as well: a debris jam was cut and cleared and the channel was dredged and reshaped by a single landowner, likely in hopes of preventing future flood damage to his property across Dickerman Hill Road. Some of the debris from the jam appeared to have been placed in a manner to impede the stream from re-accessing the former (now dry) channel along the roadside (this assumes that the debris jam caused the avulsion as opposed to the in-stream work, but this is not entirely clear). While there may appear to be some advantages to having the stream further away from the road, inability of the stream to access the former channel as a flood chute in high flows will mean increased stream power in the new channel. With no grade controls present in this segment to limit downcutting, incision has the potential to quickly restrict access to former floodchutes and floodplains, leading to increased flood impacts on downstream infrastructure and streamside environs.

Primary Stressors:

- Straightening (20-50% of reach length) primarily by virtue of extensive encroachments, both development and roads; plugged floodchute at recent channel avulsion near upstream end
- Frequent confinement of valley by elevated road embankments
- Two bridges and two culverts all undersized and contributing to straightening and impacts of heightened streampower; all entirely block access to floodplain
- Restriction of access to historic floodplains (incision ratio 1.4-1.5)
- Thirteen stormwater inputs (12 road ditches, 1 daylighted footing drain or other ‘urban’ stormwater input)

Table 34. FB-T2.01 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T2.01A	Stream Buffers	Low	Low	N	Create/protect buffer, primarily DS end missing; passive or low cost due to both widening and aggrading; trees to outside edge of belt width in anticipation of widening
T2.01A	Remove/ Replace Structures	Medium	Low	N	Replace: Rte 110 bridge at base of Dickerman Hill 59 pct bankfull width, entirely blocks access to floodplain, appears to have plugged in past; needs assessment of relationship to downstream house
T2.01A	Watershed Strategies to restore incised reach	High	High	N	FEH (house at confluence mapped outside SFHA, not eligible for FEMA funding); mitigate peak flow impacts. Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in T2.01C), Buffer Establishment and Protection
T2.01B	Remove/ Replace Structures	High	Medium	N	Replace: Two bridges, one culvert all undersized, full floodpln constrictions; highest priority to upstream culvert, 47 pct bankfull, potential to trigger mass failure under house at 98 Dickerman Hill; most DS bridge is smallest (30 pct bankfull)- substantial concrete structure, primary threat to road
T2.01B	Watershed Strategies to restore incised reach	High	High	N	FEH high priority, history of streamside development along much of road; mitigate peak flow impacts: Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in T2.01C), Buffer Establishment and Protection (difficult, primarily roadside embankments)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T2.01C	Remove Berms	High	Medium	Y	Not technically a berm, but post-Irene snagging/dredging/ windrowing plugged what is now a flood chute in vicinity of channel avulsion; avulsion is beneficial in lengthening meander (reducing slope and stream power) but unplugging floodchute may be beneficial in flood conditions - needs further scoping
T2.01C	Watershed Strategies to restore incised reach	Very High	High	N	FEH high priority, important for protecting small but important floodplain attenuation assets - history of streamside development along much of road; mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in this segment), Buffer Establishment and Protection (difficult due to primarily roadside embankments)

6.1 Reach FB-T3.01 - Cram Brook - Confluence with First Branch (East Randolph Rd. at VT Rte. 110) to Brook Road

Cram Brook reach T3.01 is situated in a mostly Narrow valley with alternating intermittent pockets of wider valley and occasional pinch points (as low as 70 ft), which are commonly the locations of bridge or culvert crossings (Fig. 96). Farm fields at the base of the reach are situated in a naturally broader valley on an apparent alluvial fan, likely a deltaic formation on one corner of the northern extent of the "First Branch arm" of glacial Lake Hitchcock. This feature is a kame terrace largely comprised of sands (Figs. 7 and 9 in Sec. 3.2, Geologic Setting). The stream has historically incised so deeply through these sands (likely post-glacial with the emptying of Lake Hitchcock, not the more recent downcutting reflected in the incision ratio – there are multiple terraces) that it functions in a diminished floodplain similar to the naturally narrower valley upstream; it was thus not segmented out for Phase 2 assessment

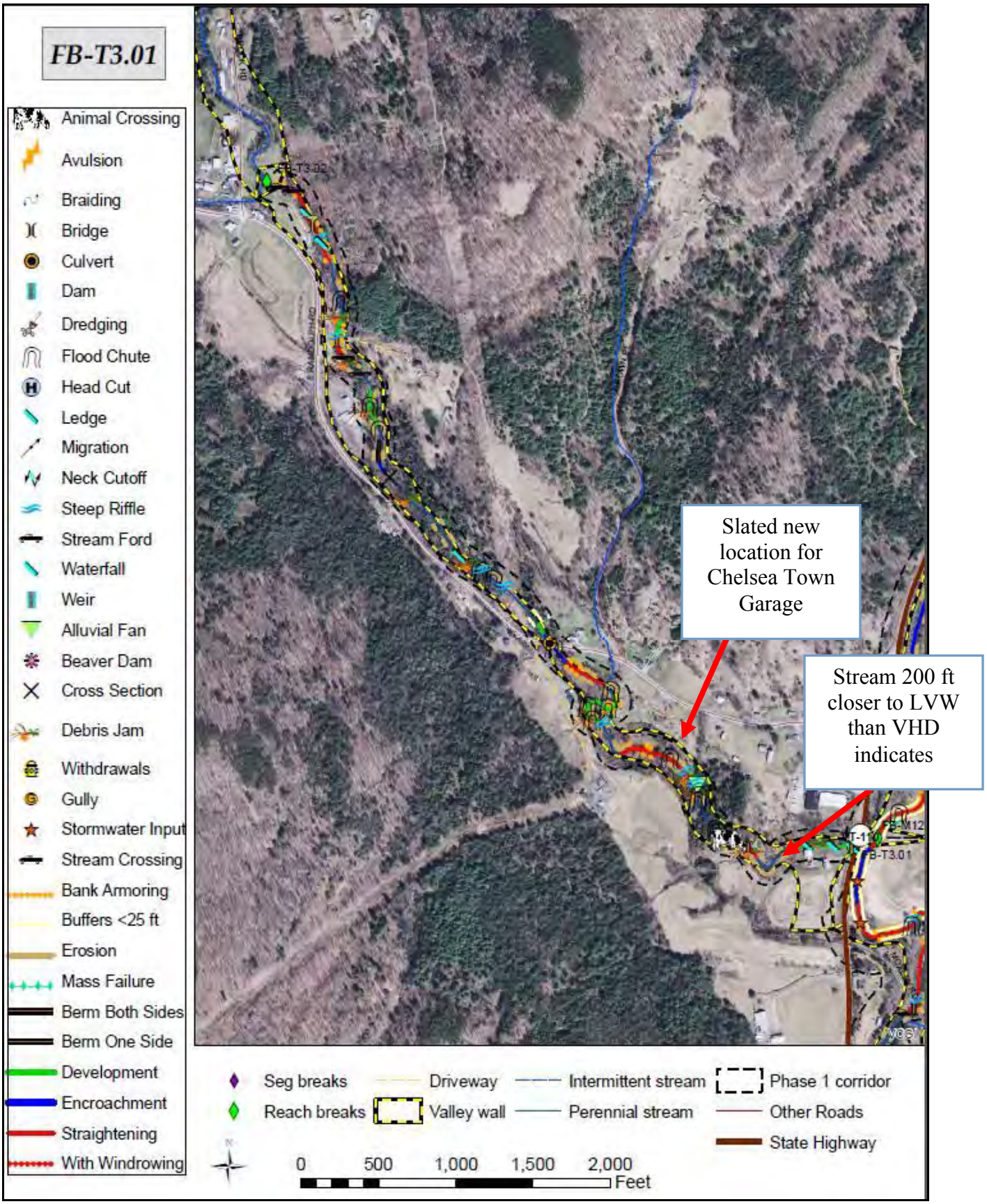


Figure 96. FB-T3.01 Reach map - Cram Brook

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T3.01	6,982	C	b	Cobble	Step-pool	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T3.01	6,982	C	b	Cobble	Step-pool	Semi-confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
	Fair	High	1.4	III	F	None

At various locations throughout reach T3.01 old channels are visible on either side of the valley outside the current channel location, likely indicating a historic dynamic of channel avulsion and relocation. Cram Brook diverges from Vermont Hydrography Dataset mapping by more than 200 ft toward the left valley wall on the upstream end of the kame terrace described in the previous paragraph, ~900-1000 ft upstream of the base of the reach (Fig. 96) - indicative of the ability of debris jams and/or sediment plugs to shift the stream from side to side in this valley, leaving evidence of old channels and/or flood chutes in the former locations of the stream.The Town of Chelsea voted in October 2013 to move the Town Garage, sand pile, associated equipment and shed out of the First Branch mainstem floodplain (in reach M13) to the "Garrow Lot" on reach T3.01 (Conarck 2013), near the upstream extent of the kame terrace on the downstream end of the reach (Fig. 97). Evidence of channel relocations and the highly erodible sands present in the vicinity suggest that ample setbacks from the stream would be prudent in developing this site. Flagging along the stream channel indicated that some sort of wetland delineation has occurred in this area, possibly in relation to the power substation located on the terraces above the opposite side of the stream, but work within the scope of this study did not determine who conducted the delineation and where the information from it resides.

Figure 97. The "Garrow Lot" in reach T3.01, future site of the Chelsea Town Garage, includes multiple terraces along a deeply incised stream on a sandy kame terrace. L: from left bank terrace (E. Randolph Rd.); R: from right bank terrace.

A berm on the right bank in the midsection of reach T3.01 is mostly the remains of bark and tailings from the former Meadowbrook Lumber yard, pushed to one side, and could potentially provide some floodplain access if cuffed out (it is not clear how restrictive these tailings are in a high flow).

A hard turn of the stream toward the left bank just upstream of the farm at the base of the reach is at a knoll/terrace that is an unusual feature forming an effective valley wall at this point in time (10 ft height above water, drops to 6-7 ft HAW shortly downstream). It appears this is a natural feature that may be composed of less erodible materials than the surrounding sands through which the stream has eroded historically, but little is known about the history or actual geologic composition of this formation that pins the stream to the left valley wall (and away from the broad former floodplain toward the right valley wall) as it passes the farm.

Primary Stressors:

- Straightening (20-50% of segment length) primarily by virtue of intermittent bank armoring at key junctures in combination with multiple stream crossings and some road encroachment
- Restriction of access to historic floodplains (incision ratio 1.4)
- Four bridges and one culvert; all but one bridge block floodplain access, and all but two bridges are channel constrictions contributing to straightening and heightened stream power
- Highly erodible banks (sand and gravel)

Table 35. FB-T3.01 Projects and Practices Table – Cram Brook

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T3.01-0	Stream Buffers	Medium	Medium	Y	Create/protect buffer; buffers generally good, but free cattle access to stream US of VAST bridge toward DS end of reach
T3.01-0	Remove Berms	High	High	Y	"Berm" appears to be bark tailings pushed to one side of former Meadowbrook Lumber yard; not clear how restrictive this would be in a high flow, but cuffing out could provide some floodplain access downstream of the buildings in one of the broader portions of this valley with relatively limited attenuation assets
T3.01-0	Remove/ Replace Structures	High	Medium	N	Replace: Highest priority: Culvert mid-reach 30 pct bankfull, floodprone constriction, plugged in Irene, scour pool below; Mid-priority: private bridge US end of reach 43 pct bankfull, may have been replaced once already, appeared to have plugged in Irene.
T3.01-0	Remove/ Replace Structures (cont'd)	Medium	Medium	N	Lower priorities: Rte 110 bridge at base of reach is less than half bankfull, signs of scour but has grade control just upstream; DS end empties almost directly into mainstem. Low priority: VAST bridges are new, sized above channel width but some floodplain restriction. No apparent risks.
T3.01-0	Watershed Strategies to restore incised reach	High	High	N	FEH high priority, important for protecting small but important floodplain attenuation assets. Area around power substation appears to have had some sort of wetland delineation and may already have maps of some vital assets; undetermined where this info resides. Mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US), Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape)

6.1 Reach FB-T4.01 - Jenkins Brook - Confluence with First Branch (Jenkins Brook Rd. at VT Rte. 110) to junction of Town Farm and Vershire Center Roads

Reach T4.01 of Jenkins Brook is a 2.25+ mile long reach paralleled fairly closely by Jenkins Brook Rd. for most of its length, predominantly forested and relatively steep, with diffuse but common residential development throughout the reach – frequently in close proximity to the stream (Fig. 98). The reach was broken into four segments for Phase 2 assessment, primarily on the basis of differences in valley width and slope (segments A and C are situated in broader, less steep portions of the valley).

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T4.01	11,988	B	a	Cobble	Step-pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T4.01-A	645	B	none	Cobble	Step-pool	Very Broad
FB-T4.01-B	4,367	B	a	Cobble	Step-pool	Semi-Confined
FB-T4.01-C	3,884	B	none	Cobble	Step-pool	Broad
FB-T4.01-D	3,094	B	a	Cobble	Step-pool	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T4.01-A	Poor	Very High	2.5	III	F	C to B
FB-T4.01-B	Fair	High	1.4	III	F	None
FB-T4.01-C	Poor	High	2.5	III	F	C to B
FB-T4.01-D	Fair	High	1.9	III	F	None

T4.01-A is a short segment at the base of Jenkins Brook that would probably share floodplain with the First Branch under reference conditions but has almost entirely lost access to that floodplain. Some of the soils from that shared floodplain may have been pushed up into the embankments of a small pond off the right bank; though the pond is small it does appear to be a possibility for capture by flood flows in a major flood, heightening risk to a house that was built in the floodplain of the First Branch a short distance downstream (along VT Rte. 110). An alluvial fan noted in this segment is coarse, but there is significant aggradation at the base of the reach and it appears a fair bit of material from the channel has likely been used to line the banks over time. Trees in this segment are critical to stream stability and only one row deep on the right bank.

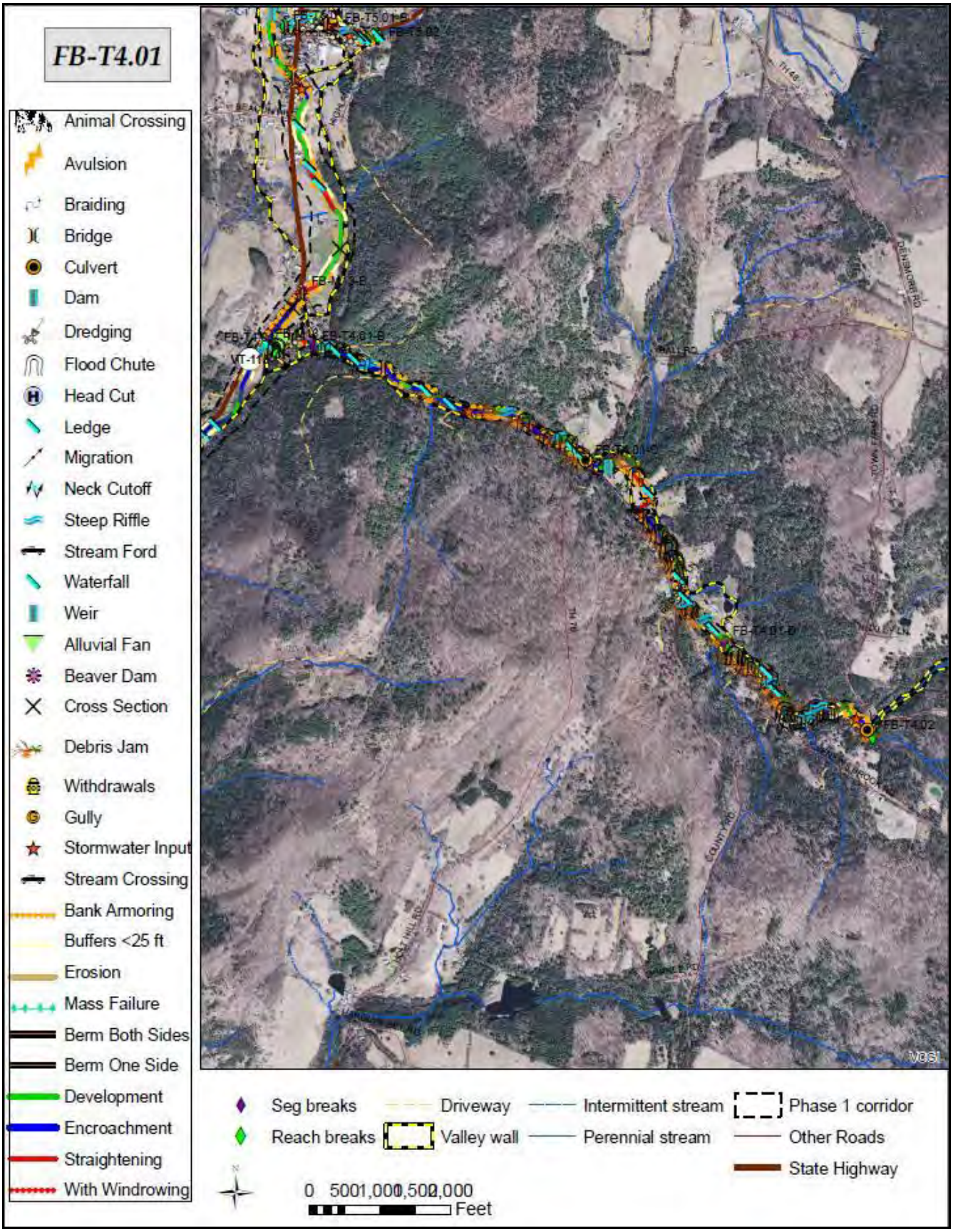


Figure 98. FB-T4.01 Reach map - Jenkins Brook

Remains of two historic mill sites were observed in reach T4.01, one in segment T4.01-B just downstream of Hall Rd and the other in segment T4.01-C upstream of Redrock Lane. Flow regulation at these sites (pulse flows associated with store and release regimes) likely contributed to the high degree of historic incision noted in segment T4.01-C, while the very coarse substrate (many boulders) and multiple ledge grade controls in segment T4.01-B limited the degree of downcutting in that segment. Segment T4.01-C also contains the relatively intact remains of a dam for a recreational pond upstream of Hall Rd. that appears to have been constructed in the 1960s and probably breached in the last 2-3 decades (flood of 1998?; Fig. 99). In that same time frame the Hall Rd. grade elevation just downstream of this dam was raised significantly to make the road more passable, and a dry hydrant was installed to take water from the large pool that may have been deepened in the stream just below the culvert (Fig. 100). The net effect of this straightening, constriction, and amplification of stream force is a heightened propensity to mass failures and movement of large boulders further downstream where frequent road encroachment and multiple ledge grade controls are likely to result in stream/road conflicts (washouts and eroded or undercut banks) with some regularity.

Figure 99. This dam for a recreational pond upstream of Hall Rd. was breached around the left bank side (left in photo), and the sluice gate has since been removed.

Figure 100. Hall Rd., just downstream of the breached dam, has a deep scour pool downstream of the undersized culvert over which the road bed was significantly elevated, limiting access to floodplain on either side.

The upstream end of reach T4.01 (segment T4.01-D) is mapped incorrectly in the Vermont Hydrography Dataset, as Jenkins Brook and Beaver Meadow Brook join ABOVE Town Farm Rd., resulting in poor alignment and a confluence just upstream of an undersized bridge. The bridge is a substantial concrete structure and the road is more likely to be damaged in a flood, probably outflanking off the right bank – a potential benefit to a house in the left bank floodplain a short distance downstream.

Primary Stressors:

- Straightening (>50% of reach length) by virtue of a combination of bank armoring, extensive road and development encroachments, remains of two old mill sites and one breached dam, and a series of undersized culverts and bridges
- Five bridges, two culverts, and one breached dam, all undersized and contributing to channel straightening and heightened streampower; only two bridges and the dam do not act additionally as floodplain constrictions
- Confinement of valley by elevated road embankments
- Restriction or loss of access to historic floodplains throughout the length of the reach (incision ratio 1.4-2.5)
- Stormwater inputs (5 road ditches, 2 field ditches, and 1 pond overflow outlet), high road density in subwatershed

Table 36. FB-T4.01 Projects and Practices Table – Jenkins Brook

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T4.01A	Stream Buffers	High	High	Y	Create/protect buffer; buffers generally >25 ft, but location on alluvial fan would benefit from augmentation; passive reseeding from existing buffers - both lateral and vertical instability
T4.01A	Remove/ Replace Structures	Low	Low	N	Replace: Wooden bridge placed on riprap/windrow that is both channel and floodplain constriction contributing to straightening and heightened streampower, but stream deeply incised in this area and structure replacement not likely to change much at this time
T4.01A	Watershed Strategies to restore incised reach	High	High	N	Alluvial fan with high potential for sudden channel shifts, but currently entrenched; FEH zone indicates clear risk in floodplain shared with First Branch. FEMA Floodway limits on mainstem end just US, apparently due to limits of BFE measurements, shifts to only mapping of SFHA. Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and Protection (primarily protection - buffers generally in decent shape)
T4.01B	Remove/ Replace Structures	Medium	Medium	N	Replace: Higher priority: culvert at US end (Hall Rd) constricts channel, completely blocks access to floodplain, high contribution to straightening and streampower; assess potential impact to downstream house in floodplain as bed elevation adjustments likely. Lower priority: Concrete bridge at DS end of segment is channel constriction and low clearance, but only partial floodplain constriction; risk for plugging but poses little threat to other structures - primary risk to road
T4.01B	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Planning and Protection (FEH; priority attenuation assets both DS and US), Drainage and Stormwater Management, Buffer Establishment and Protection (primarily protection as buffers generally decent - retain as much as possible, large woody debris plays major role in diffusion of streampower and sediment retention)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T4.01C	Remove Berms	High	High	Y	Berm by one of Redrock's x-mas tree plantations needs further assessment of potential impacts to plantation and structures but has potential to free up a decent amount of floodplain
T4.01C	Remove/ Replace Structures	Medium	Medium	N	Two bridges in segment, both channel constrictions contributing to straightening and streampower; DS one only partial floodplain constriction but could allow better access plus channel accommodation if sized at bankfull plus. US bridge is full floodprone constriction but has camp immediately DS that would be at much greater risk. Dam US of Hall Rd is channel constriction contributing to straightening and heightened stream power at low to moderate flows but is outflanked at LB breach in higher flows; structure may actually increase value of attenuation assets US and be contributing to rebuild of floodplain access, recommend low priority for removal
T4.01C	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Planning and Protection (FEH; priority attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (primarily protection, buffers generally decent - encourage retention as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T4.01D	Stream Buffers	Medium	Low	Y	Create/protect buffer; buffers generally >25 ft, but augmenting buffer US of house at top of reach would benefit flood mitigation for the house as well as stream health; passive reseeding of existing buffer or low-cost due to lateral and vertical instability
T4.01D	Remove/ Replace Structures	Medium	Medium	N	Town Farm Rd bridge and culvert immediately US constrict channel, block access to floodplain, contribute to stream power. However, current configuration of culvert entering directly US of bridge diffuses stream power in flood, makes right bank outflanking more likely - potentially mitigating damage to downstream LB house but increasing risk to Town Farm Rd. Sediment dropouts more likely at confluence, may require more frequent "clean-outs" and potentially ramp up streampower if stone is windrowed US
T4.01D	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Planning and Protection (FEH; priority attenuation DS), Drainage and Stormwater Mngmnt, Buffer Establishment and Protection (primarily protection - buffers generally decent - encourage retention; large woody debris plays major role in diffusing stream power, sediment retention, possibility of rebuilding floodplain access)

6.1 Reach FB-T5.01 – Jail Brook – Parallel to VT Rte. 113 from confluence with First Branch behind basketball court in Chelsea Village to upstream end of central village development (~0.25 mi.)

Reach T5.01 is a very short reach located between the two town greens in Chelsea village (Fig. 101). It was broken into two segments for Phase 2 assessment due to the steep slope and relative inaccessibility of the floodplain in the upstream portion compared to the downstream portion.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T5.01	1,438	C	none	Gravel	Riffle-pool	Very Broad

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T5.01-A	790	C	none	Gravel	Plane-bed	Very Broad
FB-T5.01-B	648	B	a	Cobble	Step-pool	Semi-confined
	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T5.01-A	Fair	Very High	1.7	III	F	None
FB-T5.01-B	Poor	Extreme	2.6	III	F	None

Jail Brook reach T5.01 includes an alluvial fan at the downstream end of a relatively steep portion of Jail Brook, is largely channelized and heavily riprapped both historically and currently, and contains the remains of a historic mill site (indicated as a Bark Mill on an old map of the Chelsea Business District; Walling 1858) in the upstream segment T5.01-B (Fig. 102).

Figure 101. Segment T5.01-B descends from a relatively steep portion of the stream and is funneled past an old mill site before entering the largely developed floodplain at the base of the reach in segment T.01-A.

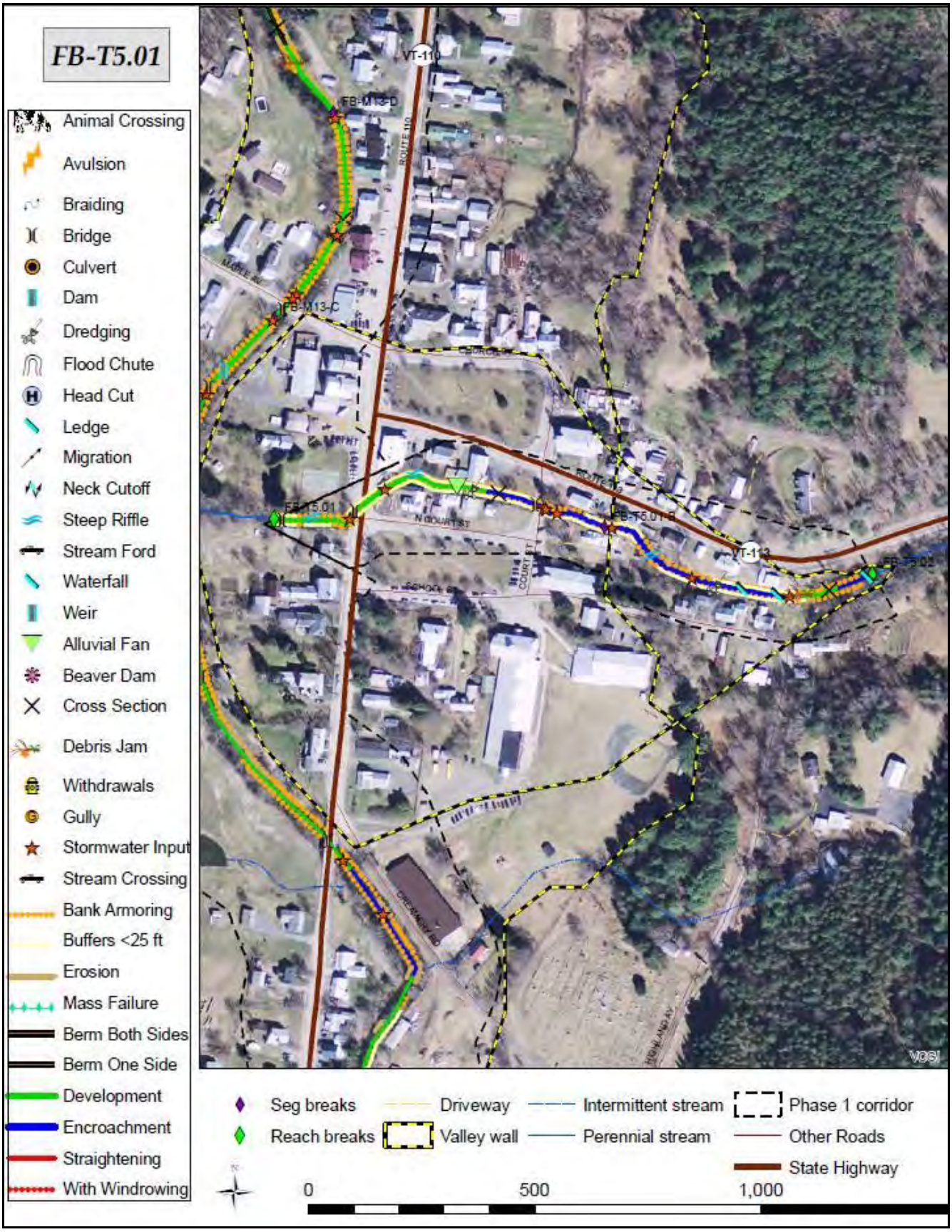


Figure 102. FB-T5.01 Reach map - Jail Brook

The alluvial fan at the base of reach T5.01 is obscured by a largely developed floodplain that is a repeat site for flash flooding of various sorts, including ice jams at undersized bridges, and upstream channelized portions of the reach that amplify flows approaching that floodplain were heavily impacted by August 2009 flooding (Fig. 103). Further development in this reach, or even maintenance of existing development and infrastructure, is likely to remain in conflict with stream processes and require escalating expenditures.

Figure 103. Flood impacts on Jail Brook reach T5.01: overflow from an ice jam at the Rte. 110 bridge (2007, above) and bank failure at a house on Rte. 113 just upstream of the Court St. bridge (2009, right).

Primary Stressors:

- Alluvial fan (rapidly decreased slope situated below much steeper section of stream) occupied by extensive development, largely channelized
- Straightening (>50% of reach length) primarily by virtue of extensive encroachments, both development and roads, with repeat dredging and snagging of channel following ice and debris jams
- Undersized bridges at Court St. and Rte. 110 contribute to channel straightening and heightened streampower, repeat plugging by ice and debris jams
- Restriction or loss of access to historic floodplains (incision ratio 1.7-2.6)
- Highly erodible banks (sand)
- Stormwater inputs (6 “urban”, 2 road ditches; high road density and impervious surfaces)

Table 37. FB-T5.01 Projects and Practices Table – Jail Brook

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T5.01A	Stream Buffers	Medium	Low	Y	Create/protect buffer; important to stream health but opportunities may be limited by social constraints in this setting; native shrubs close to stream would help, may need knotweed control
T5.01A	Remove/ Replace Structures	Low	Low	N	Replace: Both Court St and Rte 110 bridges are undersized and contribute to straightening and heightened stream power, but replacement of either is severely constrained by development up and downstream; not likely to become feasible unless there are substantial changes
T5.01A	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Planning and Protection (FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; discuss buyout and elevation options now available through FEMA; most structures downstream of Court St are in FEMA zone B), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)
T5.01B	Stream Buffers	Medium	Low	Y	Create/protect buffer; important to stream health but opportunities may be limited by social constraints; may need knotweed and chervil control, may preclude passive approach; low-cost due to lateral and vertical instability
T5.01B	Watershed Strategies to restore incised reach	High	High	N	Floodplain and River Corridor Planning and Protection (FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; discuss buyout and elevation options, but largely not in FEMA mapped flood zone), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)

6.1 Reach FB-T6.01 - Hart Hollow Brook (aka South Washington Branch) - Confluence with First Branch (behind Brookhaven School in Chelsea Village) along Upper Village Rd. to Washington Turnpike ("the Dump Rd.")

Reach T6.01 includes a fairly steep section of stream feeding into a likely alluvial fan that is masked by a relatively developed floodplain (Fig. 104), with the downstream portion sharing a very broad valley with the First Branch mainstem (Fig. 105). The reach was divided into two segments for Phase 2 assessment based on differences in valley confinement in addition to these factors of slope and floodplain accessibility.

Figure 104. Windrowing in segment T6.01A dug out many of the cobbles that dumped out on this alluvial fan in a developed area during flash flooding in August 2009. This type of straightening can increase high flow and sediment transfer impacts on downstream areas in the next flood.

Phase 1 (reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T6.01	1,438	B	none	Cobble	Plane-bed	Narrow

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T6.01-A	3,209	C	none	Cobble	Plane-bed	Very Broad
FB-T6.01-B	4,157	F	none	Cobble	Plane-bed	Narrow

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T6.01-A	Fair	High	1.4	III	F	None
FB-T6.01-B	Poor	Extreme	2.2	III	F	B to F

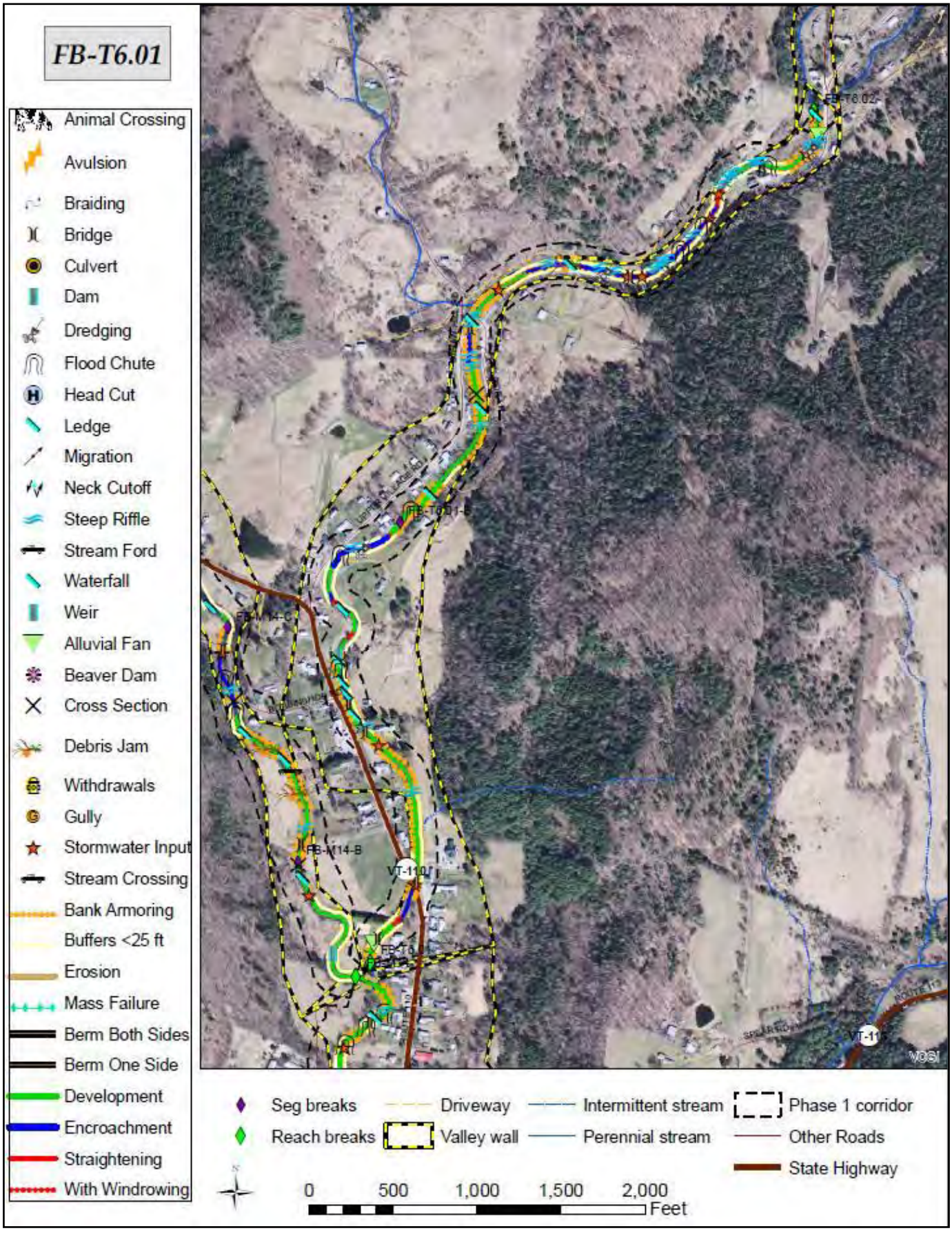


Figure 105. FB-T6.01 Reach map – Hart Hollow Brook (aka South Washington Branch)

Both segments of reach T6.01 have numerous ledge grade controls, and the remains of old mill sites were found in both segments (Fig. 106). While both sections of the stream appear to have historically incised down to bedrock, both segments appear to be aggrading; numerous sugar maples (typically intolerant of inundation) in downstream segment T6.01A were noted right at water's edge rather than being elevated above the level of annual bankfull flows.

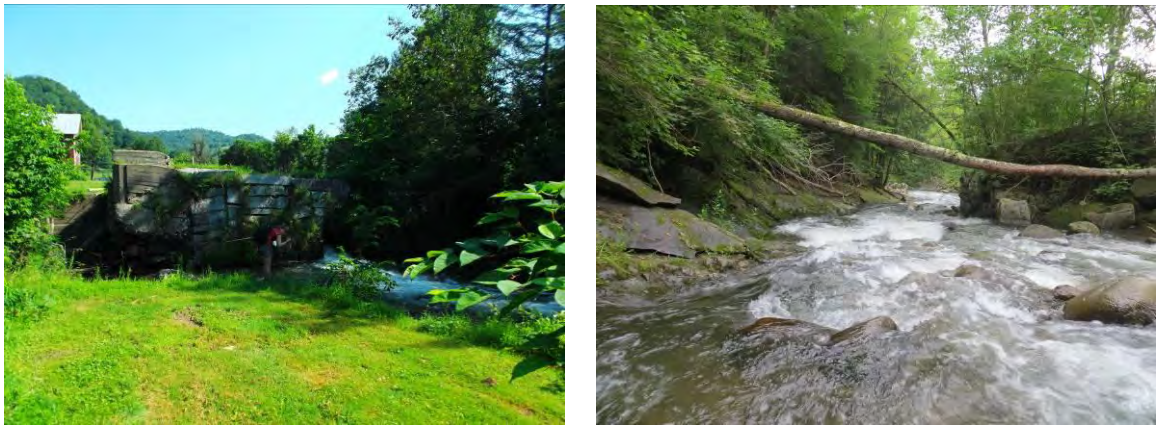


Figure 106. Old mill sites in reach T6.01: site at north end of Chelsea village (left) has relatively intact stonework that funnels the stream through a 4 ft. stone culvert, plus the old millstone from a former gristmill further upstream (foundation and bedrock constriction, right).

The foundation stonework at the old mill site at the north end of Chelsea village in downstream segment T6.01A is still relatively intact, and features a memorial plaque noting this as the location of the first gristmill and sawmill in Chelsea, 1788. The stonework funnels the stream through a 4 ft. wide stone culvert that is barely visible (due to sedimentation) on the upstream end and appears to have plugged in high flows; the left bank mill race has been accessed as a flood chute in flood events; additional water flowed toward the right bank and down Rte. 110 toward many structures in the village in August 2009 flash flooding. Although this dam is a channel constriction it appears that it may be playing a valuable attenuation role in a less developed section of the stream than further downstream where there are numerous development encroachments in close proximity to the stream.

Upstream segment T6.01B is marked by heavy road encroachment on the left bank and is extensively riprapped in numerous areas. The valley is borderline Narrow/Semi-confined, functionally Semi-confined in many areas due to road encroachment but intermittently able to access the wider valley in major floods. Due to location at the downstream end of the overall stream, and heightened stream power due to confinement and a relatively steep slope, this segment has significant aggradation of large mobile particles (boulders and cobbles). An alluvial fan noted in the segment is at the upstream end of the reach, just below the confluence with a tributary. With a house and shop located in the floodplain just downstream, a stream alteration permit was issued to take some of the boulders and cobbles and build up the left bank following flooding in 2009 to prevent major damage to the road and house downstream (Fig. 107). The owner reported he "has lost track" of the damages from repeat flooding (pers. comm., Mike Chapin, May 2013).

Figure 107. Cobbles and boulders at the upstream of end of segment T6.01B were windrowed on the left bank (photo above left, 2013) to shunt high flows further downstream and try to limit flooding on the road and at a house and auto repair shop just downstream. After 2009 flooding: photo above right is same house as 2013 photo - no windrow present, sediment both sides of road; photo at left shows path of water toward shop and house downstream.

Further downstream in segment T6.01B, elevated stream force in this confined valley led to severe erosion and infrastructure damage along other portions of the reach in 2009, where follow-up structural control measures have continued to pass heightened impacts further downstream (Fig. 108). Some of the materials for the structural repairs were taken from the stream, counteracting deposition that could potentially rebuild access to the floodplain occupied by the road. With little accessible floodplain afforded to the stream in this area, deposition and planform adjustments (stream migration, channel avulsions and flood chute access and/or formation) can be expected to recur in segment T6.01A entering Chelsea village where there is extensive development. While it may appear counterintuitive at face value, permitting the stream to access the floodplain occupied by the road in this area may be a less costly management alternative in the long run; there is little opportunity for relocating the road further back from the stream in this confined valley.

Figure 108. Left bank abutment of snowmobile bridge on the Upper Village Rd. in segment T6.01B collapsed in 2009 flooding (left); riprap and windrowed materials from stream bed (right, in 2013) greatly elevate stream force passing downstream.

Primary Stressors:

- Straightening (>50% of reach length) primarily by virtue of extensive encroachments, both development and roads
- Restriction or loss of access to historic floodplains (incision ratio 1.4 - 2.2)
- Confinement of valley by elevated road embankments
- Eight bridges and one culvert; all but two bridges are channel constrictions contributing to straightening and heightened streampower, all but three are also floodplain constrictions
- Highly erodible banks (sand, stony sands)
- Stormwater inputs (10 road ditches, 1 field ditch, 1 “urban” stormwater pipe)

Table 38. FB-T6.01 Projects and Practices Table – Jail Brook

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T6.01A	Stream Buffers	Very High	Very High	Y	Create/protect buffer; priority increased by Wellhead Protection Area; passive (some areas have decent existing buffer) or low-cost due to high lateral and vertical instability. High priority for area in vicinity of old mill site on north end of village, even if just dense native shrub buffer for sediment retention and streampower diffusion, and trees upstream of there; high likelihood for repeat flooding running along Rt 110 downstream of here.
T6.01A	Remove/ Replace Structures	Medium	Very High	N	Replace: Five bridges, one culvert in segment, all undersized and mostly floodprone constrictions; priority increased by WHPA. Lower priority because the three private vehicular bridges have been recently replaced or shored up, all but most US (sized largest and least restricting for floodplain) have development nearby needing assessment for potential impacts. The most DS is footbridge at Brookhaven with development nearby as well. Rte 110 bridge is adequately sized but effective width reduced by angle of alignment. Any of these replacements recommended for upsizing or reconfiguration (recommend adoption of 2013 VT Bridge and Culvert Standards for watershed strategies) as opportunities arise but need design and impact assessments beyond the scope of this study. Culvert (virtually a dam) is a channel constriction but may be playing a valuable attenuation role in less developed section of the stream than further DS where there is extensive development; removal would entail bed elevation changes.

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T6.01A	Watershed Strategies to restore incised reach	Very High	Very High	N	Floodplain and River Corridor Planning and Protection (FEH, stream setbacks for US areas lacking data to create FEH; clarify and administer jurisdiction of WHPO and flood hazard bylaw; discuss new buyout and elevation options from FEMA, weigh against costs of repeat remediation); Drainage and Stormwater Management, Buffer Establishment and Protection (priority shrub plantation in this segment near old mill minimum; encourage retention in US areas; large woody debris plays major role in diffusion of streampower and sediment retention). High priority reach, social constraints for projects. May need further discussion on whether segment is being managed as a modified reach while watershed BMPs are being implemented, assess need to access dam for remediation (increasingly plugged) or removal, with careful eye to impacts on surrounding structures and infrastructure.
T6.01B	Stream Buffers	Medium	High	Y	Create/protect buffer; priority increased by WHPA; opportunities limited by social constraints and location largely along road embankments; encourage retention where feasible, passive (many areas have decent existing buffer) or low-cost otherwise due to high lateral and vertical instability.
T6.01B	Remove Berms	Low	Very High	N	Berm/windrow removal at upstream alluvial fan likely only becomes feasible if owner just downstream ever opts for buyout, otherwise removal poses risk. Watershed priority increased by WHPA.

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T6.01B	Remove/ Replace Structures	High	High	N	Replace: Four bridges in this segment, three undersized channel constrictions contributing to straightening/ elevated streampower; fourth is footbridge with minimal impact on stream. Bridge by Baraw Hill and Hillside housing is highest priority because most constricted, in part due to angle of alignment - substantial concrete structure more likely to outflank; replacement costs should be weighed against potential repeat damage to roads and/or downstream residences. VAST bridge sits on roadside and valley pinch point and is essentially at same risk as road. For both, priority increased by WHPA. Upstream private bridge is sized approaching bankfull but located on alluvial fan, blocks access to floodplain (but has house in floodplain downstream); recommend upsizing above bankfull and design to allow at least some right bank floodplain access if opportunity arises.
T6.01B	Watershed Strategies to restore incised reach	High	Very High	N	Floodplain and River Corridor Planning and Protection (weigh new buyout and elevation options from FEMA against costs of repeat remediation; FEH, stream setbacks for US areas), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in US areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention). Priority increased by WHPA.

6.1 Reach FB-T7.01 - Jones Pond Brook - Confluence with First Branch on Rte. 110 north of Edwards Road to intersection of Edwards and Williamstown Roads

Reach T7.01 runs along Edwards Road for most of its length and draws its name from a pond located ~1.2 miles up Edwards Road from Rte. 110, identified as Jones Pond on USGS topographic maps at least as far back as 1948 (UNH Dimond 2013; Fig. 109). The reach is more than 2.6 miles long and is highly diverse; it was broken into six segments during Phase 2 assessment due to changes in valley width, planform and slope and presence of breached beaver dams in one segment. Irene impacts were more evident than on First Branch reaches, but qualitative field observations included a healthy brook trout population.

Downstream segment 7.01-A is a steep and confined portion of the stream, for the most part further from Dickerman Hill Road than the rest of the stream and well-buffered by woods except in areas with road encroachment (~one-third of the segment). When accessible the wooded buffers have provided important material for sediment retention and helped limit erosion, although mass failures were common during Irene in this semi-confined valley historically incised to bedrock and downstream of extensive straightening. Mass failures were present downstream of the undersized culvert (40% bankfull width) in this segment.

At the downstream end of T7.01-A, a 400-500 foot section lower gradient stream with hayfields on both sides (in historically shared floodplain with First Branch mainstem reach M16) were not segmented out due to inclusion of the basic information for such a short length within the assessment of the mainstem reach.

The pond lending the Brook its name is located on the upstream end of T7.01-A at the segment break for T7.01-B. A diversionary channel to the formerly larger pond from Jones Pond Brook is now dry (though accessible at flood levels), and the original dam for a larger pond is now breached (VT DEC 2009). The current pond is a roughly 1.2-acre recreational pond with an earthen dam (not listed or rated in the VT Dam Inventory), which appears to be fed by springs and a tributary to the north of Jones Pond Brook (Fig. 109; VT-ANR 2013). The dam appears visually to be in good shape and showed no noticeable impacts from Irene; a breach would only impact segment T7.01-A (not upstream segments).

The slope of the stream becomes a bit gentler in the next segment upstream (T7.01-B), which is more sinuous than it appears on maps using the Vermont Hydrography Dataset (VHD 2010), especially upstream of Jones Pond where the stream has triggered mass failures due to its proximity to Edwards Rd and makes an ‘S-curve’ around a striking high hill on the south side of Jones Pond Brook completely missed by the VHD and USGS topographic maps (this feature appears to be right on the seam of different USGS quadrangles).

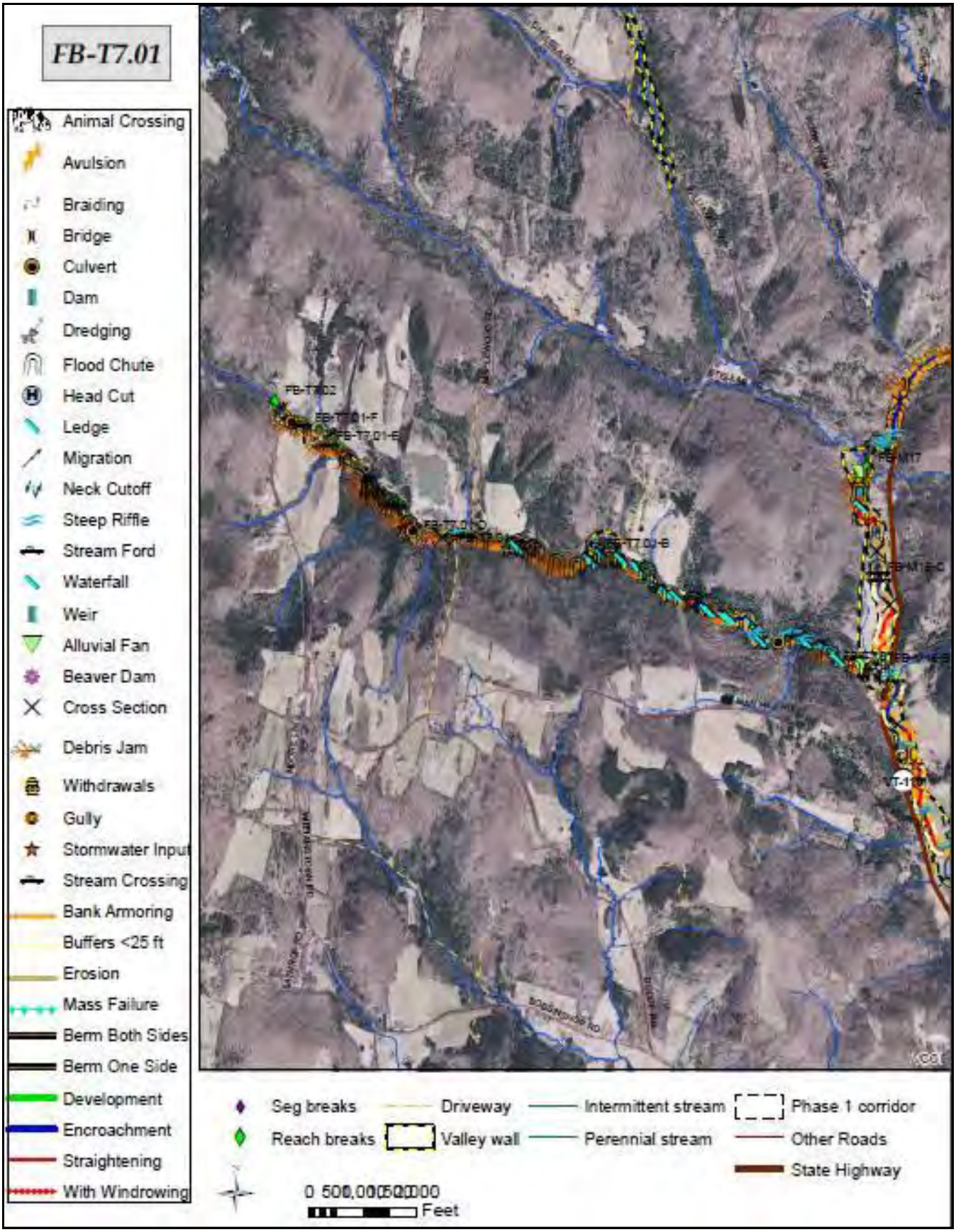


Figure 109. FB-T7.01 Reach map - Jones Pond Brook.

Phase 1
(reference)

Reach ID	Channel length (ft)	Stream type (reference)	Sub-slope	Bed material	Bed-form	Valley type
FB-T7.01	13,951	B	a	Cobble	Step-pool	Semi-Confined

Phase 2

Segment ID	Channel length (ft)	Stream type (existing)	Sub-slope	Bed material	Bed-form	Valley type
FB-T7.01-A	6,067	B	a	Cobble	Step-pool	Semi-Confined
FB-T7.01-B	3,163	C	b	Gravel	Riffle-pool	Semi-Confined
FB-T7.01-C	726	C	none	Sand	Riffle-pool	Broad
FB-T7.01-D	2,388	C	b	Gravel	Riffle-pool	Narrow
FB-T7.01-E	805	E	b	Sand	Riffle-pool	Very Broad
FB-T7.01-F	804	C	a	Gravel	Riffle-pool	Semi-Confined

	Geomorphic condition	Stream sensitivity	Incision ratio	Channel evolution stage	Channel evolution model	Stream Type Departure
FB-T7.01-A	Fair	High	1.8	III	F	None
FB-T7.01-B	Fair	Very High	1.8	III	F	None
FB-T7.01-C	Fair	Very High	1.0	III	F	None
FB-T7.01-D	Good	High	1.6	III	F	None
FB-T7.01-E	Fair	Extreme	1.0	IIc	D	None
FB-T7.01-F	Fair	Very High	1.1	III	F	None

Blue clay till exposures are present in T7.01-B, indicating localized incision historically at least, and possibly more recently in flooding events; only two ledge grade controls are present in this segment in contrast with the extensive runs of ledge downstream. This localized incision appears at least partially offset by aggradation however, as there were numerous depositional features that were likely amplified with Irene blow-outs of beaver dams in the next segment upstream.

T7.01-B is a borderline step-pool system due to slope and confinement, but has relatively high sinuosity and pockets of floodplain access on alternating sides of the stream. While these pockets are highly valuable in mitigating the effects of flood flows (mass failures

were common in this segment following Irene) and maintaining stream equilibrium, they are limited in extent and can be compromised quickly by cumulative impacts of straightening and encroachments both within the segment and upstream. This was evident in the localized deposition (steep riffle) and attendant bank erosion just downstream of an old bridge abutment constriction at Old Schoolhouse Road on the upstream end of T7.01-B (now discontinued as a road but listed as a legal trail (VT ANR 2013); Fig. 110). This abutment has a stream ford apparently used by motocross riders or ATVs (several wooden motocross bridges upstream in segments T7.01-C and -D were destroyed in Irene), and it was not clear if there had been a bridge here before Irene (no remains besides the abutments were evident).

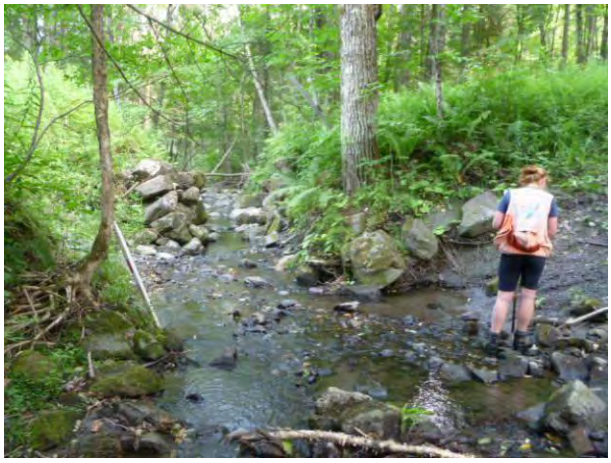


Figure 110. Old bridge abutments at discontinued Old Schoolhouse Rd. at the upstream end of segment T7.01-B.

The gradient of Jones Pond Brook drops significantly in the very short segment (727 feet) broken out for segment T7.01-C. This segment consists of a series of beaver ponds/dams blown out in Irene, with none currently intact and the stream now occupying a primarily single thread channel. It is unclear whether beavers will reoccupy but seems likely as there is still ample vegetation in the area to support them. Buffers are intact but mostly shrub-herbaceous and attendant herbaceous wetland vegetation. Although Irene breached these dams, the presence of beavers in this segment is likely to mitigate the impacts of flood flows in all but the more extreme events. This area also appeared to be offering important habitat for a number of fish observed in the segment. Additional water and sediment inputs when the dams are breached can impact encroachments downstream.

Segment T7.01-D is a steeper and more confined portion of the valley above the blown beaver dams. The stream line of the Vermont Hydrography Dataset used on the maps in this report and on the VT ANR Atlas (2013) is not highly accurate in this segment, as the stream is more sinuous and sometimes much closer to Edwards Road than the VHD indicates. Despite this fact, the road encroaches less on this segment than other portions of Jones Pond Brook, and wooded buffers are in good shape. Bobcat and mink tracks were observed in soft sediments along stream edges, and this segment appears to have relatively high quality habitat that is experiencing some recent impacts.

Soft sediments were a somewhat surprising feature along the margins of segment T7.01-D and heavy fines were notably kicking up while walking the stream, clouding a relatively cobbly stream. This section of stream clearly got humming in Irene, but a surprising lack of more mass failures was likely due to good buffers. With relatively little incision noted upstream (despite a sandy substrate in T7.01-E), some of these sediments may be coming from road encroachments further upstream or may have issued from tributaries to Jones Pond Brook. Two small ponds (0.2 ac, 0.3 ac) are located on tributaries feeding into this segment - one on a tributary in this segment, one on the next

segment upstream (T7.01-E) - but aerial imagery does not appear to indicate any breaches during Irene. Irene did wash Japanese knotweed and wild chervil downstream into this wooded area, with a number of new small dispersed populations noted.

There were multiple motocross fords in segment T7.01-D, and signs along the stream indicated there is a NETRA course set up in the area. Three wooden plank bridges were blown out (by appearance more likely by Irene than by 2009 flash flooding) and washed downstream; none were in place at the time of assessment and these crossings were instead being used as fords; it was not clear how frequently they are used. One section of trail was captured as a flood chute in Irene with concomitant erosion, but the heavy fines present in and along the stream were noted upstream of this area as well.

Segment T7.01E was an unusual segment of stream with an exceedingly narrow channel, often only 1- 2 ft wide, and occasionally nearly disappeared beneath slumped banks. It is suspected that this segment may be an altered wetland ditched around a former barnyard; the barn was burned by the Volunteer Fire Department for a training exercise. Vegetation along the stream was heavily dominated by reed canary grass and wild chervil. The floodplain appeared to have been quickly and easily accessed in Tropical Storm Irene, indicating its value as an attenuation asset.

Upstream segment T7.01F has apparent longstanding confinement by Edwards Rd and a private driveway on opposite sides of the stream, with two culverts in this short segment. The slope flattens a bit in this segment from a run of ledge grade controls shortly upstream but is still relatively steep, with a patched culvert (broken midway under the Williamstown Rd) perched and cascading 6 ft before the stream is funneled through the driveway culvert (also perched with a 0.5 ft freefall) a short distance downstream. A road ditch on the upstream side of the Williamstown Rd just above the upstream culvert may be contributing significant sediment to the stream. Segment T7.01F is more sinuous than it appears on the VHD and USGS topographic maps downstream of these culverts (VT ANR 2013), with bank armoring used to funnel the stream around outbuildings and past a stream ford.

Primary Stressors:

- Straightening concentrated in the upstream two segments (>50% of segment length) primarily by combination of encroachments (both development and roads), culverts and bank armoring at key junctures
- Fine sediments in upstream portions, sources unclear, and in downstream sections likely deriving from blown beaver dams post-Irene
- Wetland encroachment in beaver-dominated area mid-reach
- Restriction of access to historic floodplains in segments A, B and D (roughly two-thirds of the total stream length; incision ratio 1.6-1.8)
- Highly erodible banks and valley walls (sandy and loamy tills)
- Stormwater inputs (9 road ditches, 1 field ditch; road ditch upstream of Williamstown Rd on upstream end of reach may be a significant fine sediment contribution)

Table 39. FB-T7.01 Projects and Practices Table – First Branch mainstem

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T7.01A	Stream Buffers	Medium	High	Y	Create/protect buffer; primarily protection-limited areas lacking buffer, but camp at 54 Edwards Rd would benefit due to impacts from undersized culvert upstream, and alluvial fan at base of reach is an important one-benefits for sediment retention especially. Encourage buffer retention along roadsides where feasible, passive establishment (most areas have decent existing buffer) or low-cost otherwise due to high lateral and vertical instability. Woody debris recruitment important for stream dynamics in this setting - diffusion of stream power, sediment retention, transient grade controls and rebuilding of floodplain access, habitat
T7.01A	Remove/ Replace Structures	Medium	Medium	Y	Replace: Culvert on Edwards Rd is both channel and floodprone constriction likely contributing to heightened erosion and mass failures downstream, footbridge at Jones Pond only constricts floodplain but likely contributing to heightened erosion as well; lower priority due to impacts not being immediate threat to nearby structures or infrastructure, though culvert may contribute to outflanking/road damage and should be upsized if opportunity arises.
T7.01A	Watershed Strategies to restore incised reach	High	High	N	FEH and stream setbacks for US areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (priority attenuation assets upstream, particularly beaver area), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in US areas as much as possible; large woody debris plays major role in diffusion of streampower, sediment retention, possibility of rebuilding floodplain access)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T7.01B	Protect River Corridors	Medium	Medium	Y	Explore easement if no FEH - corridor largely undeveloped and unconstrained; priority reduced by limited amounts of floodplain to be protected
T7.01B	Stream Buffers	Low	High	Y	Create/protect buffer; mostly protection- limited areas lacking buffer, primarily areas of recent roadside mass failures. Retention important for availability of large woody debris, very important to stream dynamics in this setting
T7.01B	Remove/ Replace Structures	High	High	Y	Replace or remove: figure out status of former bridge at Old Schoolhouse Rd (now a legal trail). Remove abutments if not being rebuilt, remove abutments and replace with larger structure (2013 VTrans Bridge and Culvert Standards) if being rebuilt
T7.01B	Watershed Strategies to restore incised reach	High	High	N	FEH and stream setbacks for US areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (lower priority limited attenuation assets here, higher priority US - particularly beaver area), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)
T7.01C	Protect River Corridors	High	High	Y	Class 2 Wetland is mapped but not fully captured by current VSWI maps, not captured by FEH; possible that part of NETRA motocross course is laid out through wetland and buffers; check with owners on knowledge of the issue. Beaver-controlled area plays important role in flow and sediment attenuation, habitat for fish population (in-field observations)
T7.01C	Stream Buffers	Low	High	Y	Create/protect buffer; primarily protection - current native scrub-shrub buffers good, but next reach up had several stream fords and numerous small incipient knotweed and chervil populations post-Irene

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T7.01C	Watershed Strategies to restore incised reach	High	High	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (high priority attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention along road and protect Class 2 wetland buffers)
T7.01D	Protect River Corridors	Medium	Low	Y	Encourage replacement of wooden bridges, setback of trails from stream, protection of DS Class 2 wetland at a minimum if corridor intended for continued use for racing
T7.01D	Stream Buffers	High	High	Y	Create/protect buffer; primarily protection - current buffers good, but several stream fords and numerous small incipient knotweed and chervil populations post-Irene pose potential for distribution
T7.01D	Remove/ Replace Structures	Very High	High	Y	Replace or remove: Side by side culverts under bridge US of beaver area half-filled with sediment, almost completely obstructed by debris and shrubs on US end; bridge not functional; structure lies between beaver pond area (with brookies observed in pools during low- water dry weather) and US network
T7.01D	Watershed Strategies to restore incised reach	High	High	N	FEH and stream setbacks for US areas; Floodplain and River Corridor Planning and Protection (priority limited attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention along road and protect Class 2 wetland buffers, streamside buffers in riding trail areas)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*
T7.01E	Stream Buffers	High	High	Y	Create/protect buffer; yard setting and likely altered wetland area - focus on shrubs; may need chervil and reed canary grass control to establish native shrubs; low cost due to lateral instability
T7.01E	Watershed Strategies to restore incised reach	Very High	High	N	FEH and stream setbacks for US areas; Floodplain and Corridor Planning and Protection (high priority attenuation assets here and beaver area; large parcel under single ownership includes these smaller high priority attenuation assets (T7.01C and E) US and DS of longer length of relatively undeveloped corridor with more limited attenuation assets).
T7.01E	Watershed Strategies to restore incised reach (cont'd)	Very High	High	N	Drainage and Stormwater Management, Buffer Establishment and Protection (encourage roadside retention and protect Class 2 wetland buffers, streamside buffers in riding trail areas)
T7.01F	Stream Buffers	Medium	Medium	Y	Create/protect buffer; primarily protection - current buffers good, but this area may be source knotweed population for plants distributed further DS- not large population in and of itself; lower priority - ecologic not geomorphic import -but weigh potential long-term impact on overall buffer conditions and lower costs to control early
T7.01F	Remove/ Replace Structures	Low	Low	N	Replace or remove: Williamstown Rd culvert is broken midway under road, may dictate need for replacement on its own terms; limited span may make bridge cost-effective - steeper slope US - will be a sediment drop-out point. Culvert under driveway needs assessment of impact to nearby structures; bed elevation changes likely

6.2 PROJECT PRIORITIZATION

Based on the foregoing analysis, project prioritization for this iteration of a River Corridor Plan for the First Branch basin falls loosely into a three-pronged approach:

- Watershed (largely municipal) strategies
- Buffer establishment and protection
- Reach-scale restoration of incised streams

Due to the extensive and pervasive nature of current stressors in the First Branch basin (only 2 of 61 segments assessed in stable condition), the success of localized project implementation is highly dependent on moving toward best management practices on a watershed scale. The highest priority recommendations thus feature strategies that may be best or most efficiently effected at a municipal level. Adaptive management should be used to periodically assess the feasibility and prioritization of localized projects based on stability gained from these larger efforts.

Buffer establishment and protection, while included with the watershed strategies due to the extent of the issue in the basin and some role for consideration at a municipal level, are a high priority for other groups including the White River Partnership, which has taken a lead in coordinating and implementing these efforts in the basin. These projects are almost always beneficial to stream health and can generally be implemented independently of other considerations although long-term success will greatly benefit from buffer design that acknowledges the current degree of stream instability. Buffer projects identified during preparation of this Corridor Plan are listed following the municipal strategies, prioritized for inclusion with high-priority reach-scale restoration projects and then as stand-alone planting projects.

The highest priority project recommendations include the following watershed strategies (listed in order of descending priority but understood to be strongly interconnected and interdependent):

1) Floodplain and River Corridor Planning and Protection

- Fluvial Erosion Hazard overlay (where data exists) in conjunction with updated Flood Hazard Bylaws; 50 ft setback for streams with no tributaries, 100 ft setback for other streams. It would be difficult to overemphasize the importance of the role that encroachments on small streams play in a setting such as the First Branch basin; large costs associated with road repair are challenging for small towns to accommodate. Since there have been few houses or structures damaged in flash flood events, the primary exposure that most people have to these events is along localized portions of roads, and it is often not easy to see how these impacts are being amplified by loss of floodplain access or heightened streampower transferred from upstream of the impacts (frequently due to protection of development or road encroachments). Setbacks, FEH zones, or other belt-width corridors provide not only flood protection for land and structures adjacent to the stream, but accommodation of stream processes that will help break a cycle of impacts being amplified and passed to downstream reaches.

2) Buffer Establishment and Protection

- Predominant widening and meander re-establishment needed to achieve stability may entail frequent erosion and will benefit from large woody debris for sediment retention, diffusion of stream power and provision of habitat features.
- Although buffers are good in many areas, frequent roadside encroachment, intermittent stretches of missing buffers, and long stretches of shallow ledge grade controls contribute to water temperature as a primary stressor (qualitative field observation). Road crews are encouraged to leave roadside trees to the greatest extent of safe feasibility.
- Buffer establishment is generally recommended for passive reseeding or low-cost plantings with shrubs closer to the stream and trees toward the rear edge of the Fluvial Erosion Hazard zone (due to lateral instability and risk of losing plantings to widening and planform adjustments)

3) Road-Stream Crossing Retrofits and Replacements

- All towns: adopt Vermont Agency of Transportation 2013 Bridge and Culvert Standards (VTrans 2014)
- Tunbridge and Washington: get digital inventories, through VOBCIT at a minimum but preferably using River Management/Fish & Wildlife data collection protocols (Milone & McBroom 2008; Milone & McBroom 2009) to permit use of the Culvert Screening Tools for prioritization
- Vermont River Management: Expand Culvert Geomorphic Compatibility Screening Tool to permit prioritization of bridges on geomorphic compatibility basis
- All towns: Capital budget planning with geomorphic compatibility included in prioritization discussions with structure owners on replacement schedules

4) Drainage and Stormwater Management

- Management of overland flow and keeping entry points well vegetated currently more of an issue on assessed reaches than erosion at entry points
- U-shaped and lined ditches highly desirable, will likely need prioritization as the issue is more prominent along smaller tributaries sharing narrow valleys with a relatively dense road network
- Priority areas (due to more notable cumulative impacts) on tributaries and headwaters portions of the mainstem

Although buffer establishment is an important part of any efforts in the basin and can certainly be conducted as a stand-alone project if opportunities arise, selecting areas for prioritization favors areas where reach-scale restoration activities will help move streams more quickly toward equilibrium conditions. With all but two assessed stream segments in the basin historically incised, it will likely be necessary (or at least highly beneficial) to implement reach-scale projects with multiple coordinated strategies that may require multiple partners or organizations to restore better floodplain function and meander geometry. Ten reaches or segments were identified as priorities for reach-scale restoration strategies, listed in order of priority in Table 40.

Table 40. Priority reaches for integrated reach-scale restoration strategies for incised reaches

1	M14A-B	First Branch mainstem from Old Chelsea Cemetery to Bobbinshop Rd
2	M16A-B	First Branch mainstem from former Nick Gilman farm (558 VT Rte. 110) to 0.5 mi north of Edwards Rd
3	M08	First Branch mainstem from Foundry Rd. bridge to confluence with Dickerman Brook
4	M10	First Branch mainstem from upstream end of sand and gravel pit across from Hanson Rd. to ledge grade controls downstream of Flint Covered Bridge (north end of Hunt Cemetery on Rte. 110)
5	T1.01	Unnamed tributary along Strafford Road -Tunbridge Recreation Field to approach of stream to road above woods-field edge 1.7 mi up Strafford Road
6	M02	First Branch mainstem from north end of Branch View Cemetery to Rte. 110 bridge at Russell Rd.
7	M07A	First Branch mainstem from Tunbridge Recreation Field to just upstream of Rte 110 bridge at Whitney Hill
8	T6.01	Hart Hollow Brook - Confluence with First Branch (behind Brookhaven School in Chelsea Village
9	M14C	First Branch mainstem from Bobbinshop Rd to former A.C. and M.W. Button Farm (489 VT Rt. 110)
10	M16C	First Branch mainstem from 0.5 mi north of Edwards Rd to Chelsea-Williamstown Rd

Buffer establishment and protection are thus preferentially recommended on these high-priority reaches, ideally as part of an integrated strategy aimed at restoring floodplain function and a more stable planform allowing greater meander development - but as a good starting point regardless of whether other pieces of an overall reach strategy can be implemented.

Stream reaches including additional priority buffer establishment projects recommended for stand-alone implementation, roughly in order of recommended priority, are found in Table 41.

Table 41. Stream segments with priority buffer projects recommended for stand-alone implementation.

River Segment	*Next Steps and Other Project Notes*
M09B	Create/protect buffer; incorporate design considerations to limit possibility of capture of pond but encourage access to floodplain downstream in event of a breached dam surge from Bicknell Brook; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; knotweed control at pit access rd- frequent inundation point - relatively small population currently, high potential for dispersal
T7.01E	Create/protect buffer; yard setting and likely altered wetland area - focus particularly on shrub establishment; may need chervil and reed canary grass control in order to establish native shrubs; low cost to lateral instability
M04A	Create/protect buffer; will likely need active establishment, recommend low-cost stock only due to vertical and lateral instability; NFIP Floodway is 85 ft at narrowest point; recommend at least 100 ft, clarify stable planform accommodation (FEH zone) is even further out
M04B	Create/protect buffer; has had multiple plantings and is largely regenerating, not sure what protections are in place; active erosion has taken some buffers that could use replacement but might restrict access to most US field portion - but also may eventually approach Rte 110
M05A	Create/protect buffer; frequently lined by box elder, adequate start for natural regeneration in many areas but numerous areas completely absent and would require establishment; low-cost due to vertical and lateral instability; may need fencing and some knotweed control. Establish near animal barns at fairgrounds.
M07B	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; frequent ice jam area
M09A	Create/protect buffer; plant to augment or establish buffer; frequently flooded chute along Rte 110 has herbaceous veg, trees tolerant of inundation and ice would benefit shading of channel and physical dissipation of streampower; low cost due to lateral instability
M13B	Create/protect buffer, plant; low-cost due to lateral and vertical instability though herbaceous vegetation is intact in numerous areas and might facilitate some larger stock for outside edge of belt-width

Current geomorphic conditions in the First Branch basin are largely related to two primary factors:

3) widespread restriction of access to historic floodplains through glacial legacies as well as significant land and river use changes; and

4) extensive and pervasive channel straightening

The dense road network and diffuse settlement pattern of the basin amplify these factors through increased rate and intensity of water delivered to the stream network, working in tandem with the topography in strongly predisposing the basin to flash flooding.

These factors place the highest priority (in terms of project prioritization) on protection or restoration of optimal floodplain functions (especially attenuation of high flows and storage of sediment and nutrients) and accommodation of stable planform geometries (typically allowing establishment of meanders that help to reduce stream slope). In the First Branch basin, this primarily translates to accommodating streams that are widening and/or migrating laterally at this point in time. In addition to the projects noted above (watershed strategies primarily contingent upon municipal actions and buffer creation and establishment projects), the highest priority projects identified in the creation of this River Corridor Plan are listed in a Project and Strategy Summary Table (Table 42) intended as a quick reference for those wishing to assess project status and/or plan further project activities.

It should be noted that existing floodplains in the First Branch basin include beaver-controlled areas that were not able to be fully assessed in Phase 2 as well as such areas in and along the margins of assessed reaches ("river-adjacent wetlands"). These areas help provide flood resiliency and permit a break from transfer of impacts to downstream reaches. In assessed portions of the First Branch basin beaver-controlled areas are all class 2 wetlands that are legally protected, including portions of segments M07A, M18A and B, M19B and C, and T7.01C (though it is not clear that these protections are effected in M07A and T7.01C). These high-priority assets are not included in the following list of prioritized projects only because of the protections already in place.

Table 42. Prioritized Project and Strategy Summary Table for top 11 projects identified in First Branch Corridor Planning 2012-2013.

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
1	M14A: Fair, FSTCD sediment regime, Very High Sensitivity M14B: Fair, CEFD sediment regime, Very High Sensitivity	Attenuation asset US of Chelsea village. Small dam in M14A, seasonal flashboard removal; town bridge near old mill site (increases natural valley constriction) and VAST or footbridge in M14B, both undersized. M14A has restricted access to floodplain (IR 1.7). Minor trail encroachments, heavier road encroachment upstream end. Location of recent town well project, includes both zone 1 and 2 groundwater source protection areas for two different wells	Protect River Corridor: Explore easement status and possibilities, relationship to Wellhead Protection Area (Chelsea has overlay district) and SFHA (part lies in Floodway). Important step if reach-scale restoration is being pursued.	Very High feasibility and priority
2	M10-0: Fair, FSTCD sediment regime, Very High sensitivity	Attenuation asset with restricted access to floodplain (IR 1.7), straightened by key placement of bank toe armoring and riprap to maintain against left valley wall. Reach is on likely glacial alluvial fan at base of Bicknell Brook, which has High Hazard dam in VT Dam Inventory	High priority planting area at base of Bicknell Brook	Very High feasibility and priority

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
1	increased flood resilience for village area downstream; water quality and habitat; groundwater protection	corridor easement purchase and transaction costs	possible trail relocations, leased hayfields to buffer plantings	White River Partnership (WRP), CT River Watershed Council (CRWC) & Clean Water Future, Vermont River Conservancy
2	Flood hazard mitigation, increased flood resilience for village area downstream	planting stock, installation costs	Hayfields, cropland, pasture to buffers	WRP Trees for Streams, NRCS - CREP

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
3	T1.01-A: Fair, FSTCD sediment regime, Very High sensitivity	Attenuation asset on alluvial fan with at least seven different channel locations over time, located beneath waterfalls at the end of a long run of grade controls and highly confined stream segment along Strafford Road. Project might be higher priority except that it should likely have corridor easements as part of reach-scale restoration including replacement of Recreation Rd culvert at a minimum, relocation of road further back from stream desirable (difficult due to high degree of constraints and extent of alluvial fan). Location spans two ownerships including Town as one, road relocation to Town Garage would pass through two other ownerships; need to assess full implications. Rec field mostly within SFHA; house on abutting property is not, would not be eligible for FEMA elevation or buyout funding in emergency situation.	Remove berms: Stream windrowed above Recreation Rd culvert post-Irene and in conjunction with reconfiguration of driveway access to "Town Pool" at Tunbridge Recreation Field. Highly preferred as part of reach-scale restoration but not necessarily dependent.	Very high technical feasibility and priority complicated by prioritization within reach-scale restoration

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
3	Hazard mitigation, flood resilience in this reach and downstream to Fairgrounds. Main access to Town Garage. Equipment moved from Town Garage prior to Irene due to possibility of losing access. Berms increase risk to road due to increased stream power and restricted ability of wood and sediment to be distributed on floodplain; also contributing to potential mass failure underneath Rte 110 on opposite bank of mainstem.	permits, engineering to determine stable channel dimensions, machine work, restoration plantings	Allow floodplain access; house lot front yard on one side, recreation field on the other.	WRP-Ecosystem Restoration Program application, Trees for Streams, MEF, CRWC & Clean Water Future

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
4	M07A: Fair, FSTCD sediment regime, Very High sensitivity	Attenuation asset upstream of natural pinch point in valley along Strafford Rd and upstream of Tunbridge village and Fairgrounds. Corridor shares many of same issues as T1.01A: culvert at base of that segment may trigger mass failure under Rte. 110 in this segment, relocation of Recreation Rd further back from stream desirable but difficult due to high degree of constraints. Old Meetinghouse bridge abutments at Town Garage and hayfield access upstream of Monarch Hill block access to floodplain on right bank. Recreation Rd upgraded to access "back side of river" after that bridge was blown out for the third time and not replaced. Increasing development pressure despite SFHA, former camp in SFHA downstream of T1.01A converted to house. Breached Farnham Bros. dam just downstream in reach M06 is accruing sediments from this reach and has potential to contribute to rapid channel migration and mass failure under Strafford Road.	Protect River Corridor: Important step if reach-scale restoration is to be pursued. Explore corridor easement possibilities and relationship to SFHA and FEH zone if adopted. Discuss options for relocation of Recreation Rd further back from river, location of structures as far as possible from streams. State of Vermont Fish & Wildlife has Streambank Access (South Tract) one rod off top of bank from Recreation Field up to downstream end of fields that have Old Meetinghouse bridge abutments on upstream end. Discuss new buyout and elevation options from FEMA for camp downstream of Recreation field.	High technical feasibility and priority complicated by prioritization within reach-scale restoration

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
4	Hazard mitigation, flood resilience in this reach and downstream to Fairgrounds. Main access to Town Garage. Equipment moved from Town Garage prior to Irene due to possibility of losing access. Berms increase risk to road due to increased stream power and restricted ability of wood and sediment to be distributed on floodplain; also contributing to potential mass failure underneath Rte 110 on opposite bank of mainstem.Water quality and habitat benefits.	corridor easement purchase and transaction costs	Floodplain access; house lot front yard on one side, recreation field on the other.	WRP-Ecosystem Restoration Program application, CRWC & Clean Water Future, Vermont River Conservancy

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
5	M14A: Fair, FSTCD sediment regime, Very High Sensitivity	Small dam in M14A; backwater effects contribute to bank instability and sedimentation; flashboard removal/ replacement contributes to pulse flows and aggradation/degradation cycling. Restricted access to floodplain (IR 1.7). Location includes both zone 1 and 2 groundwater source protection areas.	Remove structure: Consider dam removal with full recognition of social constraints and need to evaluate potential impacts to downstream encroachments in corridor (sedimented above, likelihood of bed elevation changes)	High priority, feasibility needs assessment of upstream and downstream impacts
6	M14B: Fair, CEFD sediment regime, Very High Sensitivity	VAST bridge? footbridge? at north end of Brookhaven soccer field near new Town well structure is undersized (span 26 ft, channel width 45 ft) and contributes to straightening but is relatively minimal floodplain constriction; Town bridge at Bobbinshop is at valley pinch point but further constricts channel (span 31 ft); priority for both increased by location in priority restoration reach (attenuation asset upstream of Chelsea village, zone 1 and 2 groundwater source protection areas	Replace structures: Explore options for upsizing span of bridge abutments (VAST/foot bridge relocation likely challenging due to property access constraints). Town bridge at Bobbinshop lower priority due to cost and location. Size to meet Stream Alteration permit requirements (typically 1.2 x bankfull width, ~55 ft in this reach; VT DEC-WMD 2014)	High feasibility and priority for VAST or footbridge; less sure about town bridge, may be a matter of prep for opportunity (see potential partner notes)

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
5	increased flood resilience for village area downstream; water quality and habitat; groundwater protection	unsure, needs assessment including dealing with potential bed elevation changes; permits, machine work, restoration	Pool below dam used for recreational and educational purposes by Brookhaven School	American Rivers, Partners for Fish & Wildlife, MEF
6	increased flood resilience for village area downstream; water quality and habitat; groundwater protection, high visibility project area	permitting and plan prep, structures, machine work, construction costs; engineering for town structure	Believe Episcopal Diocese (Brookhaven school) allows use for VAST/ footbridge, but unsure; possible trail relocations, leased hayfields to buffer plantings	WRP-Ecosystem Restoration Program application; recreation and trail groups? FEMA and state for town bridge if damaged and IF 2013 bridge and culvert standards have been adopted; higher state match if NFIP enrollment is up-to-date and FEH is adopted (Emergency Relief Assistance Fund, aka ERAF)

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
7	M16A: Fair, UST sediment regime, High Sensitivity M16B: Fair, CEFD sediment regime, Very High Sensitivity	Four bridges in M16A contributing strongly to straightening, three private; will be hard to address short-term. Less incised (IR 1.3 in M16A and B) than geologically similar M16C (IR 2.0, contains old mill site, passing impacts DS). Downstream farm bridge has check dam installed US of it.Woody debris very important to stream dynamics (meander development, sediment retention), currently diminished or lacking in several areas. M16B/ top of M16A alluvial fans with high sand and gravel (some from alluvial fan in M16C as well), owner in M16B systematically cutting buffers; dense shrubs holding now but potential for rapid widening or channel avulsion. M16A geologically complex, lateral moraines locally confining in floods, increasing stream power; large stone bank toe armoring/ riprap toppling in many areas	Buffer establishment and protection: very high priority planting area, plant or augment; take advantage of lower sensitivity in M16A and areas of bank toe armoring still holding in both segments (and dense shrub cover in M16B) to target higher-quality plantings, especially along outer edge of FEH zone	High feasibility and priority
8	M16B: Fair, CEFD sediment regime, Very High Sensitivity	Attenuation asset DS of moraine and alluvial fan at tributary confluence at end of Chelsea-Williamstown Rd, where stream has lost historic floodplain access in vicinity of old mill trees removed from banks; dense shrubs holding now but potential for rapid widening or channel avulsion. Large stone bank toe armoring/ riprap toppling in several areas.	Protect River Corridor: Explore corridor easement possibilities; SFHA and FEH zones divergent due to planform of river in this area	High technical feasibility and priority

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
7	increased flood resilience for village area downstream; water quality and habitat, connectivity with relatively high quality habitat corridor along Jones Pond Brook (T7.01); high visibility project area	planting stock, installation costs, possibly fencing	Hayfields, cropland, pasture to buffers; may need fencing in some areas. Owner in M16B has concerns about woody debris in stream, has removed trees along banks.	WRP Trees for Streams, CRWC & Clean Water Future, NRCS - CREP, EQIP
8	increased flood resilience for village area downstream; water quality and habitat, connectivity with relatively high quality habitat corridor along Jones Pond Brook (T7.01); high visibility project area	corridor easement purchase and transaction costs	Hayfields, cropland, pasture to buffers; may need fencing (?). Owner has concerns about woody debris in stream, has removed trees along banks. House well elevated above SFHA but well within FEH; consider implications if bank stabilization needed in future	WRP-Ecosystem Restoration Program application, Vermont River Conservancy, Vermont Land Trust, Upper Valley Land Trust

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
9	M16A: Fair, UST sediment regime, High Sensitivity	Four bridges in M16A contributing strongly to straightening, three private. Less incised (IR 1.3 in M16A and B) than geologically similar M16C (IR 2.0, contains old mill site, passing impacts downstream). Downstream farm bridge has check dam installed upstream of it. Degree of straightening associated with these bridges is possibly largest issue on this reach, easily observable in aerial imagery.	Replace structures: size to meet Stream Alteration permit requirements (typically 1.2 x bankfull width, ~50 ft in this reach; VT DEC-WMD 2014). Explore funding options. MAY NEED TO MONITOR AND MAINTAIN CHECK DAM if replacement of downstream farm bridge does not seem feasible in short term; important not to lose access to floodplain and unclear how critical a role this structure is playing.	Technically feasible and high priority; funding challenges

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
9	increased flood resilience for village area downstream; water quality and habitat, connectivity with relatively high quality habitat corridor along Jones Pond Brook (T7.01); high visibility project area	permitting and plan prep, structures, machine work, construction costs, possible engineering costs	Hayfields, cropland, pasture to buffers; may need fencing (?).	Needs exploration of funding sources for private bridge replacements; Stream Alteration permits will require upsizing going forward

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
10	M08B: Fair, FSTCD sediment regime, Very High sensitivity M08A: Poor, CST sediment regime, Extreme sensitivity	M08A is former location of impoundment behind dam at Foundry complex, now deeply entrenched (IR 2.3) at north end of North Tunbridge village where there are numerous encroachments; right bank valley wall lies beneath side of Rte. 110 and shows signs of previous mass failure. High priority attenuation asset (IR 1.4) in M08B upstream of Tunbridge Central School has hayfield access on side of Rte 110 that restricts access to floodplain off right bank and limits meander development, increasing stream power funneled through Foundry bridge area and toward village. Ice jam area.	Protect River Corridor: Explore easement status and possibilities US of Tunbridge Central School, both sides, plus possibility of moving driveway off left bank in M08A-B further back from stream. State of Vermont Fish & Wildlife has Streambank Access (North Tract) one rod off top of bank through all of M08A and up to hayfield access off Rte 110 in M08B. Important step if reach-scale restoration is being pursued. Discuss new buyout and elevation options from FEMA for houses at either end of Foundry bridge, downstream of Gile/Camp/Grant mill dam (DS of Dickerman Hill; house at base of Dickerman Hill is not in current mapped SFHA), and on tributary confluence just upstream of Larkin covered bridge (not clear this is in SFHA)	High feasibility and priority. Easement arrangements at site upstream of Tunbridge Central School may need tweaking due to State land.

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
10	increased flood resilience for village area downstream; high visibility project area, educational/ monitoring possibilities with school nearby	corridor easement purchase and transaction costs	possible driveway relocation, hayfields to buffer plantings	WRP- Ecosystem Restoration Program application, CRWC & Clean Water Future, Vermont River Conservancy, Two Rivers-Ottauquechee Regional Commission (buyout and elevation discussions)

Project#	Reach/Segment Condition	Site Description including Stressors and Constraints	Project or Strategy Description	Technical Feasibility & Priority
11	M08B: Fair, FSTCD sediment regime, Very High sensitivity	Primary attenuation assets in M08B include hayfields upstream of Tunbridge Central School and potentially areas upstream of Larkin Covered Bridge and at top of reach near breached dam at old Gile/Camp/Grant mill site just downstream of base of Dickerman Hill. Floodplain access is constrained at each by: hayfield access road (US of school; highest priority); old bridge abutments (upstream of Larkin bridge; next priority); and breached dam (lower current priority)	Remove structures: Higher priority: Explore moving hayfield access on right bank upstream of Tunbridge Central School further downstream, to permit better floodplain access on RB - include potential impacts to Rte 110 and house on opposite bank; suggest Town of Tunbridge consider relocation of Recreation Field here. Next priority: assessment of old abutments ~400 ft upstream of Larkin Bridge; needs further investigation as its not clear how much floodplain access would be gained (due to terraces off right bank and how overgrown the abutments are) and how covered bridge would be affected. Lower priority: breached dam at upstream end of reach has outbuilding converted to house in last 10 years just downstream that would be at higher risk with removal; also possibility of impacts upstream and downstream due to bed elevation changes.	High feasibility and priority for hayfield access upstream of school. Feasibility less certain upstream of Larkin bridge; feasibility unlikely at breached dam while house is situated just downstream.

Project#	Other Social Benefits	Costs	Land Use Conversion & Landowner Commitments	Potential Partner Commitments
11	increased flood resilience for village area downstream and hazard mitigation for valley wall beneath Rte 110 just US Foundry bridge; high visibility project area, educational/ monitoring possibilities with school nearby	permitting and plan prep, replacement hayfield access, machine work, possible engineering costs	change of location for hayfield access; hayfields, pasture to buffers	WRP- Ecosystem Restoration Program application, CRWC & Clean Water Future; American Rivers, Partners for Fish & Wildlife, MEF for dam

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Appendices

Appendix 1. Reach/Segment Rapid Geomorphic Assessment Scores, Channel Geometry Data, Rapid Habitat Assessment Scores

Appendix 2. Phase I Reach Summary Reports

Appendix 3. Phase II Reach/Segment Summary Reports

Appendix 4. Plots of Channel Cross Sections

Appendix 5. QA/QC Reports and documentation

Appendix 6. Consolidated project identification tables (sorted by priority)

Appendix 7. Large Format (11x17) Maps

Appendix 8. Bridge and Culvert Survey Reports

Failure modes: Geomorphic incompatibility
Failure modes: Problem causes
Aquatic organism passage ratings: Passage, geomorphic compatibility, retrofit potential
Wildlife passage

- Appendix 1 –

Reach/Segment Summary Reports:
Rapid Geomorphic Assessment summary statistics
Channel geometry data
Habitat assessment scores summary

Phase 2 - Rapid Geomorphic Assessment

White River - First Branch

			Degradation			Aggradation			Widening		Planform								
Reach	Seg-ment	Sub Rch?	Score	STD	Historic	Score	STD	Historic	Score	Historic	Score	Historic	Geo Score	Geo Condition	Evol. Stage	Confin. Type	Sensitivity	QC Staff	QC Auto
M01	A	No	4	C to B	Yes	11	None	No	10	No	10	No	0.44	Fair	III	NC	Very High	P	P
M01	B	No	4	C to B	Yes	11	None	No	9	No	9	No	0.41	Fair	III	SC	Very High	P	P
M01	C	No	6	None	Yes	6	Other	No	9	No	5	No	0.33	Poor	III	SC	Extreme	P	P
M02	0	No											0.00					P	F
M02	A	No	12	None	Yes	11	None	No	11	No	11	No	0.56	Fair	III	BD	Very High	P	P
M02	B	No	6	None	Yes	9	None	No	11	No	7	No	0.41	Fair	III	SC	Very High	P	P
M02	C	No	10	None	Yes	10	None	No	11	No	7	No	0.48	Fair	III	VB	Very High	P	P
M03	0	No	5	C to B	Yes	10	None	No	9	No	10	No	0.43	Fair	III	SC	Very High	P	P
M04	A	No	9	None	No	10	None	No	9	No	8	Yes	0.45	Fair	III	BD	Very High	P	P
M04	B	No	10	None	Yes	7	None	No	5	No	5	No	0.34	Fair	III	BD	Very High	P	P
M05	A	No	10	None	Yes	10	None	No	9	No	8	No	0.46	Fair	III	BD	Very High	P	P
M05	B	No	9	None	Yes	11	None	No	9	No	8	No	0.46	Fair	III	BD	High	P	P
M06	0	No	5	B to F	Yes	5	None	No	5	No	4	No	0.24	Poor	III	SC	Extreme	P	P
M07	A	No	10	None	Yes	9	None	No	8	No	7	No	0.43	Fair	III	NW	Very High	P	P
M07	B	No	8	None	Yes	12	None	No	11	No	11	No	0.53	Fair	III	SC	Very High	P	P
M08	A	No	3	C to F	Yes	11	None	No	8	No	12	No	0.43	Poor	III	SC	Extreme	P	P
M08	B	No	13	None	Yes	9	None	No	10	No	10	No	0.53	Fair	III	NW	Very High	P	P
M09	A	No	11	None	Yes	12	None	No	12	No	12	No	0.59	Fair	III	NW	Very High	P	P
M09	B	No	5	C to F	No	9	None	No	8	No	8	No	0.38	Fair	III	BD	Extreme	P	P
M10	0	No	10	None	Yes	14	None	No	12	No	11	No	0.59	Fair	III	BD	Very High	P	P
M11	0	No	12	None	Yes	13	None	No	10	No	10	No	0.56	Fair	III	NW	Very High	P	P
M12	0	No	9	None	Yes	9	None	No	9	No	10	No	0.46	Fair	III	SC	High	P	P
M13	A	No	10	None	Yes	12	None	No	12	No	11	No	0.56	Fair	III	BD	High	P	P
M13	B	No	9	None	No	10	None	No	10	No	10	No	0.49	Fair	III	BD	Very High	P	P
M13	C	No	5	Other	No	10	None	No	10	No	9	No	0.43	Fair	III	SC	Very High	P	P
M13	D	No	13	None	Yes	13	None	No	12	No	12	No	0.63	Fair	III	NW	High	P	P
M14	A	No	8	None	No	7	None	No	9	No	6	No	0.38	Fair	III	VB	Very High	P	P

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Reach	Seg-ment	Sub Rch?	Score	STD	Historic	Score	STD	Historic	Score	Historic	Score	Historic	Geo Score	Geo Condition	Evol. Stage	Confin. Type	Sensitivity	QC Staff	QC Auto
M14	B	No	11	None	Yes	11	None	No	13	No	9	No	0.55	Fair	IV	NW	Very High	P	P
M14	C	No	12	None	Yes	13	None	No	12	No	11	No	0.60	Fair	III	BD	High	P	P
M15	A	No	10	None	Yes	11	None	No	9	No	8	No	0.48	Fair	III	NW	Very High	P	P
M15	B	No	13	None	Yes	12	None	No	12	No	11	No	0.60	Fair	III	VB	Very High	P	P
M16	A	No	11	None	Yes	12	None	No	13	No	10	No	0.58	Fair	III	BD	High	P	P
M16	B	No	12	None	Yes	13	None	No	11	No	12	No	0.60	Fair	III	VB	Very High	P	P
M16	C	No	5	None	Yes	9	None	No	8	No	9	No	0.39	Poor	III	NW	Very High	P	P
M17	A	No	12	None	Yes	13	None	No	12	No	11	No	0.60	Fair	III	SC	High	P	P
M17	B	No	10	None	Yes	12	None	No	10	No	11	No	0.54	Fair	III	NW	High	P	P
M18	A	Yes	14	None	No	12	None	No	16	No	13	No	0.69	Good	V	BD	High	P	P
M18	B	No											0.00			VB		P	F
M19	A	Yes	9	C to B	Yes	10	None	No	11	No	10	No	0.50	Fair	III	SC	High	P	P
M19	B	No											0.00			VB		P	F
M19	C	No	4	None	No	10	None	No	10	No	10	No	0.43	Fair	II	VB	Extreme	P	P
T1.01	A	Yes	9	None	Yes	9	None	No	9	No	6	No	0.41	Fair	III	VB	High	P	P
T1.01	B	Yes	3	B to F	Yes	9	None	No	7	No	7	No	0.33	Poor	III	SC	Extreme	P	P
T1.01	C	No	9	None	Yes	10	None	No	9	Yes	7	No	0.44	Fair	III	BD	Very High	P	P
T1.01	D	Yes	10	None	Yes	7	None	No	9	No	7	No	0.41	Fair	III	VB	Very High	P	P
T1.01	E	No	12	None	No	15	None	No	11	No	12	No	0.63	Fair	III	BD	Very High	P	P
T2.01	A	Yes	10	None	Yes	10	None	No	9	No	7	No	0.45	Fair	III	BD	Very High	P	P
T2.01	B	No	10	None	Yes	9	None	No	7	No	6	No	0.40	Fair	III	SC	High	P	P
T2.01	C	Yes	9	None	Yes	13	None	No	10	No	9	No	0.51	Fair	III	NW	Very High	P	P
T3.01	0	No	15	None	Yes	11	None	No	13	No	8	No	0.59	Fair	III	NW	High	P	P
T4.01	A	Yes	5	C to B	Yes	9	None	No	6	No	7	No	0.34	Poor	III	VB	Very High	P	P
T4.01	B	No	8	None	Yes	9	None	No	8	No	7	No	0.40	Fair	III	SC	High	P	P
T4.01	C	Yes	4	C to B	Yes	8	None	No	8	No	6	No	0.33	Poor	III	BD	High	P	P
T4.01	D	No	11	None	Yes	8	None	No	7	No	7	No	0.41	Fair	III	NW	High	P	P
T5.01	A	No	6	None		9	None		10		7		0.40	Fair	III	VB	Very High	P	P
T5.01	B	Yes	5	None	Yes	9	None	No	6	No	6	No	0.33	Poor	III	SC	Extreme	P	P
T6.01	A	Yes	7	None	Yes	10	None	No	10	No	10	No	0.46	Fair	III	VB	High	P	P

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Reach	Seg-ment	Sub Rch?	Score	STD	Historic	Score	STD	Historic	Score	Historic	Score	Historic	Geo Score	Geo Condition	Evol. Stage	Confin. Type	Sensitivity	QC Staff	QC Auto
T6.01	B	No	4	B to F	Yes	5	None	No	8	No	7	No	0.30	Poor	III	NW	Extreme	P	P
T7.01	A	No	9	None	No	10	None	No	8	No	9	No	0.45	Fair	III	SC	High	P	P
T7.01	B	Yes	10	None	Yes	10	None	No	10	No	7	No	0.46	Fair	III	SC	Very High	P	P
T7.01	C	Yes	12	None	No	8	None	No	9	No	9	No	0.48	Fair	III	BD	Very High	P	P
T7.01	D	Yes	12	None	Yes	12	None	No	12	No	12	No	0.60	Good	III	NW	High	P	P
T7.01	E	Yes	12	None	Yes	15	None	No	12	No	12	No	0.64	Fair	IIc	VB	Extreme	P	P
T7.01	F	Yes	11	None	Yes	11	None	No	13	No	11	No	0.58	Fair	III	SC	Very High	P	P

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Phase 2 - Stream Geometry Data

White River - First Branch

		Phase 2 Stream Type					Phase 1 Data			Phase 2 Channel Data												
Reach	Seg-ment	Stream Type	Bed Material	Bedform	Subcl. Slope	Sub Rch?	Channel Slope	Channel Width	Bankfull Width	Max Depth	Mean Depth	Floodpr Width	Recnt Abandn Fldpln	Width Depth Ratio	Entrench-ment Ratio	Incision Ratio	Channel Evolution Stage	Channel Evolution Model	Geo Assess Condition	Hab Assess Condition	QC Staff	QC Auto
M01	A	B	Gravel	Plane Bed	c	No	0.45		92.5	5.3	4.69	125	8.1	19.72	1.35	1.53	III	F	Fair		P	P
M01	B	B	Gravel	Riffle-Pool	c	No	0.45		103	4.9	4.14	161	7.4	24.88	1.56	1.51	III	F	Fair		P	P
M01	C	E	Sand	Plane Bed	None	No	0.45		60.6	8.75	6.77	340.5	10.65	8.95	5.62	1.22	III	F	Poor		P	P
M02	0					No	0.13							0.00	0.00	0.00					P	F
M02	A	C	Gravel	Riffle-Pool	None	No	0.13		94.6	6.85	4.78	599.5	9.75	19.79	6.34	1.42	III	F	Fair		P	P
M02	B	C	Gravel	Plane Bed	None	No	0.13		74.8	8	6.48	507.8	10.7	11.54	6.79	1.34	III	F	Fair		P	P
M02	C	C	Gravel	Riffle-Pool	None	No	0.13		74.8	8.25	5.74	1005	10.15	13.03	13.44	1.23	III	F	Fair		P	P
M03	0	B	Gravel	Riffle-Pool	c	No	0.58		95.2	4.9	3.88	135.5	6.7	24.54	1.42	1.37	III	F	Fair		P	P
M04	A	C	Gravel	Riffle-Pool	None	No	0.15		77.6	5.9	4.86	420	9.2	15.97	5.41	1.56	III	F	Fair		P	P
M04	B	C	Gravel	Riffle-Pool	None	No	0.15		113.9	4.4	3.27	400	7.9	34.83	3.51	1.80	III	F	Fair		P	P
M05	A	C	Gravel	Riffle-Pool	None	No	0.27		84	5.5	4.17	407	7.6	20.14	4.85	1.38	III	F	Fair		P	P
M05	B	C	Cobble	Riffle-Pool	None	No	0.27		98.8	5	4.23	533	7	23.36	5.39	1.40	III	F	Fair		P	P
M06	0	F	Gravel	Riffle-Pool	None	No	0.48		105.4	3.8	2.99	135.7	6.8	35.25	1.29	1.79	III	F	Poor		P	P
M07	A	C	Gravel	Riffle-Pool	None	No	0.57		85.4	5.85	4.03	208	8.9	21.19	2.44	1.52	III	F	Fair		P	P
M07	B	C	Gravel	Riffle-Pool	None	No	0.57		103.7	4.5	3.3	235.8	7.9	31.42	2.27	1.76	III	F	Fair		P	P
T1.01	A	C	Cobble	Step-Pool	a	Yes	5.89		25.5	2.6	1.75	207	4.1	14.57	8.12	1.58	III	F	Fair		P	P
T1.01	B	F	Cobble	Step-Pool	a	Yes	5.89		23.9	2.4	1.68	30.2	6.8	14.23	1.26	2.83	III	F	Poor		P	P
T1.01	C	C	Gravel	Step-Pool	b	No	5.89		20.3	2.5	1.97	83	4.8	10.30	4.09	1.92	III	F	Fair		P	P
T1.01	D	E	Sand	Riffle-Pool	None	Yes	5.89		18.5	2.85	1.82	155	4.95	10.16	8.38	1.74	III	F	Fair		P	P
T1.01	E	C	Gravel	Riffle-Pool	b	No	5.89		20.3	2.35	1.78	51.3	4.25	11.40	2.53	1.81	III	F	Fair		P	P
M08	A	F	Gravel	Riffle-Pool	None	No	0.27		91	4.65	3.64	104.1	11.05	25.00	1.14	2.38	III	F	Poor		P	P
M08	B	C	Gravel	Riffle-Pool	None	No	0.27		106	4.7	3.2	375	6.7	33.13	3.54	1.43	III	F	Fair		P	P
M09	A	C	Gravel	Riffle-Pool	None	No	0.28		69.9	5	4.04	184.6	6.2	17.30	2.64	1.24	III	F	Fair		P	P
M09	B	F	Gravel	Riffle-Pool	None	No	0.28		91.5	4.8	3.45	121.5	6.7	26.52	1.33	1.40	III	F	Fair		P	P
M10	0	C	Gravel	Riffle-Pool	None	No	0.55		79	4.9	3.83	265	8.1	20.63	3.35	1.65	III	F	Fair		P	P
M11	0	C	Gravel	Riffle-Pool	None	No	0.51		80.3	4.65	3.48	339	6.9	23.07	4.22	1.48	III	F	Fair		P	P

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Stream Geomorphic Assessment

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Reach	Segment	Stream Type	Bed Material	Bedform	Subcl. Slope	Sub Rch?	Channel Slope	Channel Width	Bankfull Width	Max Depth	Mean Depth	Floodpr Width	Recnt Abandn Fldpln	Width Depth Ratio	Entrenchment Ratio	Incision Ratio	Channel Evolution Stage	Channel Evolution Model	Geo Assess Condition	Hab Assess Condition	QC Staff	QC Auto
M12	0	C	Cobble	Plane Bed	None	No	1.18		77.5	4.8	3.23	279	8.3	23.99	3.60	1.73	III	F	Fair		P	P
T4.01	A	B	Cobble	Step-Pool	None	Yes	3.76		35	2.9	2	56.9	7.2	17.50	1.63	2.48	III	F	Poor		P	P
T4.01	B	B	Cobble	Step-Pool	a	No	3.76		34.4	3.4	2.01	56.6	4.9	17.11	1.65	1.44	III	F	Fair		P	P
T4.01	C	B	Cobble	Step-Pool	None	Yes	3.76		30.5	2.85	2.01	57.6	7.05	15.17	1.89	2.47	III	F	Poor		P	P
T4.01	D	B	Cobble	Step-Pool	a	No	3.76		38.3	2.9	1.6	72.3	5.45	23.94	1.89	1.88	III	F	Fair		P	P
M13	A	C	Cobble	Riffle-Pool	None	No	0.29		60.1	4.5	3.36	134.5	6.1	17.89	2.24	1.36	III	F	Fair		P	P
M13	B	C	Gravel	Riffle-Pool	None	No	0.29		59	4.35	3.39	475	7.55	17.40	8.05	1.74	III	F	Fair		P	P
M13	C	E	Gravel	Plane Bed	None	No	0.29		34.7	7.05	5.6	420	8.05	6.20	12.10	1.14	III	F	Fair		P	P
M13	D	C	Cobble	Riffle-Pool	None	No	0.29		47	4.7	3.58	240.5	5.95	13.13	5.12	1.27	III	F	Fair		P	P
T5.01	A	C	Gravel	Plane Bed	None	No	6.26		27.1	3.3	2.06	138.2	5.5	13.16	5.10	1.67	III	F	Fair		P	P
T5.01	B	B	Cobble	Step-Pool	a	Yes	6.26		26.8	2.6	1.97	39.8	6.8	13.60	1.49	2.62	III	None	Poor		P	P
T6.01	A	C	Cobble	Plane Bed	None	Yes	2.53		35	4.1	2.85	245.5	5.7	12.28	7.01	1.39	III	F	Fair		P	P
T6.01	B	F	Cobble	Plane Bed	None	No	2.53		47	3.3	2.18	53.1	7.3	21.56	1.13	2.21	III	F	Poor		P	P
M14	A	C	Sand	Riffle-Pool	None	No	0.72		41.4	3	2.4	244	5.2	17.25	5.89	1.73	III	F	Fair		P	P
M14	B	C	Gravel	Riffle-Pool	None	No	0.72		36.3	4.3	3.14	89.2	4.3	11.56	2.46	1.00	IV	F	Fair		P	P
M14	C	C	Cobble	Riffle-Pool	None	No	0.72		37.6	3.4	2.62	220.3	5.45	14.35	5.86	1.60	III	F	Fair		P	P
M15	A	C	Gravel	Riffle-Pool	None	No	0.73		41.9	3.9	2.64	113.2	6.5	15.87	2.70	1.67	III	F	Fair		P	P
M15	B	C	Gravel	Riffle-Pool	None	No	0.73		39.6	4	2.59	514.6	5.5	15.29	12.99	1.38	III	F	Fair		P	P
M16	A	C	Cobble	Riffle-Pool	None	No	1.18		34.6	3.5	2.7	264.2	4.6	12.81	7.64	1.31	III	F	Fair		P	P
M16	B	C	Gravel	Riffle-Pool	None	No	1.18		32.7	3.7	2.8	544.2	4.8	11.68	16.64	1.30	III	F	Fair		P	P
M16	C	C	Gravel	Riffle-Pool	None	No	1.18		39.6	3	2.3	109.6	6	17.22	2.77	2.00	III	F	Poor		P	P
M17	A	C	Cobble	Step-Pool	b	No	3.31		22.4	2.4	1.92	101.2	3.45	11.67	4.52	1.44	III	F	Fair		P	P
M17	B	C	Cobble	Riffle-Pool	b	No	3.31		23	2.9	1.83	104.4	4.8	12.57	4.54	1.66	III	F	Fair		P	P
M18	A	C	Gravel	Riffle-Pool	None	Yes	1.02		20.6	2.25	1.36	87.4	2.25	15.15	4.24	1.00	V	F	Good		P	P
M18	B					No	1.02							0.00	0.00	0.00					P	F
M19	A	B	Gravel	Step-Pool	None	Yes	2.09		17.8	1.7	0.92	32.5	2.3	19.35	1.83	1.35	III	F	Fair		P	P
M19	B					No	2.09							0.00	0.00	0.00					P	F
M19	C	E	Sand	Riffle-Pool	b	No	2.09		7.9	2.1	1.1	191.4	3.2	7.18	24.23	1.52	II	F	Fair		P	P
T7.01	A	B	Cobble	Step-Pool	a	No	4.66		25.6	2.1	1.45	42.7	3.8	17.66	1.67	1.81	III	F	Fair		P	P
T7.01	B	C	Gravel	Riffle-Pool	b	Yes	4.66		19.3	2	1.48	41.2	3.5	13.04	2.13	1.75	III	F	Fair		P	P

Reach	Segment	Stream Type	Bed Material	Bedform	Subcl. Slope	Sub Rch?	Channel Slope	Channel Width	Bankfull Width	Max Depth	Mean Depth	Floodpr Width	Recnt Abandn Fldpln	Width Depth Ratio	Entrench-ment Ratio	Incision Ratio	Channel Evolution Stage	Channel Evolution Model	Geo Assess Condition	Hab Assess Condition	QC Staff	QC Auto
T7.01	C	C	Sand	Riffle-Pool	None	Yes	4.66		19.8	2.1	1.25	54.4	2.1	15.84	2.75	1.00	III	F	Fair		P	P
T7.01	D	C	Gravel	Riffle-Pool	b	Yes	4.66		19.3	2.3	1.61	80	3.6	11.99	4.15	1.57	III	F	Good		P	P
T7.01	E	E	Sand	Riffle-Pool	b	Yes	4.66		7.5	2.2	1.09	170	2.2	6.88	22.67	1.00	IIc	D	Fair		P	P
T7.01	F	C	Gravel	Riffle-Pool	a	Yes	4.66		14.4	1.45	0.79	35.9	1.65	18.23	2.49	1.14	III	F	Fair		P	P
T3.01	0	C	Cobble	Step-Pool	b	No	2.51		31.5	3	2.19	181.5	4.2	14.38	5.76	1.40	III	F	Fair		P	P
T2.01	A	C	Gravel	Riffle-Pool	b	Yes	4.71		23.7	2.9	2.08	93.3	4	11.39	3.94	1.38	III	F	Fair		P	P
T2.01	B	B	Cobble	Step-Pool	None	No	4.71		25	2.4	1.64	45.8	3.3	15.24	1.83	1.37	III	F	Fair		P	P
T2.01	C	C	Gravel	Riffle-Pool	b	Yes	4.71		21.8	2.25	1.46	39.2	3.4	14.93	1.80	1.51	III	F	Fair		P	P

Phase 2 - Rapid Habitat Assessment Scores

White River - First Branch

Explanation of codes used in table header

6.1	Woody Debris Cover	**6.5**	Hydrologic Characteristics
6.2	Bed Substrate Cover	**6.6**	Connectivity
6.3	Scour and Deposition Features	**6.7**	River Banks
6.4	Channel Morphology	**6.8**	Riparian Area

Reach	Reference Stream Type	Bed-form	Habitat Departure	Reach Length	6.1	6.2	6.3	6.4	6.5	6.6	6.7 Left	6.7 Right	6.8 Left	6.8 Right	Total Score	Percent-age	Habitat Condition
M01-A	Riffle-Pool	Riffle-Pool	Plane Bed	2,207	15	7	9	10	14	9	4	3	5	7	83	52	Fair (Major Departure)
M01-B	Riffle-Pool	Riffle-Pool	None	1,631	15	8	9	7	11	9	5	6	4	8	82	51	Fair (Major Departure)
M01-C	Riffle-Pool	Riffle-Pool	Plane Bed	3,017	12	6	3	11	12	4	4	4	3	5	64	40	Fair (Major Departure)
M02-0		Riffle-Pool	None	11,038											0	0	Poor (Severe Departure)
M02-A	Riffle-Pool	Riffle-Pool	None	2,261	16	6	10	13	10	9	3	5	3	4	79	49	Fair (Major Departure)
M02-B	Riffle-Pool	Riffle-Pool	Plane Bed	4,724	14	6	7	10	12	5	4	5	2	2	67	42	Fair (Major Departure)
M02-C	Riffle-Pool	Riffle-Pool	None	4,055	16	7	12	12	9	9	4	2	3	2	76	48	Fair (Major Departure)
M03-0	Riffle-Pool	Riffle-Pool	None	1,893	11	9	10	9	13	9	7	6	9	2	85	53	Fair (Major Departure)
M04-A	Riffle-Pool	Riffle-Pool	None	4,804	14	7	10	9	13	12	2	2	3	2	74	46	Fair (Major Departure)
M04-B	Riffle-Pool	Riffle-Pool	None	3,860	16	6	12	6	10	15	3	5	4	4	81	51	Fair (Major Departure)
M05-A	Riffle-Pool	Riffle-Pool	None	8,576	13	9	11	9	10	13	7	6	2	2	82	51	Fair (Major Departure)
M05-B	Riffle-Pool	Riffle-Pool	None	973	12	11	11	7	8	10	2	5	2	4	72	45	Fair (Major Departure)
M06-0	Riffle-Pool	Riffle-Pool	None	2,720	10	8	9	4	11	7	6	4	3	3	65	41	Fair (Major Departure)
M07-A	Riffle-Pool	Riffle-Pool	None	6,641	11	9	11	8	11	10	5	3	5	1	74	46	Fair (Major Departure)
M07-B	Riffle-Pool	Riffle-Pool	None	2,160	8	11	12	8	10	4	6	4	4	2	69	43	Fair (Major Departure)
M08-A	Riffle-Pool	Riffle-Pool	None	998	10	9	11	7	11	11	5	5	3	4	76	48	Fair (Major Departure)
M08-B	Riffle-Pool	Riffle-Pool	None	7,666	11	8	9	8	11	9	7	5	3	1	72	45	Fair (Major Departure)
M09-A	Riffle-Pool	Plane Bed	None	1,577	10	7	10	12	13	12	8	5	9	3	89	56	Fair (Major Departure)
M09-B	Riffle-Pool	Plane Bed	None	2,315	6	6	9	5	7	11	3	2	2	1	52	33	Poor (Severe Departure)
M10-0	Riffle-Pool	Riffle-Pool	None	3,975	8	9	11	10	11	12	6	4	8	3	82	51	Fair (Major Departure)
M11-0	Riffle-Pool	Riffle-Pool	None	6,122	9	10	11	11	11	10	5	6	6	5	84	53	Fair (Major Departure)
M12-0	Plane Bed	Plane Bed	None	7,605	12	9	14	10	10	11	5	3	5	4	83	52	Fair (Major Departure)

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

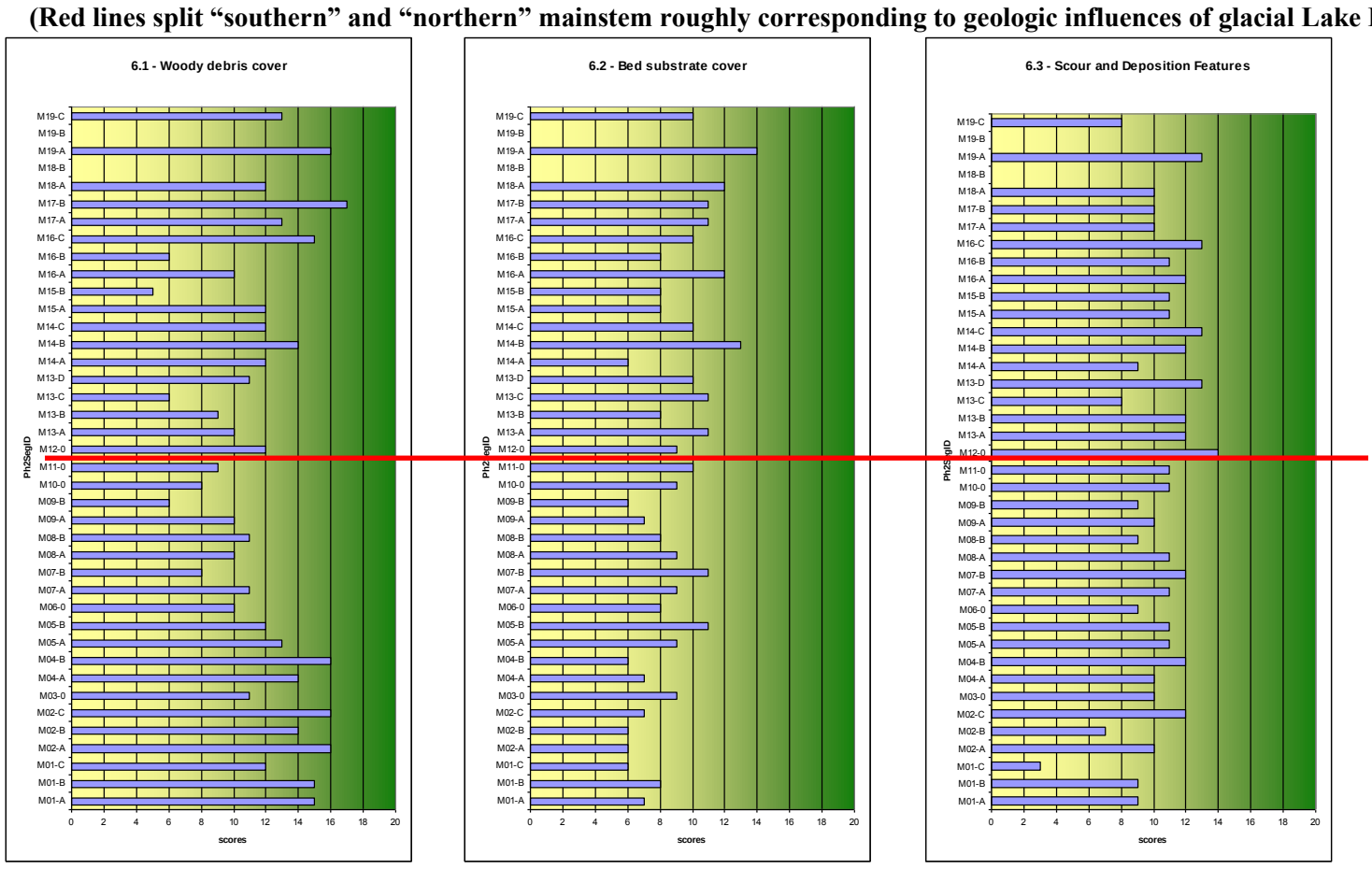
March, 09 2014

Reach	Reference Stream Type	Bed-form	Habitat Departure	Reach Length	6.1	6.2	6.3	6.4	6.5	6.6	6.7 Left	6.7 Right	6.8 Left	6.8 Right	Total Score	Percent-age	Habitat Condition
M13-A	Riffle-Pool	Riffle-Pool	None	936	10	11	12	10	9	10	6	3	5	2	78	49	Fair (Major Departure)
M13-B	Riffle-Pool	Riffle-Pool	None	4,875	9	8	12	8	11	10	4	4	2	2	70	44	Fair (Major Departure)
M13-C	Riffle-Pool	Riffle-Pool	Plane Bed	508	6	11	8	8	8	9	4	5	1	1	61	38	Fair (Major Departure)
M13-D	Riffle-Pool	Riffle-Pool	None	1,164	11	10	13	13	11	8	5	6	2	4	83	52	Fair (Major Departure)
M14-A	Riffle-Pool	Riffle-Pool	None	956	12	6	9	8	10	8	4	4	3	5	69	43	Fair (Major Departure)
M14-B	Riffle-Pool	Riffle-Pool	None	1,610	14	13	12	10	12	8	3	4	2	5	83	52	Fair (Major Departure)
M14-C	Riffle-Pool	Riffle-Pool	None	6,465	12	10	13	11	9	10	4	4	4	4	81	51	Fair (Major Departure)
M15-A	Riffle-Pool	Riffle-Pool	None	4,654	12	8	11	10	9	9	4	3	4	2	72	45	Fair (Major Departure)
M15-B	Riffle-Pool	Riffle-Pool	None	683	5	8	11	11	9	10	4	4	3	3	68	43	Fair (Major Departure)
M16-A	Riffle-Pool	Riffle-Pool	None	6,593	10	12	12	13	10	14	3	3	3	3	83	52	Fair (Major Departure)
M16-B	Riffle-Pool	Riffle-Pool	None	2,022	6	8	11	12	10	11	4	4	3	3	72	45	Fair (Major Departure)
M16-C	Riffle-Pool	Riffle-Pool	None	2,532	15	10	13	8	11	14	6	7	6	6	96	60	Fair (Major Departure)
M17-A	Step-Pool	Step-Pool	None	6,917	13	11	10	12	15	12	5	5	3	4	90	56	Fair (Major Departure)
M17-B	Riffle-Pool	Step-Pool	Riffle-Pool	1,958	17	11	10	12	11	15	8	8	8	6	106	66	Good (Minor Departure)
M18-A	Riffle-Pool	Dune-Ripple	None	550	12	12	10	14	14	7	7	8	6	6	96	60	Fair (Major Departure)
M18-B		Dune-Ripple	None	1,904											0	0	Poor (Severe Departure)
M19-A	Step-Pool	Riffle-Pool	None	2,698	16	14	13	7	14	15	10	5	9	3	106	66	Good (Minor Departure)
M19-B		Riffle-Pool	None	912											0	0	Poor (Severe Departure)
M19-C	Riffle-Pool	Riffle-Pool	None	1,316	13	10	8	11	12	7	8	7	7	6	89	56	Fair (Major Departure)
T1.01-A	Step-Pool	Step-Pool	None	1,670	13	10	9	8	9	6	5	3	7	7	77	48	Fair (Major Departure)
T1.01-B	Step-Pool	Step-Pool	None	1,802	10	9	11	6	6	9	2	3	1	8	65	41	Fair (Major Departure)
T1.01-C	Step-Pool	Step-Pool	None	1,808	11	10	10	9	9	5	4	5	4	4	71	44	Fair (Major Departure)
T1.01-D	Riffle-Pool	Step-Pool	None	1,042	13	7	10	10	9	11	3	6	2	3	74	46	Fair (Major Departure)
T1.01-E	Riffle-Pool	Step-Pool	None	969	17	9	11	11	9	10	9	7	8	7	98	61	Fair (Major Departure)
T2.01-A	Riffle-Pool	Step-Pool	None	1,086	15	10	12	9	9	7	8	7	6	6	89	56	Fair (Major Departure)
T2.01-B	Step-Pool	Step-Pool	None	4,350	13	13	10	10	11	8	7	7	8	7	94	59	Fair (Major Departure)
T2.01-C	Riffle-Pool	Step-Pool	None	1,208	17	10	12	12	13	14	7	7	6	9	107	67	Good (Minor Departure)
T3.01-0	Step-Pool	Step-Pool	None	6,982	12	11	10	10	13	9	7	7	6	4	89	56	Fair (Major Departure)
T4.01-A	Step-Pool	Step-Pool	None	645	7	10	8	6	9	6	5	4	5	5	65	41	Fair (Major Departure)
T4.01-B	Step-Pool	Step-Pool	None	4,367	9	11	8	8	11	9	6	8	4	5	79	49	Fair (Major Departure)

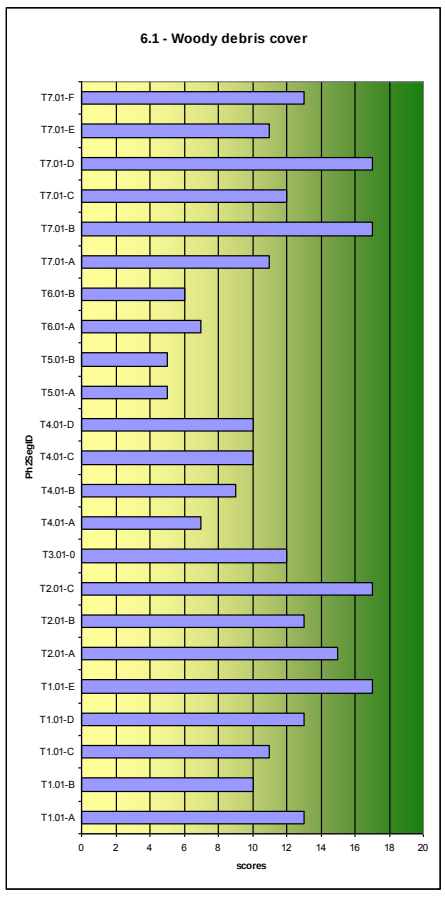
Reach	Reference Stream Type	Bed-form	Habitat Departure	Reach Length	6.1	6.2	6.3	6.4	6.5	6.6	6.7 Left	6.7 Right	6.8 Left	6.8 Right	Total Score	Percent-age	Habitat Condition
T4.01-C	Step-Pool	Step-Pool	None	3,884	10	11	10	6	12	8	5	5	3	3	73	46	Fair (Major Departure)
T4.01-D	Step-Pool	Step-Pool	None	3,094	10	11	7	8	13	11	4	4	4	6	78	49	Fair (Major Departure)
T5.01-A	Riffle-Pool	Riffle-Pool	Plane Bed	791	5	8	4	8	9	11	4	4	3	3	59	37	Fair (Major Departure)
T5.01-B	Step-Pool	Riffle-Pool	None	648	5	13	6	7	8	13	3	4	2	1	62	39	Fair (Major Departure)
T6.01-A	Riffle-Pool	Plane Bed	Plane Bed	3,209	7	10	8	11	9	4	4	5	1	1	60	38	Fair (Major Departure)
T6.01-B	Step-Pool	Plane Bed	Plane Bed	4,157	6	9	7	4	10		4	5	2	4	51	32	Poor (Severe Departure)
T7.01-A	Step-Pool	Step-Pool	None	6,067	11	12	11	7	11	8	5	4	3	6	78	49	Fair (Major Departure)
T7.01-B	Step-Pool	Step-Pool	Riffle-Pool	3,163	17	11	10	11	12	12	7	6	4	6	96	60	Fair (Major Departure)
T7.01-C	Riffle-Pool	Step-Pool	None	727	12	8	9	11	10	9	4	5	7	8	83	52	Fair (Major Departure)
T7.01-D	Riffle-Pool	Step-Pool	None	2,388	17	10	10	14	14	15	8	7	7	8	110	69	Good (Minor Departure)
T7.01-E	Riffle-Pool	Step-Pool	None	806	11	12	11	14	9	10	3	5	2	3	80	50	Fair (Major Departure)
T7.01-F	Step-Pool	Step-Pool	Riffle-Pool	804	13	9	9	11	11	6	5	5	3	4	76	48	Fair (Major Departure)

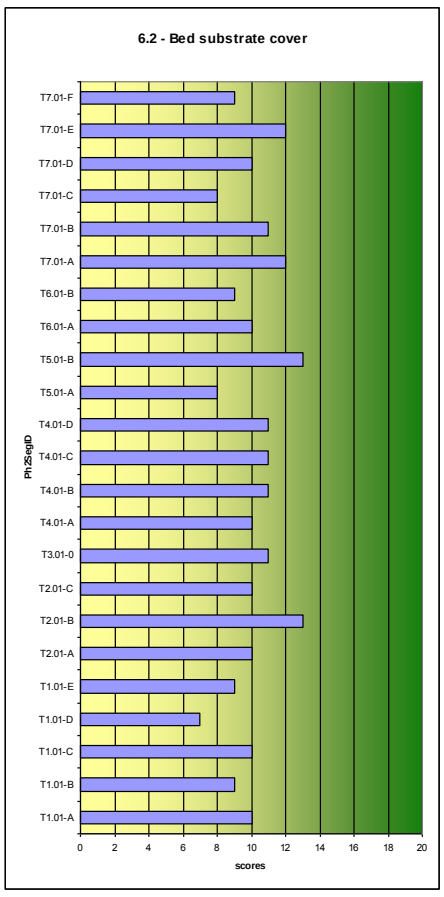
Rapid Habitat Assessment Score Charts – First Branch Mainstem

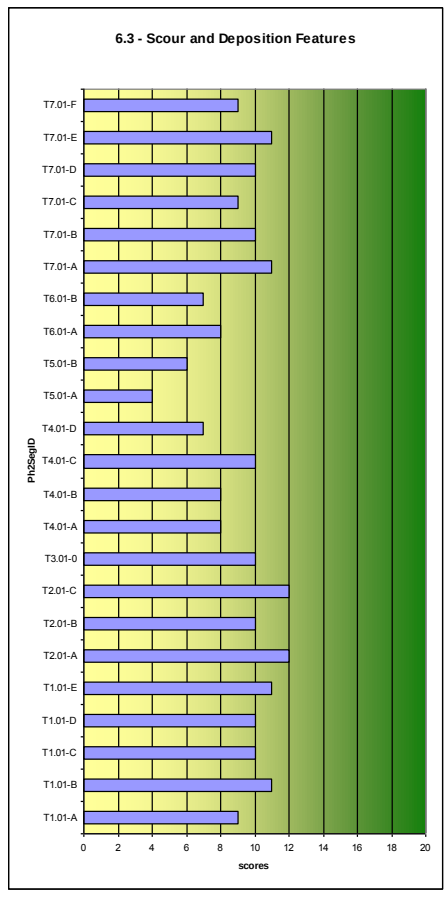
(Red lines split "southern" and "northern" mainstem roughly corresponding to geologic influences of glacial Lake Hitchcock)

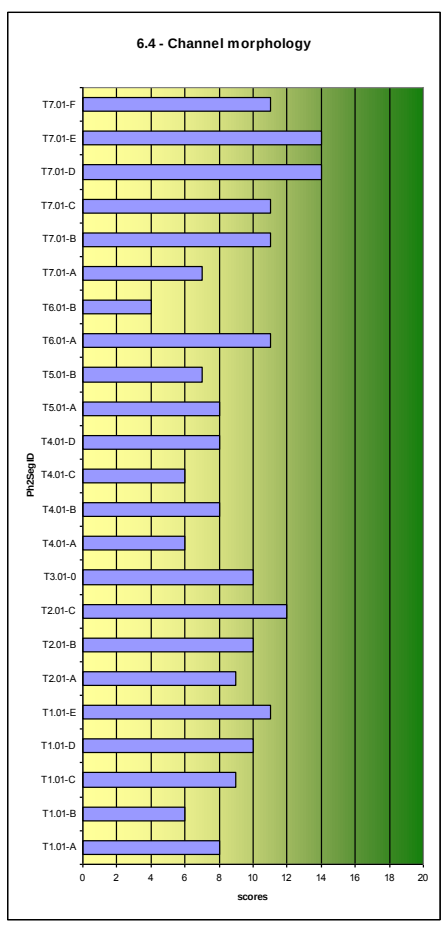


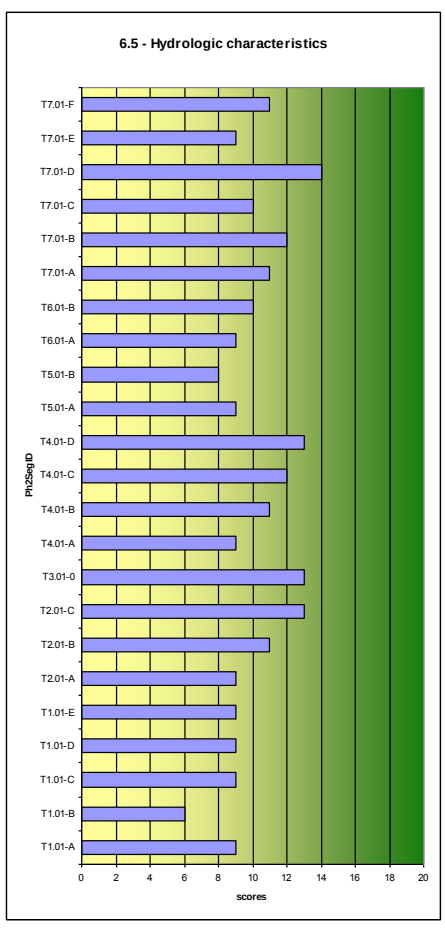
Rapid Habitat Assessment Score Charts – First Branch select tributaries

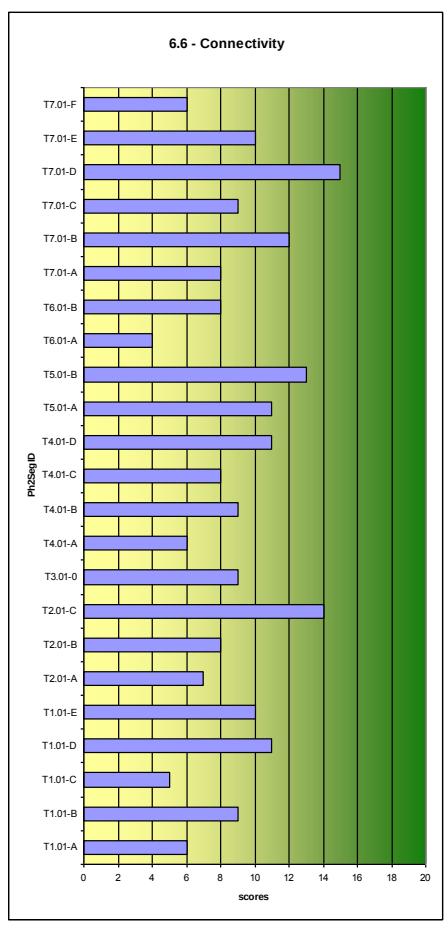


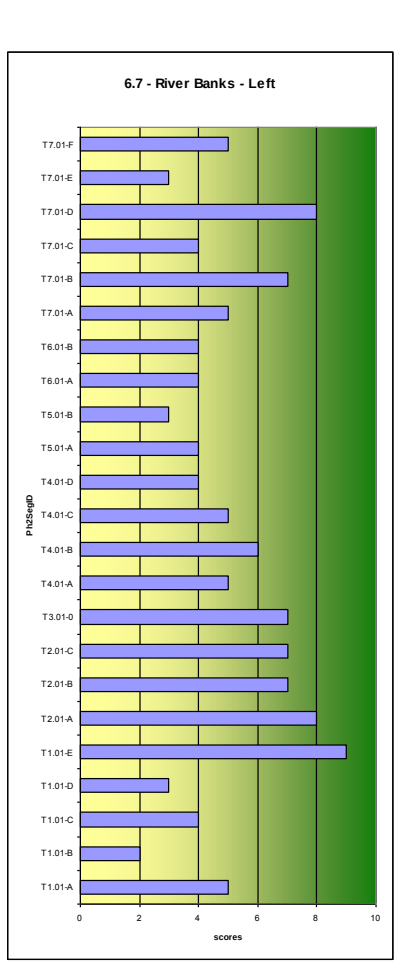


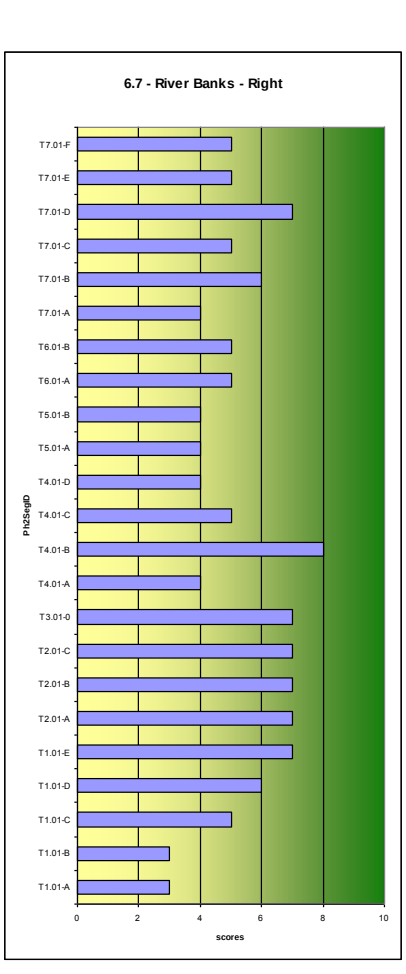


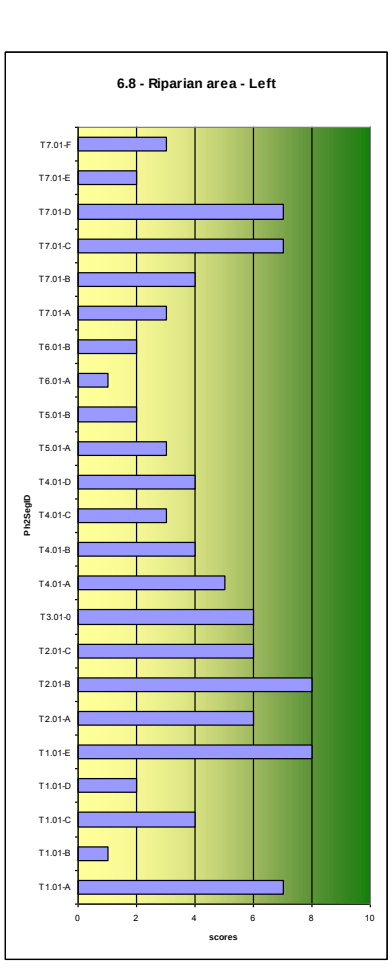


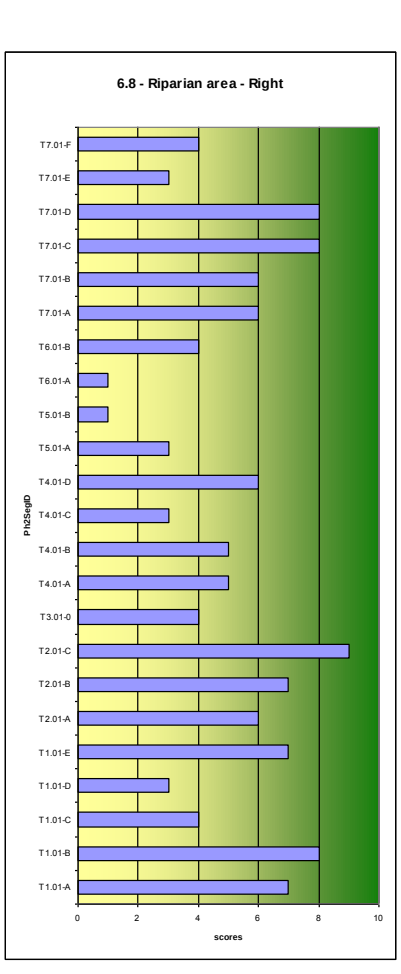












– Appendix 2 –

Phase I Reach Summary Reports

(also see https://anrnode.anr.state.vt.us/SGA/projects/phase1/reports.aspx?pid=3 and select 'Reach Summary Report' from the drop down list; then select 'All' or any one segment of interest)

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M01**
SGAT Version: **3**
Date Last Edited: **December, 19 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location

1.1 Reach Description: **Reach is west of Rt 110 and begins at confluence with the White River. Reach ends just West of Branch View cemetery.**

1.2 Towns: **Royalton**

1.3 Downstream Latitude: **43.8237134737**

1.3 Downstream Longitude: **-72.5206486038**

Step 2. Stream Type

2.1 Elevation Upstream:	**490**	
2.1 Elevation Downstream:	**459**	
2.1 Is Gradient Gentle?:	**No**	
2.2 Valley Length:	**6,355.0** ft.	**1.20** Miles
2.3 Valley Slope:	**0.5**	
2.4 Channel Length:	**6,855.0** ft.	**1.30** Miles
2.5 Channel Slope:	**0.45 %**	
2.6 Sinuosity:	**1.08**	
2.7 Watershed Area:	**104.6** Square Miles	
2.8 Channel Width:	**101.3** feet	
2.9 Valley Width:	**400.0** feet	
2.10 Confinement Ratio:	**3.9**	
2.10 Confinement Type:	**Semi-confined**	
2.11 Reference Stream Type:	**C**	
Bedform:	**Riffle-Pool**	
Sub-Class Slope:	**None**	
Bed Material:	**Gravel**	

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**None**	
3.2 Grade Control:	**Multiple**	
3.3 Dominant Geological Mat.:	**Ice-Contact**	**65.6** %
3.3 Sub-dom. Geological Mat.:	**Glacial Lake**	
3.4 Valley Slope Left:	**Very Steep**	
3.4 Valley Slope Right:	**Ext. Steep**	
3.5 Soils		
Hydrologic Group:	**A**	**47.9** %
Flooding:	**None/Rare**	**90.2** %
Water Table Deep:	**6.0**	**87.1** %
Water Table Shallow:	**6.0**	**87.1** %
Erodibility:	**Moderate**	**40.2** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**81.5** %
Current Sub-Dominant Land Cover:	**Field**	

4.2 Corridor

Historic Land Cover::	**Forest**	
Current Dominant Land Cover:	**Forest**	**39.2** %
Current Sub-Dominant Land Cover:	**Urban**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**258.0** ft.	**341.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type:	**Large Run of River**		
Use:	**Other**		
5.2 Bridges and Culverts:	**2**	**4.4** %	
5.3 Bank Armoring:	**2,403.0**	**35.1** %	
Left:	**1,364.1** ft.	Right:	**1,039.0** ft.
5.4 Channel Straightening:	**3,486.8**	**50.9** %	
5.5 Dredging History:	**No Data**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**3,059.2** ft.	**44.6**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**1,640.9** ft.	**52.6** ft.
6.3 Channel Bars:	**Side**	
6.4 Meander Migration:	**Flood Chute**	
6.5 Meander Width:	**ft.** Rato:	**0.0**
6.6 Wavelength:	**ft.** Ratio:	**0.0**

Step 7. Windshield Survey

7.1 Bank Erosion:	**4359.84**	ft
7.2 Bank Height:	**4**	ft
7.3 Ice/Debris Jam Potential:	**None**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	1 Low	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	2 High	2 High	1 Low	0 N.D.	0 N.D.	2 High	0 N.S.	18

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M02**

SGAT Version: **3**

Date Last Edited: **June, 10 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **West of Rt 110. Begins at Branch View cemetery. Ends where river moves to E side of Rt 110 (at bridge).**

1.1 Reach Description:

1.2 Towns: **Royalton, Tunbridge**

1.3 Downstream Latitude: **43.8366251456**

1.3 Downstream Longitude: **-72.5160404475**

Step 2. Stream Type

2.1 Elevation Upstream: **504**

2.1 Elevation Downstream: **490**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **9,326.0** ft. **1.77** Miles

2.3 Valley Slope: **0.2**

2.4 Channel Length: **11,038.0** ft. **2.09** Miles

2.5 Channel Slope: **0.13 %**

2.6 Sinuosity: **1.18**

2.7 Watershed Area: **103.8** Square Miles

2.8 Channel Width: **101.0** feet

2.9 Valley Width: **528.0** feet

2.10 Confinement Ratio: **5.2**

2.10 Confinement Type: **Narrow**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Alluvial** **45.2** %

3.3 Sub-dom. Geological Mat.: **Ice-Contact**

3.4 Valley Slope Left: **Very Steep**

3.4 Valley Slope Right: **Very Steep**

3.5 Soils

Hydrologic Group: **B** **61.9** %

Flooding: **None/Rare** **54.8** %

Water Table Deep: **6.0** **63.6** %

Water Table Shallow: **6.0** **45.8** %

Erodibility: **Moderate** **41.2** %

7.4 Comments:

Murky water.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.5** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Field**

Current Dominant Land Cover: **Field** **31.9** %

Current Sub-Dominant Land Cover: **Forest**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**3,605.0** ft.	**5,501.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **3** **1.9** %

5.3 Bank Armoring: **4,744.9** **43.0** %

Left: **2,944.0** ft. Right: **1,800.9** ft.

5.4 Channel Straightening: **7,020.8** **63.6** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,847.8** ft. **16.7**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **242.2** ft. **0.0** ft.

6.3 Channel Bars: **Point**

6.4 Meander Migration: **Migration**

6.5 Meander Width: **353 ft.** Rato: **3.5**

6.6 Wavelength: **694 ft.** Ratio: **6.9**

Step 7. Windshield Survey

7.1 Bank Erosion: **7090.71** ft

7.2 Bank Height: **4** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	1 Low	0 N.S.	1 Low	0 N.S.	1 Low	1 Low	2 High	0 N.S.	16

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M03**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins where river goes under Rt 110 to the east. Ends .4 mi up from there.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.8547347462**

1.3 Downstream Longitude: **-72.5026219144**

Step 2. Stream Type

2.1 Elevation Upstream: **515**

2.1 Elevation Downstream: **504**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **1,891.0** ft. **0.36** Miles

2.3 Valley Slope: **0.6**

2.4 Channel Length: **1,892.0** ft. **0.36** Miles

2.5 Channel Slope: **0.58 %**

2.6 Sinuosity: **1.00**

2.7 Watershed Area: **97.2** Square Miles

2.8 Channel Width: **98.1** feet

2.9 Valley Width: **300.0** feet

2.10 Confinement Ratio: **3.1**

2.10 Confinement Type: **Semi-confined**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Ice-Contact** **44.2** %

3.3 Sub-dom. Geological Mat.: **Glacial Lake**

3.4 Valley Slope Left: **Very Steep**

3.4 Valley Slope Right: **Very Steep**

3.5 Soils

Hydrologic Group: **A** **52.8** %

Flooding: **None/Rare** **92.7** %

Water Table Deep: **6.0** **97.6** %

Water Table Shallow: **6.0** **90.3** %

Erodibility: **Severe** **60.2** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.6** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Urban** **47.9** %

Current Sub-Dominant Land Cover: **Forest**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**0-25**
Sub-dominant:	**51-100**	**26-50**
Length w / less than 25 ft.:	**0.0** ft.	**297.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **0** **0.0** %

5.3 Bank Armoring: **1,083.5** **57.3** %

Left: **355.7** ft. Right: **727.8** ft.

5.4 Channel Straightening: **822.8** **43.5** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,444.3** ft. **76.3**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **267.0** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **ft.** Rato: **0.0**

6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **525.86** ft

7.2 Bank Height: **3** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	1 Low	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	1 Low	1 Low	1 Low	0 N.D.	0 N.D.	2 High	0 N.S.	16

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M04**

SGAT Version: **3**

Date Last Edited: **June, 10 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins where river diverges from Rt 110 and heads E. Ends .1 mi S of Town Farm Rd.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.859371696**

1.3 Downstream Longitude: **-72.5005920026**

Step 2. Stream Type

2.1 Elevation Upstream: **528**

2.1 Elevation Downstream: **515**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **5,776.0** ft. **1.09** Miles

2.3 Valley Slope: **0.2**

2.4 Channel Length: **8,663.0** ft. **1.64** Miles

2.5 Channel Slope: **0.15 %**

2.6 Sinuosity: **1.50**

2.7 Watershed Area: **95.0** Square Miles

2.8 Channel Width: **97.2** feet

2.9 Valley Width: **705.0** feet

2.10 Confinement Ratio: **7.3**

2.10 Confinement Type: **Broad**

2.11 Reference Stream Type: **E**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Sand**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **None**

3.3 Dominant Geological Mat.: **Alluvial** **51.5** %

3.3 Sub-dom. Geological Mat.: **Ice-Contact**

3.4 Valley Slope Left: **Very Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **B** **62.9** %

Flooding: **None/Rare** **48.5** %

Water Table Deep: **6.0** **92.8** %

Water Table Shallow: **4.0** **48.0** %

Erodibility: **Moderate** **32.5** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.5** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Forest** **36.4** %

Current Sub-Dominant Land Cover: **Field**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**26-50**
Length w / less than 25 ft.:	**4,411.0** ft.	**5,596.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **2** **2.1** %

5.3 Bank Armoring: **2,518.4** **29.1** %

Left: **703.6** ft. Right: **1,814.8** ft.

5.4 Channel Straightening: **3,932.0** **45.4** %

5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,571.6** ft. **18.1**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **215.4** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **99 ft.** Rato: **1.0**

6.6 Wavelength: **99 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **5663.11** ft

7.2 Bank Height: **4** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	1 Low	0 N.S.	1 Low	2 High	2 High	2 High	2 High	0 N.S.	20

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M05**

SGAT Version: **3**

Date Last Edited: **June, 10 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .1 mi S of Town Farm Rd. Ends by Mill covered bridge.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.8753914996**

1.3 Downstream Longitude: **-72.4991637715**

Step 2. Stream Type

2.1 Elevation Upstream: **554**

2.1 Elevation Downstream: **528**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **8,274.0** ft. **1.57** Miles

2.3 Valley Slope: **0.3**

2.4 Channel Length: **9,549.0** ft. **1.81** Miles

2.5 Channel Slope: **0.27 %**

2.6 Sinuosity: **1.15**

2.7 Watershed Area: **89.4** Square Miles

2.8 Channel Width: **94.6** feet

2.9 Valley Width: **906.0** feet

2.10 Confinement Ratio: **9.6**

2.10 Confinement Type: **Broad**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **None**

3.3 Dominant Geological Mat.: **Alluvial** **72.1** %

3.3 Sub-dom. Geological Mat.: **Ice-Contact**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **B** **81.8** %

Flooding: **Occasional** **59.8** %

Water Table Deep: **6.0** **83.1** %

Water Table Shallow: **4.0** **59.8** %

Erodibility: **slight** **21.9** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.8** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Field**

Current Dominant Land Cover: **Field** **35.5** %

Current Sub-Dominant Land Cover: **Crop**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**26-50**	**26-50**
Length w / less than 25 ft.:	**3,972.0** ft.	**3,133.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **1** **0.5** %

5.3 Bank Armoring: **5,202.8** **54.5** %

Left: **3,016.5** ft. Right: **2,186.3** ft.

5.4 Channel Straightening: **9,548.6** **100.0** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **3,058.8** ft. **32.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **2,260.4** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **96 ft.** Rato: **1.0**

6.6 Wavelength: **96 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **8062.18** ft

7.2 Bank Height: **4** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	2 High	1 Low	2 High	2 High	2 High	2 High	0 N.S.	23

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M06**
SGAT Version: **3**
Date Last Edited: **December, 19 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins at Mill covered bridge. Ends just below the tributary confluence to the E.**

1.1 Reach Description:
1.2 Towns: **Tunbridge**
1.3 Downstream Latitude: **43.8916021492**
1.3 Downstream Longitude: **-72.4917318476**

Step 2. Stream Type

2.1 Elevation Upstream: **567**
2.1 Elevation Downstream: **554**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **2,574.0** ft. **0.49** Miles
2.3 Valley Slope: **0.5**
2.4 Channel Length: **2,720.0** ft. **0.52** Miles
2.5 Channel Slope: **0.48 %**
2.6 Sinuosity: **1.06**
2.7 Watershed Area: **80.4** Square Miles
2.8 Channel Width: **90.3** feet
2.9 Valley Width: **240.0** feet
2.10 Confinement Ratio: **2.7**
2.10 Confinement Type: **Semi-confined**
2.11 Reference Stream Type: **B**
Bedform: **Riffle-Pool**
Sub-Class Slope: **c**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Multiple**
3.3 Dominant Geological Mat.: **Ice-Contact** **38.4** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **A** **66.0** %
Flooding: **None/Rare** **87.6** %
Water Table Deep: **6.0** **100.0** %
Water Table Shallow: **6.0** **87.6** %
Erodibility: **Very Severe** **75.4** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **81.7** %
Current Sub-Dominant Land Cover: **Field**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Urban** **43.9** %
Current Sub-Dominant Land Cover: **Forest**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**26-50**	**26-50**
Length w / less than 25 ft.:	**1,090.0** ft.	**1,139.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **Large Run of River**
Use: **Other**
5.2 Bridges and Culverts: **2** **8.8** %
5.3 Bank Armoring: **2,720.0** **1.0** %
Left: **1,576.1** ft. Right: **1,353.1** ft.
5.4 Channel Straightening: **2,719.5** **100.0** %
5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **2,127.6** ft. **78.2**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **765.1** ft. **0.0** ft.
6.3 Channel Bars: **Mid-channel**
6.4 Meander Migration: **Flood Chute**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1288.7** ft
7.2 Bank Height: **4** ft
7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	1 Low	2 High	2 High	0 N.S.	2 High	2 High	1 Low	1 Low	0 N.D.	0 N.D.	2 High	0 N.S.	19

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M07**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins below tributary confluence (T1.1). Ends .1 mi S of Tunbridge Central school.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.8949938072**

1.3 Downstream Longitude: **-72.4848655749**

Step 2. Stream Type

2.1 Elevation Upstream: **617**

2.1 Elevation Downstream: **567**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **7,962.0** ft. **1.51** Miles

2.3 Valley Slope: **0.6**

2.4 Channel Length: **8,799.0** ft. **1.67** Miles

2.5 Channel Slope: **0.57 %**

2.6 Sinuosity: **1.11**

2.7 Watershed Area: **80.1** Square Miles

2.8 Channel Width: **90.1** feet

2.9 Valley Width: **422.0** feet

2.10 Confinement Ratio: **4.7**

2.10 Confinement Type: **Narrow**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Ice-Contact** **47.1** %

3.3 Sub-dom. Geological Mat.: **Alluvial**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Very Steep**

3.5 Soils

Hydrologic Group: **A** **47.1** %

Flooding: **None/Rare** **70.2** %

Water Table Deep: **6.0** **91.3** %

Water Table Shallow: **6.0** **65.7** %

Erodibility: **Moderate** **41.9** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.7** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Field**

Current Dominant Land Cover: **Forest** **37.0** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**3,723.0** ft.	**0.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **1** **0.8** %

5.3 Bank Armoring: **3,088.0** **35.1** %

Left: **596.7** ft. Right: **2,491.3** ft.

5.4 Channel Straightening: **5,372.6** **61.1** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **3,647.4** ft. **41.5**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **2,663.1** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **91 ft.** Rato: **1.0**

6.6 Wavelength: **91 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **2449.2** ft

7.2 Bank Height: **4** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	2 High	2 High	1 Low	2 High	2 High	2 High	0 N.S.	23

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M08**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .1 mi S of Tunbridge Central School. Ends just N of Dickerman Brook.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.9148596822**

1.3 Downstream Longitude: **-72.4765408142**

Step 2. Stream Type

2.1 Elevation Upstream: **640**

2.1 Elevation Downstream: **617**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **7,474.0** ft. **1.42** Miles

2.3 Valley Slope: **0.3**

2.4 Channel Length: **8,664.0** ft. **1.64** Miles

2.5 Channel Slope: **0.27 %**

2.6 Sinuosity: **1.16**

2.7 Watershed Area: **72.2** Square Miles

2.8 Channel Width: **86.1** feet

2.9 Valley Width: **479.0** feet

2.10 Confinement Ratio: **5.6**

2.10 Confinement Type: **Narrow**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Ice-Contact** **66.9** %

3.3 Sub-dom. Geological Mat.: **Alluvial**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **A** **66.1** %

Flooding: **None/Rare** **68.2** %

Water Table Deep: **6.0** **92.1** %

Water Table Shallow: **6.0** **66.3** %

Erodibility: **Moderate** **33.8** %

7.4 Comments:

Appears to be over-widened.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **82.1** %

Current Sub-Dominant Land Cover: **Urban**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Forest** **50.1** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**26-50**
Sub-dominant:	**>100**	**0-25**
Length w / less than 25 ft.:	**1,412.0** ft.	**3,606.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **1** **0.7** %

5.3 Bank Armoring: **1,877.0** **21.7** %

Left: **90.1** ft. Right: **1,787.0** ft.

5.4 Channel Straightening: **3,941.8** **45.5** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **2,587.3** ft. **29.9**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **1,009.1** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **86 ft.** Rato: **1.0**

6.6 Wavelength: **86 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **2083.87** ft

7.2 Bank Height: **2** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	1 Low	2 High	1 Low	2 High	2 High	2 High	0 N.S.	22

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M09**
SGAT Version: **3**
Date Last Edited: **June, 10 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins just N of Dickerman Brook. Ends .1 mi N of Cherry Hill Rd.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.9314019934**

1.3 Downstream Longitude: **-72.4657382093**

Step 2. Stream Type

2.1 Elevation Upstream:	**651**		
2.1 Elevation Downstream:	**640**		
2.1 Is Gradient Gentle?:	**No**		
2.2 Valley Length:	**3,715.0** ft.	**0.70**	Miles
2.3 Valley Slope:	**0.3**		
2.4 Channel Length:	**3,891.0** ft.	**0.74**	Miles
2.5 Channel Slope:	**0.28 %**		
2.6 Sinuosity:	**1.05**		
2.7 Watershed Area:	**63.8** Square Miles		
2.8 Channel Width:	**81.6** feet		
2.9 Valley Width:	**259.0** feet		
2.10 Confinement Ratio:	**3.2**		
2.10 Confinement Type:	**Semi-confined**		
2.11 Reference Stream Type:	**B**		
Bedform:	**Plane Bed**		
Sub-Class Slope:	**c**		
Bed Material:	**Cobble**		

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**None**	
3.2 Grade Control:	**Ledge**	
3.3 Dominant Geological Mat.:	**Ice-Contact**	**63.9** %
3.3 Sub-dom. Geological Mat.:	**Other**	
3.4 Valley Slope Left:	**Ext. Steep**	
3.4 Valley Slope Right:	**Very Steep**	
3.5 Soils		
Hydrologic Group:	**A**	**49.3** %
Flooding:	**None/Rare**	**87.4** %
Water Table Deep:	**6.0**	**62.6** %
Water Table Shallow:	**6.0**	**62.6** %
Erodibility:	**Severe**	**59.2** %

7.4 Comments:
Stream ford.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**81.8** %
Current Sub-Dominant Land Cover:	**Field**	

4.2 Corridor

Historic Land Cover::	**Forest**	
Current Dominant Land Cover:	**Forest**	**44.6** %
Current Sub-Dominant Land Cover:	**Crop**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**0-25**	**0-25**
Length w / less than 25 ft.:	**0.0** ft.	**1,278.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type:	**None**		
Use:			
5.2 Bridges and Culverts:	**0**		**0.0** %
5.3 Bank Armoring:	**43.6**		**1.1** %
Left:	**43.6** ft.	Right:	**0.0** ft.
5.4 Channel Straightening:	**2,015.5**		**51.8** %
5.5 Dredging History:	**No Data**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**2,230.3** ft.	**57.3**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**0.0** ft.	**0.0** ft.
6.3 Channel Bars:	**Multiple**	
6.4 Meander Migration:	**Flood Chute**	
6.5 Meander Width:	**81 ft.** Rato:	**1.0**
6.6 Wavelength:	**81 ft.** Ratio:	**1.0**

Step 7. Windshield Survey

7.1 Bank Erosion:	**863.85**	ft
7.2 Bank Height:	**2**	ft
7.3 Ice/Debris Jam Potential:	**None**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	0 N.S.	2 High	0 N.S.	2 High	0 N.S.	1 Low	1 Low	2 High	2 High	2 High	0 N.S.	18

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M10**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Reach starts .1 mi North of Cherry hill Rd. Ends just North of Hunt cemetery.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.9398570939**

1.3 Downstream Longitude: **-72.4639345515**

Step 2. Stream Type

2.1 Elevation Upstream: **673**

2.1 Elevation Downstream: **651**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **3,431.0** ft. **0.65** Miles

2.3 Valley Slope: **0.6**

2.4 Channel Length: **3,975.0** ft. **0.75** Miles

2.5 Channel Slope: **0.55 %**

2.6 Sinuosity: **1.16**

2.7 Watershed Area: **63.1** Square Miles

2.8 Channel Width: **81.1** feet

2.9 Valley Width: **500.0** feet

2.10 Confinement Ratio: **6.2**

2.10 Confinement Type: **Broad**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Ice-Contact** **52.4** %

3.3 Sub-dom. Geological Mat.: **Alluvial**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **A** **50.7** %

Flooding: **None/Rare** **76.0** %

Water Table Deep: **6.0** **68.6** %

Water Table Shallow: **6.0** **51.2** %

Erodibility: **Moderate** **42.3** %

7.4 Comments:

Reach not visible for windshield survey.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.9** %

Current Sub-Dominant Land Cover: **Urban**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Forest** **53.4** %

Current Sub-Dominant Land Cover: **Crop**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**0-25**
Sub-dominant:	**51-100**	**>100**
Length w / less than 25 ft.:	**0.0** ft.	**2,518.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **0** **0.0** %

5.3 Bank Armoring: **626.8** **15.8** %

Left: **0.0** ft. Right: **626.8** ft.

5.4 Channel Straightening: **2,891.1** **72.7** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **712.2** ft. **0.0** ft.

6.3 Channel Bars: **Side**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **81 ft.** Rato: **1.0**

6.6 Wavelength: **81 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **527.02** ft

7.2 Bank Height: **2** ft

7.3 Ice/Debris Jam Potential: **No Data**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	1 Low	2 High	0 N.S.	0 Unk.	1 Low	1 Low	1 Low	2 High	2 High	1 Low	0 N.S.	17

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M11**

SGAT Version: **3**

Date Last Edited: **June, 10 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins just N of Hunt cemetery. Ends just N of confluence with Cram Brook.**

1.1 Reach Description:

1.2 Towns: **Chelsea, Tunbridge**

1.3 Downstream Latitude: **43.9477594038**

1.3 Downstream Longitude: **-72.4579571007**

Step 2. Stream Type

2.1 Elevation Upstream: **704**

2.1 Elevation Downstream: **673**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **5,206.0** ft. **0.99** Miles

2.3 Valley Slope: **0.6**

2.4 Channel Length: **6,121.0** ft. **1.16** Miles

2.5 Channel Slope: **0.51 %**

2.6 Sinuosity: **1.18**

2.7 Watershed Area: **59.6** Square Miles

2.8 Channel Width: **79.1** feet

2.9 Valley Width: **400.0** feet

2.10 Confinement Ratio: **5.1**

2.10 Confinement Type: **Narrow**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Gravel**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Ice-Contact** **42.9** %

3.3 Sub-dom. Geological Mat.: **Till**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **A** **49.3** %

Flooding: **None/Rare** **81.4** %

Water Table Deep: **6.0** **86.7** %

Water Table Shallow: **6.0** **70.8** %

Erodibility: **Severe** **50.1** %

7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.7** %

Current Sub-Dominant Land Cover: **Crop**

4.2 Corridor

Historic Land Cover:: **Field**

Current Dominant Land Cover: **Forest** **32.9** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**51-100**
Sub-dominant:	**>100**	**0-25**
Length w / less than 25 ft.:	**1,154.0** ft.	**2,644.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **2** **2.0** %

5.3 Bank Armoring: **1,838.9** **30.0** %

Left: **1,183.9** ft. Right: **655.0** ft.

5.4 Channel Straightening: **3,054.3** **49.9** %

5.5 Dredging History: **None**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **790.3** ft. **12.9**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **79 ft.** Rato: **1.0**

6.6 Wavelength: **79 ft.** Ratio: **1.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1145.53** ft

7.2 Bank Height: **3** ft

7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	1 Low	0 N.S.	1 Low	1 Low	2 High	2 High	1 Low	0 N.S.	18

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M12**
SGAT Version: **3**
Date Last Edited: **June, 10 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins just N of confluence with Cram Brook. Ends just N of confluence with Jenkins Brook.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9599685198**

1.3 Downstream Longitude: **-72.4642387312**

Step 2. Stream Type

2.1 Elevation Upstream: **794**
2.1 Elevation Downstream: **704**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **7,062.0** ft. **1.34** Miles
2.3 Valley Slope: **1.3**
2.4 Channel Length: **7,605.0** ft. **1.44** Miles
2.5 Channel Slope: **1.18 %**
2.6 Sinuosity: **1.08**
2.7 Watershed Area: **47.6** Square Miles
2.8 Channel Width: **71.7** feet
2.9 Valley Width: **350.0** feet
2.10 Confinement Ratio: **4.9**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **C**
Bedform: **Plane Bed**
Sub-Class Slope: **None**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Till** **46.0** %
3.3 Sub-dom. Geological Mat.: **Ice-Contact**
3.4 Valley Slope Left: **Ext. Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **A** **67.2** %
Flooding: **None/Rare** **92.8** %
Water Table Deep: **6.0** **95.6** %
Water Table Shallow: **6.0** **88.4** %
Erodibility: **Severe** **74.7** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **82.6** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Field**
Current Dominant Land Cover: **Forest** **46.9** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**0-25**
Sub-dominant:	**0-25**	**51-100**
Length w / less than 25 ft.:	**1,180.0** ft.	**749.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **1** **0.6** %
5.3 Bank Armoring: **1,440.4** **18.9** %
Left: **248.1** ft. Right: **1,192.3** ft.
5.4 Channel Straightening: **2,635.7** **34.7** %
5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **2,743.0** ft. **36.1**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **144.7** ft. **0.0** ft.
6.3 Channel Bars: **Side**
6.4 Meander Migration: **Flood Chute**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1171.43** ft
7.2 Bank Height: **3** ft
7.3 Ice/Debris Jam Potential: **None**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	1 Low	2 High	0 N.S.	2 High	0 N.S.	1 Low	1 Low	0 N.D.	0 N.D.	1 Low	0 N.S.	14

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M13**
SGAT Version: **3**
Date Last Edited: **June, 10 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins just N of confluence with Jenkins Brook. Ends .33 mi N of Rt 113 & Rt 110 intersection.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9756412416**

1.3 Downstream Longitude: **-72.4496728052**

Step 2. Stream Type

2.1 Elevation Upstream:	**816**		
2.1 Elevation Downstream:	**794**		
2.1 Is Gradient Gentle?:	**No**		
2.2 Valley Length:	**6,610.0** ft.	**1.25**	Miles
2.3 Valley Slope:	**0.3**		
2.4 Channel Length:	**7,481.0** ft.	**1.42**	Miles
2.5 Channel Slope:	**0.29 %**		
2.6 Sinuosity:	**1.13**		
2.7 Watershed Area:	**38.5** Square Miles		
2.8 Channel Width:	**65.3** feet		
2.9 Valley Width:	**429.0** feet		
2.10 Confinement Ratio:	**6.6**		
2.10 Confinement Type:	**Broad**		
2.11 Reference Stream Type:	**C**		
Bedform:	**Riffle-Pool**		
Sub-Class Slope:	**None**		
Bed Material:	**Cobble**		

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**None**	
3.2 Grade Control:	**Multiple**	
3.3 Dominant Geological Mat.:	**Alluvial**	**47.0** %
3.3 Sub-dom. Geological Mat.:	**Ice-Contact**	
3.4 Valley Slope Left:	**Very Steep**	
3.4 Valley Slope Right:	**Very Steep**	
3.5 Soils		
Hydrologic Group:	**B**	**58.3** %
Flooding:	**None/Rare**	**53.0** %
Water Table Deep:	**6.0**	**89.7** %
Water Table Shallow:	**4.0**	**47.0** %
Erodibility:	**slight**	**17.9** %

7.4 Comments:

NULL

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**81.1** %
Current Sub-Dominant Land Cover:	**Crop**	

4.2 Corridor

Historic Land Cover::		
Current Dominant Land Cover:	**Forest**	**32.1** %
Current Sub-Dominant Land Cover:	**Urban**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**51-100**
Length w / less than 25 ft.:	**1,408.0** ft.	**1,048.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts:	**6**	**3.3** %	
5.3 Bank Armoring:	**7,396.6**	**98.9** %	
Left:	**3,602.2** ft.	Right:	**3,794.4** ft.
5.4 Channel Straightening:	**7,148.4**	**95.6** %	
5.5 Dredging History:	**No Data**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**1,370.6** ft.	**18.3**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**3,795.2** ft.	**1,693.8** ft.
6.3 Channel Bars:	**Multiple**	
6.4 Meander Migration:	**Flood Chute**	
6.5 Meander Width:	**345 ft.** Rato:	**5.3**
6.6 Wavelength:	**995 ft.** Ratio:	**15.2**

Step 7. Windshield Survey

7.1 Bank Erosion:	**2048.58**	ft
7.2 Bank Height:	**3**	ft
7.3 Ice/Debris Jam Potential:	**Debris**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	1 Low	2 High	1 Low	1 Low	0 N.S.	1 Low	2 High	1 Low	19

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M14**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .33 mi N of intersection of Rt 113 and Rt 110. Ends where the valley becomes confined.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9928697716**

1.3 Downstream Longitude: **-72.4483994104**

Step 2. Stream Type

2.1 Elevation Upstream:	**881**		
2.1 Elevation Downstream:	**816**		
2.1 Is Gradient Gentle?:	**No**		
2.2 Valley Length:	**7,103.0** ft.	**1.35**	Miles
2.3 Valley Slope:	**0.9**		
2.4 Channel Length:	**9,029.0** ft.	**1.71**	Miles
2.5 Channel Slope:	**0.72 %**		
2.6 Sinuosity:	**1.27**		
2.7 Watershed Area:	**17.1** Square Miles		
2.8 Channel Width:	**45.6** feet		
2.9 Valley Width:	**420.0** feet		
2.10 Confinement Ratio:	**9.2**		
2.10 Confinement Type:	**Broad**		
2.11 Reference Stream Type:	**C**		
Bedform:	**Riffle-Pool**		
Sub-Class Slope:	**None**		
Bed Material:	**Cobble**		

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**None**	
3.2 Grade Control:	**Multiple**	
3.3 Dominant Geological Mat.:	**Alluvial**	**60.0** %
3.3 Sub-dom. Geological Mat.:	**Ice-Contact**	
3.4 Valley Slope Left:	**Very Steep**	
3.4 Valley Slope Right:	**Very Steep**	
3.5 Soils		
Hydrologic Group:	**B**	**81.4** %
Flooding:	**Frequent**	**44.3** %
Water Table Deep:	**6.0**	**50.8** %
Water Table Shallow:	**1.5**	**48.1** %
Erodibility:	**slight**	**21.7** %

7.4 Comments:

NULL

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**80.6** %
Current Sub-Dominant Land Cover:	**Crop**	

4.2 Corridor

Historic Land Cover::	**Field**	
Current Dominant Land Cover:	**Field**	**34.4** %
Current Sub-Dominant Land Cover:	**Forest**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**26-50**	**>100**
Length w / less than 25 ft.:	**4,589.0** ft.	**3,236.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type:	**Small Run of River**		
Use:	**Recreation**		
5.2 Bridges and Culverts:	**5**	**1.4** %	
5.3 Bank Armoring:	**3,942.8**	**43.7** %	
Left:	**2,506.0** ft.	Right:	**1,436.8** ft.
5.4 Channel Straightening:	**310.0**	**3.4** %	
5.5 Dredging History:	**No Data**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**1,036.3** ft.	**11.5**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**2,354.8** ft.	**0.0** ft.
6.3 Channel Bars:	**Side**	
6.4 Meander Migration:	**Flood Chute**	
6.5 Meander Width:	**247 ft.** Rato:	**5.4**
6.6 Wavelength:	**644 ft.** Ratio:	**14.1**

Step 7. Windshield Survey

7.1 Bank Erosion:	**3274.4**	ft
7.2 Bank Height:	**3**	ft
7.3 Ice/Debris Jam Potential:	**Debris**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	0 N.S.	0 N.S.	1 Low	2 High	1 Low	1 Low	0 N.S.	1 Low	2 High	1 Low	17

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M15**

SGAT Version: **3**

Date Last Edited: **December, 19 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins where valley becomes confined. Ends at pond to W of river.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **44.0114648469**

1.3 Downstream Longitude: **-72.4619985762**

Step 2. Stream Type

2.1 Elevation Upstream: **920**

2.1 Elevation Downstream: **881**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **4,655.0** ft. **0.88** Miles

2.3 Valley Slope: **0.8**

2.4 Channel Length: **5,336.0** ft. **1.01** Miles

2.5 Channel Slope: **0.73 %**

2.6 Sinuosity: **1.15**

2.7 Watershed Area: **15.7** Square Miles

2.8 Channel Width: **44.0** feet

2.9 Valley Width: **194.0** feet

2.10 Confinement Ratio: **4.4**

2.10 Confinement Type: **Narrow**

2.11 Reference Stream Type: **C**

Bedform: **Riffle-Pool**

Sub-Class Slope: **None**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Till** **81.0** %

3.3 Sub-dom. Geological Mat.: **Alluvial**

3.4 Valley Slope Left: **Very Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **A** **80.3** %

Flooding: **None/Rare** **85.9** %

Water Table Deep: **6.0** **81.1** %

Water Table Shallow: **6.0** **81.1** %

Erodibility: **Very Severe** **81.1** %

7.4 Comments:

No buffer, great location for tree planting. Channelized in downstream section.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.4** %

Current Sub-Dominant Land Cover: **Crop**

4.2 Corridor

Historic Land Cover:: **Field**

Current Dominant Land Cover: **Forest** **31.4** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**26-50**	**>100**
Length w / less than 25 ft.:	**424.0** ft.	**338.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **2** **0.8** %

5.3 Bank Armoring: **3,751.4** **70.3** %

Left: **1,403.0** ft. Right: **2,348.4** ft.

5.4 Channel Straightening: **2,344.6** **43.9** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **557.6** ft. **10.5**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **520.7** ft. **0.0** ft.

6.3 Channel Bars: **Side**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **322 ft.** Rato: **7.3**

6.6 Wavelength: **748 ft.** Ratio: **17.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1421.17** ft

7.2 Bank Height: **3** ft

7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	1 Low	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	1 Low	1 Low	1 Low	1 Low	0 N.S.	2 High	2 High	1 Low	18

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M16**
SGAT Version: **3**
Date Last Edited: **December, 19 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins at pond to W of river. Ends where Chelsea Rd crosses river.**

1.1 Reach Description:

1.2 Towns: **Chelsea, Washington**

1.3 Downstream Latitude: **44.022861213**

1.3 Downstream Longitude: **-72.4691719317**

Step 2. Stream Type

2.1 Elevation Upstream: **1,052**
2.1 Elevation Downstream: **920**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **9,648.0** ft. **1.83** Miles
2.3 Valley Slope: **1.4**
2.4 Channel Length: **11,145.0** ft. **2.11** Miles
2.5 Channel Slope: **1.18 %**
2.6 Sinuosity: **1.16**
2.7 Watershed Area: **14.6** Square Miles
2.8 Channel Width: **42.6** feet
2.9 Valley Width: **399.0** feet
2.10 Confinement Ratio: **9.4**
2.10 Confinement Type: **Broad**
2.11 Reference Stream Type: **C**
Bedform: **Riffle-Pool**
Sub-Class Slope: **None**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**
3.2 Grade Control: **Multiple**
3.3 Dominant Geological Mat.: **Alluvial** **66.7** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **B** **78.1** %
Flooding: **Frequent** **66.7** %
Water Table Deep: **3.0** **66.7** %
Water Table Shallow: **1.5** **66.7** %
Erodibility: **Moderate** **33.0** %
7.4 Comments:
Looks good!

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **81.4** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Field**
Current Dominant Land Cover: **Forest** **26.5** %
Current Sub-Dominant Land Cover: **Field**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**51-100**	**51-100**
Length w / less than 25 ft.:	**6,441.0** ft.	**6,832.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **5** **0.9** %
5.3 Bank Armoring: **5,189.1** **46.6** %
Left: **2,970.5** ft. Right: **2,218.7** ft.
5.4 Channel Straightening: **6,492.9** **58.3** %
5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **755.2** ft. **6.8**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **520.1** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **Migration**
6.5 Meander Width: **304 ft.** Rato: **7.1**
6.6 Wavelength: **447 ft.** Ratio: **10.5**

Step 7. Windshield Survey

7.1 Bank Erosion: **2902.84** ft
7.2 Bank Height: **3** ft
7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	2 High	1 Low	0 N.S.	1 Low	1 Low	0 N.S.	0 N.S.	2 High	1 Low	18

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **First Branch of the White River**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **M17**

SGAT Version: **3**

Date Last Edited: **June, 10 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins where Chelsea Rd crosses river. Ends .25 mi N of Sky Acres Rd.**

1.1 Reach Description:

1.2 Towns: **Chelsea, Washington**

1.3 Downstream Latitude: **44.0471481632**

1.3 Downstream Longitude: **-72.4762270928**

Step 2. Stream Type

2.1 Elevation Upstream: **1,346**

2.1 Elevation Downstream: **1,052**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **8,014.0** ft. **1.52** Miles

2.3 Valley Slope: **3.7**

2.4 Channel Length: **8,874.0** ft. **1.68** Miles

2.5 Channel Slope: **3.31 %**

2.6 Sinuosity: **1.11**

2.7 Watershed Area: **4.8** Square Miles

2.8 Channel Width: **26.1** feet

2.9 Valley Width: feet

2.10 Confinement Ratio: **0.0**

2.10 Confinement Type: **Semi-confined**

2.11 Reference Stream Type: **C**

Bedform: **Step-Pool**

Sub-Class Slope: **b**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**

3.2 Grade Control: **Ledge**

3.3 Dominant Geological Mat.: **Till** **96.8** %

3.3 Sub-dom. Geological Mat.: **Alluvial**

3.4 Valley Slope Left: **Very Steep**

3.4 Valley Slope Right: **Very Steep**

3.5 Soils

Hydrologic Group: **A** **57.9** %

Flooding: **None/Rare** **96.8** %

Water Table Deep: **6.0** **63.0** %

Water Table Shallow: **6.0** **63.0** %

Erodibility: **Very Severe** **96.2** %

7.4 Comments:

NULL

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **87.4** %

Current Sub-Dominant Land Cover: **Urban**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Forest** **35.9** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**51-100**	**51-100**
Length w / less than 25 ft.:	**451.0** ft.	**203.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **4** **1.1** %

5.3 Bank Armoring: **5,670.8** **63.9** %

Left: **3,298.7** ft. Right: **2,372.2** ft.

5.4 Channel Straightening: **3,599.8** **40.6** %

5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **6,358.5** ft. **71.7**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **83.1** ft. **0.0** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **ft.** Rato: **0.0**

6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **638.67** ft

7.2 Bank Height: **3** ft

7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	1 Low	0 N.S.	0 N.S.	2 High	2 High	0 N.S.	2 High	0 N.S.	1 Low	1 Low	0 N.D.	0 N.D.	1 Low	1 Low	15

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M18**
SGAT Version: **3**
Date Last Edited: **December, 19 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .25 mi N of Sky Acres Rd. Ends just S of bridge where river mover to E side of Rt 110.**

1.1 Reach Description:

1.2 Towns: **Washington**

1.3 Downstream Latitude: **44.063035815**

1.3 Downstream Longitude: **-72.4679790162**

Step 2. Stream Type

2.1 Elevation Upstream:	**1,371**		
2.1 Elevation Downstream:	**1,346**		
2.1 Is Gradient Gentle?:	**No**		
2.2 Valley Length:	**2,141.0** ft.	**0.41**	Miles
2.3 Valley Slope:	**1.2**		
2.4 Channel Length:	**2,453.0** ft.	**0.46**	Miles
2.5 Channel Slope:	**1.02 %**		
2.6 Sinuosity:	**1.15**		
2.7 Watershed Area:	**2.7** Square Miles		
2.8 Channel Width:	**20.3** feet		
2.9 Valley Width:	**281.0** feet		
2.10 Confinement Ratio:	**13.9**		
2.10 Confinement Type:	**Very Broad**		
2.11 Reference Stream Type:	**E**		
Bedform:	**Dune-Ripple**		
Sub-Class Slope:	**None**		
Bed Material:	**Sand**		

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**None**	
3.2 Grade Control:	**None**	
3.3 Dominant Geological Mat.:	**Till**	**100.0** %
3.3 Sub-dom. Geological Mat.:		
3.4 Valley Slope Left:	**Ext. Steep**	
3.4 Valley Slope Right:	**Very Steep**	
3.5 Soils		
Hydrologic Group:	**D**	**72.5** %
Flooding:	**None/Rare**	**100.0** %
Water Table Deep:	**0.0**	**64.8** %
Water Table Shallow:	**-1.0**	**64.8** %
Erodibility:	**Moderate**	**35.2** %

7.4 Comments:
Wetland area.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**90.7** %
Current Sub-Dominant Land Cover:	**Urban**	

4.2 Corridor

Historic Land Cover::	**Forest**	
Current Dominant Land Cover:	**Forest**	**37.1** %
Current Sub-Dominant Land Cover:	**Wetland**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**221.0** ft.	**74.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**
Use:

5.2 Bridges and Culverts:	**1**		**1.6** %
5.3 Bank Armoring:	**120.0**		**4.9** %
Left:	**60.0** ft.	Right:	**60.0** ft.
5.4 Channel Straightening:	**102.6**		**4.2** %
5.5 Dredging History:	**No Data**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**536.6** ft.	**21.9**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**199.0** ft.	**0.0** ft.
6.3 Channel Bars:	**Point**	
6.4 Meander Migration:	**Flood Chute**	
6.5 Meander Width:	**57 ft.** Rato:	**2.8**
6.6 Wavelength:	**94 ft.** Ratio:	**4.6**

Step 7. Windshield Survey

7.1 Bank Erosion:	**0**	ft
7.2 Bank Height:	**No Data**	ft
7.3 Ice/Debris Jam Potential:	**None**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	1 Low	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	2 High	1 Low	1 Low	1 Low	2 High	2 High	0 N.S.	0 N.S.	13

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **First Branch of the White River**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **M19**
SGAT Version: **3**
Date Last Edited: **June, 10 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins just downstream of bridge on Rt 110. Ends where stream becomes seasonal.**

1.1 Reach Description:

1.2 Towns: **Washington**

1.3 Downstream Latitude: **44.0685132871**

1.3 Downstream Longitude: **-72.4660955668**

Step 2. Stream Type

2.1 Elevation Upstream: **1,474**
2.1 Elevation Downstream: **1,371**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **4,310.0** ft. **0.82** Miles
2.3 Valley Slope: **2.4**
2.4 Channel Length: **4,925.0** ft. **0.93** Miles
2.5 Channel Slope: **2.09 %**
2.6 Sinuosity: **1.14**
2.7 Watershed Area: **1.5** Square Miles
2.8 Channel Width: **15.7** feet
2.9 Valley Width: **303.0** feet
2.10 Confinement Ratio: **19.4**
2.10 Confinement Type: **Very Broad**
2.11 Reference Stream Type: **E**
Bedform: **Riffle-Pool**
Sub-Class Slope: **b**
Bed Material: **Sand**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Till** **100.0** %
3.3 Sub-dom. Geological Mat.:
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **C** **80.9** %
Flooding: **None/Rare** **100.0** %
Water Table Deep: **2.0** **85.5** %
Water Table Shallow: **1.0** **80.9** %
Erodibility: **Very Severe** **94.2** %
7.4 Comments:
Wetlands.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **90.0** %
Current Sub-Dominant Land Cover: **Urban**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **52.0** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**0-25**
Sub-dominant:	**0-25**	**51-100**
Length w / less than 25 ft.:	**31.0** ft.	**1,315.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **1** **0.2** %
5.3 Bank Armoring: **854.2** **17.3** %
Left: **32.7** ft. Right: **821.5** ft.
5.4 Channel Straightening: **1,430.2** **29.0** %
5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **1,831.9** ft. **37.2**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **Flood Chute**
6.5 Meander Width: **12 ft.** Rato: **0.8**
6.6 Wavelength: **12 ft.** Ratio: **0.8**

Step 7. Windshield Survey

7.1 Bank Erosion: **957.95** ft
7.2 Bank Height: **2** ft
7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	2 High	0 N.S.	0 N.S.	1 Low	2 High	0 N.S.	2 High	0 N.S.	1 Low	1 Low	2 High	2 High	1 Low	2 High	19

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **T1 - Runs along Strafford Rd in Tunbridge**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **T1.01**

SGAT Version: **3**

Date Last Edited: **July, 18 2013**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .43 mi N of intersection of Rt 110 and Justin Smith Morrill Highway. Ends 1.68 mi up JSMH.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.8959494417**

1.3 Downstream Longitude: **-72.4833913721**

Step 2. Stream Type

2.1 Elevation Upstream: **999**

2.1 Elevation Downstream: **570**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **7,214.0** ft. **1.37** Miles

2.3 Valley Slope: **5.9**

2.4 Channel Length: **7,289.0** ft. **1.38** Miles

2.5 Channel Slope: **5.89 %**

2.6 Sinuosity: **1.01**

2.7 Watershed Area: **3.8** Square Miles

2.8 Channel Width: **23.7** feet

2.9 Valley Width: feet

2.10 Confinement Ratio: **0.0**

2.10 Confinement Type: **Semi-confined**

2.11 Reference Stream Type: **C**

Bedform: **Step-Pool**

Sub-Class Slope: **b**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**

3.2 Grade Control: **Multiple**

3.3 Dominant Geological Mat.: **Till** **62.9** %

3.3 Sub-dom. Geological Mat.: **Ice-Contact**

3.4 Valley Slope Left: **Steep**

3.4 Valley Slope Right: **Steep**

3.5 Soils

Hydrologic Group: **A** **45.6** %

Flooding: **None/Rare** **100.0** %

Water Table Deep: **6.0** **48.7** %

Water Table Shallow: **6.0** **48.7** %

Erodibility: **Very Severe** **83.7** %

7.4 Comments:

Mass failures!!

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.0** %

Current Sub-Dominant Land Cover: **Field**

4.2 Corridor

Historic Land Cover:: **Forest**

Current Dominant Land Cover: **Forest** **35.2** %

Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**>100**
Sub-dominant:	**51-100**	**0-25**
Length w / less than 25 ft.:	**1,472.0** ft.	**1,057.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **4** **1.5** %

5.3 Bank Armoring: **3,059.0** **42.0** %

Left: **2,049.6** ft. Right: **1,009.4** ft.

5.4 Channel Straightening: **3,914.6** **53.7** %

5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **3,088.6** ft. **42.4**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **189.3** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **Flood Chute**

6.5 Meander Width: **ft.** Rato: **0.0**

6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **2304.81** ft

7.2 Bank Height: **4** ft

7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	2 High	0 N.S.	0 N.S.	2 High	2 High	2 High	2 High	0 N.S.	1 Low	2 High	0 N.D.	0 N.D.	2 High	2 High	20

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **Dickerman Brook**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **T2.01**
SGAT Version: **3**
Date Last Edited: **July, 29 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins at intersection of Hardscrabble Rd and Rt 110. Ends 1.23 mi up Hardscrabble Rd.**

1.1 Reach Description:

1.2 Towns: **Tunbridge**

1.3 Downstream Latitude: **43.9307342411**

1.3 Downstream Longitude: **-72.4660095217**

Step 2. Stream Type

2.1 Elevation Upstream: **951**
2.1 Elevation Downstream: **638**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **6,608.0** ft. **1.25** Miles
2.3 Valley Slope: **4.7**
2.4 Channel Length: **6,642.0** ft. **1.26** Miles
2.5 Channel Slope: **4.71 %**
2.6 Sinuosity: **1.01**
2.7 Watershed Area: **4.7** Square Miles
2.8 Channel Width: **25.9** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrowly Confined**
2.11 Reference Stream Type: **B**
Bedform: **Step-Pool**
Sub-Class Slope: **None**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**
3.2 Grade Control: **Multiple**
3.3 Dominant Geological Mat.: **Till** **74.3** %
3.3 Sub-dom. Geological Mat.: **Ice-Contact**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **C** **45.5** %
Flooding: **None/Rare** **97.5** %
Water Table Deep: **6.0** **52.0** %
Water Table Shallow: **6.0** **52.0** %
Erodibility: **Very Severe** **97.5** %
7.4 Comments:
NULL

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **82.2** %
Current Sub-Dominant Land Cover: **Field**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **40.4** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**26-50**	**51-100**
Length w / less than 25 ft.:	**0.0** ft.	**0.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **4** **9.0** %
5.3 Bank Armoring: **947.3** **14.3** %
Left: **692.0** ft. Right: **255.4** ft.
5.4 Channel Straightening: **2,696.6** **40.6** %
5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **2,817.8** ft. **42.4**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **811.4** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **Flood Chute**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1783.47** ft
7.2 Bank Height: **4** ft
7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	0 N.S.	0 N.S.	1 Low	1 Low	2 High	2 High	2 High	1 Low	1 Low	2 High	0 N.D.	0 N.D.	2 High	2 High	19

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **Cram Brook**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **T3.01**
SGAT Version: **3**
Date Last Edited: **November, 01 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .14 mi S of intersection of E Randolph Rd and Rt 110. Ends at intersection of E Randolph Rd and Rt 110.**

1.1 Reach Description:
1.2 Towns: **Chelsea**
1.3 Downstream Latitude: **43.9597846968**
1.3 Downstream Longitude: **-72.4648794468**

Step 2. Stream Type

2.1 Elevation Upstream: **876**
2.1 Elevation Downstream: **701**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **6,277.0** ft. **1.19** Miles
2.3 Valley Slope: **2.8**
2.4 Channel Length: **6,982.0** ft. **1.32** Miles
2.5 Channel Slope: **2.51 %**
2.6 Sinuosity: **1.11**
2.7 Watershed Area: **10.9** Square Miles
2.8 Channel Width: **37.5** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Narrow**
2.11 Reference Stream Type: **C**
Bedform: **Step-Pool**
Sub-Class Slope: **b**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Ice-Contact** **41.9** %
3.3 Sub-dom. Geological Mat.: **Till**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Ext. Steep**
3.5 Soils
Hydrologic Group: **C** **39.7** %
Flooding: **None/Rare** **80.9** %
Water Table Deep: **2.0** **38.4** %
Water Table Shallow: **1.0** **27.5** %
Erodibility: **Severe** **64.7** %
7.4 Comments:

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **77.6** %
Current Sub-Dominant Land Cover: **Field**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **49.7** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**0-25**
Sub-dominant:	**0-25**	**51-100**
Length w / less than 25 ft.:	**82.0** ft.	**84.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **5** **9.0** %
5.3 Bank Armoring: **1,112.0** **15.9** %
Left: **590.8** ft. Right: **521.2** ft.
5.4 Channel Straightening: **2,115.2** **30.3** %
5.5 Dredging History: **No Data**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **565.9** ft. **8.1**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **1,305.5** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **None**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **1631.85** ft
7.2 Bank Height: **4** ft
7.3 Ice/Debris Jam Potential: **Culvert**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	0 N.S.	0 N.S.	1 Low	1 Low	2 High	0 N.S.	1 Low	1 Low	1 Low	0 N.S.	0 N.D.	0 N.D.	2 High	1 Low	14

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **Jenkins Brook**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **T4.01**
SGAT Version: **3**
Date Last Edited: **April, 23 2014**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins .17 mi S of intersection of Old Stafford Rd and Rt 110. Ends where the river goes under Colton Rd.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9755007571**

1.3 Downstream Longitude: **-72.449180064**

Step 2. Stream Type

2.1 Elevation Upstream: **1,242**
2.1 Elevation Downstream: **791**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **10,997.0** ft. **2.08** Miles
2.3 Valley Slope: **4.1**
2.4 Channel Length: **11,988.0** ft. **2.27** Miles
2.5 Channel Slope: **3.76 %**
2.6 Sinuosity: **1.09**
2.7 Watershed Area: **7.2** Square Miles
2.8 Channel Width: **31.1** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Semi-confined**
2.11 Reference Stream Type: **B**
Bedform: **Step-Pool**
Sub-Class Slope: **a**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **None**
3.2 Grade Control: **Ledge**
3.3 Dominant Geological Mat.: **Till** **88.0** %
3.3 Sub-dom. Geological Mat.: **Ice-Contact**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **C** **40.6** %
Flooding: **None/Rare** **99.2** %
Water Table Deep: **2.0** **68.3** %
Water Table Shallow: **1.0** **36.7** %
Erodibility: **Very Severe** **93.9** %
7.4 Comments:
Bifurcated flow.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **90.8** %
Current Sub-Dominant Land Cover: **Urban**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **41.8** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**>100**
Sub-dominant:	**>100**	**0-25**
Length w / less than 25 ft.:	**188.0** ft.	**0.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **2** **2.1** %
5.3 Bank Armoring: **441.8** **3.7** %
Left: **304.6** ft. Right: **137.2** ft.
5.4 Channel Straightening: **1,037.7** **8.7** %
5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **812.5** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **None**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **207.37** ft
7.2 Bank Height: **3** ft
7.3 Ice/Debris Jam Potential: **Culvert**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	0 N.S.	0 N.S.	0 N.S.	0 N.S.	1 Low	2 High	0 Unk.	1 Low	1 Low	0 N.S.	0 N.D.	0 N.D.	0 N.S.	1 Low	9

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **Jail Brook**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **T5.01**
SGAT Version: **3**
Date Last Edited: **April, 23 2014**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Begins at intersection of Rt 110 and Rt 113. Ends .24 miles from the intersection along Rt 113.**

1.1 Reach Description:

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9880157281**

1.3 Downstream Longitude: **-72.4486052303**

Step 2. Stream Type

2.1 Elevation Upstream:	**913**		
2.1 Elevation Downstream:	**823**		
2.1 Is Gradient Gentle?:	**No**		
2.2 Valley Length:	**1,078.0** ft.	**0.20**	Miles
2.3 Valley Slope:	**8.3**		
2.4 Channel Length:	**1,438.0** ft.	**0.27**	Miles
2.5 Channel Slope:	**6.26 %**		
2.6 Sinuosity:	**1.33**		
2.7 Watershed Area:	**4.8** Square Miles		
2.8 Channel Width:	**26.1** feet		
2.9 Valley Width:	**322.0** feet		
2.10 Confinement Ratio:	**12.3**		
2.10 Confinement Type:	**Very Broad**		
2.11 Reference Stream Type:	**C**		
Bedform:	**Riffle-Pool**		
Sub-Class Slope:	**None**		
Bed Material:	**Gravel**		

Step 3. Basin Charateristicts

3.1 Alluvial Fan:	**Yes**	
3.2 Grade Control:	**None**	
3.3 Dominant Geological Mat.:	**Ice-Contact**	**93.1** %
3.3 Sub-dom. Geological Mat.:	**Till**	
3.4 Valley Slope Left:	**Flat**	
3.4 Valley Slope Right:	**Flat**	
3.5 Soils		
Hydrologic Group:	**A**	**100.0** %
Flooding:	**None/Rare**	**100.0** %
Water Table Deep:	**6.0**	**100.0** %
Water Table Shallow:	**6.0**	**100.0** %
Erodibility:	**slight**	**6.9** %

7.4 Comments:

All rock. Ice and debris jams have been recurrent. Sediment deposit observations influenced by snagging and dredging.

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover:	**Forest**	
Current Dominant Land Cover:	**Forest**	**81.7** %
Current Sub-Dominant Land Cover:	**Field**	

4.2 Corridor

Historic Land Cover::		
Current Dominant Land Cover:	**Urban**	**56.7** %
Current Sub-Dominant Land Cover:	**Forest**	

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**548.0** ft.	**649.0** ft.

4.4 Ground Water Inputs: **Minimal**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type:	**None**		
Use:			
5.2 Bridges and Culverts:	**2**	**13.9** %	
5.3 Bank Armoring:	**1,438.0**	**1.0** %	
Left:	**781.1** ft.	Right:	**772.0** ft.
5.4 Channel Straightening:	**762.0**	**53.0** %	
5.5 Dredging History:	**Dredging**		

Step 6. Floodplain Modifications

6.1 Berms & Roads - old:	**0.0** ft.	**0.0**
	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.
6.2 Development:	**0.0** ft.	**790.3** ft.
6.3 Channel Bars:	**Side**	
6.4 Meander Migration:	**None**	
6.5 Meander Width:	**ft.** Rato:	**0.0**
6.6 Wavelength:	**ft.** Ratio:	**0.0**

Step 7. Windshield Survey

7.1 Bank Erosion:	**0**	ft
7.2 Bank Height:	**No Data**	ft
7.3 Ice/Debris Jam Potential:	**Multiple**	

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
1 Low	2 High	2 High	0 N.S.	1 Low	2 High	2 High	2 High	0 Unk.	2 High	1 Low	0 N.S.	0 N.D.	0 N.D.	0 N.S.	2 High	17

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**

Stream Name: **Hart Hollow Brook**

Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**

Watershed: **White River**

Sub-watershed: **First Branch White River**

Reach ID: **T6.01**

SGAT Version: **3**

Date Last Edited: **April, 23 2014**

QA Status: **Step 7 done**

Is Reach An Impoundment?: **No**

Step 1. Reach Location

1.1 Reach Description: **Begins .46 mi S of intersection of Rt 110 and Upper Village Rd. Ends at intersection of the Dump Rd and Taylor Rd.**

1.2 Towns: **Chelsea**

1.3 Downstream Latitude: **43.9930960607**

1.3 Downstream Longitude: **-72.4480747929**

Step 2. Stream Type

2.1 Elevation Upstream: **1,003**

2.1 Elevation Downstream: **817**

2.1 Is Gradient Gentle?: **No**

2.2 Valley Length: **7,036.0** ft. **1.33** Miles

2.3 Valley Slope: **2.6**

2.4 Channel Length: **7,366.0** ft. **1.40** Miles

2.5 Channel Slope: **2.53 %**

2.6 Sinuosity: **1.05**

2.7 Watershed Area: **15.5** Square Miles

2.8 Channel Width: **43.7** feet

2.9 Valley Width: feet

2.10 Confinement Ratio: **0.0**

2.10 Confinement Type: **Narrowly Confined**

2.11 Reference Stream Type: **B**

Bedform: **Plane Bed**

Sub-Class Slope: **None**

Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**

3.2 Grade Control: **Multiple**

3.3 Dominant Geological Mat.: **Ice-Contact** **43.5** %

3.3 Sub-dom. Geological Mat.: **Till**

3.4 Valley Slope Left: **Ext. Steep**

3.4 Valley Slope Right: **Ext. Steep**

3.5 Soils

Hydrologic Group: **A** **73.2** %

Flooding: **None/Rare** **86.9** %

Water Table Deep: **6.0** **88.5** %

Water Table Shallow: **6.0** **80.8** %

Erodibility: **Moderate** **43.4** %

7.4 Comments:

NULL

Step 4. Land Cover - Reach Hydrology

4.1 Watershed

Historic Land Cover: **Forest**

Current Dominant Land Cover: **Forest** **81.7** %

Current Sub-Dominant Land Cover: **Crop**

4.2 Corridor

Historic Land Cover::

Current Dominant Land Cover: **Urban** **33.0** %

Current Sub-Dominant Land Cover: **Forest**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**0-25**	**0-25**
Sub-dominant:	**>100**	**>100**
Length w / less than 25 ft.:	**1,001.0** ft.	**2,303.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):

Type: **None**

Use:

5.2 Bridges and Culverts: **6** **10.9** %

5.3 Bank Armoring: **4,110.9** **55.8** %

Left: **1,915.1** ft. Right: **2,195.8** ft.

5.4 Channel Straightening: **3,168.9** **43.0** %

5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **0.0** ft. **0.0**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **1,081.0** ft. **1,271.2** ft.

6.3 Channel Bars: **Multiple**

6.4 Meander Migration: **None**

6.5 Meander Width: **ft.** Rato: **0.0**

6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **36.08** ft

7.2 Bank Height: **3** ft

7.3 Ice/Debris Jam Potential: **Debris**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	2 High	0 N.S.	1 Low	2 High	2 High	2 High	0 Unk.	2 High	1 Low	0 N.S.	0 N.D.	0 N.D.	0 N.S.	1 Low	17

White River - First Branch

Phase 1 - Reach Summary Report

Basin: **White**
Stream Name: **Jones Pond Brook**
Topo Maps: **Washington, Brookfield, Chelsea, Randolph Center, Sharon, S Royalton**
Watershed: **White River**
Sub-watershed: **First Branch White River**

Reach ID: **T7.01**
SGAT Version: **3**
Date Last Edited: **August, 05 2013**
QA Status: **Step 7 done**
Is Reach An Impoundment?: **No**

Step 1. Reach Location **Reach is along Edwards Rd for 2.66 mi from its intersection with Rt 110.**

1.1 Reach Description:
1.2 Towns: **Chelsea**
1.3 Downstream Latitude: **44.036917554**
1.3 Downstream Longitude: **-72.4756705185**

Step 2. Stream Type

2.1 Elevation Upstream: **1,647**
2.1 Elevation Downstream: **997**
2.1 Is Gradient Gentle?: **No**
2.2 Valley Length: **13,277.0** ft. **2.51** Miles
2.3 Valley Slope: **4.9**
2.4 Channel Length: **13,951.0** ft. **2.64** Miles
2.5 Channel Slope: **4.66 %**
2.6 Sinuosity: **1.05**
2.7 Watershed Area: **2.9** Square Miles
2.8 Channel Width: **20.9** feet
2.9 Valley Width: feet
2.10 Confinement Ratio: **0.0**
2.10 Confinement Type: **Semi-confined**
2.11 Reference Stream Type: **B**
Bedform: **Step-Pool**
Sub-Class Slope: **a**
Bed Material: **Cobble**

Step 3. Basin Charateristicts

3.1 Alluvial Fan: **Yes**
3.2 Grade Control: **None**
3.3 Dominant Geological Mat.: **Till** **90.5** %
3.3 Sub-dom. Geological Mat.: **Alluvial**
3.4 Valley Slope Left: **Very Steep**
3.4 Valley Slope Right: **Very Steep**
3.5 Soils
Hydrologic Group: **D** **38.9** %
Flooding: **None/Rare** **94.4** %
Water Table Deep: **2.0** **56.3** %
Water Table Shallow: **0.0** **44.5** %
Erodibility: **Very Severe** **94.3** %
7.4 Comments:

Stream ford & mass failures. Ph2-2012: debris jams common, several culvert failures (not necessarily related to debris) over time at different locations

Step 4. Land Cover - Reach Hydrology

4.1 Watershed
Historic Land Cover: **Forest**
Current Dominant Land Cover: **Forest** **69.9** %
Current Sub-Dominant Land Cover: **Crop**
4.2 Corridor
Historic Land Cover:: **Forest**
Current Dominant Land Cover: **Forest** **42.5** %
Current Sub-Dominant Land Cover: **Urban**

4.3 Riparian Buffer	Left Bank	Right Bank
Dominant:	**>100**	**>100**
Sub-dominant:	**51-100**	**0-25**
Length w / less than 25 ft.:	**0.0** ft.	**0.0** ft.

4.4 Ground Water Inputs: **Abundant**

Step 5. Instream Channel Modifications

5.1 Flow Regulation - (old):
Type: **None**
Use:
5.2 Bridges and Culverts: **0** **0.0** %
5.3 Bank Armoring: **0.0** **0.0** %
Left: **0.0** ft. Right: **0.0** ft.
5.4 Channel Straightening: **0.0** **0.0** %
5.5 Dredging History: **Dredging**

Step 6. Floodplain Modifications

6.1 Berms & Roads - old: **357.3** ft. **2.6**

	One Side	Both Sides
Road:	ft.	ft.
Railroad:	ft.	ft.
Berm:	ft.	ft.
Improved Path:	ft.	ft.

6.2 Development: **0.0** ft. **0.0** ft.
6.3 Channel Bars: **Multiple**
6.4 Meander Migration: **Flood Chute**
6.5 Meander Width: **ft.** Rato: **0.0**
6.6 Wavelength: **ft.** Ratio: **0.0**

Step 7. Windshield Survey

7.1 Bank Erosion: **478.2** ft
7.2 Bank Height: **2** ft
7.3 Ice/Debris Jam Potential: **Multiple**

4.1	4.2	4.3	5.1	5.2	5.3	5.4	5.5	6.1	6.2	6.3	6.4	6.5	6.6	7.1	7.3	Total
2 High	2 High	0 N.S.	0 N.S.	0 N.S.	0 N.S.	0 N.S.	2 High	0 N.S.	0 N.S.	1 Low	1 Low	0 N.D.	0 N.D.	0 N.S.	2 High	10

– Appendix 3 –

Phase II Reach/Segment Summary Reports

(also see https://anrnode.anr.state.vt.us/SGA/projects/phase2/reports.aspx?pid=3 and select 'Segment Summary Report' from the drop down list; then select 'All' or any one segment of interest)

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M01-A
Segment Length(ft): 2,207
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/26/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Confluence with White River Mainstem upstream to S. end of Mill Rd.**

Step 5 - Notes: **Riprap not very evident on banks, but VW below Rte. 110 covered in honeysuckle: unclear if it is riprapped or bedrock, but assumed to be heavily riprapped. Rte. 14 bridge at base of segment had Irene debris lodged into girders 18' high, but did not appear that terrace on RB (old Crawford Autoland) had been accessed. Deep entrenchment of this segment may be related to emptying of glacial Lake Hitchcock rather than historic incision, which may make this segment a subreach (B4c vs. overall reach type C4) rather than a stream type departure (C-->B) as it is characterized here. Regardless of this distinction, plane bed features and limited planform adjustments are related to the entrenchment.**

Step 7 - Narrative: **Planform adjustments manifesting primarily as minor to major widening following historic incision related in part to valley constriction from Rte 110 construction and maintenance. Entrenchment is sufficiently deep that we felt the RB terrace is likely a glacial feature rather than historical (entrenchment related to emptying of glacial Lake Hitchcock rather than historic incision) and now functions as RVW; in conjunction with riprap along Rte. 110 on LVW lends to a C-->B stream type departure.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	248	14	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	111		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	N.E.	Sand

1.5 Valley Features
Valley Width (ft): 180
Width Determination: Measured
Confinement Type: NC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**92.50**	2.11 Riffle/Step Spacing:	**398 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.30**	2.12 Substrate Composition		Bed:	**5.7**	**inches**
2.3 Mean Depth (tf):	**4.69**	Bedrock:	**3.0 %**	Bar:	**5.5**	**inches**
2.4 Floodprone Width (ft.):	**125.00**	Boulder:	**1.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**8.10**	Cobble:	**24.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**14.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**19.72**	Fine Gravel:	**27.0 %**	Subclass Slope:	**c**	
2.7 Entrenchment Ratio:	**1.35**	Sand:	**29.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.53**	Silt and Smaller:	**2.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**55**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**798.2**	**555.8**	Dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.8**	**4.8**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**87.0**	**66.5**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**51-100**	**51-100**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Mixed Trees**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
Sub-dominant	**Residential**	**Hay**
(Legacy)	Amount	Mean Hieght
Failures	**Multiple**	**16.5**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**1**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Run-of-river Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**130**	**Yes**	**Yes**	**No**	**Yes**	**Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**0**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**0**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,029**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**4**	**C to B**	**Yes**	Geomorphic Rating	**0.44**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**35**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M01-B
Segment Length(ft): 1,631
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/26/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **S end of Mill Rd upstream to just downstream of dam/waterfall below Mill Rd.**

Step 5 - Notes: **Depositional area below dam. Dam has caused widening of the channel. Flood chute along right valley wall indicates channel may have historically been along the valley wall. Houses on left bank are at same level as dam.**

Step 7 - Narrative: **Major to minor planform adjustments, widening, and aggradation following historic incision downstream of dam complex. Straightening at upstream end has pinned stream to right valley wall.**

Step 1. Valley and Floodplain

1.1 Segmentation: Valley Width
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	565		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Hilly	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft):	475
Width Determination:	Measured
Confinement Type:	SC
In Rock Gorge:	No

Human Caused Change in Valley Width?: Yes

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**103.00**	2.11 Riffle/Step Spacing:	**577 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.90**	2.12 Substrate Composition		Bed:	**6.5**	**inches**
2.3 Mean Depth (tf):	**4.14**	Bedrock:	**0.0 %**	Bar:	**3.7**	**inches**
2.4 Floodprone Width (ft.):	**161.00**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.40**	Cobble:	**8.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**27.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**24.88**	Fine Gravel:	**42.0 %**	Subclass Slope:	**c**	
2.7 Entrenchment Ratio:	**1.56**	Sand:	**21.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.51**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**73**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**479.7**	**550.6**	Dominant:	**Herbaceous**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.0**	**5.1**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Hard Bank**	**None**	Bank Canopy		
Lower			Revetment Length:	**227.0**	**0.0**	Canopy %:	**51-75**	**76-100**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**>100**
Sub-Dominant	**51-100**	**None**
W less than 25	**258**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Deciduous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Hay**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**13.5**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:	**Unknown**	Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**2**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**3**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**3**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**275**
Side:	**3**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**4**	**C to B**	**Yes**	Geomorphic Rating	**0.41**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**33**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M01-C	Organization:	White River Partnership
Segment Length(ft):	3,017	Observers:	DR, AS- Redstart
Rain:	Yes	Completion Date:	10/26/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Just downstream of waterfall/dam upstream to N end of Branch View Cemetery (Reach break)**

Step 5 - Notes: **Have classed as C-->E stream type departure due to aggradation and loss of planform; see Step 7 comments. Breached dam (Upper Eaton) constricts channel to ~15' in low flow, water overtops most of dam at bankfull; Lower Eaton dam is intact. First 200' of reach could have been included in Reach M02 due to valley wall and depositional features (gravel). Old toy factory mill building on right bank just upstream of intact dam has become an electronics dump; project? Also, garage at Lower Eaton's Trailer Park may have hazardous materials in floodplain. Sand substrate likely due to presence of dams; suspect gravel under reference conditions. Riffles have very little stability, and much of the more prominent deposition DS of the first 200' was organic matter and CPOM.**

Step 7 - Narrative: **Major aggradation and loss of planform due to damming and bank armoring. Widening limited by extensive rip-rapping, with w/d ratio in E stream-type range. Low sinuosity however, and significant aggadation of fines. Suspect this would be a reference C stream and have thus given 'Other' stream type departure, C-->E, for aggradation and planform.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	1,701	16	1,111	13
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	965		53	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft):	350
Width Determination:	Measured
Confinement Type:	SC
In Rock Gorge:	No
Human Caused Change in Valley Width?:	Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		8.0	3.0		
Waterfall		19.0	16.0		
Dam		2.0	2.0		

Stream: **First Branch of the White River** Reach: **M01-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**60.60**	2.11 Riffle/Step Spacing:	**825 ft.**	2.13 Average Largest Particle on	
2.2 Max Depth (ft.):	**8.75**	2.12 Substrate Composition		Bed:	**N/A**
2.3 Mean Depth (tf):	**6.77**	Bedrock:	**0.0 %**	Bar:	**N/A**
2.4 Floodprone Width (ft.):	**340.50**	Boulder:	**3.0 %**	2.14 Stream Type	
2.5 Aband. Floodpn (ft.):	**10.65**	Cobble:	**0.0 %**	Stream Type:	**E**
Human Elev FloodPln (ft.):		Coarse Gravel:	**0.0 %**	Bed Material:	**Sand**
2.6 Width/Depth Ratio:	**8.95**	Fine Gravel:	**28.0 %**	Subclass Slope:	**None**
2.7 Entrenchment Ratio:	**5.62**	Sand:	**69.0 %**	Bed Form:	**Plane Bed**
2.8 Incision Ratio:	**1.22**	Silt and Smaller:	**0.0 %**	Field Measured Slope:	
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type	
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:	
2.10 Riffles Type:	**Eroded**	# Large Woody Debris:	**80**	Reference Bed Material:	
				Reference Subclass Slope:	
				Reference Bedform:	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**668.8**	**1,306.8**	Dominant:	**Shrubs/Sapling**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**3.6**	**4.2**	Sub-dominant:	**Herbaceous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**1,050.0**	**972.5**	Canopy %:	**51-75**	**76-100**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**>100**	**51-100**
W less than 25	**0**	**341**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Shrubs/Sapling**	**Residential**	Mass Failures		
Sub-dominant	**Residential**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**12.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M01-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**6**
4.3 Flow Status:	**Low**	Impoundments:	**Unknown**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**81**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Scour Above,Scour Below**
Old Abutment	**65**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Bridge	**75**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**4**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,183**
Side:	**4**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**6**	**None**	**Yes**	Geomorphic Rating	**0.32**
7.2 Channel Aggradation		**6**	**Other**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**5**	**Other**	**No**	Geomorphic Condition	**Poor**
Total Score		**26**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: **First Branch of the White River**
Reach: **M02-0**
Segment Length(ft):
Rain:

SGAT Version: **3**
Organization:
Observers:
Completion Date:
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location:

Step 5 - Notes:

Step 7 - Narrative:

Step 1. Valley and Floodplain

1.1 Segmentation:
1.2 Alluvial Fan:
1.3 Corridor Encroachments:

	Length (ft)	One	Height	Both	Height
Berm:					
Road:					
Railroad:					
Imp. Path:					
Dev.:					

1.4 Adjacent Side Left Right
Hillside Slope:
Continuous w/ Bank:
Within 1 Bankfull W:
Texture:

1.5 Valley Features
Valley Width (ft):
Width Determination:
Confinement Type:
In Rock Gorge:
Human Caused Change in Valley Width?:

1.6 Grade Controls:

Stream: **First Branch of the White River** Reach: **M02-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):
2.2 Max Depth (ft.):
2.3 Mean Depth (tf):
2.4 Floodprone Width (ft.):
2.5 Aband. Floodpn (ft.):
Human Elev FloodPln (ft.):
2.6 Width/Depth Ratio: **0.00**
2.7 Entrenchment Ratio: **0.00**
2.8 Incision Ratio: **0.00**
Human Elevated Inc. Rat.: **0.00**
2.9 Sinuosity:
2.10 Riffles Type:

2.11 Riffle/Step Spacing:
2.12 Substrate Composition
Bedrock: %
Boulder: %
Cobble: %
Coarse Gravel: %
Fine Gravel: %
Sand: %
Silt and Smaller: %
Silt/Clay Present:
Detritus: %
Large Woody Debris:

2.13 Average Largest Particle on
Bed:
Bar:
2.14 Stream Type
Stream Type:
Bed Material:
Subclass Slope:
Bed Form:
Field Measured Slope:
2.15 Sub-reach Stream Type
Reference Stream Type:
Reference Bed Material:
Reference Subclass Slope:
Reference Bedform:

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank Slope:

Bank Texture	Left	Right
Upper		
Material Type:		
Consistency:		
Lower		
Material Type:		
Consistency:		

Bank Erosion	Left	Right
Erosion Length (ft.):		
Erosion Height (ft.):		
Revetment Type:		
Revetment Length:		

Near Bank Vegetation Type	Left	Right
Dominant:		
Sub-dominant:		
Bank Canopy		
Canopy %:		
Mid-Channel Canopy:		

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant		
Sub-Dominant		
W less than 25		
Buffer Vegitation Type		
Dominant		
Sub-Dominant		

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant		
Sub-dominant		
(Legacy)		
Failures		
Gullies		

	Amount	Mean Hieght
Mass Failures		
Height		
Gullies Number		
Gullies Length		

Stream: **First Branch of the White River** Reach: **M02-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:

4.2 Adjacent Wetlands:

4.3 Flow Status:

4.4 # of Debris Jams:

4.5 Flow Regulation Type

Flow Reg. Use:

Impoundments:

Impoundment Loc.:

4.6 Up/Down Strm flow reg.:

(old) Upstrm Flow Reg.:

4.7 Stormwater Inputs **None**

Field Ditch: Road Ditch:

Other: Tile Drain:

Overland Flow: Urb Strm Wtr Pipe:

4.9 # of Beaver Dams:

Affected Length (ft):

4.8 Channel Constrictions:

Step 5. Channel Bed and Planform Changes

5.1 Bar Types Diagonal:

Mid: Delta:

Point: Island:

Side: Braiding:

5.2 Other Features

Flood chutes:

5.3 Steep Riffles and Head Cuts

Steep Riffles:

Neck Cutoff:

Avulsion:

Head Cuts:

Trib Rejuv.:

5.4 Stream Ford or Animal Crossing:

5.5 Straightening:

Straightening Length (ft.): **0**

5.5 Dredging:

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:

6.2 Pool Substrate:

6.3 Pool Variability:

Total Score:

Habitat Rating:

Habitat Stream Condition:

6.4 Sediment Deposition:

6.5 Channel Flow Status:

6.6 Channel Alteration:

6.7 Channel Sinuosity:

Stream Gradiant Type Left Right

6.8 Bank Stability:

6.9 Bank Vegetation Protection

6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	Score	STD	Historic
7.1 Channel Degradation			
7.2 Channel Aggradation			
7.3 Widening Channel			
7.4 Change in Planforml			
Total Score			

Geomorphic Rating

Channel Evolution Model

Channel Evolution Stage

Geomorphic Condition

Stream Sensitivity

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M02-A	Organization:	White River Partnership
Segment Length(ft):	2,261	Observers:	DR, AS- Redstart
Rain:	Yes	Completion Date:	10/25/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Reach break below N end of Branch View Cemetery upstream to grade control at N end of rugby fields behind River View Log Homes (Log Landing Rd.)**

Step 5 - Notes: **Likely alluvial fan, but possibly of glacial origin. Large well vegetated point bar on upstream end by rugby field shows significant deposition over time; sediment plumes evident crossing this bend in post-Irene aerial imagery.**

Step 7 - Narrative: **Minor to major aggradation (primarily fines), widening and planform adjustments following historic incision; loss of access to LB floodplain has pinned stream to RVW and increased bank pressure at all but highest flood levels.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	42		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Sand	Mixed

1.5 Valley Features	
Valley Width (ft):	650
Width Determination:	Measured
Confinement Type:	BD
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		7.0	4.0		

Stream: **First Branch of the White River** Reach: **M02-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**94.60**	2.11 Riffle/Step Spacing:	**647 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**6.85**	2.12 Substrate Composition		Bed:	**2.3**	**inches**
2.3 Mean Depth (tf):	**4.78**	Bedrock:	**0.0 %**	Bar:	**3**	**inches**
2.4 Floodprone Width (ft.):	**599.50**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**9.75**	Cobble:	**0.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**7.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**19.79**	Fine Gravel:	**50.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**6.34**	Sand:	**37.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.42**	Silt and Smaller:	**5.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**116**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**974.4**	**839.5**	Dominant:	**Herbaceous**	**Deciduous**
Material Type:	**Sand**	**Mix**	Erosion Height (ft.):	**4.4**	**3.7**	Sub-dominant:	**Shrubs/Sapling**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**263.4**	**115.7**	Canopy %:	**26-50**	**76-100**
Material Type:	**Sand**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**>100**
Sub-Dominant	**26-50**	**51-100**
W less than 25	**1,218**	**194**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Residential**
Sub-dominant	**Shrubs/Sapling**	**Forest**
(Legacy)	Amount	Mean Hieght
Failures	**One**	**15.0**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M02-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**

4.2 Adjacent Wetlands: **Minimal**

4.3 Flow Status: **Low**

4.4 # of Debris Jams: **0**

4.5 Flow Regulation Type

Flow Reg. Use:

Impoundments: **None**

Impoundment Loc.:

4.6 Up/Down Strm flow reg.: **None**

(old) Upstrm Flow Reg.:

4.7 Stormwater Inputs

Field Ditch: **0** Road Ditch: **4**

Other: **0** Tile Drain: **0**

Overland Flow: **0** Urb Strm Wtr Pipe: **0**

4.9 # of Beaver Dams: **0**

Affected Length (ft): **0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Diagonal: **0**

Mid: **2** Delta: **0**

Point: **3** Island: **0**

Side: **4** Braiding: **0**

5.2 Other Features

Flood chutes: **4**

5.3 Steep Riffles and Head Cuts

Steep Riffles: **0**

Neck Cutoff: **0**

Avulsion: **1**

Head Cuts: **0**

Trib Rejuv.: **No**

5.4 Stream Ford or Animal Crossing: **No**

5.5 Straightening: **None**

Straightening Length (ft.): **0**

5.5 Dredging: **None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:

6.2 Pool Substrate:

6.3 Pool Variability:

Total Score: **0**

Habitat Rating: **0.00**

Habitat Stream Condition:

6.4 Sediment Deposition:

6.5 Channel Flow Status:

6.6 Channel Alteration:

6.7 Channel Sinuosity:

Stream Gradiant Type Left Right

6.8 Bank Stability:

6.9 Bank Vegetation Protection

6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**12**	**None**	**Yes**
7.2 Channel Aggradation	**11**	**None**	**No**
7.3 Widening Channel	**11**	**None**	**No**
7.4 Change in Planforml	**11**	**None**	**No**
Total Score	**45**		

Geomorphic Rating **0.56**

Channel Evolution Model **F**

Channel Evolution Stage **III**

Geomorphic Condition **Fair**

Stream Sensitivity **Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M02-B
Segment Length(ft): 4,724
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/24/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Grade control at N end of rugby fields off Log Landing Rd. upstream to pinch point in valley 0.1 mi N of TH 93/Dodge Rd.**

Step 5 - Notes: **Poor riffle-pool formation and extensive scour pools. Used +/- 2 width/depth factor to class as C-type stream as bed degradation contributes to low width/depth ratio but grade control is likely limiting further degradation, and sinuosity is low for E-type stream. Cross section at one of wider points of valley due to lack of good riffles at which to place it; multiple terraces at cross section indicate successive floodplain abandonment. Cross section location DS of bridge likely influences substrate size in pebble count;overall segment borders on sand substrate (C5).**

Step 7 - Narrative: **Altered planform with minor to major aggradation and widening following historic incision. Widening limited to some degree by heavy rip-rapping; most of segment is dominated by scour pools and deep runs; aggradation is primarily fines.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,848	11	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	200		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Sometimes	Never
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Sand

1.5 Valley Features
Valley Width (ft): 300
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		4.0	2.0		
Ledge		8.0	3.0		

Stream: **First Branch of the White River** Reach: **M02-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**74.80**	2.11 Riffle/Step Spacing:	**809 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**8.00**	2.12 Substrate Composition		Bed:	**6.7**	**inches**
2.3 Mean Depth (tf):	**6.48**	Bedrock:	**0.0 %**	Bar:	**2.9**	**inches**
2.4 Floodprone Width (ft.):	**507.80**	Boulder:	**1.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**10.70**	Cobble:	**3.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**17.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.54**	Fine Gravel:	**38.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**6.79**	Sand:	**41.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.34**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Eroded**	# Large Woody Debris:	**104**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**931.9**	**1,839.3**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**3.9**	**3.9**	Sub-dominant:	**Shrubs/Sapling**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,655.6**	**653.7**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**1,784**	**2,495**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Hay**
Sub-dominant	**Hay**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M02-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**

4.2 Adjacent Wetlands: **Minimal**

4.3 Flow Status: **Low**

4.4 # of Debris Jams: **0**

4.5 Flow Regulation Type

Flow Reg. Use:

Impoundments: **None**

Impoundment Loc.:

4.6 Up/Down Strm flow reg.: **None**

(old) Upstrm Flow Reg.:

4.7 Stormwater Inputs

Field Ditch: **4** Road Ditch: **4**

Other: **0** Tile Drain: **0**

Overland Flow: **0** Urb Strm Wtr Pipe: **0**

4.9 # of Beaver Dams: **0**

Affected Length (ft): **0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**60**	**Yes**	**Yes**	**Yes**	**Yes**	**Scour Above,Scour Below,Alignment**
Bridge	**63**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid: **0**

Point: **2**

Side: **3**

Diagonal: **0**

Delta: **0**

Island: **0**

Braiding: **0**

5.2 Other Features

Flood chutes: **0**

5.3 Steep Riffles and Head Cuts

Steep Riffles: **0**

Neck Cutoff: **0**

Avulsion: **0**

Head Cuts: **0**

Trib Rejuv.: **No**

5.4 Stream Ford or Animal Crossing: **No**

5.5 Straightening: **Straightening**

Straightening Length (ft.): **3,222**

5.5 Dredging: **None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:

6.2 Pool Substrate:

6.3 Pool Variability:

Total Score: **0**

Habitat Rating: **0.00**

Habitat Stream Condition:

6.4 Sediment Deposition:

6.5 Channel Flow Status:

6.6 Channel Alteration:

6.7 Channel Sinuosity:

Stream Gradiant Type Left Right

6.8 Bank Stability:

6.9 Bank Vegetation Protection

6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**6**	**None**	**Yes**
7.2 Channel Aggradation	**9**	**None**	**No**
7.3 Widening Channel	**11**	**None**	**No**
7.4 Change in Planforml	**7**	**None**	**No**
Total Score	**33**		

Geomorphic Rating **0.41**

Channel Evolution Model **F**

Channel Evolution Stage **III**

Geomorphic Condition **Fair**

Stream Sensitivity **Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M02-C
Segment Length(ft): 4,055
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/23/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Pinch point in valley 0.1 mi N of TH 93/Dodge Rd. upstream to Rte. 110 bridge at Russell Rd (Reach break)**

Step 5 - Notes: **Upstream 600' by breached dam could have been included in Reach M03- wider channel, infrastructure. Pasture fenced right to bank at 14 Russell Rd LLC, mass and bank failures common. Nice healthy big elm near cross section. Alluvial fan may be glacial related. Oxbow wetland and terrace shapes indicate likely migration of channel across entire valley floor over time.**

Step 7 - Narrative: **Major planform alterations and minor to major widening and aggradation following historic incision downstream of now-breached dam; oxbow wetland off LB indicates different channel location historically; segment is on likely alluvial fan, possibly of glacial origin.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 1,100
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Stream: **First Branch of the White River** Reach: **M02-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**74.80**	2.11 Riffle/Step Spacing:	**474 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**8.25**	2.12 Substrate Composition		Bed:	**3.7**	**inches**
2.3 Mean Depth (tf):	**5.74**	Bedrock:	**0.0 %**	Bar:	**3**	**inches**
2.4 Floodprone Width (ft.):	**1,005.00**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**10.15**	Cobble:	**4.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**20.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**13.03**	Fine Gravel:	**44.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**13.44**	Sand:	**32.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.23**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**168**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**982.6**	**1,522.9**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.9**	**5.1**	Sub-dominant:	**Deciduous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**1,025.1**	**1,031.6**	Canopy %:	**51-75**	**26-50**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**0-25**
Sub-Dominant	**0-25**	**26-50**
W less than 25	**602**	**2,811**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Crop**	**Pasture**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**15.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M02-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**3**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**90**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Old Abutment	**87**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Below**
Old Abutment	**56**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**5**	Delta:	**1**	Flood chutes:	**5**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**7**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,798**
Side:	**5**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**10**	**None**	**Yes**	Geomorphic Rating	**0.47**
7.2 Channel Aggradation	**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**11**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**38**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M03-0
Segment Length(ft): 1,893
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/22/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just upstream of Rte. 110 bridge at Russell Rd. upstream to trib above grade control 0.4 mi N of Russell Rd.**

Step 5 - Notes: **South Tunbridge Village more populated here mid-1800s and buildings may be on fill (increasing entrenchment); old shingle mill site on DS end, ledge grade controls on upstream end of this short reach. Phase 1 indicated plane bed but it is more characteristic of a riffle-pool.**

Step 7 - Narrative: **Aggradation and altered planform (straightening); breached mill dam just DS in next reach, significant historic aggradation evident there; grade controls have limited incision. Entrenchment may be increased by fill for buildings on RB (S. Tunbridge village).**

Step 1. Valley and Floodplain

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,444	12	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	267		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Sand

1.5 Valley Features
Valley Width (ft): 300
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	4.0		
Ledge		5.0	1.0		

Stream: **First Branch of the White River** Reach: **M03-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**95.20**	2.11 Riffle/Step Spacing:	**424 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.90**	2.12 Substrate Composition		Bed:	**7.6**	**inches**
2.3 Mean Depth (tf):	**3.88**	Bedrock:	**2.0 %**	Bar:	**7.4**	**inches**
2.4 Floodprone Width (ft.):	**135.50**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.70**	Cobble:	**31.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**15.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**24.54**	Fine Gravel:	**20.0 %**	Subclass Slope:	**c**	
2.7 Entrenchment Ratio:	**1.42**	Sand:	**30.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.37**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**20**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**274.4**	**251.5**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**3.3**	**3.0**	Sub-dominant:	**Coniferous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**355.7**	**727.8**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**26-50**
Sub-Dominant	**26-50**	**0-25**
W less than 25	**0**	**297**
Buffer Vegitation Type		
Dominant	**Coniferous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Residential**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M03-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**
4.2 Adjacent Wetlands: **Abundant**
4.3 Flow Status: **Low**
4.4 # of Debris Jams: **0**

4.5 Flow Regulation Type
Flow Reg. Use:
Impoundments: **Unknown**
Impoundment Loc.:
4.6 Up/Down Strm flow reg.: **None**
(old) Upstrm Flow Reg.:

4.7 Stormwater Inputs
Field Ditch: **0** Road Ditch: **2**
Other: **0** Tile Drain: **0**
Overland Flow: **0** Urb Strm Wtr Pipe: **0**
4.9 # of Beaver Dams: **0**
Affected Length (ft): **0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
Diagonal: **0**
Mid: **1** Delta: **1**
Point: **2** Island: **0**
Side: **2** Braiding: **0**

5.2 Other Features
Flood chutes: **2**
5.3 Steep Riffles and Head Cuts
Steep Riffles: **1**

Neck Cutoff: **0**
Avulsion: **0**
Head Cuts: **0**
Trib Rejuv.: **No**

5.4 Stream Ford or Animal Crossing: **No**
5.5 Straightening: **Straightening**
Straightening Length (ft.): **823**
5.5 Dredging: **None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score: **0**
Habitat Rating: **0.00**
Habitat Stream Condition:

6.4 Sediment Deposition:
6.5 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:

Stream Gradiant Type Left Right
6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**5**	**C to B**	**Yes**
7.2 Channel Aggradation	**10**	**None**	**No**
7.3 Widening Channel	**9**	**None**	**No**
7.4 Change in Planforml	**10**	**None**	**No**
Total Score	**34**		

Geomorphic Rating **0.43**
Channel Evolution Model **F**
Channel Evolution Stage **III**
Geomorphic Condition **Fair**
Stream Sensitivity **Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M04-A
Segment Length(ft): 4,804
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/22/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Grade control at trib confluence 0.4 mi N of Russell Rd. upstream to where river swings away from Rte. 110, just N of pink house.**

Step 5 - Notes: **Reach is dominated by runs; small sediment deposits, water fills channel through most of the Reach. Old terraces and geologic materials suggest E reference type, but longstanding straightening and gravel substrate due to enhanced sediment transport - hence E-->C STD. Lack of grade controls has allowed for incision, apparently offset by aggradation but not setting up as prominent bed features (heavy contributions of sand from eroding banks in next seg US). Cattle have access to water on S end of Twin Farm by trib.**

Step 7 - Narrative: **Cyclic scouring followed by widening and aggradation. Straightened. Extensive scour pools along riprapped areas, poor riffle formation and altered planform. 'Other' STD for planform is E-->C due to long-standing straightening and loss of planform.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,554	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	215		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 700
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M04-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**77.60**	2.11 Riffle/Step Spacing:	**792 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.90**	2.12 Substrate Composition		Bed:	**6.1**	**inches**
2.3 Mean Depth (tf):	**4.86**	Bedrock:	**0.0 %**	Bar:	**7.8**	**inches**
2.4 Floodprone Width (ft.):	**420.00**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**9.20**	Cobble:	**22.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**22.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**15.97**	Fine Gravel:	**19.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.41**	Sand:	**35.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.56**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**90**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**1,946.1**	**1,504.1**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.2**	**4.9**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**241.6**	**1,059.4**	Canopy %:	**26-50**	**1-25**
Material Type:	**Sand**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**>100**	**None**
W less than 25	**2,914**	**4,452**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Coniferous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Crop**	**Residential**	Mass Failures		
Sub-dominant	**Forest**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**17.3**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M04-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**3**
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**1**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**64**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**1**	Delta:	**0**	Flood chutes:	**3**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**4**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,278**
Side:	**7**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**9**	**None**	**No**	Geomorphic Rating	**0.45**
7.2 Channel Aggradation	**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**8**	**Other**	**Yes**	Geomorphic Condition	**Fair**
Total Score	**36**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M04-B
Segment Length(ft): 3,860
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/22/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Where river meets Rte. 110 N of the pink house US to Rte. 110 bridge S of Town Farm Rd.**

Step 5 - Notes: **Good bird habitat due to flood chutes dominated by boxelder and oxbow wetland; recent neck cut off. Landowner noted that buffers were cleared in the past, as recommended by SCS at the time. Multiple projects done in this segment, including buffer plantings and log vanes installed; deep pools forming around log vanes. Planform and geologic materials suggest E reference type; substantial widening and gravel substrate are believed to be changes due to straightening (particularly at bridge on US end) and mass failure with enhanced sediment transport, hence E-->C STD.**

Step 7 - Narrative: **Major aggradation, extreme widening and planform change following historic incision. Recent neck cut-off, mass failure, and extensive erosion. Log vane project implementation aiding pool formation and channel evolution. 'Other' STD is E-->C due to widening and planform change.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	18	11	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 1,100
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M04-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**113.90**	2.11 Riffle/Step Spacing:	**620 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.40**	2.12 Substrate Composition		Bed:	**2.7**	**inches**
2.3 Mean Depth (tf):	**3.27**	Bedrock:	**0.0 %**	Bar:	**3.1**	**inches**
2.4 Floodprone Width (ft.):	**400.00**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.90**	Cobble:	**1.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**22.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**34.83**	Fine Gravel:	**39.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**3.51**	Sand:	**38.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.80**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**87**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**801.3**	**1,411.6**	Dominant:	**Herbaceous**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.8**	**5.0**	Sub-dominant:	**Deciduous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**462.0**	**755.4**	Canopy %:	**51-75**	**76-100**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**1,496**	**1,143**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Crop**	**Crop**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Residential**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**45.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M04-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**115**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**1**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**3**	Delta:	**1**	Flood chutes:	**8**	Avulsion:	**0**	5.5 Straightening:		**Straightening**
Point:	**6**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**654**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:		**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.34**
7.2 Channel Aggradation		**7**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**5**	**Other**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**5**	**Other**	**No**	Geomorphic Condition	**Fair**
Total Score		**27**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M05-A
Segment Length(ft): 8,576
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/10/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Rt. 110 bridge south of Town Farm Rd. US to Tunbridge Worlds Fair office (north end of fairgrounds)**

Step 5 - Notes: **No grade controls (scour pools present in almost every rip-rapped area); extensive erosion, trees critical to holding what didn't erode. Incised channel, floodplain primarily accessed in larger floods. Many tires founds throughout Reach channel/in bed.**

Step 7 - Narrative: **Major widening, aggradation and planform change following historic incision**

Step 1. Valley and Floodplain

1.1 Segmentation: **Substrate Size**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	377	10	0	
Road:	2,508	9	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	2,022		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Hilly	Steep
Continuous w/ Bank:	Never	Never
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 700
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M05-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**84.00**	2.11 Riffle/Step Spacing:	**335 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.50**	2.12 Substrate Composition		Bed:	**3.8**	**inches**
2.3 Mean Depth (tf):	**4.17**	Bedrock:	**0.0 %**	Bar:	**3.8**	**inches**
2.4 Floodprone Width (ft.):	**407.00**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.60**	Cobble:	**24.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**29.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**20.14**	Fine Gravel:	**24.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**4.85**	Sand:	**23.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.38**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**189**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**3,218.1**	**4,635.6**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.6**	**4.5**	Sub-dominant:	**Deciduous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**2,461.1**	**1,933.7**	Canopy %:	**76-100**	**76-100**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**3,795**	**2,832**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**None**	**None**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Hay**
Sub-dominant	**Commercial**	**Shrubs/Sapling**
(Legacy)	Amount	Mean Hieght
Failures	**One**	**13.0**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M05-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**4**
4.3 Flow Status:	**Low**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**50**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**8**	Delta:	**1**	Flood chutes:	**8**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**5**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**8,576**
Side:	**8**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.46**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**8**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**37**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M05-B
Segment Length(ft): 973
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/10/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Tunbridge Worlds Fair office (north end of fairgrounds) upstream to Mill Bridge**

Step 5 - Notes: **Entire bed dominated by boulders (likely failed rip-rap) making bed more resistant to change than banks. Large mass failure beneath VT Rte. 110 directly across from Village Store in Irene, repaired with 35 ft wall of stone that may amplify future flows on mass failure just DS by Fairgrounds office.**

Step 7 - Narrative: **Major widening and planform change following historic incision. Run of river dam immediately upstream, channel filled with failred riprap over time; mass failures along LVW have claimed several buildings over the years. Aggradation of coarse materials may have offset incision to some degree.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Substrate Size**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	174	60	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	238		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Always	Never
Within 1 Bankfull W:	Always	Sometimes
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft): 600
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M05-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**98.80**	2.11 Riffle/Step Spacing:	**189 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.00**	2.12 Substrate Composition		Bed:	**15**	**inches**
2.3 Mean Depth (tf):	**4.23**	Bedrock:	**2.0 %**	Bar:	**9**	**inches**
2.4 Floodprone Width (ft.):	**533.00**	Boulder:	**43.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.00**	Cobble:	**21.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**5.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**23.36**	Fine Gravel:	**7.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.39**	Sand:	**22.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.40**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**21**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**208.5**	**0.0**	Dominant:	**Shrubs/Sapling**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**1.4**	**0.0**	Sub-dominant:	**Deciduous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**555.4**	**252.5**	Canopy %:	**26-50**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**51-100**	**26-50**
W less than 25	**176**	**300**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Hay**	Mass Failures		
Sub-dominant	**Bare**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**37.5**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M05-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**None**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:	**Unknown**	Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:	**Run-of-river Dam**	Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:	**No**		
Mid:	**0**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**973**
Side:	**1**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**Yes**	Geomorphic Rating	**0.46**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**8**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**37**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M06-0
Segment Length(ft): 2,720
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 10/2/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just downstream of Mill Bridge (Spring Rd) upstream to just downstream of Town Pool Trib confluence/Tunbridge Rec. Field.**

Step 5 - Notes: **One breached dam and one intact dam in reach, 2 bridges. Owner of intact (DS) dam has applied for permits for hydro generation but has not succeeded; dam previously supplied power for woodworking and grist mill at different times. Mill Bridge just DS of this dam was knocked off by ice in 1998; ice jam progressively backed up and eventually lifted bridge off abutments. Many boulders deposited downstream of the (US) breached dam indicated a change in dominant substrate type for ~300 ft. Ph 1 indicated reference Plane bed, and it might be a coarse plane bed under reference conditions but channel changes are long-standing and hence difficult to know. Bed is clearly heavily sedimented at this point in time - combination sedimented riffles and heavily sedimented plane bed (muck). Cumulative incremental development impacts US of Rte 110 bridge have increased flood risk to DS portions of reach.**

Step 7 - Narrative: **Extreme aggradation , widening, and planform adjustments following historic entrenchment. One breached dam and one intact dam in reach.**

Step 1. Valley and Floodplain

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

	Length (ft)	One	Height	Both	Height
Berm:	0			0	
Road:	1,560	26		568	33
Railroad:	0			0	
Imp. Path:	0			0	
Dev.:	765			0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 240
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		4.0	2.0		
Dam		16.0	16.0		
Dam		16.0	1.0		

Stream: **First Branch of the White River** Reach: **M06-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**105.40**	2.11 Riffle/Step Spacing:	**212 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.80**	2.12 Substrate Composition		Bed:	**4.5**	**inches**
2.3 Mean Depth (tf):	**2.99**	Bedrock:	**1.0 %**	Bar:	**5.4**	**inches**
2.4 Floodprone Width (ft.):	**135.70**	Boulder:	**6.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.80**	Cobble:	**21.0 %**	Stream Type:	**F**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**16.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**35.25**	Fine Gravel:	**22.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.29**	Sand:	**34.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.79**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**24**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**733.6**	**555.1**	Dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**3.9**	**5.3**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,576.1**	**1,353.1**	Canopy %:	**51-75**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**1,090**	**1,139**
Buffer Vegitation Type		
Dominant	**Deciduous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Residential**
Sub-dominant	**Forest**	**Shrubs/Sapling**
(Legacy)	Amount	Mean Hieght
Failures	**One**	**10.0**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M06-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**Large Run of River**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Other**	Field Ditch:	**0**	Road Ditch:	**6**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**150**	**No**	**Yes**	**Yes**	**Yes**	**Deposition Below,Alignment**
Old Abutment	**80**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bridge	**60**	**No**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**3**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**0**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,720**
Side:	**3**	Braiding:	**1**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**B to F**	**Yes**	Geomorphic Rating	**0.24**
7.2 Channel Aggradation		**5**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**5**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**4**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**19**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M07-A	Organization:	White River Partnership
Segment Length(ft):	6,641	Observers:	DR, AS- Redstart
Rain:	Yes	Completion Date:	9/27/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Tunbridge Rec. Field US to just US of Whitney Hill brook confluence**

Step 5 - Notes: **Segment undergoing significant incremental encroachment; flood chute at downstream end has been plugged; ford mid-segment is scouring (no bedrock present), and riprap placed just upstream of ford is likely to increase left bank lateral instability beneath recently placed carriage shed. Development at base of Monarch Hill continues to build fill further into floodplain, and windrowing at base of Town Pool Trib significantly increases pressure on the extremely steep valley wall beneath Rt. 110 on right bank where there is evidence of recent bank failure.**

Step 7 - Narrative: **Major widening and planform adjustments with minor to major aggradation following historic incision; historic mills located US and DS.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	98	14	0	
Road:	3,200	9	296	35
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,108		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Mixed

1.5 Valley Features	
Valley Width (ft):	450
Width Determination:	Measured
Confinement Type:	NW
In Rock Gorge:	No
Human Caused Change in Valley Width?:	Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	0.0		
Ledge		5.0	3.0		
Ledge		3.0	0.0		

Stream: **First Branch of the White River** Reach: **M07-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**85.40**	2.11 Riffle/Step Spacing:	**490 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.85**	2.12 Substrate Composition		Bed:	**8.2**	**inches**
2.3 Mean Depth (tf):	**4.03**	Bedrock:	**1.0 %**	Bar:	**5.5**	**inches**
2.4 Floodprone Width (ft.):	**208.00**	Boulder:	**3.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**8.90**	Cobble:	**31.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**16.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**21.19**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.44**	Sand:	**39.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.52**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**43**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**1,271.2**	**1,020.8**	Dominant:	**Shrubs/Sapling**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**4.8**	**4.6**	Sub-dominant:	**Herbaceous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**431.2**	**1,987.5**	Canopy %:	**51-75**	**1-25**
Material Type:	**Boulder/Cobble**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**0-25**
Sub-Dominant	**0-25**	**26-50**
W less than 25	**3,218**	**0**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Herbaceous**
Sub-Dominant	**Herbaceous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Residential**	Mass Failures		
Sub-dominant	**Hay**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M07-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**3**
4.3 Flow Status:	**Low**	Impoundments:	**Unknown**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**1**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**81**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**5**	Delta:	**2**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**9**	Island:	**2**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**4,212**
Side:	**4**	Braiding:	**3**	Steep Riffles:	**3**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**10**	**None**	**Yes**	Geomorphic Rating	**0.43**
7.2 Channel Aggradation	**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**34**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M07-B
Segment Length(ft): 2,160
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 9/26/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just US of Whitney Hill brook confluence US to Foundry Rd bridge**

Step 5 - Notes: **N. Tunbridge Village on RB, houses likely act as effective but not true VW and reduce available floodplain**

Step 7 - Narrative: **Altered planform and minor to major widening and aggradation following historic incision; extensive RB development forms effective but not true VW, reduces available floodplain.**

Step 1. Valley and Floodplain

1.1 Segmentation: Valley Width
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	53	7	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,555		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	350
Width Determination:	Measured
Confinement Type:	SC
In Rock Gorge:	No

Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		13.0	11.0		
Ledge		4.0	3.0		
Ledge		3.0	1.0		
Ledge		5.0	3.0		

Stream: **First Branch of the White River** Reach: **M07-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**103.70**	2.11 Riffle/Step Spacing:	**327 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.50**	2.12 Substrate Composition		Bed:	**8**	**inches**
2.3 Mean Depth (tf):	**3.30**	Bedrock:	**4.0 %**	Bar:	**7.2**	**inches**
2.4 Floodprone Width (ft.):	**235.80**	Boulder:	**3.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.90**	Cobble:	**39.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**21.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**31.42**	Fine Gravel:	**13.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.27**	Sand:	**20.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.76**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**7**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**157.2**	**0.0**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**2.0**	**0.0**	Sub-dominant:	**Deciduous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**165.6**	**503.7**	Canopy %:	**51-75**	**1-25**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**0-25**
Sub-Dominant	**>100**	**26-50**
W less than 25	**504**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Hay**	**Residential**	Mass Failures		
Sub-dominant	**Forest**	**Commercial**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M07-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:	**Unknown**	Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**70**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**2**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**2**	Delta:	**0**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,160**
Side:	**0**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**8**	**None**	**Yes**	Geomorphic Rating	**0.52**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**11**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**42**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: T1 - Runs along Strafford Rd in Tunbridge
Reach: T1.01-A
Segment Length(ft): 1,670
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/8/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Confluence with First Branch Mainstem upstream to 0.17 mi W of 55 Strafford Rd.**

Step 5 - Notes: **Alluvial fans above and below waterfall, at least 7 different major flood chutes several of which may have been the active channel over time. Valley width increases toward base of slope. Berming/straightening at base likely to increase erosive power on opposite bank of Mainstem across from culvert at base of reach; may eventually trigger mass failure under Rte. 110. Berming/straightening also increases the chance of the culvert plugging with debris.**

Step 7 - Narrative: **Planform adjustments with major aggradation and widening. Segment is on an alluvial fan with at least 5 channels in current valley below waterfall, other channels in a 'higher valley' coming off alluvial fan above the falls. Incision occurs rapidly when a new channel is cut, followed by aggradation until a channel is plugged and stream jumps to a new channel. Evaluated as a confined reach because its very much a step-pool system, though confinement type is VB, and braiding only appears to happen intermittently with longer time intervals in between.**

Step 1. Valley and Floodplain

1.1 Segmentation: Planform and Scope
1.2 Alluvial Fan: Yes
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0	7	78	6
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		189	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Steep
Continuous w/ Bank:	Never	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 250
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		11.0	9.0		
Waterfall		14.0	11.0		
Ledge		6.0	4.0		

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**25.50**	2.11 Riffle/Step Spacing:	**26.4 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.60**	2.12 Substrate Composition		Bed:	**24.9**	**inches**
2.3 Mean Depth (tf):	**1.75**	Bedrock:	**0.0 %**	Bar:	**24.2**	**inches**
2.4 Floodprone Width (ft.):	**207.00**	Boulder:	**31.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.10**	Cobble:	**32.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**4.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**14.57**	Fine Gravel:	**14.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**8.12**	Sand:	**19.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.58**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**15.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**93**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**a**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**247.2**	**290.2**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.9**	**4.2**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**98.5**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**0-25**	**26-50**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Coniferous**	**Coniferous**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Forest**
Sub-dominant	**Residential**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**Multiple**	**13.5**
Gullies	**One**	**70.0**

	Left	Right
Mass Failures		
Height		
Gullies Number	**1**	
Gullies Length	**12**	

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**Small Bypass**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Recreation**	Field Ditch:	**0**	Road Ditch:	**3**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**3**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**6**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**5**	Delta:	**0**	Flood chutes:	**15**	Avulsion:	**1**	5.5 Straightening:	**Straightening**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**198**
Side:	**9**	Braiding:	**1**	Steep Riffles:	**4**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**Yes**	Geomorphic Rating	**0.41**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**6**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**33**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: T1 - Runs along Strafford Rd in Tunbridge
Reach: T1.01-B
Segment Length(ft): 1,802
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/6/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **0.17 mi W of 55 Strafford Rd. upstream to 0.14 mi E of 126 Strafford Rd. where stream pinches against road.**

Step 5 - Notes: **Semi-confined, jammed against Strafford Rd. Recommend upgrading Drew Rd. to become the main road? Strafford Rd will be a chronic, perennial trouble spot. Narrowing of valley significantly increases force of water, huge material being moved in floods. Stream has been dredged for riprap on road bank, likely throughout much of this segment length over time. Borders on G-type stream, but w/d ratio is just above expected range for G and thus classed as B to F-type stream type departure.**

Step 7 - Narrative: **Major planform adjustments with major aggradation and widening following historic incision.Former mill US may have contributed to historic incision due to 'pulse flows'. Planform adjustments restricted by extensive road encroachment on LB.**

Step 1. Valley and Floodplain

1.1 Segmentation: Planform and Scope
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	1,760	15	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 60
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		8.0	5.0		
Ledge		8.0	5.0		
Ledge		9.0	8.0		
Ledge		13.0	11.0		
Ledge		24.0	22.0		
Ledge		8.0	7.0		

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**23.90**	2.11 Riffle/Step Spacing:	**34.5 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.40**	2.12 Substrate Composition		Bed:	**20**	**inches**
2.3 Mean Depth (tf):	**1.68**	Bedrock:	**0.0 %**	Bar:	**15.8**	**inches**
2.4 Floodprone Width (ft.):	**30.20**	Boulder:	**35.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.80**	Cobble:	**28.0 %**	Stream Type:	**F**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**7.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**14.23**	Fine Gravel:	**10.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**1.26**	Sand:	**20.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**2.83**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:	**B**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**24**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**a**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**359.6**	**400.4**	Dominant:	**Shrubs/Sapling**	**Coniferous**
Material Type:	**Boulder/Cobble**	**Mix**	Erosion Height (ft.):	**4.0**	**5.7**	Sub-dominant:	**Deciduous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**None**	Bank Canopy		
Lower			Revetment Length:	**1,421.0**	**0.0**	Canopy %:	**26-50**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**>100**
Sub-Dominant	**26-50**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Mixed Trees**
Sub-Dominant	**Mixed Trees**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Forest**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**15.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**7**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bedrock Outcrops	**15**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**0**	Delta:	**1**	Flood chutes:	**7**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**0**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,799**
Side:	**9**	Braiding:	**0**	Steep Riffles:	**5**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**3**	**B to F**	**Yes**	Geomorphic Rating	**0.32**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**7**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**26**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: T1 - Runs along Strafford Rd in Tunbridge
Reach: T1.01-C
Segment Length(ft): 1,808
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/6/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **0.14 mi E of 126 Strafford Rd. where stream pinches against road upstream to across from 131 Strafford Rd.**

Step 5 - Notes: **Drew Rd./Strafford Rd. culvert is 5'x5', plugged and backed up in Irene as well as historically (1998, 1973); stonework has been repeatedly rebuilt, road foreman believes there are constraints on replacement because structure is historic. Stream dredged in rebuild of this culvert post-Irene. Old mill site at upstream end of Tuttle Rd. Horses have free access to water at stream crossing by Tuttles. Used +/-2 'fudge factor' on w/d ratio to class as C-type stream (current w/d ratio of 10.35 is technically within range of E-type stream) due to observation that low w/d ratio may indicate recent incision (Irene) through previous aggradation that had offset higher degree of historic incision and rebuilt some access to floodplain. In addition, sinuosity in this segment appears low, and gradient high, for a reference E-type stream.**

Step 7 - Narrative: **Planform adjustments with major to minor widening and aggradation following historic incision. Old mill site in segment as well as 5ftx5ft stone bridge that has repeatedly plugged in floods. Low w/d ratio may indicate recent incision through previous aggradation that had offset higher degree of historic incision and rebuilt some access to floodplain.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One	Height	Both	Height
Berm:	0			260	7
Road:	219	12		0	
Railroad:	0			0	
Imp. Path:	0			0	
Dev.:	0			0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 150
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		9.0	8.0		
Ledge		11.0	10.0		
Waterfall		9.0	5.0		

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**20.30**	2.11 Riffle/Step Spacing:	**30.3 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.50**	2.12 Substrate Composition		Bed:	**13**	**inches**
2.3 Mean Depth (tf):	**1.97**	Bedrock:	**3.0 %**	Bar:	**13.8**	**inches**
2.4 Floodprone Width (ft.):	**83.00**	Boulder:	**16.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.80**	Cobble:	**23.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**11.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**10.30**	Fine Gravel:	**14.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**4.09**	Sand:	**33.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.92**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**34**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**147.1**	**148.9**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.8**	**4.8**	Sub-dominant:	**Pasture**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**167.7**	**564.1**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**26-50**	**0-25**
W less than 25	**307**	**217**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Pasture**	**Pasture**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**3**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	**1**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**15**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bridge	**17.7**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Bridge	**5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**2**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**5**	Delta:	**1**	Flood chutes:	**10**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**5**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**882**
Side:	**5**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**9**	**None**	**Yes**	Geomorphic Rating	**0.44**
7.2 Channel Aggradation	**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**9**	**None**	**Yes**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**35**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream:	T1 - Runs along Strafford Rd in Tunbridge	SGAT Version:	3
Reach:	T1.01-D	Organization:	White River Partnership
Segment Length(ft):	1,042	Observers:	DR, AS- Redstart
Rain:	Yes	Completion Date:	11/5/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Across from 131 Strafford Rd. upstream to just W of 149 Strafford Rd where field starts**

Step 5 - Notes: **Although valley is broader, primary difference between this segment and the upstream segment is banks and buffers. Horse shed and pasture close to stream though crossing to paddock is in next segment downstream due to change in slope. Sand D50 substrate may be due in part to sedimentation related to recent flood impacts and lack of buffers; surrounding soils are loamy sands over sand or glaciofluvial outwash terraces. Limited steps occur in localized areas of higher slope. Bridge in segment is a VAST snowmobile xing. Quite possible the stream was ditched through these fields historically, contributing to current reduced sinuosity (atypical of E-type stream in this setting).**

Step 7 - Narrative: **Major aggradation, planform change and widening following historic incision. Possible that subsequent aggradation has offset some of the incision following historic ditching of the stream through these fields.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Banks and Buffers**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Both Height
Berm:	0		0	
Road:	249	12	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Hilly	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features

Valley Width (ft):	450
Width Determination:	Measured
Confinement Type:	VB
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls: **None**

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-D**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**18.50**	2.11 Riffle/Step Spacing:	**71.3 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.85**	2.12 Substrate Composition		Bed:	**4.7**	**inches**
2.3 Mean Depth (tf):	**1.82**	Bedrock:	**0.0 %**	Bar:	**3.7**	**inches**
2.4 Floodprone Width (ft.):	**155.00**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.95**	Cobble:	**6.0 %**	Stream Type:	**E**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**20.0 %**	Bed Material:	**Sand**	
2.6 Width/Depth Ratio:	**10.16**	Fine Gravel:	**18.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**8.38**	Sand:	**54.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.74**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:	**E**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**16**	Reference Bed Material:	**Sand**	
				Reference Subclass Slope:	**None**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**250.3**	**387.8**	Dominant:	**Pasture**	**Pasture**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.8**	**2.3**	Sub-dominant:	**Invasives**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**461.0**	**199.4**	Canopy %:	**26-50**	**51-75**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**51-100**
W less than 25	**1,041**	**839**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Invasives**	**Invasives**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Hay**	**Hay**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-D**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**0**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**3**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**20**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**2**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,036**
Side:	**3**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**10**	**None**	**Yes**	Geomorphic Rating	**0.41**
7.2 Channel Aggradation	**7**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**33**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: T1 - Runs along Strafford Rd in Tunbridge
Reach: T1.01-E
Segment Length(ft): 969
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/5/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just W of 149 Strafford Rd. where field starts upstream to 0.2 mi E of 191 Strafford Rd (Reach start)**

Step 5 - Notes: **Extensive forest cover limited Irene impacts to scour on banks, though there was plenty of sediment movement. Trib rejuvenation likely related to impacts of Irene up on the trib rather than in response to processes on this stream. Used +/-2 w/d ratio 'fudge factor' to classify as a C-type stream due to these primary factors: lower than expected sinuosity for an E-type stream; lack of characteristic verticality in bank morphology; alternating pockets of floodplain rather than a broader more well-developed floodplain; and woody rather than herbaceous vegetation.**

Step 7 - Narrative: **Minor widening and planform adjustments following historic incision and more recent Irene impacts. Large woody debris playing important role in stream stability, channel morphology and sediment storage.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Banks and Buffers**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	523	10	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Hilly	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 250
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-E**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**20.30**	2.11 Riffle/Step Spacing:	**81 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.35**	2.12 Substrate Composition		Bed:	**7**	**inches**
2.3 Mean Depth (tf):	**1.78**	Bedrock:	**0.0 %**	Bar:	**6.9**	**inches**
2.4 Floodprone Width (ft.):	**51.30**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.25**	Cobble:	**23.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**25.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.40**	Fine Gravel:	**15.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**2.53**	Sand:	**32.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.81**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**48**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**73.3**	**0.0**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.5**	**0.0**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**147.4**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**26-50**	**None**
W less than 25	**123**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Hay**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **T1 - Runs along Strafford Rd in Tunbridge** Reach: **T1.01-E**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**2**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**5**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**		
Mid:	**3**	Delta:	**0**	Flood chutes:	**6**	Avulsion:	**0**	5.5 Straightening:		**None**	
Point:	**4**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**0**	
Side:	**6**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**Yes**	5.5 Dredging:		**None**	

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left / Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**No**	Geomorphic Rating	**0.63**
7.2 Channel Aggradation		**15**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**11**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**12**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**50**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M08-A
Segment Length(ft): 998
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR- Redstart
Completion Date: 9/25/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Foundry Rd bridge to 1000' upstream where valley opens by old Welch farm**

Step 5 - Notes: **Left bank driveways range from 9-13 ft above water; Right bank valley wall nearly vertical beneath Rt. 110, already been one mass failure; near continuous scour along driveway on left bank, was only tallied in areas of active larger erosion**

Step 7 - Narrative: **Major widening and minor to major aggradation and planform change following historic incision. DS end of segment was historic mill site, and driveway installed on LB in last 30 years added to entrenchment; near continuous scour evident along driveway. Condition rated Poor (Extreme adjustments) due to C-->F stream type departure.**

Step 1. Valley and Floodplain

1.1 Segmentation: Valley Width
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	650	7	346	7
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 220
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	3.0		

Stream: **First Branch of the White River** Reach: **M08-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**91.00**	2.11 Riffle/Step Spacing:	**290 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.65**	2.12 Substrate Composition		Bed:	**10.5**	**inches**
2.3 Mean Depth (tf):	**3.64**	Bedrock:	**2.0 %**	Bar:	**8**	**inches**
2.4 Floodprone Width (ft.):	**104.10**	Boulder:	**13.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**11.05**	Cobble:	**35.0 %**	Stream Type:	**F**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**13.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**25.00**	Fine Gravel:	**7.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.14**	Sand:	**30.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**2.38**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**5**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**131.4**	**244.6**	Dominant:	**Shrubs/Sapling**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**2.5**	**3.0**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**715.8**	Canopy %:	**76-100**	**76-100**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**51-100**
Sub-Dominant	**51-100**	**>100**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Deciduous**
Sub-Dominant	**Deciduous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Forest**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**35.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M08-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**1**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**820**
Side:	**3**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**3**	**C to F**	**Yes**	Geomorphic Rating	**0.43**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**12**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**34**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M08-B
Segment Length(ft): 7,666
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, Walter Hastings- Redstart
Completion Date: 9/17/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Tunbridge Central School US to Dickerman Hill Rd.**

Step 5 - Notes: **Windrowing at upstream end of reach may be contributing to erosion undercutting Rt. 110 just upstream of old mill abutments and large wall of riprap at base of Dickerman Hill placed in last 5 years also amplifies these impacts.**

Step 7 - Narrative: **Major widening and minor to major aggradation and planform change following historic incision. Breached dam in US portion of reach was historic mill.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,591	10	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,009		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	400
Width Determination:	Measured
Confinement Type:	NW
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		4.0	0.0		
Ledge		4.0	2.0		
Ledge		5.0	4.0		
Ledge		5.0	4.0		

Stream: **First Branch of the White River** Reach: **M08-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**106.00**	2.11 Riffle/Step Spacing:	**248 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.70**	2.12 Substrate Composition		Bed:	**10.3**	**inches**
2.3 Mean Depth (tf):	**3.20**	Bedrock:	**0.0 %**	Bar:	**6.6**	**inches**
2.4 Floodprone Width (ft.):	**375.00**	Boulder:	**4.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.70**	Cobble:	**42.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**24.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**33.13**	Fine Gravel:	**0.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**3.54**	Sand:	**30.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.43**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**59**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**985.9**	**722.0**	Dominant:	**Shrubs/Sapling**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.3**	**2.6**	Sub-dominant:	**Deciduous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**90.1**	**1,071.2**	Canopy %:	**76-100**	**51-75**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**>100**	**0-25**
W less than 25	**1,412**	**3,606**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Shrubs/Sapling**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Residential**	Mass Failures		
Sub-dominant	**Hay**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**12.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M08-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**1**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**63**	**Yes**	**Yes**	**Yes**	**No**	**Scour Above,Scour Below,Alignment**
Old Abutment	**78**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**4**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**5**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**5**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,122**
Side:	**5**	Braiding:	**1**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**13**	**None**	**Yes**	Geomorphic Rating	**0.52**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**42**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M09-A	Organization:	White River Partnership
Segment Length(ft):	1,577	Observers:	DR, Emily Miller- Redstart
Rain:	Yes	Completion Date:	9/13/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Dickerman brook confluence US to south end of McCullough gravel pit**

Step 5 - Notes: **Rt. 110 narrows valley slightly in some places but does not significantly change valley width and will be overtopped by flooding in some sections. Downstream right bank is herbaceous because of flooding, not mowing, shrubs might be possible but trees unlikely to grow. These may be vegetated sidebars (rebuilt floodplain) upstream of old dam.**

Step 7 - Narrative: **Notes say III-IV. Minor widening, aggradation and plantform change following historic incision and concurrent/subsequent aggradation. Deposition (particularly side bars) US of old mill dam, likely built or maintained access to floodplain.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	401	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features

Valley Width (ft): **350**

Width Determination: **Measured**

Confinement Type: **NW**

In Rock Gorge: **No**

Human Caused Change in Valley Width?: **No**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	2.0		
Ledge		5.0	3.0		

Stream: **First Branch of the White River** Reach: **M09-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**69.90**	2.11 Riffle/Step Spacing:	**655 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**5.00**	2.12 Substrate Composition		Bed:	**7.6**	**inches**
2.3 Mean Depth (tf):	**4.04**	Bedrock:	**1.0 %**	Bar:	**5**	**inches**
2.4 Floodprone Width (ft.):	**184.60**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.20**	Cobble:	**22.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**30.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**17.30**	Fine Gravel:	**19.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.64**	Sand:	**23.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.24**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**6**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**209.2**	**347.6**	Dominant:	**Coniferous**	**Herbaceous**
Material Type:	**Mix**	**Sand**	Erosion Height (ft.):	**2.5**	**2.7**	Sub-dominant:	**Herbaceous**	**Coniferous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**76-100**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**51-100**
Sub-Dominant	**None**	**26-50**
W less than 25	**0**	**100**
Buffer Vegitation Type		
Dominant	**Coniferous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Residential**
Sub-dominant	**None**	**Shrubs/Sapling**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M09-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**0**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**592**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**11**	**None**	**Yes**	Geomorphic Rating	**0.59**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**12**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**47**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M09-B
Segment Length(ft): 2,315
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, Walter Hastings- Redstart
Completion Date: 9/12/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **S end of McCullough gravel pit US to reach break just N of Hanson Rd/Rt. 110 intersection**

Step 5 - Notes: **Berm above gravel pit significantly confines upstream end of reach. River very active at this bend. River overtops Rt. 110 in floods.**

Step 7 - Narrative: **Major aggradation, widening, and planform change cycling with scour/erosion. Deposition currently concentrated in US and DS portions of segment. Mid-section scoured; erosion not currently heavily active, but healed areas evident. Berm at US end pins stream to RVW.**

Step 1. Valley and Floodplain

1.1 Segmentation: Valley Width
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both Height
Berm:	714	12	0
Road:	1,116	7	0
Railroad:	0		0
Imp. Path:	0		0
Dev.:	0		0

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Hilly
Continuous w/ Bank:	Always	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 550
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	2.0		

Stream: **First Branch of the White River** Reach: **M09-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**91.50**	2.11 Riffle/Step Spacing:	**357 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.80**	2.12 Substrate Composition		Bed:	**9.6**	**inches**
2.3 Mean Depth (tf):	**3.45**	Bedrock:	**0.0 %**	Bar:	**5.8**	**inches**
2.4 Floodprone Width (ft.):	**121.50**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.70**	Cobble:	**42.0 %**	Stream Type:	**F**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**20.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**26.52**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.33**	Sand:	**23.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.40**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**11**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**307.1**	**0.0**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Sand**	Erosion Height (ft.):	**2.5**	**0.0**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**None**	Bank Canopy		
Lower			Revetment Length:	**43.6**	**0.0**	Canopy %:	**26-50**	**1-25**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**0-25**
Sub-Dominant	**>100**	**51-100**
W less than 25	**0**	**1,177**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Herbaceous**
Sub-Dominant	**Herbaceous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Bare**	**Residential**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M09-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**2**	Delta:	**0**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**3**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,424**
Side:	**3**	Braiding:	**1**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**C to F**	**No**	Geomorphic Rating	**0.38**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**8**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**30**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M10-0
Segment Length(ft): 3,975
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 9/11/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **0.1 mi N of Wellspring School US to grade control after Flint Bridge**

Step 5 - Notes: **Many rip rapped and eroded areas may have been missed because they were masked by peak growth vegetation. High banks along hay field indicative of historical incision. Ditched wetlands in hay fields on right bank. VTrans highway garage and Wireform (only property in Tunbridge listed as 'Industrial') are elevated above floodplain along RVW. Trib rejuvenation may have been triggered on trib during Irene rather than being triggered by processes on mainstem.**

Step 7 - Narrative: **minor to major widening following historic incision and loss of planform due to maintenance against valley wall**

Step 1. Valley and Floodplain

1.1 Segmentation: None
1.2 Alluvial Fan: Yes
1.3 Corridor Encroachments:

Length (ft)	One Height	Both	Height
Berm:	0	0	
Road:	0	0	
Railroad:	0	0	
Imp. Path:	0	0	
Dev.:	712	0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 500
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	5.0		
Ledge		6.0	4.0		
Ledge		4.0	3.0		
Ledge		5.0	2.0		

Stream: **First Branch of the White River** Reach: **M10-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**79.00**	2.11 Riffle/Step Spacing:	**285 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.90**	2.12 Substrate Composition		Bed:	**8.7**	**inches**
2.3 Mean Depth (tf):	**3.83**	Bedrock:	**1.0 %**	Bar:	**8.5**	**inches**
2.4 Floodprone Width (ft.):	**265.00**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**8.10**	Cobble:	**31.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**15.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**20.63**	Fine Gravel:	**12.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**3.35**	Sand:	**36.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.65**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**14**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**163.9**	**363.2**	Dominant:	**Deciduous**	**Herbaceous**
Material Type:	**Mix**	**Sand**	Erosion Height (ft.):	**2.5**	**2.7**	Sub-dominant:	**Coniferous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**626.8**	Canopy %:	**76-100**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**0-25**
Sub-Dominant	**51-100**	**>100**
W less than 25	**0**	**2,518**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Herbaceous**
Sub-Dominant	**Herbaceous**	**Mixed Trees**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Hay**
Sub-dominant	**Pasture**	**Industrial**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M10-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**3**	Delta:	**1**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,891**
Side:	**4**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.59**
7.2 Channel Aggradation		**14**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**47**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M11-0
Segment Length(ft): 6,122
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 9/6/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Flint Bridge (Bicknell Hill Rd) US to Cram Brook confluence**

Step 5 - Notes: **Bedrock grade controls account for bulk of slope change, low sinuosity but not much visible riprap- more historically? Major transmission line crosses and runs along stream mid-reach. Looks like there were some former farm-scale sand and/or gravel pits along LB, none open at this point - all vegetated. A bit unfortunate that x-sec did not capture the bedrock presence, but still believe gravel does represent overall reach d50.**

Step 7 - Narrative: **minor to major widening and planform change following historic incision and straightening**

Step 1. Valley and Floodplain

1.1 Segmentation: None
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

	Length (ft)	One	Height	Both	Height
Berm:	0			0	
Road:	582	9		208	15
Railroad:	0			0	
Imp. Path:	0			0	
Dev.:	0			0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 400
Width Determination: Estimated
Confinement Type: NW
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		16.0	14.0		
Ledge		6.0	4.0		
Ledge		3.0	0.0		
Ledge		6.0	4.0		
Ledge		6.0	3.0		

Stream: **First Branch of the White River** Reach: **M11-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**80.30**	2.11 Riffle/Step Spacing:	**213 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.65**	2.12 Substrate Composition		Bed:	**9.9**	**inches**
2.3 Mean Depth (tf):	**3.48**	Bedrock:	**0.0 %**	Bar:	**8.6**	**inches**
2.4 Floodprone Width (ft.):	**339.00**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.90**	Cobble:	**38.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**10.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**23.07**	Fine Gravel:	**14.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**4.22**	Sand:	**33.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.48**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**24**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**767.3**	**378.2**	Dominant:	**Shrubs/Sapling**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.5**	**3.1**	Sub-dominant:	**Herbaceous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,183.9**	**655.0**	Canopy %:	**51-75**	**76-100**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**26-50**
Sub-Dominant	**0-25**	**51-100**
W less than 25	**1,154**	**2,644**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Mixed Trees**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Shrubs/Sapling**	**Forest**	Mass Failures		
Sub-dominant	**Hay**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**12.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M11-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch: **0**	Road Ditch: **2**
4.3 Flow Status:	**Low**	Impoundments:		Other: **0**	Tile Drain: **0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow: **0**	Urb Strm Wtr Pipe: **0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**47**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Below,Alignment**
Bridge	**77**	**Yes**	**Yes**	**No**	**Yes**	**Deposition Above,Deposition Below,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**2**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**7**	Delta:	**1**	Flood chutes:	**6**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**11**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,054**
Side:	**9**	Braiding:	**1**	Steep Riffles:	**7**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**Yes**	Geomorphic Rating	**0.56**
7.2 Channel Aggradation		**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**45**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M12-0
Segment Length(ft): 7,605
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 9/3/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Confluence of Cram Brook (E. Randolph Rd) US to Jenkins Brook confluence**

Step 5 - Notes: **Though valley is narrowed by human activities, including historic dam mid-reach, overall the reach appears semi-confined naturally. Pinch points (confined) are at bedrock grade controls and stream is overwidened in these areas, bedrock outcrops are common along LB. Ice scour and tree damage common. Geo. Springston research indicates northern limits of glacial Lake Hitchcock 'finger' likely in DS portions of this reach. Possible that plane bed stream type is a departure from reference riffle-pool, but field observations, slope (1.1 pct by GIS) and natural confinement lend to coarse plane bed as reference.**

Step 7 - Narrative: **major widening and aggradation with minor to major planform change following historic incision; old mill site in mid-section of reach**

Step 1. Valley and Floodplain

1.1 Segmentation: **None**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both Height
Berm:	100	14	0
Road:	2,643	21	0
Railroad:	0		0
Imp. Path:	0		0
Dev.:	145		0

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 180
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	1.0		
Ledge		5.0	1.0		
Ledge		6.0	4.0		
Ledge		6.0	3.0		

Stream: **First Branch of the White River** Reach: **M12-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**77.50**	2.11 Riffle/Step Spacing:	**120 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.80**	2.12 Substrate Composition		Bed:	**13**	**inches**
2.3 Mean Depth (tf):	**3.23**	Bedrock:	**0.0 %**	Bar:	**14**	**inches**
2.4 Floodprone Width (ft.):	**279.00**	Boulder:	**25.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**8.30**	Cobble:	**44.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**4.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**23.99**	Fine Gravel:	**3.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**3.60**	Sand:	**24.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.73**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**80**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**609.0**	**562.4**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.2**	**3.7**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**248.1**	**1,192.3**	Canopy %:	**76-100**	**76-100**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**51-100**
Sub-Dominant	**0-25**	**26-50**
W less than 25	**1,180**	**749**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Herbaceous**
Sub-Dominant	**Herbaceous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Hay**
Sub-dominant	**Residential**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**Multiple**	**15.0**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M12-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**39**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above,Scour Below**
Old Abutment	**50**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bridge	**48**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**5**	Delta:	**2**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**8**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,636**
Side:	**15**	Braiding:	**0**	Steep Riffles:	**8**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Plane Bed**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**Yes**	Geomorphic Rating	**0.46**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**37**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jenkins Brook**
Reach: **T4.01-A**
Segment Length(ft): **645**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW, SL**
Completion Date: **7/9/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **From confluence with First Branch Main Stem to where valley narrows US of private bridge from pond to field on S side of Jenkins Brook.**

Step 5 - Notes: **Short segment at base of reach would probably share floodplain with First Branch under reference conditions but has almost entirely lost access to that floodplain, though some of the soils from that shared floodplain were likely pushed up into embankments of pond off RB. No withdrawals were observed for pond, believe it is spring fed. Alluvial fan noted in segment is somewhat coarse, but there is significant aggradation at the base of the reach and it appears a fair bit of material from the channel has likely been used to line the banks over time.**

Step 7 - Narrative: **Major widening, planform change and aggradation following historic incision. Possible alluvial fan under reference conditions (though not indicated as such on soil maps, and substrate is coarse); largest deposits now accruing very close to mainstem and channel is functioning in vastly reduced floodplain. Trees critical to stability and only one row deep on RB.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Steep	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Boulder	Boulder

1.5 Valley Features
Valley Width (ft): **600**
Width Determination: **Measured**
Confinement Type: **VB**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls: **None**

Stream: **Jenkins Brook** Reach: **T4.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**35.00**	2.11 Riffle/Step Spacing:	**40.8 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.90**	2.12 Substrate Composition		Bed:	**9.4**	**inches**
2.3 Mean Depth (tf):	**2.00**	Bedrock:	**0.0 %**	Bar:	**7.7**	**inches**
2.4 Floodprone Width (ft.):	**56.90**	Boulder:	**35.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.20**	Cobble:	**27.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**11.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**17.50**	Fine Gravel:	**9.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.63**	Sand:	**18.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**2.48**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**3.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**7**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**0.0**	**79.4**	Dominant:	**Coniferous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**0.0**	**6.0**	Sub-dominant:	**Deciduous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**253.5**	**380.6**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**51-100**	**51-100**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Shrubs/Sapling**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **Jenkins Brook** Reach: **T4.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**High**	Impoundments:	**None**	Other:	Tile Drain:
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:	**None**	Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**27**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:		**With Windrowing**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**491**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:		**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**C to B**	**Yes**	Geomorphic Rating	**0.34**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**6**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**27**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jenkins Brook**
Reach: **T4.01-B**
Segment Length(ft): **4,367**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW, SL**
Completion Date: **7/4/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **From just above private bridge off Jenkins Brook Rd to Hall Rd bridge.**

Step 5 - Notes: **Frequent road encroachment and multiple ledge grade controls are likely to result in stream/road conflicts (washouts and eroded or undercut banks) with some regularity.**

Step 7 - Narrative: **Major planform change, widening and aggradation following historic incision; numerous islands and frequent flood chutes.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	3,628	7	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	320		385	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Cobble	Cobble

1.5 Valley Features
Valley Width (ft): **100**
Width Determination: **Measured**
Confinement Type: **SC**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		0.0	0.0		
Ledge		12.0	7.0		
Ledge		16.0	14.0		
Ledge		6.0	3.0		
Ledge		11.0	8.0		
Ledge		3.0	1.0		

Stream: **Jenkins Brook** Reach: **T4.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**34.40**	2.11 Riffle/Step Spacing:	**33.3 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.40**	2.12 Substrate Composition		Bed:	**15.6**	**inches**
2.3 Mean Depth (tf):	**2.01**	Bedrock:	**0.0 %**	Bar:	**7.7**	**inches**
2.4 Floodprone Width (ft.):	**56.60**	Boulder:	**40.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.90**	Cobble:	**27.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**18.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**17.11**	Fine Gravel:	**6.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**1.65**	Sand:	**9.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.44**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**3.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**123**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**37.2**	**186.7**	Dominant:	**Herbaceous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.5**	**3.9**	Sub-dominant:	**Coniferous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,313.9**	**88.8**	Canopy %:	**51-75**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**26-50**	**51-100**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Coniferous**
Sub-Dominant	**Coniferous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures	**30**	
Sub-dominant	**Shrubs/Sapling**	**Forest**	Height	**10.0**	
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**10.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Jenkins Brook** Reach: **T4.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**

4.2 Adjacent Wetlands: **Abundant**

4.3 Flow Status: **High**

4.4 # of Debris Jams: **9**

4.5 Flow Regulation Type

Flow Reg. Use:

Impoundments: **None**

Impoundment Loc.:

4.6 Up/Down Strm flow reg.: **None**

(old) Upstrm Flow Reg.: **None**

4.7 Stormwater Inputs

Field Ditch: **0** Road Ditch: **3**

Other: **0** Tile Drain: **0**

Overland Flow: **0** Urb Strm Wtr Pipe: **0**

4.9 # of Beaver Dams: **0**

Affected Length (ft): **0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**10.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above**
Bridge	**19.6**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Diagonal: **4**

Mid: **3**

Delta: **0**

Point: **8**

Island: **7**

Side: **17**

Braiding: **0**

5.2 Other Features

Flood chutes: **9**

5.3 Steep Riffles and Head Cuts

Steep Riffles: **5**

Neck Cutoff: **0**

Avulsion: **0**

Head Cuts: **0**

Trib Rejuv.: **Yes**

5.4 Stream Ford or Animal Crossing: **No**

5.5 Straightening: **With Windrowing**

Straightening Length (ft.): **3,890**

5.5 Dredging: **None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:

6.2 Pool Substrate:

6.3 Pool Variability:

Total Score: **0**

Habitat Rating: **0.00**

Habitat Stream Condition:

6.4 Sediment Deposition:

6.5 Channel Flow Status:

6.6 Channel Alteration:

6.7 Channel Sinuosity:

Stream Gradiant Type Left Right

6.8 Bank Stability:

6.9 Bank Vegetation Protection

6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Confined**

	Score	STD	Historic
7.1 Channel Degradation	**8**	**None**	**Yes**
7.2 Channel Aggradation	**9**	**None**	**No**
7.3 Widening Channel	**8**	**None**	**No**
7.4 Change in Planforml	**7**	**None**	**No**
Total Score	**32**		

Geomorphic Rating **0.40**

Channel Evolution Model **F**

Channel Evolution Stage **III**

Geomorphic Condition **Fair**

Stream Sensitivity **High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jenkins Brook**
Reach: **T4.01-C**
Segment Length(ft): **3,884**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW, SL**
Completion Date: **7/4/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **From Hall Rd upstream to Red Rocks camp**

Step 5 - Notes: **Dam for recreational pond US of Hall Rd appears to have been constructed in the 1960s, probably breached in the last 2-3 decades (1998?); breach occurs around LB end as concrete is still intact but sluice gate has been removed. Hall Rd grade elevation was raised significantly to make road more passable, and dry hydrant was installed to take water from large pool in stream just below the culvert. Remains of historic mill structures just DS of Hall Rd (in next seg DS -T4.01B) and further US near Redrock Ln.**

Step 7 - Narrative: **Major planform change, widening and aggradation following historic incision likely related to pulse flows from 2 historic mills, plus breach of dam for in-stream recreation pond US of Hall Rd**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	150	6	0	
Road:	867	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,024		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Cobble	Cobble

1.5 Valley Features
Valley Width (ft): **200**
Width Determination: **Estimated**
Confinement Type: **BD**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	4.0		
Ledge		5.0	3.0		
Ledge		6.0	4.0		
Ledge		4.0	3.0		
Dam		5.0	4.0		

Stream: **Jenkins Brook** Reach: **T4.01-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**30.50**	2.11 Riffle/Step Spacing:	**53 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.85**	2.12 Substrate Composition		Bed:	**10.2**	**inches**
2.3 Mean Depth (tf):	**2.01**	Bedrock:	**0.0 %**	Bar:	**6.6**	**inches**
2.4 Floodprone Width (ft.):	**57.60**	Boulder:	**12.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.05**	Cobble:	**50.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**17.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**15.17**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.89**	Sand:	**11.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**2.47**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**4.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**123**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**62.2**	**23.3**	Dominant:	**Shrubs/Sapling**	**Herbaceous**
Material Type:	**Mix**	**Sand**	Erosion Height (ft.):	**3.5**	**3.0**	Sub-dominant:	**Deciduous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**462.3**	**595.8**	Canopy %:	**51-75**	**51-75**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**51-100**
Sub-Dominant	**>100**	**>100**
W less than 25	**0**	**153**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Mixed Trees**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		**20**
Sub-dominant	**Hay**	**Residential**	Height		**8.0**
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**8.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Jenkins Brook** Reach: **T4.01-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**
4.2 Adjacent Wetlands: **Abundant**
4.3 Flow Status: **High**
4.4 # of Debris Jams: **10**

4.5 Flow Regulation Type
Flow Reg. Use:
Impoundments: **None**
Impoundment Loc.:
4.6 Up/Down Strm flow reg.: **None**
(old) Upstrm Flow Reg.: **None**

4.7 Stormwater Inputs
Field Ditch: **2** Road Ditch: **1**
Other: **1** Tile Drain: **0**
Overland Flow: **0** Urb Strm Wtr Pipe: **0**
4.9 # of Beaver Dams: **0**
Affected Length (ft): **0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**12.3**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above**
Bridge	**22**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above**
Other	**8.5**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
Diagonal: **2**
Mid: **5**
Delta: **1**
Point: **13**
Island: **3**
Side: **13**
Braiding: **0**

5.2 Other Features
Neck Cutoff: **0**
Flood chutes: **10**
Avulsion: **0**
5.3 Steep Riffles and Head Cuts
Head Cuts: **0**
Steep Riffles: **2**
Trib Rejuv.: **Yes**

5.4 Stream Ford or Animal Crossing: **Yes**
5.5 Straightening: **Straightening**
Straightening Length (ft.): **2,547**
5.5 Dredging: **None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score: **0**
Habitat Rating: **0.00**
Habitat Stream Condition:

6.4 Sediment Deposition:
6.5 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:

Stream Gradiant Type Left Right
6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Confined**

	Score	STD	Historic
7.1 Channel Degradation	**4**	**C to B**	**Yes**
7.2 Channel Aggradation	**8**	**None**	**No**
7.3 Widening Channel	**8**	**None**	**No**
7.4 Change in Planforml	**6**	**None**	**No**
Total Score	**26**		

Geomorphic Rating: **0.32**
Channel Evolution Model: **F**
Channel Evolution Stage: **III**
Geomorphic Condition: **Poor**
Stream Sensitivity: **High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jenkins Brook**
Reach: **T4.01-D**
Segment Length(ft): **3,094**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW, SL**
Completion Date: **7/4/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **From Red Rock Farm and camp area to top of reach at Beaver Meadow Brook confluence at Town Farm Rd**

Step 5 - Notes: **US end of reach is mapped incorrectly in VHD, as Jenkins Brook and Beaver Meadow Brook join ABOVE Town Farm Rd., resulting in poor alignment and a confluence just US of an undersized bridge; bridge is a substantial concrete structure and road is more likely to be damaged.**

Step 7 - Narrative: **Major aggradation, widening and planform change following historic incision; well vegetated buffers have been critical in limiting extent of impacts.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	864	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	813		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **130**
Width Determination: **Measured**
Confinement Type: **NW**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	2.0		
Ledge		5.0	3.0		

Stream: **Jenkins Brook** Reach: **T4.01-D**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**38.30**	2.11 Riffle/Step Spacing:	**53 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.90**	2.12 Substrate Composition		Bed:	**12.5**	**inches**
2.3 Mean Depth (tf):	**1.60**	Bedrock:	**5.0 %**	Bar:	**10.4**	**inches**
2.4 Floodprone Width (ft.):	**72.30**	Boulder:	**29.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.45**	Cobble:	**32.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**2.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**23.94**	Fine Gravel:	**12.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**1.89**	Sand:	**20.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.88**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**114**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**207.4**	**0.0**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.9**	**0.0**	Sub-dominant:	**Shrubs/Sapling**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**304.6**	**137.2**	Canopy %:	**51-75**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**>100**	**51-100**
W less than 25	**188**	**0**
Buffer Vegitation Type		
Dominant	**Coniferous**	**Coniferous**
Sub-Dominant	**Herbaceous**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures	**60**	**120**
Sub-dominant	**Shrubs/Sapling**	**None**	Height	**13.5**	**8.0**
(Legacy)	Amount	Mean Hieght	Gullies Number	**1**	
Failures	**Multiple**	**11.7**	Gullies Length	**2**	
Gullies	**One**	**1.0**			

Stream: **Jenkins Brook** Reach: **T4.01-D**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**13**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**None**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**11.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Below**
Instream Culvert	**5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**13**	Avulsion:	**0**	5.5 Straightening:		**Straightening**
Point:	**11**	Island:	**2**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**1,038**
Side:	**19**	Braiding:	**0**	Steep Riffles:	**3**	Trib Rejuv.:	**Yes**	5.5 Dredging:		**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**11**	**None**	**Yes**	Geomorphic Rating	**0.41**
7.2 Channel Aggradation		**8**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**7**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**33**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M13-A
Segment Length(ft): 936
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS (Redstart)
Completion Date: 8/27/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **just US of Jenkins Brook confluence US to Jenkins Brook Rd. bridge**

Step 5 - Notes: **Soil maps show glaciofluvial parent materials in this segment, alluvial in next segment US; bank conditions appear different in the field (elevated erosion US; also, both segs have been riprapped historically but riprap is more intact in this segment). Excavation DS of Jenkins Rd bridge for pond embankment elevates LB , likely confining moderate flood flows at DS end to some degree but not continuous through segment.**

Step 7 - Narrative: **loss of planform and restricted widening and aggradation following historic incision; widening and aggradation restricted by extensive armoring and coarse materials**

Step 1. Valley and Floodplain

1.1 Segmentation: **Substrate Size**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	936	7	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 450
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	3.0		

Stream: **First Branch of the White River** Reach: **M13-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**60.10**	2.11 Riffle/Step Spacing:	**156 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.50**	2.12 Substrate Composition		Bed:	**9.8**	**inches**
2.3 Mean Depth (tf):	**3.36**	Bedrock:	**13.0 %**	Bar:	**9.2**	**inches**
2.4 Floodprone Width (ft.):	**134.50**	Boulder:	**3.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.10**	Cobble:	**38.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**14.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**17.89**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.24**	Sand:	**22.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.36**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**2**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**0.0**	**118.9**	Dominant:	**Deciduous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**0.0**	**4.2**	Sub-dominant:	**Shrubs/Sapling**	**Invasives**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**908.4**	**646.7**	Canopy %:	**76-100**	**1-25**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**0-25**
Sub-Dominant	**0-25**	**None**
W less than 25	**12**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Bare**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M13-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**29.5**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Below,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**0**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:		**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**936**
Side:	**1**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:		**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**10**	**None**	**Yes**	Geomorphic Rating	**0.56**
7.2 Channel Aggradation	**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**45**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M13-B
Segment Length(ft): 4,875
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 8/27/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Jenkins Brook Rd. US to Maple Ave Bridge**

Step 5 - Notes: **Repeated 4.9-5.0' bankfull measurements throughout assessment area, with relatively fresh sediment deposits, likely related to flooding during Irene. This portion of reach dominated by alluvial soils, more exposed high banks, in contrast to glaciofluvial in segment A (DS of Jenkins Brook).**

Step 7 - Narrative: **major aggradation, widening and planform change following primarily historic incision, though localized incision in US portion of segment is still possible (as evidenced by maintenance of check dams near Maple Ave bridge); grade controls limit further incision in DS portions of segment. Historically extensively armored, though much of the riprap is now failing.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Substrate Size**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	287	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	3,671		159	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Flat
Continuous w/ Bank:	Sometimes	Always
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Sand

1.5 Valley Features
Valley Width (ft): 400
Width Determination: Estimated
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		8.0	3.0		
Ledge		12.0	10.0		
Ledge		2.0	0.0		
Weir		1.0	0.0		
Weir		1.0	0.0		

Stream: **First Branch of the White River** Reach: **M13-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**59.00**	2.11 Riffle/Step Spacing:	**269 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.35**	2.12 Substrate Composition		Bed:	**9.1**	**inches**
2.3 Mean Depth (tf):	**3.39**	Bedrock:	**2.0 %**	Bar:	**10.4**	**inches**
2.4 Floodprone Width (ft.):	**475.00**	Boulder:	**4.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.55**	Cobble:	**32.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**11.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**17.40**	Fine Gravel:	**8.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**8.05**	Sand:	**43.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.74**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**27**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**549.2**	**878.8**	Dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Material Type:	**Mix**	**Sand**	Erosion Height (ft.):	**3.1**	**4.5**	Sub-dominant:	**Herbaceous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,728.8**	**2,334.7**	Canopy %:	**51-75**	**51-75**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**>100**	**0-25**
W less than 25	**1,035**	**1,048**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Residential**	Mass Failures		
Sub-dominant	**Forest**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M13-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**Small Withdrawal**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Drinking**	Field Ditch:	**0**	Road Ditch:	**4**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**1**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Store-release Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**27**	**Yes**	**No**	**Yes**	**No**	**Deposition Above,Alignment**
Bridge	**38**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**4**	Delta:	**1**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**5**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**4,667**
Side:	**7**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**No**	Geomorphic Rating	**0.49**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**39**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M13-C
Segment Length(ft): 508
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 8/23/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Old Chelsea Mills area, just US of Maple Ave Bridge US to end of walled in section (DS of cemetery).**

Step 5 - Notes: **Walled-in segment (this is the 'Other' channel constriction, as well as primary reason for C to E STD) in Chelsea Village. Check dams installed downstream of Maple Ave bridge (in next segment) to limit incision, but riffles/steps eroded in this segment; DS half is plane bed. True valley wall difficult to determine as aggregate of buildings on both banks form effective valley wall, though permeable to some degree; stone wall on left bank is 10' height above water. Floodprone area drops to 140 ft and entrenchment ratio to 4.0 if houses on RB are accounted as effective VW. Walls are mostly laid stone, technically non-cohesive but resistant to erosion and transferring impacts DS in all but moderate or higher-level floods, when floodplain is accessed.**

Step 7 - Narrative: **Arrested stage II-III, incision limited by 2 check dams just DS (in next seg) and ledge grade control in next seg US; widening limited by complete walling of banks. 'Other' stream type departure is C to E, as w/d ratio is in E range (due to extensive walling) but stream retains access to floodplain in moderate or higher level floods.Check dams and walls will require ongoing maintenance, and amplify flows until moderate or higher level floods when FP is accessed - at which point residential/commercial neighborhood floods (repeat area). Loss of planform and limited opportunity for adjustments.**

Step 1. Valley and Floodplain

1.1 Segmentation: Channel Dimensions
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		507	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Always	Always
Within 1 Bankfull W:	Always	Always
Texture:	Other	Other

1.5 Valley Features
Valley Width (ft): 140
Width Determination: Estimated
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M13-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**34.70**	2.11 Riffle/Step Spacing:	**120 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**7.05**	2.12 Substrate Composition		Bed:	**10.4**	**inches**
2.3 Mean Depth (tf):	**5.60**	Bedrock:	**0.0 %**	Bar:	**9.4**	**inches**
2.4 Floodprone Width (ft.):	**420.00**	Boulder:	**22.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**8.05**	Cobble:	**26.0 %**	Stream Type:	**E**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**16.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**6.20**	Fine Gravel:	**13.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**12.10**	Sand:	**23.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.14**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Eroded**	# Large Woody Debris:	**3**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**0.0**	**0.0**	Dominant:	**Invasives**	**Deciduous**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**	Erosion Height (ft.):	**0.0**	**0.0**	Sub-dominant:	**Deciduous**	**Invasives**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Hard Bank**	Bank Canopy		
Lower			Revetment Length:	**487.9**	**298.0**	Canopy %:	**51-75**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**None**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Invasives**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Residential**	Mass Failures		
Sub-dominant	**Commercial**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M13-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**None**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch: **0**	Road Ditch: **3**
4.3 Flow Status:	**Low**	Impoundments:		Other: **0**	Tile Drain: **0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow: **0**	Urb Strm Wtr Pipe: **2**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:	**Store-release Dam**	Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Other	**21**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bridge	**26.2**	**Yes**	**Yes**	**Yes**	**No**	**Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:	**No**		
Mid:	**0**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**507**
Side:	**0**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**Other**	**No**	Geomorphic Rating	**0.43**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**34**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M13-D
Segment Length(ft): 1,164
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 8/23/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **End of walled in section US of Maple Ave (old Chelsea Mills) to Cemetery DS of Brookhaven**

Step 5 - Notes: **Mixed commercial/residential in village with large cemetery occupying much of RB corridor; difficult to determine true valley wall because aggregate of buildings forms effective valley wall on left bank. Breached dam at grade control and footbridge to cemetery (behind Chelsea House of Pizza) has little remains except low broken concrete abutment on RB and stone wall on LB. Footbridge appears to have been damaged in Irene, abutments rebuilt; FP structure width of 50 reduced to effective width of 44 by sloping abutments.**

Step 7 - Narrative: **minor aggradation and minor to major widening and planform adjustments following historic incision (limited by bedrock grade control) related to historic mill dams; there is a also a small current intact dam in next seg US at Brookhaven**

Step 1. Valley and Floodplain

1.1 Segmentation: **Channel Dimensions**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	148	8	0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0	6	0	
Dev.:	124		1,027	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Hilly
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 350
Width Determination: Estimated
Confinement Type: NW
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	5.0		

Stream: **First Branch of the White River** Reach: **M13-D**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**47.00**	2.11 Riffle/Step Spacing:	**159 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.70**	2.12 Substrate Composition		Bed:	**9.9**	**inches**
2.3 Mean Depth (tf):	**3.58**	Bedrock:	**0.0 %**	Bar:	**7.5**	**inches**
2.4 Floodprone Width (ft.):	**240.50**	Boulder:	**6.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.95**	Cobble:	**53.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**14.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**13.13**	Fine Gravel:	**4.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.12**	Sand:	**23.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.27**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**10**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**186.2**	**315.4**	Dominant:	**Coniferous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.5**	**3.8**	Sub-dominant:	**Invasives**	**Invasives**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**477.1**	**515.0**	Canopy %:	**51-75**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**26-50**
Sub-Dominant	**26-50**	**0-25**
W less than 25	**360**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Deciduous**
Sub-Dominant	**Shrubs/Sapling**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Residential**	Mass Failures		
Sub-dominant	**Commercial**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M13-D**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**0**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**1**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Store-release Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**44**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**2**	Delta:	**1**	Flood chutes:	**3**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**3**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,039**
Side:	**3**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**13**	**None**	**Yes**	Geomorphic Rating	**0.63**
7.2 Channel Aggradation	**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**12**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**50**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jail Brook**
Reach: **T5.01-A**
Segment Length(ft): **791**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW-Redstart**
Completion Date: **5/22/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **From center of Chelsea Village where it meets the First Branch next to Chelsea Country store and basketball court, up Rt 113 to Court St bridge**

Step 5 - Notes: **Highly straightened segment DS of Court St bridge. Series of frequent recent flood events starting with ice jam in 2007, then local microburst storms in 2008, 2009, 2010; Irene in 2011 was actually less of an impact than these more localized events. "Cleaned out" in this segment, plane bed with only a hint of riffle formation and virtually no wood.**

Step 7 - Narrative: **Major adjustments in all categories due to repeat plugging at bridges and subsequent clean-outs, with subsequent incision offset by new aggradation. Little material left in channel to contribute to channel evolution, riffles and pools are small and unstable.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	302	6	269	6
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		790	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Flat
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft):	1,200
Width Determination:	Measured
Confinement Type:	VB
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls: **None**

Stream: **Jail Brook** Reach: **T5.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**27.10**	2.11 Riffle/Step Spacing:	**70 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.30**	2.12 Substrate Composition		Bed:	**6.4**	**inches**
2.3 Mean Depth (tf):	**2.06**	Bedrock:	**0.0 %**	Bar:	**5.35**	**inches**
2.4 Floodprone Width (ft.):	**138.20**	Boulder:	**7.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.50**	Cobble:	**28.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**19.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**13.16**	Fine Gravel:	**17.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.10**	Sand:	**29.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.67**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**0.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**1**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**0.0**	**0.0**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**0.0**	**0.0**	Sub-dominant:	**Invasives**	**Invasives**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**781.1**	**772.0**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**None**	**None**
W less than 25	**548**	**649**
Buffer Vegitation Type		
Dominant	**Deciduous**	**Deciduous**
Sub-Dominant	**Invasives**	**Invasives**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Residential**
Sub-dominant	**Commercial**	**Commercial**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Jail Brook** Reach: **T5.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**4**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**13.3**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**0**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:		**Straightening**
Point:	**0**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**762**
Side:	**6**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:		**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**6**	**None**		Geomorphic Rating	**0.40**
7.2 Channel Aggradation		**9**	**None**		Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**		Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**		Geomorphic Condition	**Fair**
Total Score		**32**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jail Brook**
Reach: **T5.01-B**
Segment Length(ft): **648**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW, SL**
Completion Date: **5/23/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Chelsea Village, upstream of Court St. Bridge along Rt 113**

Step 5 - Notes: **Slope flattens toward end of much steeper narrower valley here as stream enters Chelsea village, but overall slope for segment is ~4.1 pct (GIS calc.). Series of frequent recent flood events starting with ice jam in 2007, then local microburst storms in 2008, 2009, 2010; Irene in 2011 was actually less of an impact than these more localized events. Much riprap has been recently installed or replaced.**

Step 7 - Narrative: **Historic incision, repetitive major widening and planform change followed by "clean-outs" and rearmoring**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	158	8	474	6
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		558	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **100**
Width Determination: **Measured**
Confinement Type: **SC**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		**9.0**	**5.0**		
Ledge		**4.0**	**3.0**		
Ledge		**7.0**	**4.0**		

Stream: **Jail Brook** Reach: **T5.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**26.80**	2.11 Riffle/Step Spacing:	**14.3 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.60**	2.12 Substrate Composition		Bed:	**10.2**	**inches**
2.3 Mean Depth (tf):	**1.97**	Bedrock:	**1.0 %**	Bar:	**7.9**	**inches**
2.4 Floodprone Width (ft.):	**39.80**	Boulder:	**20.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.80**	Cobble:	**43.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**18.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**13.60**	Fine Gravel:	**8.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**1.49**	Sand:	**10.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**2.62**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**3.0 %**	Reference Stream Type:	**B**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**1**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**a**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**0.0**	**58.4**	Dominant:	**Invasives**	**Invasives**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**0.0**	**3.0**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Cohesive**	**Cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**623.1**	**623.3**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Cohesive**	**Cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**None**	**None**
W less than 25	**275**	**412**
Buffer Vegitation Type		
Dominant	**Invasives**	**Invasives**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Residential**
Sub-dominant	**Bare**	**Bare**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Jail Brook** Reach: **T5.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**1**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**2**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**None**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**20**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**0**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:		**Straightening**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**573**
Side:	**4**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:		**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**None**	**Yes**	Geomorphic Rating	**0.32**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**None**
7.3 Widening Channel		**6**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**6**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**26**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: Hart Hollow Brook
Reach: T6.01-A
Segment Length(ft): 3,209
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW, SL
Completion Date: 7/10/2013
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **From White River First Branch confluence by Brookhaven to DS end of long run of bedrock grade controls near Iron Horse shop (US of Rte 110 - Upper Village Rd jct)**

Step 5 - Notes: **Trees lining banks were frequently observed at waters edge (including inundation-intolerant sugar maple), indicating likely aggradation over time. Private bridge at US end of segment was moved following 2009 flood, and stream was windrowed US of bridge. Mill structure is still somewhat intact, with stream funneled through a very undersized stone culvert that is barely visible (due to sedimentation) on US end; LB mill race was accessed as a flood chute in recent flood events. This structure is more a constriction that a flow regulation at this point in time.**

Step 7 - Narrative: **Major aggradation with widening and planforming adjustments restricted by extensive historic straightening and revetments. Bed slowly aggrading, long stretches of planebed and mature maples observed at level of current water's edge.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,118	6	640	7
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,081		1,271	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 655
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	3.0		
Dam		0.0	6.0		
Ledge		3.0	2.0		
Ledge		2.0	1.0		
Ledge		3.0	1.0		
Ledge		3.0	1.0		

Stream: **Hart Hollow Brook** Reach: **T6.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**35.00**	2.11 Riffle/Step Spacing:	**94 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.10**	2.12 Substrate Composition		Bed:	**11**	**inches**
2.3 Mean Depth (tf):	**2.85**	Bedrock:	**0.0 %**	Bar:	**5.8**	**inches**
2.4 Floodprone Width (ft.):	**245.50**	Boulder:	**17.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.70**	Cobble:	**35.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**15.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**12.28**	Fine Gravel:	**13.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**7.01**	Sand:	**20.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**1.39**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**3.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**18**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**None**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**0.0**	**36.1**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**0.0**	**3.0**	Sub-dominant:	**Deciduous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,915.1**	**2,195.8**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**1,001**	**2,303**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Mixed Trees**	**Mixed Trees**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Residential**
Sub-dominant	**Hay**	**Hay**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Hart Hollow Brook** Reach: **T6.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Minimal**
4.2 Adjacent Wetlands: **Minimal**
4.3 Flow Status: **Moderate**
4.4 # of Debris Jams: **0**

4.5 Flow Regulation Type
Flow Reg. Use:
Impoundments: **None**
Impoundment Loc.:
4.6 Up/Down Strm flow reg.: **None**
(old) Upstrm Flow Reg.: **None**

4.7 Stormwater Inputs
Field Ditch: **1** Road Ditch: **1**
Other: **0** Tile Drain: **0**
Overland Flow: **0** Urb Strm Wtr Pipe: **1**
4.9 # of Beaver Dams: **0**
Affected Length (ft): **0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	36	Yes	Yes	Yes	Yes	Deposition Above,Scour Above,Alignment
Bridge	35	Yes	Yes	Yes	Yes	Deposition Above
Bridge	70	Yes	Yes	No	Yes	Alignment
Bridge	25	Yes	Yes	Yes	No	None
Bridge	32.5	Yes	Yes	Yes	Yes	Deposition Above,Scour Above,Scour Below,Alignment
Instream Culvert	4	Yes	Yes	Yes	Yes	Deposition Above,Scour Above,Scour Below
Bridge	36	Yes	Yes	Yes	No	Deposition Above

Step 5. Channel Bed and Planform Changes

5.1 Bar Types
Diagonal: **6**
Mid: **1** Delta: **0**
Point: **3** Island: **0**
Side: **2** Braiding: **0**

5.2 Other Features
Flood chutes: **2**
5.3 Steep Riffles and Head Cuts
Steep Riffles: **3**

Neck Cutoff: **0**
Avulsion: **0**
Head Cuts: **0**
Trib Rejuv.: **No**

5.4 Stream Ford or Animal Crossing: **No**
5.5 Straightening: **With Windrowing**
Straightening Length (ft.): **3,169**
5.5 Dredging: **Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score: **0**
Habitat Rating: **0.00**
Habitat Stream Condition:

6.4 Sediment Deposition:
6.5 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:

Stream Gradiant Type Left Right
6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	7	None	Yes
7.2 Channel Aggradation	10	None	No
7.3 Widening Channel	10	None	No
7.4 Change in Planforml	10	None	No
Total Score	37		

Geomorphic Rating **0.46**
Channel Evolution Model **F**
Channel Evolution Stage **III**
Geomorphic Condition **Fair**
Stream Sensitivity **High**

Phase 2 Segment Summary Report White River - First Branch

Stream: Hart Hollow Brook
Reach: T6.01-B
Segment Length(ft): 4,157
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW, SL
Completion Date: 7/10/2013
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **DS end of long bedrock grade controls by Iron Horse shop US to Kennedy Drive off of Upper Village Rd in Chelsea**

Step 5 - Notes: **Heavy road encroachments on left bank, extensive rip rap. Possible plane-bed reference (Narrow/Semi-confined valley, 2.8 pct slope by GIS calc); numerous steep riffles and steps due to location at downstream end of overall stream, with significant aggradation and large mobile particles. Alluvial fan noted in seg is at US end of reach, just below confluence with trib: very coarse particles but significant aggradation. Soil maps indicate alluvium further US, but series of recent flood events has dumped a lot of sediment at head of this reach. Valley is borderline Narrow/Semi-confined, functionally Semi-confined in many areas due to road encroachment but intermittently able to access the wider valley in major floods.**

Step 7 - Narrative: **Extreme aggradation with arrested widening and planform change following historic incision. Despite significant aggradation (primarily steep riffles/steps and sediment slugs) features are frequently unstable due to elevated stream power from extensive straightening and armoring; access to historic floodplains has been largely restricted and major impacts are being transferred downstream. Aggradation is largely result of being at DS end of subwatershed as reach by reference would probably be largely a transport stream.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	2,248	7	976	8
Railroad:	0		0	
Imp. Path:	0	8	0	
Dev.:	1,895		656	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Always	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Boulder	Boulder

1.5 Valley Features
Valley Width (ft): 225
Width Determination: Measured
Confinement Type: NW
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	4.0		
Ledge		3.0	2.0		
Ledge		7.0	4.0		
Ledge		3.0	1.0		
Ledge		26.0	25.0		

Stream: **Hart Hollow Brook** Reach: **T6.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**47.00**	2.11 Riffle/Step Spacing:	**43 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.30**	2.12 Substrate Composition		Bed:	**22**	**inches**
2.3 Mean Depth (tf):	**2.18**	Bedrock:	**10.0 %**	Bar:	**11.7**	**inches**
2.4 Floodprone Width (ft.):	**53.10**	Boulder:	**24.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**7.30**	Cobble:	**27.0 %**	Stream Type:	**F**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**11.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**21.56**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.13**	Sand:	**18.0 %**	Bed Form:	**Plane Bed**	
2.8 Incision Ratio:	**2.21**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**8.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**29**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**460.7**	**525.1**	Dominant:	**Herbaceous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.1**	**3.8**	Sub-dominant:	**Deciduous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Multiple**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**3,327.0**	**1,656.9**	Canopy %:	**51-75**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**51-100**
Sub-Dominant	**51-100**	**0-25**
W less than 25	**2,065**	**153**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Mixed Trees**
Sub-Dominant	**Shrubs/Sapling**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Forest**	Mass Failures		
Sub-dominant	**Forest**	**Residential**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **Hart Hollow Brook** Reach: **T6.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**9**
4.3 Flow Status:	**High**	Impoundments:	**None**	Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**1**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**None**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**27**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bedrock Outcrops	**30**	**No**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Below**
Old Abutment	**30**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below**
Bridge	**30**	**No**	**No**	**No**	**No**	**None**
Bedrock Outcrops	**25**	**No**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above,Scour Below**
Other	**30**	**No**	**No**	**Yes**	**Yes**	**Deposition Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**2**	Delta:	**1**	Flood chutes:	**4**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**4**	Island:	**2**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,892**
Side:	**10**	Braiding:	**0**	Steep Riffles:	**20**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**4**	**B to F**	**Yes**	Geomorphic Rating	**0.30**
7.2 Channel Aggradation		**5**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**24**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M14-A
Segment Length(ft): 956
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/16/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Chelsea, confluence with Hart Hollow Brook behind Chelsea House of Pizza US to Brookhaven soccer field**

Step 5 - Notes: **Constriction listed in Step 4 is Brookhaven Dam, which is primarily recreational (pool for swimming and other activities); flash board used to manipulate water levels. Heavily sedimented with fines US of dam, and stream is largely a near-continuous pool US of the dam as well.**

Step 7 - Narrative: **Fine sediment aggradation and planform alteration due to dam and extensive bank toe armoring, restricted access to floodplain and increased force of flows due to dam and constriction**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	955		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Sand	Mixed

1.5 Valley Features
Valley Width (ft): 500
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Dam		8.0	3.0		
Ledge		2.0	0.0		

Stream: **First Branch of the White River** Reach: **M14-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**41.40**	2.11 Riffle/Step Spacing:	**319 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.00**	2.12 Substrate Composition		Bed:	**6.6**	**inches**
2.3 Mean Depth (tf):	**2.40**	Bedrock:	**3.0 %**	Bar:	**4.4**	**inches**
2.4 Floodprone Width (ft.):	**244.00**	Boulder:	**4.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.20**	Cobble:	**9.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**23.0 %**	Bed Material:	**Sand**	
2.6 Width/Depth Ratio:	**17.25**	Fine Gravel:	**7.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.89**	Sand:	**54.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.73**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**28**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**137.7**	**351.4**	Dominant:	**Herbaceous**	**Shrubs/Sapling**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**3.0**	**2.9**	Sub-dominant:	**Lawn**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**199.7**	**116.7**	Canopy %:	**26-50**	**26-50**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**468**	**506**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Shrubs/Sapling**
Sub-dominant	**Residential**	**Hay**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M14-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**Small Run of River**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:	**Recreation**	Field Ditch:	**1**	Road Ditch:	**0**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Other	**10**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**None**
Point:	**1**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**0**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**8**	**None**	**No**	Geomorphic Rating	**0.38**
7.2 Channel Aggradation		**7**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**6**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**30**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M14-B	Organization:	White River Partnership
Segment Length(ft):	1,610	Observers:	DR, HW - Redstart
Rain:	Yes	Completion Date:	8/21/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Chelsea, Brookhaven soccer field US to just North of Bobbinshop Rd. bridge**

Step 5 - Notes: **More confined segment tucked along Bobbinshop Rd., noted in Chelsea history books as site of grist mill and sawmill that appear on Walling 1858 map, but only on the business district inset (not on town-wide for Walling or Beers 1877 atlas). No abandoned floodplain observed, but this could be due in part to alterations of slopes, with roads present on VWs of both sides of channel (rd on RVW is hayfield access-snowmobile trail at this point in time, on top of VW, but stream has FP access (probably at lower elevation than historic FloodPlain) on that side and no evident RAF). Though w/d ratio of 11.8 was in range of an E-type stream (w/d<12), have used +/- 2 factor to class as C-type as stream lacks high sinuosity of an E-type and bed materials are relatively coarse (d50 was coarse gravel, but barely - believe reference should be cobble and gravel is partly due to sedimentation DS of constriction at Bobbinshop Rd bridge). Little remains of former structures at Bobbinshop. Much failed riprap puts concentration of large stones along margins of channel. DS flow reg is a small dam, with flashboard, for small swimming area at Brookhaven.**

Step 7 - Narrative: **Major planform adjustments with minor to major widening and aggradation in response to historic straightening in vicinity of old mill site at Bobbinshop Rd; evolution restricted historically by extensive armoring, though much has failed over time. No current evidence of incision, but believe this may be masked by armoring and shaping of LVW which has heavy road and parking lot encroachment. Stream has access to FP on RB (probably at lower elevation than historic FloodPlain), and no evidence of incision was noted there; believe this may also be masked by reworking of RVW for road construction (farm road/VAST trail that accesses hayfield).**

Step 1. Valley and Floodplain

1.1 Segmentation:	Valley Width			1.4 Adjacent Side	Left	Right	1.5 Valley Features	
1.2 Alluvial Fan:	None			Hillside Slope:	Extr.Steep	Very Steep	Valley Width (ft):	150
1.3 Corridor Encroachments:				Continuous w/ Bank:	Always	Sometimes	Width Determination:	Estimated
Length (ft)	One	Height	Both	Height	Within 1 Bankfull W:	Always	Sometimes	Confinement Type:	NW
Berm:	0		0		Texture:	Mixed	Mixed	In Rock Gorge:	No
Road:	350	15	0				Human Caused Change in Valley Width?:		Yes
Railroad:	0		0						
Imp. Path:	0		0						
Dev.:	1,049		0						

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	4.0		
Ledge		4.0	3.0		

Stream: **First Branch of the White River** Reach: **M14-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**36.30**	2.11 Riffle/Step Spacing:	**152 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.30**	2.12 Substrate Composition		Bed:	**6.4**	**inches**
2.3 Mean Depth (tf):	**3.14**	Bedrock:	**3.0 %**	Bar:	**5.4**	**inches**
2.4 Floodprone Width (ft.):	**89.20**	Boulder:	**12.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.30**	Cobble:	**32.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**17.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.56**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.46**	Sand:	**26.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.00**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**19**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**195.6**	**219.9**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.8**	**3.2**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**980.4**	**249.9**	Canopy %:	**1-25**	**51-75**
Material Type:	**Boulder/Cobble**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**>100**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**184**	**123**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Mixed Trees**
Sub-Dominant	**Shrubs/Sapling**	**Invasives**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Residential**	**Forest**	Mass Failures		
Sub-dominant	**Shrubs/Sapling**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M14-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Down Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Run-of-river Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**26**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Scour Below**
Bridge	**31**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**1**	Delta:	**0**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**None**
Point:	**3**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**0**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**11**	**None**	**Yes**	Geomorphic Rating	**0.55**
7.2 Channel Aggradation	**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**13**	**None**	**No**	Channel Evolution Stage	**IV**
7.4 Change in Planforml	**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**44**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M14-C
Segment Length(ft): 6,465
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/20/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just N of Bobbinshop Rd. bridge to old A.C. and M.W. Button Farm (489 VT Rt. 110)**

Step 5 - Notes: **Lateral moraines and knolls/drumlins are common and can be locally confining, contributing to areas of increased stream power and heightened erosion. Extensive bank toe stabilization historically; much is now toppled or toppling into stream.**

Step 7 - Narrative: **Minor to major planform adjustments following historic straightening through extensive bank toe stabilization, now largely failed or failing**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	687	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	351		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Hilly
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 400
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	1.0		
Ledge		3.0	1.0		

Stream: **First Branch of the White River** Reach: **M14-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**37.60**	2.11 Riffle/Step Spacing:	**234 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.40**	2.12 Substrate Composition		Bed:	**5.5**	**inches**
2.3 Mean Depth (tf):	**2.62**	Bedrock:	**0.0 %**	Bar:	**3.9**	**inches**
2.4 Floodprone Width (ft.):	**220.30**	Boulder:	**11.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.45**	Cobble:	**40.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**16.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**14.35**	Fine Gravel:	**4.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**5.86**	Sand:	**29.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.60**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**15.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**96**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**947.0**	**1,422.9**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.4**	**3.1**	Sub-dominant:	**Deciduous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,326.0**	**1,070.3**	Canopy %:	**26-50**	**26-50**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**3,936**	**2,606**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Pasture**	**Hay**
Sub-dominant	**Shrubs/Sapling**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**One**	**15.0**
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M14-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**3**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**2**
4.4 # of Debris Jams:	**4**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**30**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Alignment**
Bridge	**24**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Below,Scour Above,Alignment**
Bridge	**19**	**Yes**	**Yes**	**Yes**	**No**	**Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**7**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**7**	Delta:	**1**	Flood chutes:	**4**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**9**	Island:	**2**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**310**
Side:	**16**	Braiding:	**1**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**12**	**None**	**Yes**	Geomorphic Rating	**0.60**
7.2 Channel Aggradation	**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**48**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M15-A
Segment Length(ft): 4,654
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/14/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Chelsea, old A.C. and M.W. Button Farm (489 VT Rt. 110) US to Nick Gilman Farm (558 VT Rt. 110)**

Step 5 - Notes: **Stream sits in a historically (post-glacial) incised valley that is significantly narrower than upstream portion of reach. Appears that banks were likely historically lined with large stone, possibly (likely?) removed from stream or brought from nearby. Much of this riprap has failed over time, but large stones that have toppled into stream play a prominent role in current stream dynamics.**

Step 7 - Narrative: **Major widening and planform change following historic incision and straightening. Several 'pinch points' heavily riprapped, largely failed over time**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	485	18	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	437		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 178
Width Determination: Measured
Confinement Type: NW
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		6.0	5.0		
Ledge		14.0	12.0		
Ledge		3.0	1.0		
Ledge		2.0	1.0		

Stream: **First Branch of the White River** Reach: **M15-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**41.90**	2.11 Riffle/Step Spacing:	**141 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.90**	2.12 Substrate Composition		Bed:	**8.5**	**inches**
2.3 Mean Depth (tf):	**2.64**	Bedrock:	**2.0 %**	Bar:	**4.6**	**inches**
2.4 Floodprone Width (ft.):	**113.20**	Boulder:	**13.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.50**	Cobble:	**23.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**11.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**15.87**	Fine Gravel:	**13.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.70**	Sand:	**38.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.67**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**94**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**573.0**	**615.8**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.7**	**3.8**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,196.6**	**2,084.0**	Canopy %:	**51-75**	**51-75**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**26-50**
Sub-Dominant	**51-100**	**0-25**
W less than 25	**59**	**177**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Mixed Trees**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Pasture**	**Hay**
Sub-dominant	**Forest**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M15-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**4**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**1**
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**22**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Old Abutment	**24**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Below,Scour Above,Scour Below**
Bridge	**18.5**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**6**	Delta:	**1**	Flood chutes:	**4**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**5**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,662**
Side:	**10**	Braiding:	**0**	Steep Riffles:	**5**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.47**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**8**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**38**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M15-B
Segment Length(ft): 683
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/13/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Chelsea, S. end of Gilman houselot at 558 VT Rt 110 US to intermittent trib at closest approach of First Branch to Rte 110 on south end of Nick Gilman farm (574 Rt 110)**

Step 5 - Notes: **Possible alluvial fan of post-glacial origin, situated at bases of what are now intermittent tribs on opposite sides of valley. Historically maintained against VW, field drained, much riprap has failed over time. Bank erosion masked to some degree by dense herbaceous/shrub cover. Horticultural streamside planting includes some invasives (bittersweet, goutweed)**

Step 7 - Narrative: **Minor to major aggradation, widening and planform alteration following historic incision. Maintained against valley wall, but rip rap and bank toe armoring have been failing over time and LB field has been drained; these alterations are long-standing and complicate understanding what reference conditions might be.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**

1.2 Alluvial Fan: **Yes**

1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	72	9	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	84		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Very Steep
Continuous w/ Bank:	Always	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features

Valley Width (ft): 450
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M15-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**39.60**	2.11 Riffle/Step Spacing:	**134 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**4.00**	2.12 Substrate Composition		Bed:	**4.15**	**inches**
2.3 Mean Depth (tf):	**2.59**	Bedrock:	**0.0 %**	Bar:	**4.3**	**inches**
2.4 Floodprone Width (ft.):	**514.60**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**5.50**	Cobble:	**22.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**19.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**15.29**	Fine Gravel:	**10.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**12.99**	Sand:	**47.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.38**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**0.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**1**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**110.0**	**122.5**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.0**	**2.6**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**206.5**	**264.3**	Canopy %:	**1-25**	**26-50**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**None**	**26-50**
W less than 25	**364**	**161**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Hay**
Sub-dominant	**Shrubs/Sapling**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M15-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**0**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**1**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**2**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**683**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**13**	**None**	**Yes**	Geomorphic Rating	**0.60**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**48**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M16-A
Segment Length(ft): 6,593
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/6/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **DS end of Reach M16 (at intermittent trib at US end of Gilman Farm, 574 VT Rt 110) to Rt. 110 Bridge N of Edwards Rd**

Step 5 - Notes: **Lateral moraines are intermittent (but locally confining when present) on either side of channel, causing overall valley confinement to range from limits on either end of 'broad' valley spectrum (6-10x channel width). Weir noted in seg is a log check dam just US of farm bridge at Gilman farm.**

Step 7 - Narrative: **Minor widening and minor to major aggradation and planform change following primarily historic incision (former mill in next reach US). Log check dam in DS portion of reach indicates possibility for further incision, and requires maintenance. Widening has been delayed by bank toe armoring and windrowing; indications that much of this is beginning to fail.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	755	9	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	463		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	325
Width Determination:	Measured
Confinement Type:	BD
In Rock Gorge:	No

Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Weir		1.0	0.0		

Stream: **First Branch of the White River** Reach: **M16-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**34.60**	2.11 Riffle/Step Spacing:	**103 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.50**	2.12 Substrate Composition		Bed:	**8.25**	**inches**
2.3 Mean Depth (tf):	**2.70**	Bedrock:	**0.0 %**	Bar:	**7.8**	**inches**
2.4 Floodprone Width (ft.):	**264.20**	Boulder:	**13.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.60**	Cobble:	**38.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**20.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**12.81**	Fine Gravel:	**7.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**7.64**	Sand:	**22.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.31**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**73**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**749.8**	**953.8**	Dominant:	**Invasives**	**Invasives**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.2**	**2.8**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**1,907.3**	**1,579.0**	Canopy %:	**51-75**	**51-75**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**3,970**	**4,296**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Invasives**
Sub-Dominant	**Invasives**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Hay**	**Hay**	Mass Failures		
Sub-dominant	**Forest**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**11.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M16-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**Small Withdrawal**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Irrigation**	Field Ditch:	**1**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**4**
4.4 # of Debris Jams:	**1**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**22.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Below**
Bridge	**16.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**6**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**3**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**16**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**3,738**
Side:	**13**	Braiding:	**1**	Steep Riffles:	**5**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**11**	**None**	**Yes**	Geomorphic Rating	**0.57**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**13**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**46**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M16-B
Segment Length(ft): 2,022
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/6/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Rte 110 Bridge N of Edwards Rd US to just south of Washington/Chelsea town line**

Step 5 - Notes: **Not a classic alluvial fan but likely formed by a lot of alluvial inputs from next seg US, which appears to be more situated on historic or post-glacial alluvial fan, with a second possible post-glacial alluvial fan at DS end of segment. Sinuosity reduced by historic bank toe stabilization, much of which has recently failed. Largest particles in bed often appear to be failed bank toe armoring, but also may have come out of stream originally.**
With most trees along banks now cut, this segment could undergo rapid widening in future storms (though dense shrub cover does seem to stabilize the banks sufficiently to prevent extensive erosion). May be E to C Stream Type Departure, but long-standing platform alteration makes it hard to say for sure.

Step 7 - Narrative: **Minor to major widening, planform change and aggradation following historic incision (historic mill in next segment US). Bank toe stabilization appears to be recently collapsing, trees along banks have nearly all been removed but shrub cover is dense and relatively intact, erosion levels surprisingly low.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	57		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Flat
Continuous w/ Bank:	Sometimes	Always
Within 1 Bankfull W:	Sometimes	Always
Texture:	Mixed	Mixed

1.5 Valley Features

Valley Width (ft):	600
Width Determination:	Measured
Confinement Type:	VB
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls: **None**

Stream: **First Branch of the White River** Reach: **M16-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**32.70**	2.11 Riffle/Step Spacing:	**118 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.70**	2.12 Substrate Composition		Bed:	**11.1**	**inches**
2.3 Mean Depth (tf):	**2.80**	Bedrock:	**0.0 %**	Bar:	**9.8**	**inches**
2.4 Floodprone Width (ft.):	**544.20**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.80**	Cobble:	**41.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**24.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.68**	Fine Gravel:	**11.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**16.64**	Sand:	**22.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.30**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**25**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**196.6**	**176.3**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.1**	**2.3**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**249.3**	**336.7**	Canopy %:	**1-25**	**1-25**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**51-100**	**51-100**
W less than 25	**2,021**	**1,866**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Hay**
Sub-dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M16-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**1**	Delta:	**1**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**With Windrowing**
Point:	**15**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,540**
Side:	**8**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**Yes**	Geomorphic Rating	**0.60**
7.2 Channel Aggradation		**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**11**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**12**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**48**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M16-C
Segment Length(ft): 2,532
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/1/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **From Chelsea-Washington town line US to Chelsea-Williamstown Rd**

Step 5 - Notes: **Segment appears to be located on a post-glacial alluvial fan. Old mill site remains in segment; some of the stonework is relatively intact. Historic incision in vicinity of old mill (combined with more confined true valley wall US) leaves stream largely flowing in effective Narrow valley, but confining terrace off RB may be topped in high level floods. This terrace is far enough off RB that incision ratio does not change stream type from C (entrenchment ratio 4.9, so no STD), but flood flow forces are elevated through this segment.**

Step 7 - Narrative: **Major aggradation, widening and planform change following historic incision in vicinity of old mill. Stream has lost access to historic floodplain off RB in all but high-level flood flows; though entrenchment ratio (4.9) indicates no change of stream type, moderate flood flows are more confined and likely to increase force through this segment**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	0	10	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 190
Width Determination: Measured
Confinement Type: NW
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		2.0	1.0		

Stream: **First Branch of the White River** Reach: **M16-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**39.60**	2.11 Riffle/Step Spacing:	**100 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.00**	2.12 Substrate Composition		Bed:	**19.3**	**inches**
2.3 Mean Depth (tf):	**2.30**	Bedrock:	**3.0 %**	Bar:	**13.1**	**inches**
2.4 Floodprone Width (ft.):	**109.60**	Boulder:	**21.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**6.00**	Cobble:	**25.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**14.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**17.22**	Fine Gravel:	**17.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.77**	Sand:	**20.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**2.00**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**65**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**374.9**	**451.3**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.7**	**3.0**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**813.9**	**302.9**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**51-100**
Sub-Dominant	**>100**	**>100**
W less than 25	**449**	**669**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Deciduous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Pasture**	**Pasture**	Mass Failures		
Sub-dominant	**Forest**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M16-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**Small Withdrawal**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Irrigation**	Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**3**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**9.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**0**	Delta:	**2**	Flood chutes:	**5**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**11**	Island:	**2**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,216**
Side:	**6**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**5**	**None**	**Yes**	Geomorphic Rating	**0.39**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Poor**
Total Score		**31**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M17-A
Segment Length(ft): 6,917
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, CH - Redstart
Completion Date: 7/17/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Chelsea-Williamstown Rd bridge to Sky Acres Rd culvert**

Step 5 - Notes: **multiple grade controls account for large majority of slope (GIS calc 3.4 pct slope); pockets of floodplain otherwise indicate a C-type stream, but semi-confined valley and repeated large storms (2009, 2010 localized flash floods, relatively limited impacts of 2011 TS Irene) contribute to movement of large materials lending to step-pool bedform. w/d ratio is within range for E-type stream, but have used +/- .2 factor to characterize as C-type due to relatively low sinuosity and nature of geologic materials and substrate.**

Step 7 - Narrative: **Minor to major planform change, widening and aggradation following historic incision. Historic incision may be related to post-glacial processes US of Lake Hitchcock "finger".**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	5,064	14	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 90
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	4.0		
Ledge		3.0	1.0		
Ledge		15.0	14.0		
Ledge		18.0	16.0		
Ledge		6.0	5.0		
Ledge		6.0	5.0		
Ledge		5.0	4.0		
Ledge		5.0	3.0		

Stream: **First Branch of the White River** Reach: **M17-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**22.40**	2.11 Riffle/Step Spacing:	**47 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.40**	2.12 Substrate Composition		Bed:	**9.2**	**inches**
2.3 Mean Depth (tf):	**1.92**	Bedrock:	**2.0 %**	Bar:	**5.8**	**inches**
2.4 Floodprone Width (ft.):	**101.20**	Boulder:	**15.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.45**	Cobble:	**30.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**32.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**11.67**	Fine Gravel:	**10.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**4.52**	Sand:	**11.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.44**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**0.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**262**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**61.7**	**67.1**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**5.2**	**6.7**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**3,174.2**	**1,185.0**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**399**	**203**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**Residential**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**12.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M17-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**4**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**14**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**8.9**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Bridge	**11**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**4**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**13**	Delta:	**0**	Flood chutes:	**5**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**10**	Island:	**4**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,323**
Side:	**22**	Braiding:	**0**	Steep Riffles:	**8**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**Yes**	Geomorphic Rating	**0.60**
7.2 Channel Aggradation		**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**48**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream:	First Branch of the White River	SGAT Version:	3
Reach:	M17-B	Organization:	White River Partnership
Segment Length(ft):	1,958	Observers:	DR, HW - Redstart
Rain:	No	Completion Date:	7/12/2012
		Qualtiy Control Status - Consultant:	Passed
		Qualtiy Control Status - Staff:	Provisional

Step 0 - Location: **Sky Acres Rd US to Tilton Rd**

Step 5 - Notes: **Large sediment deposits likely due to both Irene and 2009 and 2010 flash flooding; small in-stream pool (human) reported by neighborhood boy to have been blown out in Irene. Trib rejuv noted may be more related to flash flooding impacts on the trib than to response to incision on the mainstem. Borderline c/b slope (2.3 pct), particularly given presence of two grade controls that account for some of this gradient**

Step 7 - Narrative: **Minor to major aggradation, widening and altered planform following historic incision; adjustments restricted to some extent by significant road encroachment. Trib rejuvenation is likely related more to Irene impacts on trib than stream processes on First Branch mainstem.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**

1.2 Alluvial Fan: **None**

1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,294	10	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	83		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Very Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	100
Width Determination:	Measured
Confinement Type:	NW
In Rock Gorge:	No
Human Caused Change in Valley Width?:	Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	4.0		
Ledge		4.0	4.0		

Stream: **First Branch of the White River** Reach: **M17-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**23.00**	2.11 Riffle/Step Spacing:	**40 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.90**	2.12 Substrate Composition		Bed:	**7.4**	**inches**
2.3 Mean Depth (tf):	**1.83**	Bedrock:	**%**	Bar:	**5.5**	**inches**
2.4 Floodprone Width (ft.):	**104.40**	Boulder:	**8.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.80**	Cobble:	**44.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**17.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**12.57**	Fine Gravel:	**7.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**4.54**	Sand:	**24.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.66**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**7.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**69**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**433.1**	**76.9**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Sand**	**Mix**	Erosion Height (ft.):	**3.4**	**2.2**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Multiple**	Bank Canopy		
Lower			Revetment Length:	**124.5**	**1,187.2**	Canopy %:	**76-100**	**51-75**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**0-25**	**None**
W less than 25	**51**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Forest**
Sub-dominant	**Residential**	**None**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M17-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**Small Withdrawal**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Drinking**	Field Ditch:	**0**	Road Ditch:	**2**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**5**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**5.6**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Below,Scour Below**
Bridge	**13.8**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**	
Mid:	**3**	Delta:	**0**	Flood chutes:	**3**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**11**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,277**
Side:	**4**	Braiding:	**1**	Steep Riffles:	**3**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.54**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**43**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M18-A
Segment Length(ft): 550
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, CH, HW
Completion Date: 7/9/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **~600 ft DS of Tilton Rd, where valley wall pinches in on right bank, US to Tilton Rd culvert**

Step 5 - Notes: **split stream (large mid-channel bar) DS of Titlon Rd culvert may indicate past culvert failure or beaver dam blow-outs US**

Step 7 - Narrative: **minor aggradation and planform change related to periodic beaver dam blow-outs and recent flash floods US**

Step 1. Valley and Floodplain

1.1 Segmentation: **Channel Dimensions**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	334	15	0	
Railroad:	0		0	
Imp. Path:	111	6	0	
Dev.:	199		0	

1.6 Grade Controls: **None**

1.4 Adjacent Side	Left	Right
Hillside Slope:	Flat	Hilly
Continuous w/ Bank:	Always	Sometimes
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 200
Width Determination: Measured
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

Stream: **First Branch of the White River** Reach: **M18-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**20.60**	2.11 Riffle/Step Spacing:	**45 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.25**	2.12 Substrate Composition		Bed:	**5.7**	**inches**
2.3 Mean Depth (tf):	**1.36**	Bedrock:	**%**	Bar:	**4.5**	**inches**
2.4 Floodprone Width (ft.):	**87.40**	Boulder:	**2.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**2.25**	Cobble:	**40.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**14.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**15.15**	Fine Gravel:	**14.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**4.24**	Sand:	**30.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.00**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**12**	Reference Bed Material:	**Gravel**	
				Reference Subclass Slope:	**None**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Moderate**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**0.0**	**0.0**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**0.0**	**0.0**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**60.0**	**60.0**	Canopy %:	**76-100**	**76-100**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**51-100**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**221**	**74**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Mixed Trees**
Sub-Dominant	**Mixed Trees**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Shrubs/Sapling**	**Forest**
Sub-dominant	**Residential**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M18-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**Small Withdrawal**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:	**Recreation**	Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**5.2**	**Yes**	**Yes**	**Yes**	**Yes**	**Scour Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**2**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:	**No**		
Mid:	**0**	Delta:	**1**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**4**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**103**
Side:	**0**	Braiding:	**1**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**14**	**None**	**No**	Geomorphic Rating	**0.69**
7.2 Channel Aggradation		**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**16**	**None**	**No**	Channel Evolution Stage	**V**
7.4 Change in Planforml		**13**	**None**	**No**	Geomorphic Condition	**Good**
Total Score		**55**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M18-B
Segment Length(ft): 1,904
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW, CH - Redstart
Completion Date: 7/9/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional
Why Not Assessed: beaver dam

Step 0 - Location: **from Tilton Rd US to reach break at stream xing beneath VT Rte 110**

Step 5 - Notes: **Beaver-dominated wetlands with at least 4 dams, multiple impoundments and side channels; dams seem to have held or been quickly repaired after Irene and 2009 and 2010 flash floods**

Step 7 - Narrative:

Step 1. Valley and Floodplain

1.1 Segmentation: Other Reason
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	92	15	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Flat
Continuous w/ Bank:	Always	Always
Within 1 Bankfull W:	Always	Always
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft):	275
Width Determination:	Measured
Confinement Type:	VB
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M18-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):		2.11 Riffle/Step Spacing:		2.13 Average Largest Particle on	
2.2 Max Depth (ft.):		2.12 Substrate Composition		Bed:	
2.3 Mean Depth (tf):		Bedrock:	%	Bar:	
2.4 Floodprone Width (ft.):		Boulder:	%	2.14 Stream Type	
2.5 Aband. Floodpn (ft.):		Cobble:	%	Stream Type:	
Human Elev FloodPln (ft.):		Coarse Gravel:	%	Bed Material:	
2.6 Width/Depth Ratio:	**0.00**	Fine Gravel:	%	Subclass Slope:	
2.7 Entrenchment Ratio:	**0.00**	Sand:	%	Bed Form:	
2.8 Incision Ratio:	**0.00**	Silt and Smaller:	%	Field Measured Slope:	
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:		2.15 Sub-reach Stream Type	
2.9 Sinuosity:		Detritus:	%	Reference Stream Type:	
2.10 Riffles Type:		# Large Woody Debris:		Reference Bed Material:	
				Reference Subclass Slope:	
				Reference Bedform:	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**0.0**	**0.0**	Dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**0.0**	**0.0**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**51-75**	**51-75**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant		
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
Sub-dominant	**None**	**None**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M18-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type		4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**0**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**8**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**900**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:	**No**
Mid:	Delta:	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**None**
Point:	Island:	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**0**
Side:	Braiding: **0**	Steep Riffles:	**0**	Trib Rejuv.:		5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:	6.4 Sediment Deposition:	Stream Gradiant Type	Left	Right
6.2 Pool Substrate:	6.5 Channel Flow Status:	6.8 Bank Stability:		
6.3 Pool Variability:	6.6 Channel Alteration:	6.9 Bank Vegetation Protection		
Total Score:	6.7 Channel Sinuosity:	6.10 Riparian Veg. Zone Width:		
Habitat Rating:				
Habitat Stream Condition:				

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	Score	STD	Historic		
7.1 Channel Degradation				Geomorphic Rating	
7.2 Channel Aggradation				Channel Evolution Model	
7.3 Widening Channel				Channel Evolution Stage	
7.4 Change in Planforml				Geomorphic Condition	
Total Score				Stream Sensitivity	

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M19-A
Segment Length(ft): 2,698
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 7/11/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **from Rte 110 bridge at DW to 6408 Rte 110 US to beaver-dominated wetlands on E side of Rte 110**

Step 5 - Notes: **Borderline Cb stream rather than B, but valley is relatively narrow (and suspected to be semi-confined naturally) in this segment, even without the heavy encroachment of Rte 110- encroachment and consequent incision restrict floodplain enough to push to C to B stream type departure. Gravel D50 for substrate and frequent riffle-pool type sediment deposits likely due to inputs from recent breaches of upstream beaver dams as well as gravel inputs from heavy road encroachment; suspect reference is cobble.**

Step 7 - Narrative: **Minor to major aggradation following historic incision; planform evolution limited by extensive riprap.Borderline Cb stream rather than B to begin with; heavy encroachment of Rte 110 and consequent incision restrict floodplain enough to push to C to B stream type departure. History of beaver dam blow-outs US contributes to flow alterations.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,832	8	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Hilly	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Always
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	50
Width Determination:	Measured
Confinement Type:	SC
In Rock Gorge:	No
Human Caused Change in Valley Width?:	Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	5.0		

Stream: **First Branch of the White River** Reach: **M19-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**17.80**	2.11 Riffle/Step Spacing:	**35 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**1.70**	2.12 Substrate Composition		Bed:	**5**	**inches**
2.3 Mean Depth (tf):	**0.92**	Bedrock:	**%**	Bar:	**3**	**inches**
2.4 Floodprone Width (ft.):	**32.50**	Boulder:	**28.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**2.30**	Cobble:	**10.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**21.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**19.35**	Fine Gravel:	**20.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.83**	Sand:	**21.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.35**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**78**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**89.7**	**187.9**	Dominant:	**Coniferous**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.0**	**3.1**	Sub-dominant:	**Shrubs/Sapling**	**Coniferous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**32.7**	**821.5**	Canopy %:	**76-100**	**1-25**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**31**	**1,315**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Mixed Trees**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Residential**
Sub-dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **First Branch of the White River** Reach: **M19-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**4**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**1**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**1**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**50**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**9.75**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**5**	Delta:	**0**	Flood chutes:	**4**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**6**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,430**
Side:	**6**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**C to B**	**Yes**	Geomorphic Rating	**0.50**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**11**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**40**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M19-B
Segment Length(ft): 912
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW, CH - Redstart
Completion Date: 7/10/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional
Why Not Assessed: beaver dam

Step 0 - Location: **active beaver area in wetland off east side of Rte. 110**

Step 5 - Notes: **active beaver area within larger wetland; multiple channels and small impoundments**

Step 7 - Narrative:

Step 1. Valley and Floodplain

1.1 Segmentation: Other Reason
1.2 Alluvial Fan: None
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both Height
Berm:			
Road:			
Railroad:			
Imp. Path:			
Dev.:			

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Flat
Continuous w/ Bank:	Always	Always
Within 1 Bankfull W:	Always	Always
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): 500
Width Determination: Estimated
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M19-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):		2.11 Riffle/Step Spacing:		2.13 Average Largest Particle on	
2.2 Max Depth (ft.):		2.12 Substrate Composition		Bed:	
2.3 Mean Depth (tf):		Bedrock:	%	Bar:	
2.4 Floodprone Width (ft.):		Boulder:	%	2.14 Stream Type	
2.5 Aband. Floodpn (ft.):		Cobble:	%	Stream Type:	
Human Elev FloodPln (ft.):		Coarse Gravel:	%	Bed Material:	
2.6 Width/Depth Ratio:	**0.00**	Fine Gravel:	%	Subclass Slope:	
2.7 Entrenchment Ratio:	**0.00**	Sand:	%	Bed Form:	
2.8 Incision Ratio:	**0.00**	Silt and Smaller:	%	Field Measured Slope:	
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:		2.15 Sub-reach Stream Type	
2.9 Sinuosity:		Detritus:	%	Reference Stream Type:	
2.10 Riffles Type:		# Large Woody Debris:		Reference Bed Material:	
				Reference Subclass Slope:	
				Reference Bedform:	

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank Slope: **Undercut**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**0.0**	**0.0**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):			Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**		Bank Canopy		
Lower			Revetment Length:	**50.0**		Canopy %:	**1-25**	**1-25**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**None**	**None**
W less than 25		
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Other**	**Other**	Mass Failures		
Sub-dominant	**None**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number		
Failures			Gullies Length		
Gullies					

Stream: **First Branch of the White River** Reach: **M19-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Abundant**
4.2 Adjacent Wetlands: **Abundant**
4.3 Flow Status: **Low**
4.4 # of Debris Jams:

4.5 Flow Regulation Type
Flow Reg. Use:
Impoundments:
Impoundment Loc.:
4.6 Up/Down Strm flow reg.: **None**
(old) Upstrm Flow Reg.:

4.7 Stormwater Inputs **None**
Field Ditch: Road Ditch:
Other: Tile Drain:
Overland Flow: Urb Strm Wtr Pipe:
4.9 # of Beaver Dams:
Affected Length (ft):

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types Diagonal:
Mid: Delta:
Point: Island:
Side: Braiding:

5.2 Other Features
Flood chutes:
5.3 Steep Riffles and Head Cuts
Steep Riffles:

Neck Cutoff:
Avulsion:
Head Cuts:
Trib Rejuv.:

5.4 Stream Ford or Animal Crossing:
5.5 Straightening:
Straightening Length (ft.): **0**
5.5 Dredging:

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:
6.2 Pool Substrate:
6.3 Pool Variability:
Total Score:
Habitat Rating:
Habitat Stream Condition:

6.4 Sediment Deposition:
6.5 Channel Flow Status:
6.6 Channel Alteration:
6.7 Channel Sinuosity:

Stream Gradiant Type Left Right
6.8 Bank Stability:
6.9 Bank Vegetation Protection
6.10 Riparian Veg. Zone Width:

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	Score	STD	Historic	
7.1 Channel Degradation				Geomorphic Rating
7.2 Channel Aggradation				Channel Evolution Model
7.3 Widening Channel				Channel Evolution Stage
7.4 Change in Planforml				Geomorphic Condition
Total Score				Stream Sensitivity

Phase 2 Segment Summary Report White River - First Branch

Stream: First Branch of the White River
Reach: M19-C
Segment Length(ft): 1,316
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW, CH - Redstart
Completion Date: 7/10/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **N end of beaver-impounded portion of wetlands on E side of Rte 110, US to confluence of trib that comes in from the W side of Rte 110 thru a culvert (just N of wetlands visible from Rte 110)**

Step 5 - Notes: **Segment appears to have had a series of stepped beaver ponds, or possibly some of human construction: several pieces of wooden structures found but use not recognizable; no records found on old maps, no sources yet located with any knowledge of what these were. Ponds appear to have drained through the bottoms of the dams (or elsewhere) as opposed to being breached; none are active in this segment, though beavers are still active in next segment downstream. Stream is incising rapidly through legacy sediments, and a headcut is migrating upstream from the location of the most upstream of these structures.**

Step 7 - Narrative: **Historic transitory beaver dams in segment, some of which appear to have drained very recently. Stream is incising through legacy sediments, one active headcut migrating upstream, but stream has not yet lost access to floodplain so no incision ratio noted.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Channel Dimensions**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	0		0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Flat
Continuous w/ Bank:	Always	Always
Within 1 Bankfull W:	Always	Always
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 175
Width Determination: Measured
Confinement Type: VB
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls: None

Stream: **First Branch of the White River** Reach: **M19-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**7.90**	2.11 Riffle/Step Spacing:	**58 ft.**	2.13 Average Largest Particle on	
2.2 Max Depth (ft.):	**2.10**	2.12 Substrate Composition		Bed:	**1.7 inches**
2.3 Mean Depth (tf):	**1.10**	Bedrock:	**%**	Bar:	**1 inches**
2.4 Floodprone Width (ft.):	**191.40**	Boulder:	**%**	2.14 Stream Type	
2.5 Aband. Floodpn (ft.):	**3.20**	Cobble:	**%**	Stream Type:	**E**
Human Elev FloodPln (ft.):		Coarse Gravel:	**%**	Bed Material:	**Sand**
2.6 Width/Depth Ratio:	**7.18**	Fine Gravel:	**20.0 %**	Subclass Slope:	**b**
2.7 Entrenchment Ratio:	**24.23**	Sand:	**80.0 %**	Bed Form:	**Riffle-Pool**
2.8 Incision Ratio:	**1.52**	Silt and Smaller:	**%**	Field Measured Slope:	
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type	
2.9 Sinuosity:	**Moderate**	Detritus:	**3.0 %**	Reference Stream Type:	
2.10 Riffles Type:	**Eroded**	# Large Woody Debris:	**14**	Reference Bed Material:	
				Reference Subclass Slope:	
				Reference Bedform:	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Undercut**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**353.2**	**327.2**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**1.8**	**1.8**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**26-50**	**26-50**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**None**	**51-100**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**	Mass Failures		
Sub-dominant	**Forest**	**Forest**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **First Branch of the White River** Reach: **M19-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**4**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**Down Stream**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**4**	Avulsion:	**1**	5.5 Straightening:	**None**
Point:	**3**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**2**	Straightening Length (ft.):	**0**
Side:	**2**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**4**	**None**	**No**	Geomorphic Rating	**0.43**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**II**
7.4 Change in Planforml		**10**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**34**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: Jones Pond Brook
Reach: T7.01-A
Segment Length(ft): 6,067
Rain: Yes

SGAT Version: 3
Organization: White River Partnership
Observers: DR, HW - Redstart
Completion Date: 8/1/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Confluence with First Branch mainstream, 0.2 mi N of Edwards Rd on Rt. 110, US to Jones Pond**

Step 5 - Notes: **Jones Pond impounds trib in next segment US, had 15 ft waterwheel set up in draw between Pond and T701. Bridge in segment is a footbridge to a cabin on opposite bank from Jones Pond. Stream historically incised to bedrock so impacts of Irene hit primarily on valley walls (multiple mass failures). Large woody debris retained a lot of sediments. 400-500 ft section of hayfields on both sides of stream (in historically shared floodplain with First Branch mainstem) were not segmented out due to short length and placement of reach break 150 ft US of the actual confluence (that 150 ft is part of the 400-500 ft).**

Step 7 - Narrative: **Major widening, planform adjustments and aggradation largely in response to Irene. Stream had opportunity to incise historically and is now at bedrock in many areas and widening; used F-model channel evolution rather than D-model.**

Step 1. Valley and Floodplain

1.1 Segmentation: Planform and Scope
1.2 Alluvial Fan: Yes
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,873	13	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	265		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 50
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		4.0	3.0		
Ledge		11.0	10.0		
Ledge		4.0	3.0		
Ledge		11.0	10.0		
Ledge		3.0	1.0		
Ledge		4.0	3.0		
Ledge		3.0	2.0		
Ledge		6.0	4.0		
Ledge		5.0	4.0		
Ledge		4.0	3.0		
Ledge		29.0	28.0		
Ledge		9.0	8.0		
Ledge		2.0	1.0		
Ledge		41.0	39.0		
Ledge		10.0	9.0		

Stream: **Jones Pond Brook** Reach: **T7.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**25.60**	2.11 Riffle/Step Spacing:	**50 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.10**	2.12 Substrate Composition		Bed:	**13.3**	**inches**
2.3 Mean Depth (tf):	**1.45**	Bedrock:	**18.0 %**	Bar:	**11.7**	**inches**
2.4 Floodprone Width (ft.):	**42.70**	Boulder:	**15.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.80**	Cobble:	**36.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**6.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**17.66**	Fine Gravel:	**6.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**1.67**	Sand:	**19.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.81**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Low**	Detritus:	**5.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**275**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**610.7**	**422.0**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.7**	**4.6**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**586.3**	**460.1**	Canopy %:	**76-100**	**76-100**
Material Type:	**Bedrock**	**Bedrock**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Cohesive**	**Cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**51-100**	**26-50**
W less than 25	**200**	**256**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Hay**	**Hay**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**15.8**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Jones Pond Brook** Reach: **T7.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**4**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**12**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Run-of-river Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bedrock Outcrops	**24**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**
Bridge	**30**	**Yes**	**Yes**	**No**	**Yes**	**Deposition Below,Scour Above,Scour Below**
Instream Culvert	**9.8**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**4**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**3**	Delta:	**0**	Flood chutes:	**17**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**22**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,606**
Side:	**19**	Braiding:	**0**	Steep Riffles:	**6**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**No**	Geomorphic Rating	**0.45**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**8**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**36**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jones Pond Brook**
Reach: **T7.01-B**
Segment Length(ft): **3,163**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW - Redstart**
Completion Date: **7/23/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Jones Pond US to blown bridge on legal trail across from 188 Edward's Rd (Old Schoolhouse Rd).**

Step 5 - Notes: **Slope= 3.2% (calculated with GIS). More sinuous than indicated by VHD streamline. Blue clay ablation till exposures present; borderline step-pool system due to slope and confinement, but used +/- 0.2 Entrenchment Ratio due to relatively high sinuosity and pockets of floodplain access on alternating sides of stream. 'Other' corridor land use for LB is recreational pond area. Trib rejuvenation likely more related to flood processes on the trib rather than responses to Jones Pond Brook processes.**

Step 7 - Narrative: **Planform change through aggradation and widening following historic incision, abetted by beaver influences US (blown ponds in Irene)**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	643	14	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	8		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features	
Valley Width (ft):	75
Width Determination:	Measured
Confinement Type:	SC
In Rock Gorge:	No
Human Caused Change in Valley Width?:	No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		5.0	3.0		
Ledge		11.0	11.0		

Stream: **Jones Pond Brook** Reach: **T7.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**19.30**	2.11 Riffle/Step Spacing:	**60 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.00**	2.12 Substrate Composition		Bed:	**7.3**	**inches**
2.3 Mean Depth (tf):	**1.48**	Bedrock:	**0.0 %**	Bar:	**6.1**	**inches**
2.4 Floodprone Width (ft.):	**41.20**	Boulder:	**5.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.50**	Cobble:	**36.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**19.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**13.04**	Fine Gravel:	**11.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**2.13**	Sand:	**29.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.75**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**5.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**215**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Undercut**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**239.0**	**311.0**	Dominant:	**Coniferous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.1**	**3.1**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**124.2**	**89.6**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**51-100**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Other**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**10.7**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Jones Pond Brook** Reach: **T7.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**1**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**18**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Up Stream**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Store-release Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Old Abutment	**6**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid: **10**	Delta:	**0**	Flood chutes:	**10**	Avulsion:	**0**	5.5 Straightening:		**None**
Point: **14**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):		**0**
Side: **24**	Braiding:	**0**	Steep Riffles:	**1**	Trib Rejuv.:	**Yes**	5.5 Dredging:		**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.46**
7.2 Channel Aggradation		**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**37**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jones Pond Brook**
Reach: **T7.01-C**
Segment Length(ft): **727**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW - Redstart**
Completion Date: **7/31/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Blown bridge abutments on legal trail across from 188 Edwards Rd. (Old Schoolhouse Rd) to US end of blown beaver dams at next sharp bend in stream**

Step 5 - Notes: **Series of beaver ponds/dams blown out in Irene, none currently intact; now primarily a single thread channel. Unclear whether beavers will reoccupy. Buffers are intact but mostly shrub-herbaceous (wetland veg)**

Step 7 - Narrative: **Aggradation, widening and planform adjustments in response to blown beaver dams. No abandoned floodplain noted, but stream may be starting to incise through legacy sediments.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Other Reason**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	357	15	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Very Steep	Very Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Sand	Sand

1.5 Valley Features
Valley Width (ft): **170**
Width Determination: **Measured**
Confinement Type: **BD**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls: **None**

Stream: **Jones Pond Brook** Reach: **T7.01-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**19.80**	2.11 Riffle/Step Spacing:	**82 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.10**	2.12 Substrate Composition		Bed:	**2.4**	**inches**
2.3 Mean Depth (tf):	**1.25**	Bedrock:	**0.0 %**	Bar:	**3.8**	**inches**
2.4 Floodprone Width (ft.):	**54.40**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**2.10**	Cobble:	**4.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**2.0 %**	Bed Material:	**Sand**	
2.6 Width/Depth Ratio:	**15.84**	Fine Gravel:	**11.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**2.75**	Sand:	**83.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.00**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**0.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**22**	Reference Bed Material:	**Sand**	
				Reference Subclass Slope:	**None**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**243.7**	**234.5**	Dominant:	**Shrubs/Sapling**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**2.8**	**3.2**	Sub-dominant:	**Herbaceous**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**26-50**	**26-50**
Material Type:	**Sand**	**Sand**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**None**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**
Sub-dominant	**None**	**None**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Jones Pond Brook** Reach: **T7.01-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Abundant**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**4**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**3**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**305**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**No**
Mid:	**1**	Delta:	**0**	Flood chutes:	**0**	Avulsion:	**0**	5.5 Straightening:	**None**
Point:	**9**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**0**
Side:	**3**	Braiding:	**1**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**No**	Geomorphic Rating	**0.47**
7.2 Channel Aggradation		**8**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**38**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jones Pond Brook**
Reach: **T7.01-D**
Segment Length(ft): **2,388**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW - Redstart**
Completion Date: **7/31/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Sharp bend US and across road from blown beaver dams at 188 Edwards Rd US to wood's edge DS of 253 Edwards Rd.**

Step 5 - Notes: **Heavy fines notably kicking up while walking stream, clouding a relatively cobbly stream. Two small ponds (0.2 ac, 0.3 ac) located on tribs feeding into this seg - one on trib in this seg, one on next seg US. Multiple motocross crossings - 3 bridges blown out (wooden plank),washed DS; none in place now so are now fords. Bobcat and mink tracks observed in soft sediments along stream edge. This section of stream clearly got humming in Irene, surprising lack of more mass failures likely due to good buffers. Irene also washed Japanese knotweed and wild chervil DS into this wooded area, number of small dispersed populations noted. Trib rejuvenation likely more about flood processes on trib itself rather than response to processes on Jones Pond Brook. VHD not highly accurate in this segment, stream more sinuous and sometimes much closer to rd than VHD indicates.**

Step 7 - Narrative: **Minor aggradation, widening and planform change in response to Irene impacts in historically reduced floodprone area.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One	Height	Both	Height
Berm:		0		0	
Road:		1,241	14	0	
Railroad:		0		0	
Imp. Path:		0		0	
Dev.:		0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **80**
Width Determination: **Measured**
Confinement Type: **NW**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls: **None**

Stream: **Jones Pond Brook** Reach: **T7.01-D**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**19.30**	2.11 Riffle/Step Spacing:	**64 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.30**	2.12 Substrate Composition		Bed:	**8.8**	**inches**
2.3 Mean Depth (tf):	**1.61**	Bedrock:	**1.0 %**	Bar:	**7.5**	**inches**
2.4 Floodprone Width (ft.):	**80.00**	Boulder:	**11.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.60**	Cobble:	**37.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**10.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.99**	Fine Gravel:	**14.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**4.15**	Sand:	**27.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.57**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**199**	Reference Bed Material:	**Gravel**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**136.1**	**100.4**	Dominant:	**Deciduous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.2**	**3.1**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**>100**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**20.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Jones Pond Brook** Reach: **T7.01-D**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**3**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**23**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**Both**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:	**Store-release Dam**	Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**5.5**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above,Deposition Below,Scour Above,Scour Below**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid: **10**	Delta:	**1**	Flood chutes: **13**	Avulsion:	**0**	5.5 Straightening:		**None**	
Point: **15**	Island:	**0**	5.3 Steep Riffles and Head Cuts	Head Cuts:	**0**	Straightening Length (ft.):		**0**	
Side: **23**	Braiding:	**2**	Steep Riffles: **0**	Trib Rejuv.:	**Yes**	5.5 Dredging:		**None**	

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**12**	**None**	**Yes**	Geomorphic Rating	**0.60**
7.2 Channel Aggradation	**12**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**12**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**12**	**None**	**No**	Geomorphic Condition	**Good**
Total Score	**48**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jones Pond Brook**
Reach: **T7.01-E**
Segment Length(ft): **806**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW - Redstart**
Completion Date: **7/31/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Woods edge DS of 253 Edwards Rd. to ford behind house at 253 Edwards Rd.**

Step 5 - Notes: **Very unusual segment of stream - channel is exceedingly narrow, often only 1- 2 ft wide, and occasionally nearly disappears beneath slumped banks; no obvious levees along sides to help determine true bankfull width. May be altered wetland ditched around former barnyard; barn was removed sometime during late 2011 or early 2012, and late March 2012 color aerials indicate it was likely burned (later verified by Volunteer Fire Department, who used the burn for a training exercise). Vegetation heavily dominated by reed canary grass and wild chervil. Floodplain appears to have been quickly and easily accessed in Irene.**

Step 7 - Narrative: **minor to major planform change and widening following historic channel alteration (ditching). Dense herbaceous veg (reed canary grass esp.) restricts channel evolution to some degree.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	380	6	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	127		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Flat	Flat
Continuous w/ Bank:	Always	Always
Within 1 Bankfull W:	Always	Always
Texture:	Sand	Sand

1.5 Valley Features

Valley Width (ft): **200**
Width Determination: **Measured**
Confinement Type: **VB**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls: **None**

Stream: **Jones Pond Brook** Reach: **T7.01-E**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**7.50**	2.11 Riffle/Step Spacing:	**45 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.20**	2.12 Substrate Composition		Bed:	**2.9**	**inches**
2.3 Mean Depth (tf):	**1.09**	Bedrock:	**0.0 %**	Bar:	**2.25**	**inches**
2.4 Floodprone Width (ft.):	**170.00**	Boulder:	**0.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**2.20**	Cobble:	**15.0 %**	Stream Type:	**E**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**12.0 %**	Bed Material:	**Sand**	
2.6 Width/Depth Ratio:	**6.88**	Fine Gravel:	**16.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**22.67**	Sand:	**57.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.00**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**0.0 %**	Reference Stream Type:	**E**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**0**	Reference Bed Material:	**Sand**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Shallow**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**16.1**	**30.5**	Dominant:	**Herbaceous**	**Herbaceous**
Material Type:	**Sand**	**Sand**	Erosion Height (ft.):	**2.0**	**2.0**	Sub-dominant:	**Invasives**	**Invasives**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**None**	**None**	Bank Canopy		
Lower			Revetment Length:	**0.0**	**0.0**	Canopy %:	**1-25**	**1-25**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Open**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**0-25**	**0-25**
Sub-Dominant	**26-50**	**26-50**
W less than 25	**179**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Shrubs/Sapling**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Pasture**	**Pasture**
Sub-dominant	**Shrubs/Sapling**	**Hay**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Jones Pond Brook** Reach: **T7.01-E**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Low**	Impoundments:		Other:	Tile Drain:
4.4 # of Debris Jams:	**4**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:	**None**	Affected Length (ft):	**0**

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**2**	Delta:	**1**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**9**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**476**
Side:	**10**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**12**	**None**	**Yes**	Geomorphic Rating	**0.64**
7.2 Channel Aggradation		**15**	**None**	**No**	Channel Evolution Model	**D**
7.3 Widening Channel		**12**	**None**	**No**	Channel Evolution Stage	**IIc**
7.4 Change in Planforml		**12**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**51**			Stream Sensitivity	**Extreme**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Jones Pond Brook**
Reach: **T7.01-F**
Segment Length(ft): **804**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW - Redstart**
Completion Date: **7/19/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Ford behind 253 Edwards Rd to 300' US of Williamstown Rd.**

Step 5 - Notes: **Longstanding confinement by road and driveway, two culverts in short segment. Slope flattens a bit in this segment from run of ledge grade controls shortly US but is still relatively steep; GIS calc indicates >7 pct. Field observations indicate that slope flattens beneath most US culvert (perched cascade), and there is likely some error in the GIS calculation of slope (stream mapped further from road than observed in the field, placing uplsope reach point at higher elevation in GIS, and segment is more sinuous than VHD shows and actually closer to 900 ft). Still likely that this seg is >5 pct slope overall.**

Step 7 - Narrative: **Minor aggradation and planform adjustments following historic incision due to floodplain encroachments and channel constriction (road and culverts). Appears aggradation may have offset some of the historic incision.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	571	8	174	8
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	210		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **50**
Width Determination: **Measured**
Confinement Type: **SC**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls: **None**

Stream: **Jones Pond Brook** Reach: **T7.01-F**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**14.40**	2.11 Riffle/Step Spacing:	**35 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**1.45**	2.12 Substrate Composition		Bed:	**9.7**	**inches**
2.3 Mean Depth (tf):	**0.79**	Bedrock:	**0.0 %**	Bar:	**6.1**	**inches**
2.4 Floodprone Width (ft.):	**35.90**	Boulder:	**9.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**1.65**	Cobble:	**32.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**17.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**18.23**	Fine Gravel:	**14.0 %**	Subclass Slope:	**a**	
2.7 Entrenchment Ratio:	**2.49**	Sand:	**28.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.14**	Silt and Smaller:	**%**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**0.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**10**	Reference Bed Material:	**Cobble**	
				Reference Subclass Slope:	**a**	
				Reference Bedform:	**Step-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**19.8**	**25.4**	Dominant:	**Shrubs/Sapling**	**Herbaceous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**2.0**	**2.0**	Sub-dominant:	**Herbaceous**	**Deciduous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**None**	Bank Canopy		
Lower			Revetment Length:	**62.6**	**0.0**	Canopy %:	**51-75**	**51-75**
Material Type:	**Mix**	**Mix**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**51-100**
Sub-Dominant	**None**	**26-50**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Herbaceous**	**Herbaceous**
Sub-Dominant	**Shrubs/Sapling**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Residential**	**Forest**
Sub-dominant	**None**	**Residential**
(Legacy)	Amount	Mean Hieght
Failures	**None**	
Gullies	**None**	

	Left	Right
Mass Failures		
Height		
Gullies Number	**0**	
Gullies Length	**0**	

Stream: **Jones Pond Brook** Reach: **T7.01-F**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Low**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**6**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above**
Instream Culvert	**3.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**0**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**10**	Delta:	**0**	Flood chutes:	**1**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**10**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**544**
Side:	**10**	Braiding:	**0**	Steep Riffles:	**0**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**11**	**None**	**Yes**	Geomorphic Rating	**0.57**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**13**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**11**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**46**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Cram Brook**
Reach: **T3.01-0**
Segment Length(ft): **6,982**
Rain: **Yes**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, HW-Redstart**
Completion Date: **5/23/2013**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Along East Randolph Road from Rt 110 to Brook Rd**

Step 5 - Notes: **Mostly narrow valley with occasional pinch points (as low as 70 ft), which are commonly bridge or culvert crossings, and alternating intermittent pockets of wider valley. Farm fields at base of reach situated on likely alluvial fan on one corner of northern extent of "First Branch arm" of glacial Lake Hitchcock, a kame terrace largely comprised of sands. Stream has historically incised deeply through these sands, is pinned to LVW and functions in diminished floodplain so was not segmented out. Hard turn to LB just US of farm is at a knoll that is an unusual feature forming an effective valley wall at this point in time (10 ft HAW, drops to 6-7 ft HAW shortly DS), may be composed of less erodible materials than the surrounding sands through which the stream has eroded historically. Stream diverges from VHD mapping (by 200 ft plus, toward the LVW) on US end of this fan, ~900-1000 ft US of the base of the reach - indicative of ability of debris jams and/or sediment plugs to shift stream from side to side in this valley, leaving evidence of old channels and/or flood chutes on opposite sides. Berm on right bank in midsection of reach is mostly remains of bark and tailings from former Meadowbrook Lumber yard pushed to one side and could potentially provide some floodplain access if cuffed out (not clear how restrictive these tailings are).**

Step 7 - Narrative: **major planform change with minor aggradation and widening following historic incision; old channels visible on both sides of valley outside current channel location**

Step 1. Valley and Floodplain

1.1 Segmentation: **None**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	149	7	0	
Road:	417	9	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	1,306		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **150**
Width Determination: **Measured**
Confinement Type: **NW**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **Yes**

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		8.0	3.0		
Ledge		3.0	1.0		
Ledge		6.0	5.0		
Ledge		4.0	0.0		
Ledge		3.0	0.0		
Ledge		2.0	0.0		

Stream: **Cram Brook** Reach: **T3.01-0**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**31.50**	2.11 Riffle/Step Spacing:	**34.4 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**3.00**	2.12 Substrate Composition		Bed:	**8.3**	**inches**
2.3 Mean Depth (tf):	**2.19**	Bedrock:	**0.0 %**	Bar:	**7.7**	**inches**
2.4 Floodprone Width (ft.):	**181.50**	Boulder:	**10.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.20**	Cobble:	**37.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**23.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**14.38**	Fine Gravel:	**10.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**5.76**	Sand:	**20.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.40**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**3.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**149**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**745.2**	**886.7**	Dominant:	**Deciduous**	**Deciduous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.2**	**4.4**	Sub-dominant:	**Coniferous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**590.8**	**521.2**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**51-100**
Sub-Dominant	**51-100**	**>100**
W less than 25	**82**	**84**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**Pasture**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**None**		Gullies Length	**0**	
Gullies	**None**				

Stream: **Cram Brook** Reach: **T3.01-0**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs	**None**
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	Road Ditch:
4.3 Flow Status:	**Moderate**	Impoundments:	**None**	Other:	Tile Drain:
4.4 # of Debris Jams:	**11**	Impoundment Loc.:		Overland Flow:	Urb Strm Wtr Pipe:
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:	**0**
		(old) Upstrm Flow Reg.:		Affected Length (ft):	**0**

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**40**	**Yes**	**Yes**	**No**	**Yes**	**Deposition Above,Scour Below**
Bridge	**19.5**	**Yes**	**Yes**	**Yes**	**No**	**Deposition Above**
Bridge	**16.2**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Scour Above,Scour Below,Alignment**
Bridge	**37**	**Yes**	**Yes**	**No**	**Yes**	**Deposition Above,Deposition Below,Scour Below**
Instream Culvert	**11.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**9**	5.2 Other Features		Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**
Mid:	**8**	Delta:	**0**	Flood chutes:	**17**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**17**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**2,115**
Side:	**17**	Braiding:	**0**	Steep Riffles:	**7**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**15**	**None**	**Yes**	Geomorphic Rating	**0.59**
7.2 Channel Aggradation		**11**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**13**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**8**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**47**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: Dickerman Brook
Reach: T2.01-A
Segment Length(ft): 1,086
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/19/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Confluence with First Branch Mainstem upstream to just upstream of the island at 20 Dickerman Hill Rd.**

Step 5 - Notes: **Downstream end of Dickerman Hill Rd. rip-rapped heavily previous to Irene (2009); bridge area likely "cleaned out" at that time. Base of reach at confluence with First Branch Mainstem was windrowed post Irene (2011). Though these alterations may contribute to reduced sinuosity, it appears that slope and confinement also contribute to reduced sinuosity; have thus used +/-2 w/d ratio 'fudge factor' to class as C-type stream (current w/d of 11.4 is within range of E-type stream). Segment is on a likely glacial alluvial fan, though current valley is more entrenched; believe degree of entrenchment is more post-glacial than historical.**

Step 7 - Narrative: **Major planform adjustments and widening, with major to minor aggradation, following historic incision. 15 ft wall of riprap placed on RB along base of Dickerman Rd following flood damage within last decade. Segment is on likely glacial alluvial fan, though current valley is more entrenched; used +/-2w/d 'fudge factor' to class as C-type stream due to low sinuosity for an E-type stream. Reduced sinuosity likely due in part to slope as well as entrenchment.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **Yes**
1.3 Corridor Encroachments:

	Length (ft)	One Height	Both	Height
Berm:	0		0	
Road:	230	25	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	586		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Always	Sometimes
Texture:	Sand	Mixed

1.5 Valley Features
Valley Width (ft): 200
Width Determination: Estimated
Confinement Type: BD
In Rock Gorge: No
Human Caused Change in Valley Width?: No

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	0.0		
Ledge		3.0	1.0		
Ledge		6.0	4.0		

Stream: **Dickerman Brook** Reach: **T2.01-A**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**23.70**	2.11 Riffle/Step Spacing:	**40.8 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.90**	2.12 Substrate Composition		Bed:	**7.5**	**inches**
2.3 Mean Depth (tf):	**2.08**	Bedrock:	**4.0 %**	Bar:	**7.4**	**inches**
2.4 Floodprone Width (ft.):	**93.30**	Boulder:	**4.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**4.00**	Cobble:	**32.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**12.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**11.39**	Fine Gravel:	**12.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**3.94**	Sand:	**36.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.38**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**No**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**19**	Reference Bed Material:	**Gravel**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Steep**

Bank Texture			Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper	Left	Right	Erosion Length (ft.):	**105.9**	**72.0**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Sand**	**Mix**	Erosion Height (ft.):	**3.0**	**4.6**	Sub-dominant:	**Shrubs/Sapling**	**Shrubs/Sapling**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**140.0**	**155.1**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**0-25**	**0-25**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**Residential**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**One**	**12.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Dickerman Brook** Reach: **T2.01-A**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Minimal**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**None**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**2**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Bridge	**15.3**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**1**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**3**	Delta:	**1**	Flood chutes:	**2**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**4**	Island:	**1**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**294**
Side:	**7**	Braiding:	**1**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic		
7.1 Channel Degradation	**10**	**None**	**Yes**	Geomorphic Rating	**0.45**
7.2 Channel Aggradation	**10**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel	**9**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml	**7**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score	**36**			Stream Sensitivity	**Very High**

Phase 2 Segment Summary Report White River - First Branch

Stream: Dickerman Brook
Reach: T2.01-B
Segment Length(ft): 4,350
Rain: No

SGAT Version: 3
Organization: White River Partnership
Observers: DR, AS- Redstart
Completion Date: 11/15/2012
Qualtiy Control Status - Consultant: Passed
Qualtiy Control Status - Staff: Provisional

Step 0 - Location: **Just upstream of island at 20 Dickerman Hill Rd. upstream to culvert S of 98 Dickerman Hill Rd.**

Step 5 - Notes: **Slope is actually 5.4% (subslope a, GIS calc.) but a large percentage of elevation change is concentrated at one waterfall and two other relatively short but steep runs of ledge, so it was given a b subslope. Unusual design of poured concrete bridge, with bend in the middle. Mass failure not that far from structures on LB at 98 Dickerman.**

Step 7 - Narrative: **Major widening and planform adjustments following historic incision, primarily due to extensive road encroachment; multiple bridge and road repairs.**

Step 1. Valley and Floodplain

1.1 Segmentation: **Planform and Scope**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,491	7	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	225		0	

1.4 Adjacent Side	Left	Right
Hillside Slope:	Extr.Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): 100
Width Determination: Measured
Confinement Type: SC
In Rock Gorge: No
Human Caused Change in Valley Width?: Yes

1.6 Grade Controls:

Type	Location	Total Height	Total Height Above Water	Photo Taken?	GPS Taken?
Ledge		3.0	1.0		
Ledge		9.0	7.0		
Ledge		13.0	11.0		
Ledge		4.0	3.0		
Waterfall		18.0	16.0		
Ledge		5.0	4.0		
Ledge		6.0	4.0		

Stream: **Dickerman Brook** Reach: **T2.01-B**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**25.00**	2.11 Riffle/Step Spacing:	**18.9 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.40**	2.12 Substrate Composition		Bed:	**8.3**	**inches**
2.3 Mean Depth (tf):	**1.64**	Bedrock:	**0.0 %**	Bar:	**6.7**	**inches**
2.4 Floodprone Width (ft.):	**45.80**	Boulder:	**11.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.30**	Cobble:	**47.0 %**	Stream Type:	**B**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**9.0 %**	Bed Material:	**Cobble**	
2.6 Width/Depth Ratio:	**15.24**	Fine Gravel:	**13.0 %**	Subclass Slope:	**None**	
2.7 Entrenchment Ratio:	**1.83**	Sand:	**20.0 %**	Bed Form:	**Step-Pool**	
2.8 Incision Ratio:	**1.37**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:		
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**220**	Reference Bed Material:		
				Reference Subclass Slope:		
				Reference Bedform:		

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Undercut**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**493.6**	**456.0**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**3.8**	**4.8**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**Rip-Rap**	Bank Canopy		
Lower			Revetment Length:	**376.9**	**100.3**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**>100**	**>100**
Sub-Dominant	**0-25**	**26-50**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**Residential**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**14.0**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Dickerman Brook** Reach: **T2.01-B**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**10**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**7**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**1**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions:

Type	Width	Photo Taken?	GPS Taken?	Channel Constriction?	Floodprone Constriction?	Problems
Instream Culvert	**12**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Instream Culvert	**12.5**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Scour Below,Alignment**
Bridge	**7.8**	**Yes**	**Yes**	**Yes**	**Yes**	**Deposition Above,Deposition Below,Scour Above,Alignment**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**7**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:		**Yes**	
Mid:	**8**	Delta:	**1**	Flood chutes:	**20**	Avulsion:	**0**	5.5 Straightening:	**Straightening**
Point:	**15**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**1,765**
Side:	**11**	Braiding:	**0**	Steep Riffles:	**2**	Trib Rejuv.:	**No**	5.5 Dredging:	**None**

Step 6. Rapid Habitat Assessment Data

6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

Step 7. Rapid Geomorphic Assessment Data

Confinement Type	**Confined**	Score	STD	Historic		
7.1 Channel Degradation		**10**	**None**	**Yes**	Geomorphic Rating	**0.40**
7.2 Channel Aggradation		**9**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**7**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**6**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**32**			Stream Sensitivity	**High**

Phase 2 Segment Summary Report White River - First Branch

Stream: **Dickerman Brook**
Reach: **T2.01-C**
Segment Length(ft): **1,208**
Rain: **No**

SGAT Version: **3**
Organization: **White River Partnership**
Observers: **DR, AS- Redstart**
Completion Date: **11/14/2012**
Qualtiy Control Status - Consultant: **Passed**
Qualtiy Control Status - Staff: **Provisional**

Step 0 - Location: **Just US of culvert S of 98 Dickerman Hill Rd. upstream to ~400' S of 129 Dickerman Hill Rd. (Reach start)**

Step 5 - Notes: **Channel avulsion in the upstream section has left a dry channel alongside road; limited dredging in reach was one landowner- DJ cut and cleared, channel dredged/reshaped likely in hopes of preventing future flood damage to his property across road. Trib rejuvenation likely related more to flood response on trib than response to processes on this stream.**

Step 7 - Narrative: **Minor to major planform adjustments and widening following historic incision. Limited opportunistic dredging in US portion of segment post-Irene, relatively recent channel avulsion evident in US portion of segment as well**

Step 1. Valley and Floodplain

1.1 Segmentation: **Valley Width**
1.2 Alluvial Fan: **None**
1.3 Corridor Encroachments:

Length (ft)	One	Height	Both	Height
Berm:	0		0	
Road:	1,097	7	0	
Railroad:	0		0	
Imp. Path:	0		0	
Dev.:	0		0	

1.4 Adjacent Side

	Left	Right
Hillside Slope:	Steep	Extr.Steep
Continuous w/ Bank:	Sometimes	Sometimes
Within 1 Bankfull W:	Sometimes	Sometimes
Texture:	Mixed	Mixed

1.5 Valley Features
Valley Width (ft): **150**
Width Determination: **Measured**
Confinement Type: **NW**
In Rock Gorge: **No**
Human Caused Change in Valley Width?: **No**

1.6 Grade Controls: **None**

Stream: **Dickerman Brook** Reach: **T2.01-C**

Step 2. Stream Channel

2.1Bankfull Width (ft.):	**21.80**	2.11 Riffle/Step Spacing:	**27 ft.**	2.13 Average Largest Particle on		
2.2 Max Depth (ft.):	**2.25**	2.12 Substrate Composition		Bed:	**7.2**	**inches**
2.3 Mean Depth (tf):	**1.46**	Bedrock:	**0.0 %**	Bar:	**6**	**inches**
2.4 Floodprone Width (ft.):	**39.20**	Boulder:	**9.0 %**	2.14 Stream Type		
2.5 Aband. Floodpn (ft.):	**3.40**	Cobble:	**30.0 %**	Stream Type:	**C**	
Human Elev FloodPln (ft.):		Coarse Gravel:	**22.0 %**	Bed Material:	**Gravel**	
2.6 Width/Depth Ratio:	**14.93**	Fine Gravel:	**3.0 %**	Subclass Slope:	**b**	
2.7 Entrenchment Ratio:	**1.80**	Sand:	**36.0 %**	Bed Form:	**Riffle-Pool**	
2.8 Incision Ratio:	**1.51**	Silt and Smaller:	**0.0 %**	Field Measured Slope:		
Human Elevated Inc. Rat.:	**0.00**	Silt/Clay Present:	**Yes**	2.15 Sub-reach Stream Type		
2.9 Sinuosity:	**Moderate**	Detritus:	**10.0 %**	Reference Stream Type:	**C**	
2.10 Riffles Type:	**Sedimented**	# Large Woody Debris:	**85**	Reference Bed Material:	**Gravel**	
				Reference Subclass Slope:	**b**	
				Reference Bedform:	**Riffle-Pool**	

Step 3. Riparian Features

3.1 Stream Banks — Typical Bank Slope: **Undercut**

Bank Texture	Left	Right	Bank Erosion	Left	Right	Near Bank Vegetation Type	Left	Right
Upper			Erosion Length (ft.):	**417.5**	**238.4**	Dominant:	**Coniferous**	**Coniferous**
Material Type:	**Mix**	**Mix**	Erosion Height (ft.):	**4.2**	**3.9**	Sub-dominant:	**Herbaceous**	**Herbaceous**
Consistency:	**Non-cohesive**	**Non-cohesive**	Revetment Type:	**Rip-Rap**	**None**	Bank Canopy		
Lower			Revetment Length:	**175.1**	**0.0**	Canopy %:	**76-100**	**76-100**
Material Type:	**Boulder/Cobble**	**Boulder/Cobble**				Mid-Channel Canopy:	**Closed**	
Consistency:	**Non-cohesive**	**Non-cohesive**						

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**51-100**	**>100**
Sub-Dominant	**0-25**	**None**
W less than 25	**0**	**0**
Buffer Vegitation Type		
Dominant	**Mixed Trees**	**Mixed Trees**
Sub-Dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right		Left	Right
Dominant	**Forest**	**Forest**	Mass Failures		
Sub-dominant	**Residential**	**None**	Height		
(Legacy)	Amount	Mean Hieght	Gullies Number	**0**	
Failures	**Multiple**	**12.5**	Gullies Length	**0**	
Gullies	**None**				

Stream: **Dickerman Brook** Reach: **T2.01-C**

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps:	**Abundant**	4.5 Flow Regulation Type	**None**	4.7 Stormwater Inputs			
4.2 Adjacent Wetlands:	**Minimal**	Flow Reg. Use:		Field Ditch:	**0**	Road Ditch:	**1**
4.3 Flow Status:	**Moderate**	Impoundments:		Other:	**0**	Tile Drain:	**0**
4.4 # of Debris Jams:	**6**	Impoundment Loc.:		Overland Flow:	**0**	Urb Strm Wtr Pipe:	**0**
		4.6 Up/Down Strm flow reg.:	**None**	4.9 # of Beaver Dams:		**0**	
		(old) Upstrm Flow Reg.:		Affected Length (ft):		**0**	

4.8 Channel Constrictions: **None**

Step 5. Channel Bed and Planform Changes

5.1 Bar Types	Diagonal:	**3**	5.2 Other Features	Neck Cutoff:	**0**	5.4 Stream Ford or Animal Crossing:	**No**		
Mid:	**3**	Delta:	**0**	Flood chutes:	**8**	Avulsion:	**1**	5.5 Straightening:	**With Windrowing**
Point:	**7**	Island:	**0**	5.3 Steep Riffles and Head Cuts		Head Cuts:	**0**	Straightening Length (ft.):	**638**
Side:	**6**	Braiding:	**0**	Steep Riffles:	**3**	Trib Rejuv.:	**Yes**	5.5 Dredging:	**Dredging**

Step 6. Rapid Habitat Assessment Data

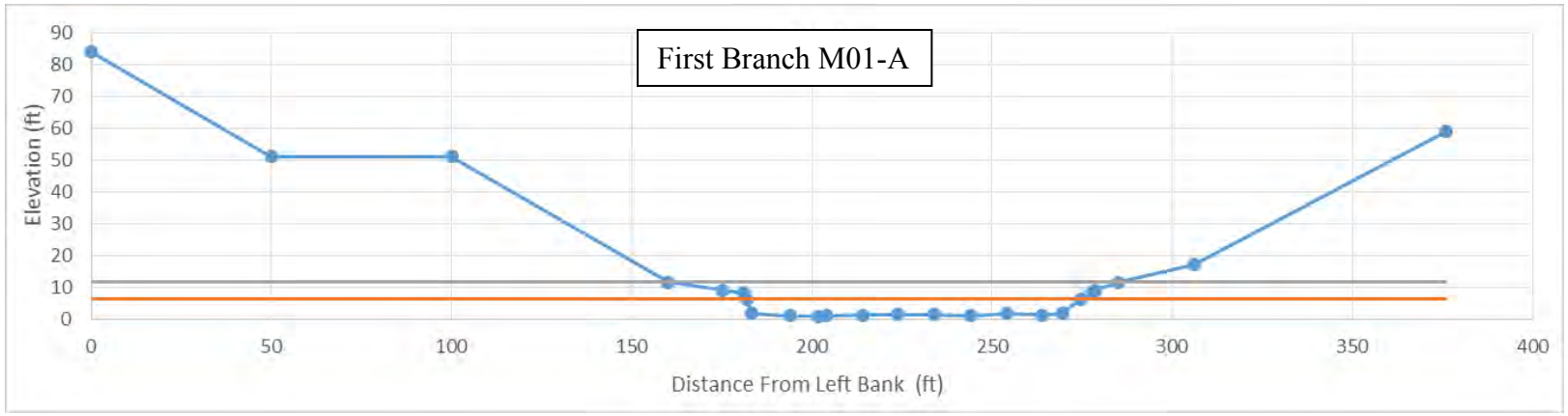
6.1 Epifaunal Substrate - Avl.:		6.4 Sediment Deposition:		Stream Gradiant Type	Left Right
6.2 Pool Substrate:		6.5 Channel Flow Status:		6.8 Bank Stability:	
6.3 Pool Variability:		6.6 Channel Alteration:		6.9 Bank Vegetation Protection	
Total Score:	**0**	6.7 Channel Sinuosity:		6.10 Riparian Veg. Zone Width:	
Habitat Rating:	**0.00**				
Habitat Stream Condition:					

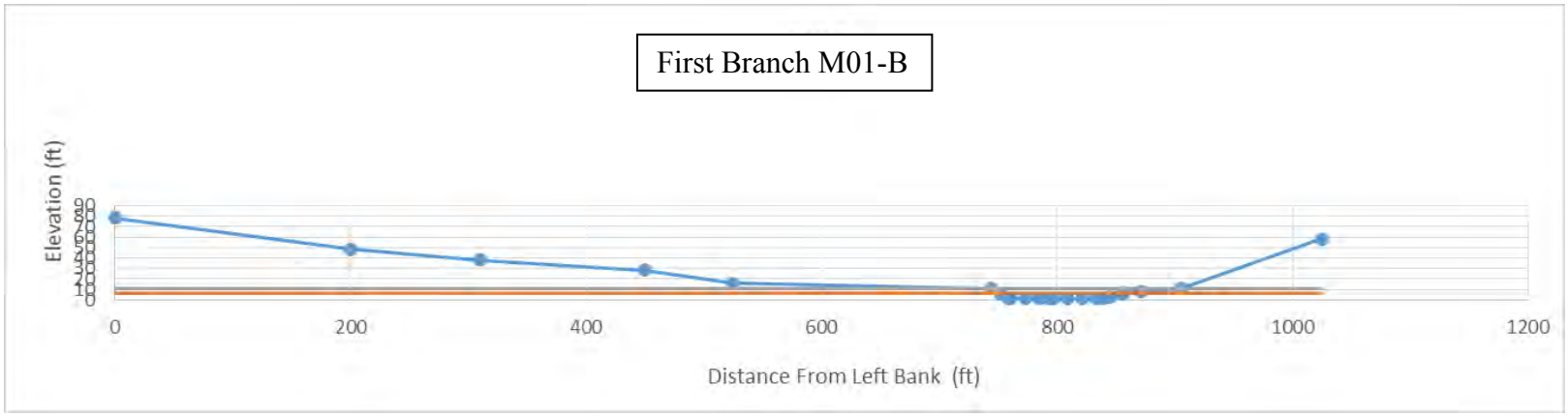
Step 7. Rapid Geomorphic Assessment Data

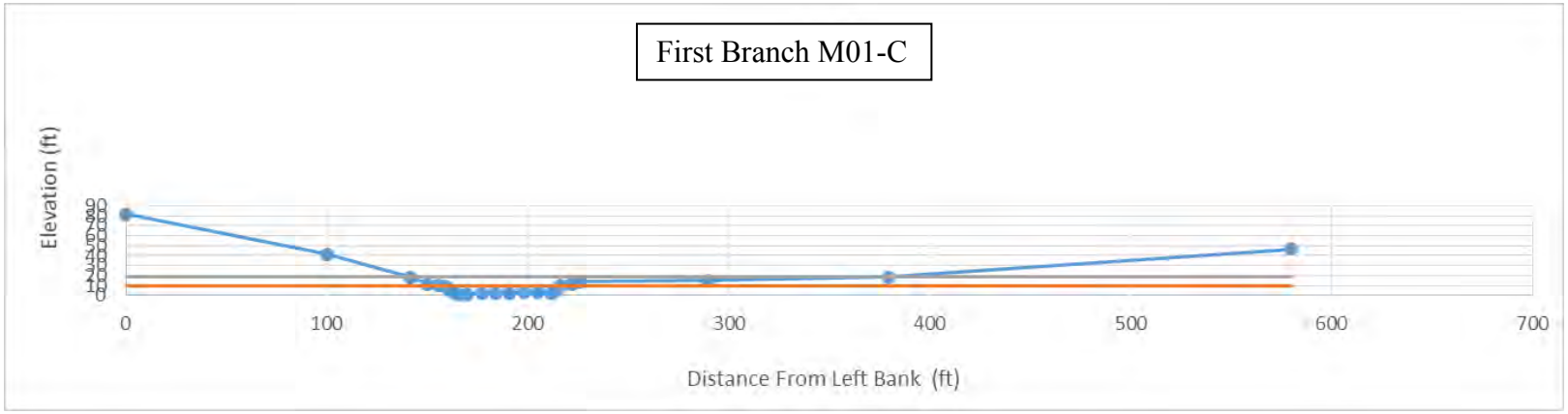
Confinement Type	**Unconfined**	Score	STD	Historic		
7.1 Channel Degradation		**9**	**None**	**Yes**	Geomorphic Rating	**0.51**
7.2 Channel Aggradation		**13**	**None**	**No**	Channel Evolution Model	**F**
7.3 Widening Channel		**10**	**None**	**No**	Channel Evolution Stage	**III**
7.4 Change in Planforml		**9**	**None**	**No**	Geomorphic Condition	**Fair**
Total Score		**41**			Stream Sensitivity	**Very High**

– Appendix 4 –

Phase II Cross-section data


First Branch M01-A
Elevation (ft)
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)


First Branch M01-B
Elevation (ft)
0
200
400
600
800
1000
1200
Distance From Left Bank (ft)


First Branch M01-C
Elevation (ft)
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100
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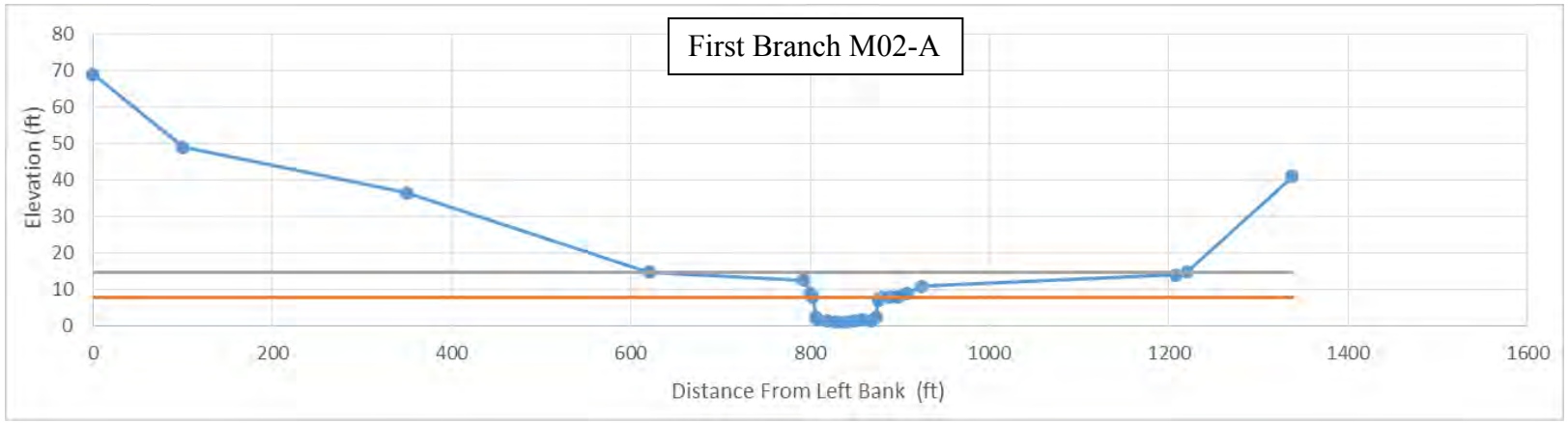
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M02-A
Elevation (ft)
80
70
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30
20
10
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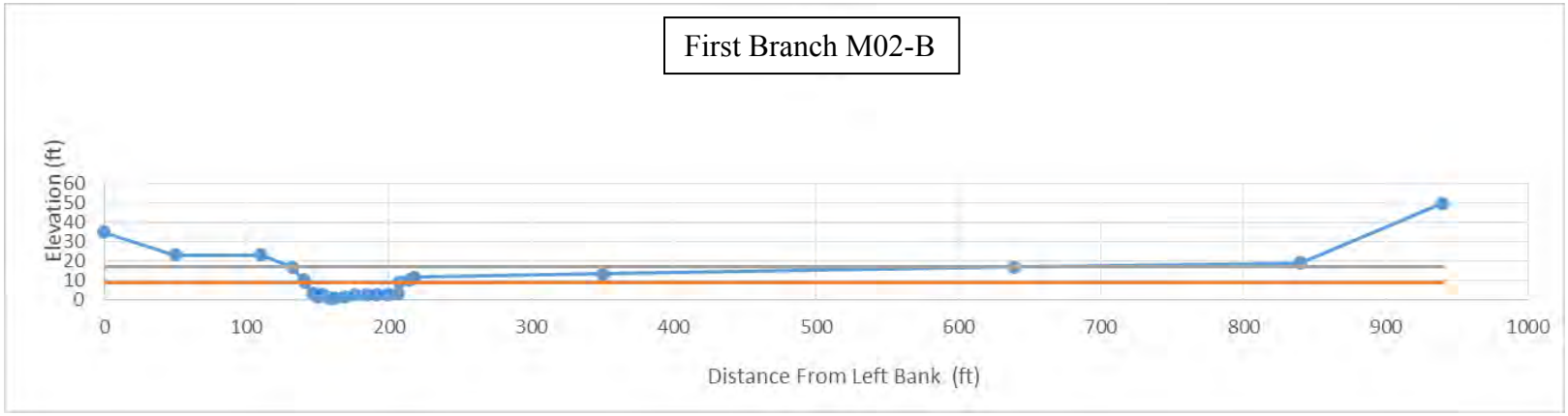
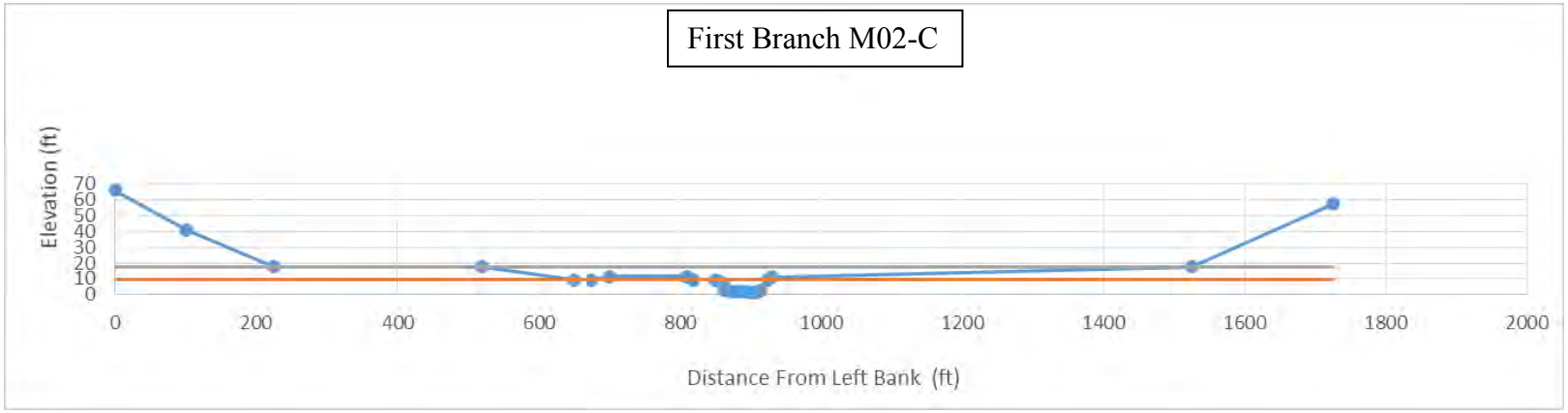
0
200
400
600
800
1000
1200
1400
1600
Distance From Left Bank (ft)


First Branch M02-B
Elevation (ft)
60
50
40
30
20
10
0
0
100
200
300
400
500
600
700
800
900
1000
Distance From Left Bank (ft)


First Branch M02-C
Elevation (ft)
70
60
50
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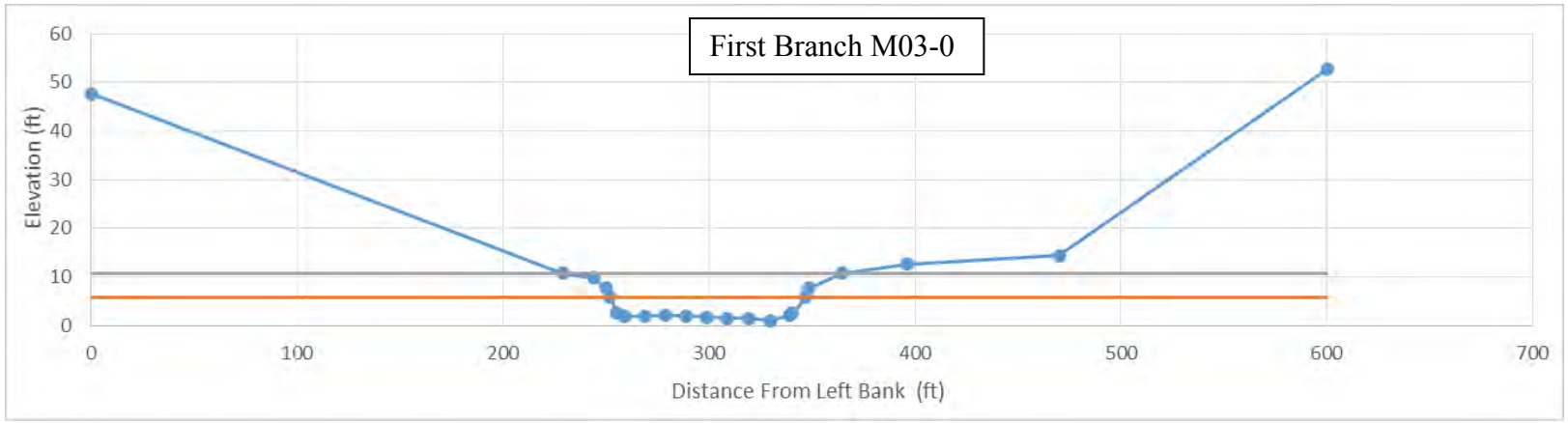
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Distance From Left Bank (ft)


First Branch M03-0
Elevation (ft)
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10
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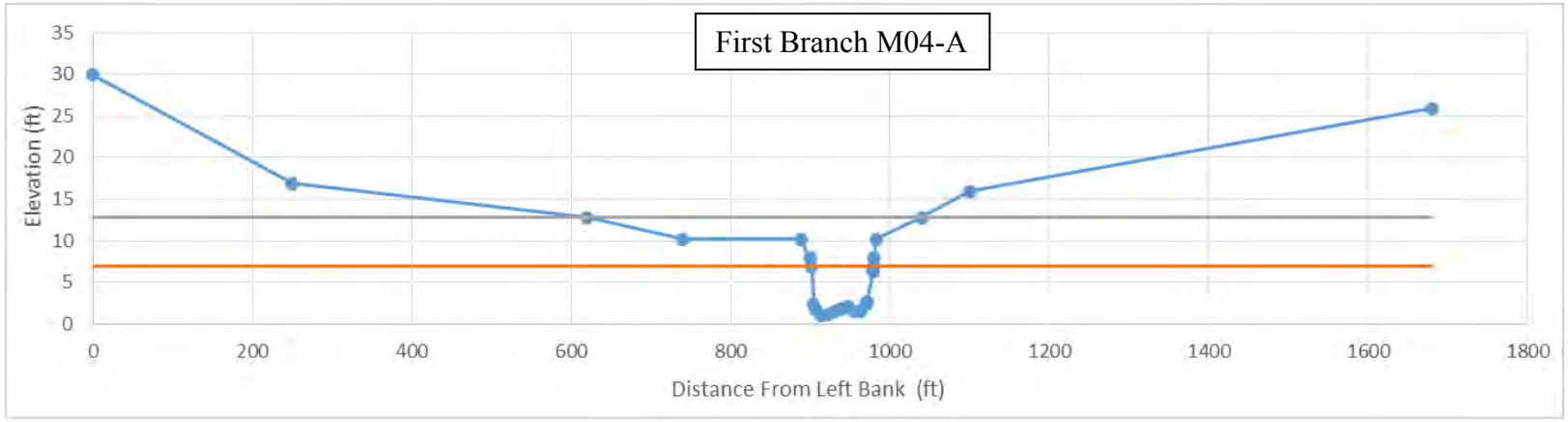
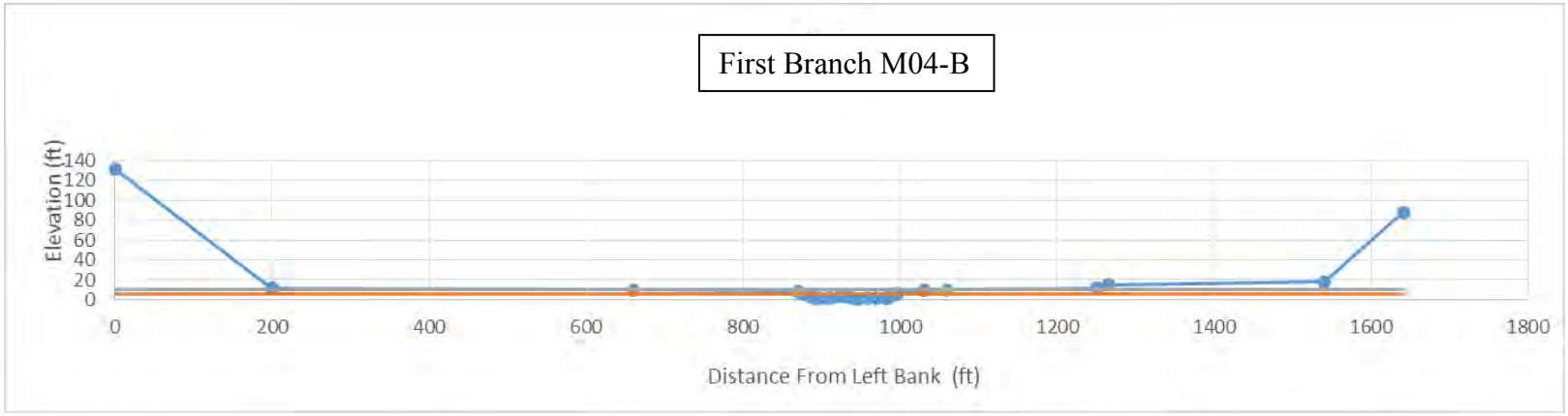
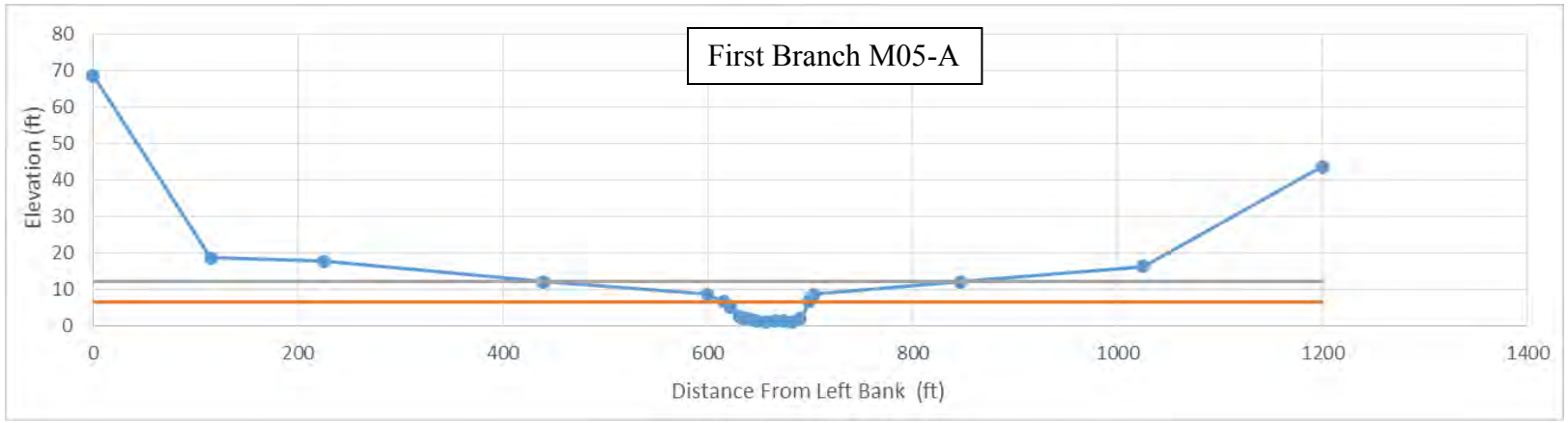
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M04-A
Elevation (ft)
35
30
25
20
15
10
5
0
0
200
400
600
800
1000
1200
1400
1600
1800
Distance From Left Bank (ft)


First Branch M04-B
Elevation (ft)
140
120
100
80
60
40
20
0
0
200
400
600
800
1000
1200
1400
1600
1800
Distance From Left Bank (ft)


First Branch M05-A
Elevation (ft)
80
70
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50
40
30
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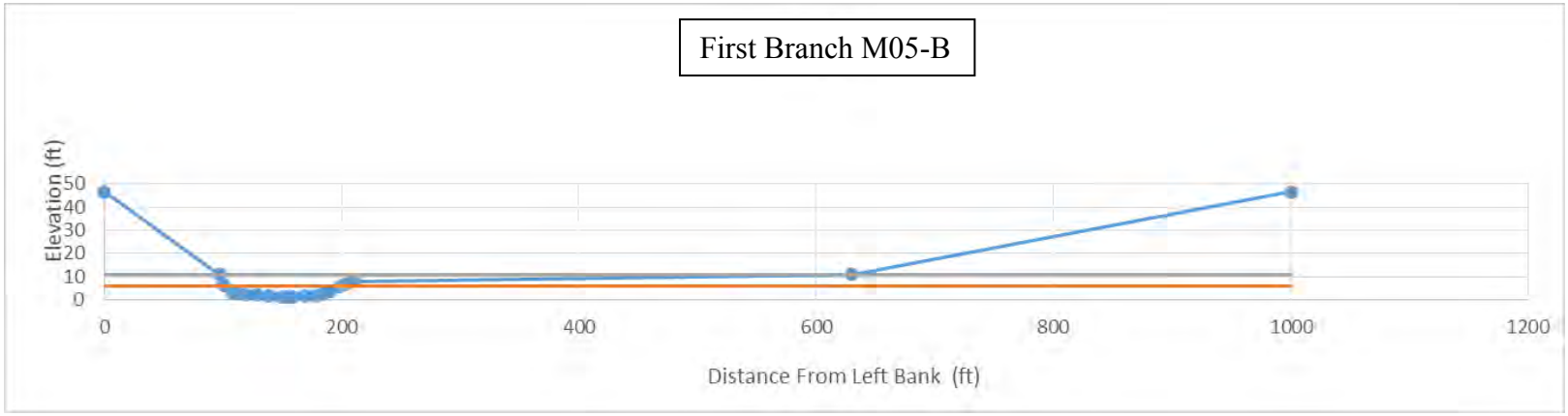
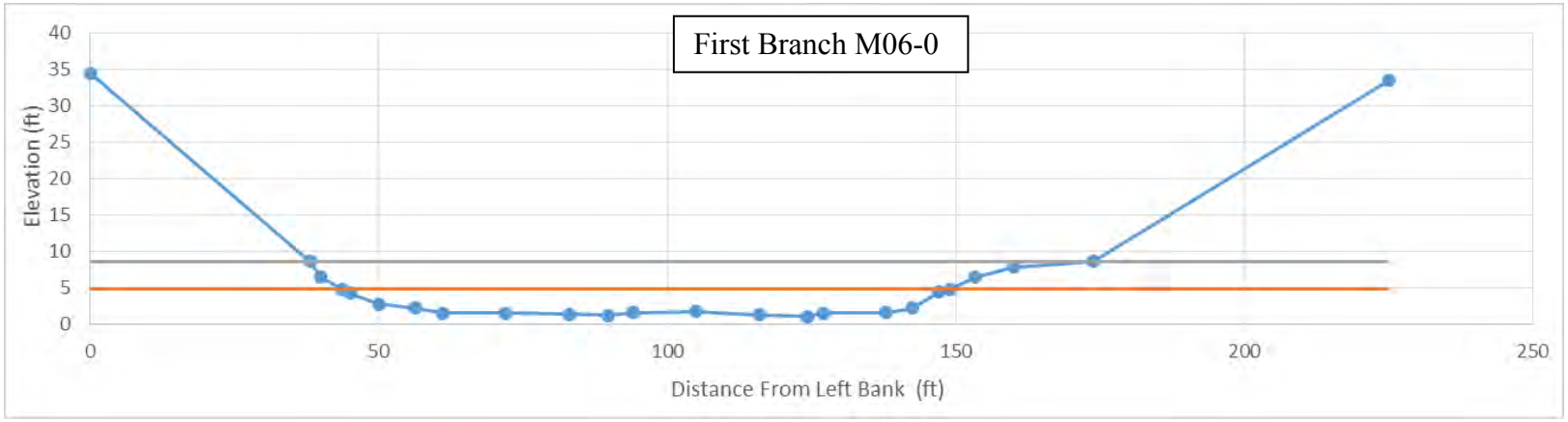
10
0
0
200
400
600
800
1000
1200
1400
Distance From Left Bank (ft)


First Branch M05-B
Elevation (ft)
50
40
30
20
10
0
0
200
400
600
800
1000
1200
Distance From Left Bank (ft)


First Branch M06-0
Elevation (ft)
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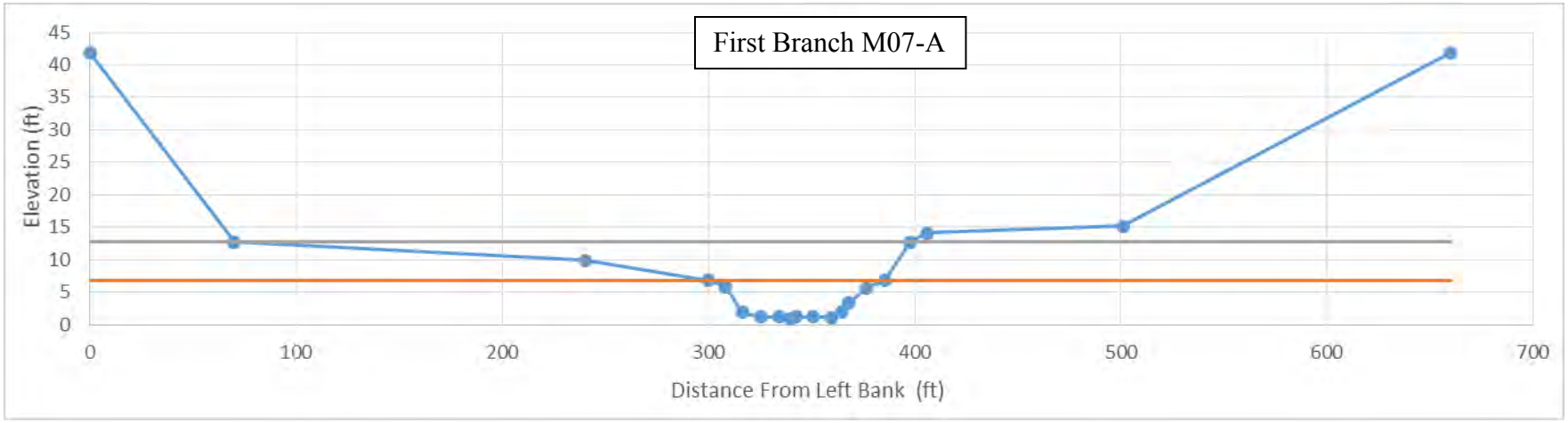
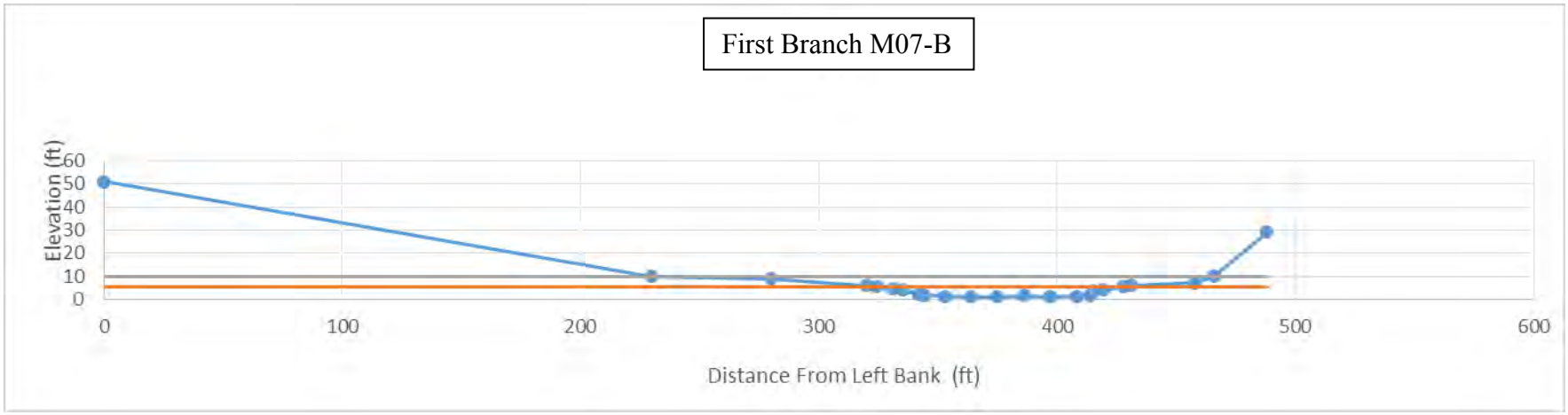
35
30
25
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)


First Branch M07-A
Elevation (ft)
45
40
35
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M07-B
Elevation (ft)
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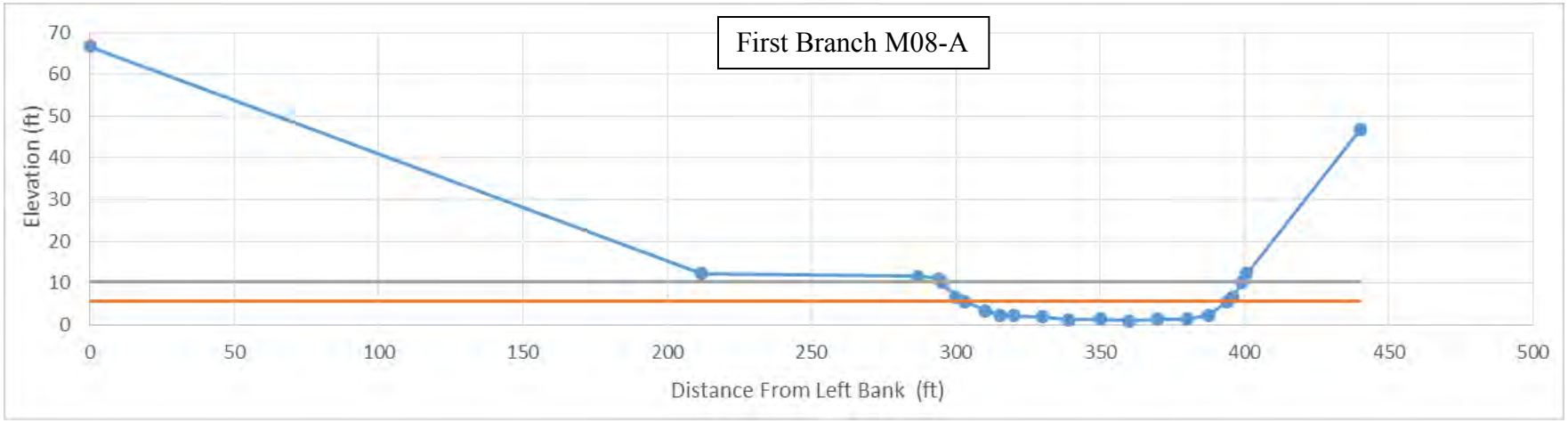
40
30
20
10
0
0
100
200
300
400
500
600
Distance From Left Bank (ft)


First Branch M08-A
Elevation (ft)
70
60
50
40
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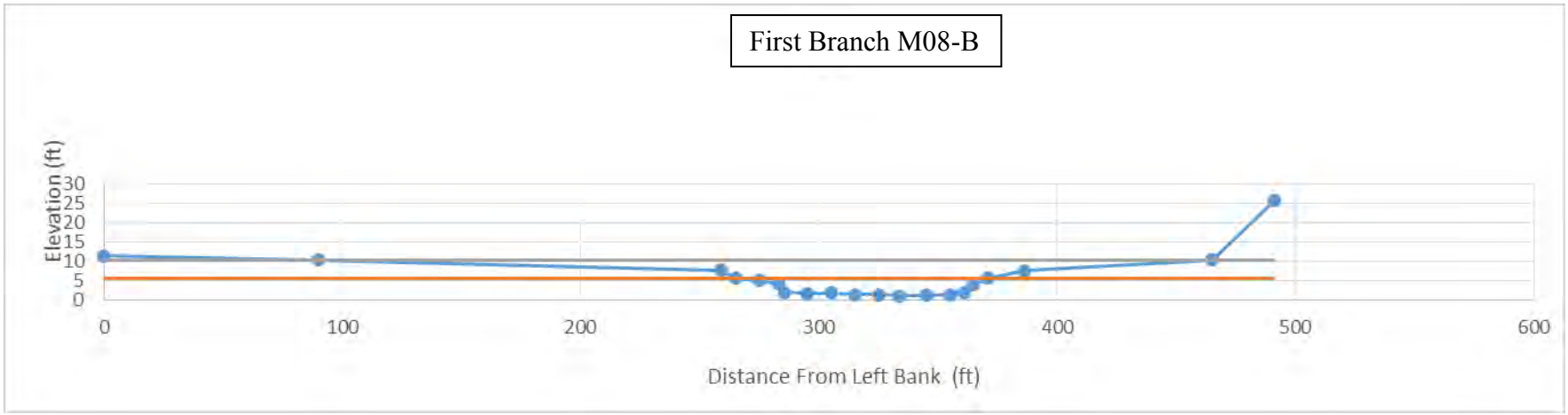
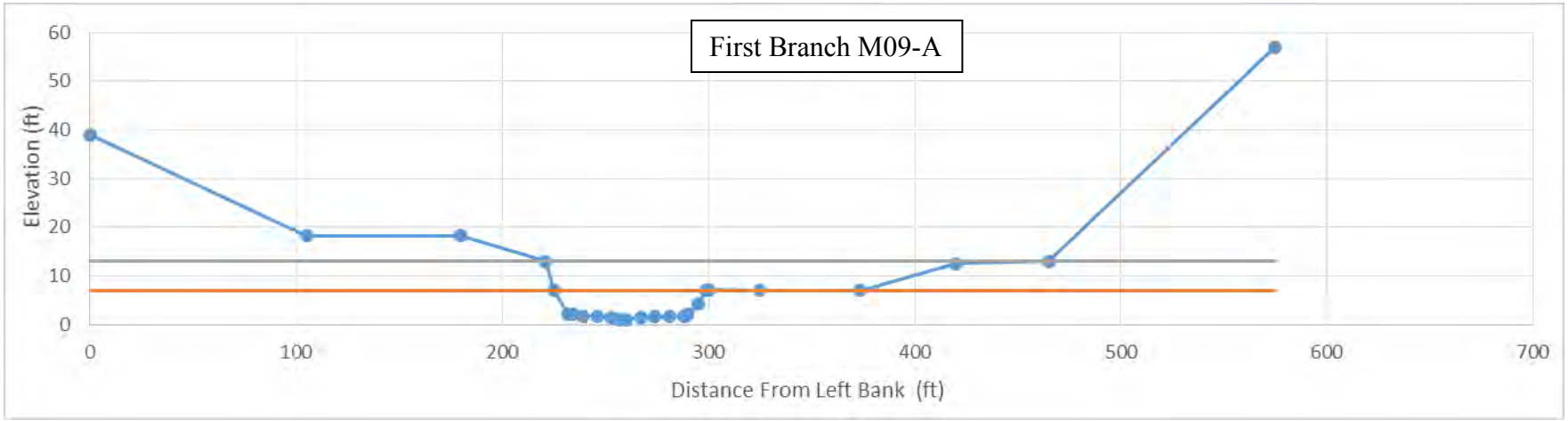
20
10
0
0
50
100
150
200
250
300
350
400
450
500
Distance From Left Bank (ft)


First Branch M08-B
Elevation (ft)
30
25
20
15
10
5
0
0
100
200
300
400
500
600
Distance From Left Bank (ft)


First Branch M09-A
Elevation (ft)
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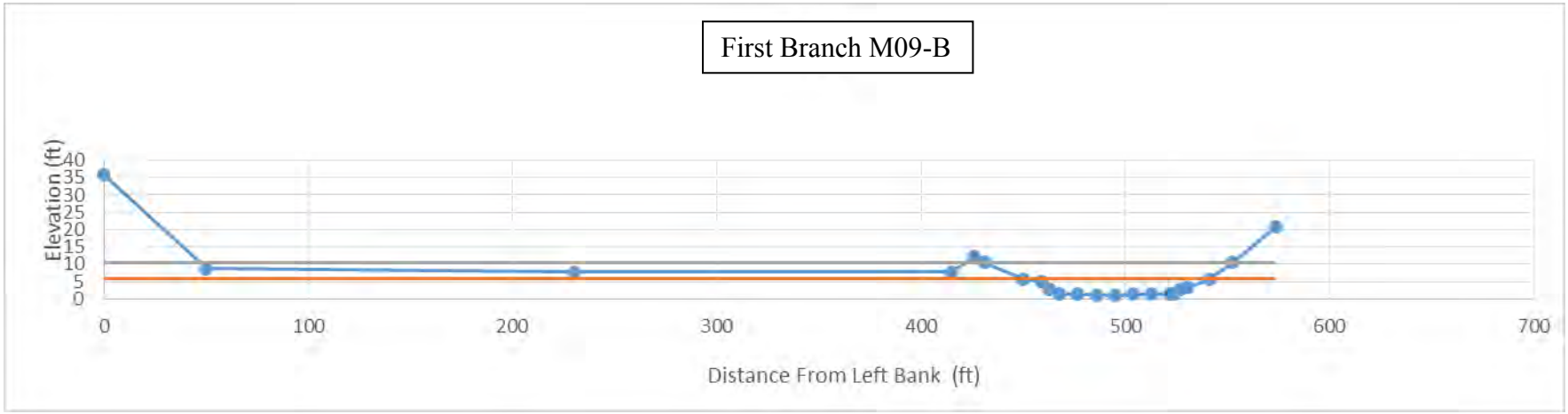
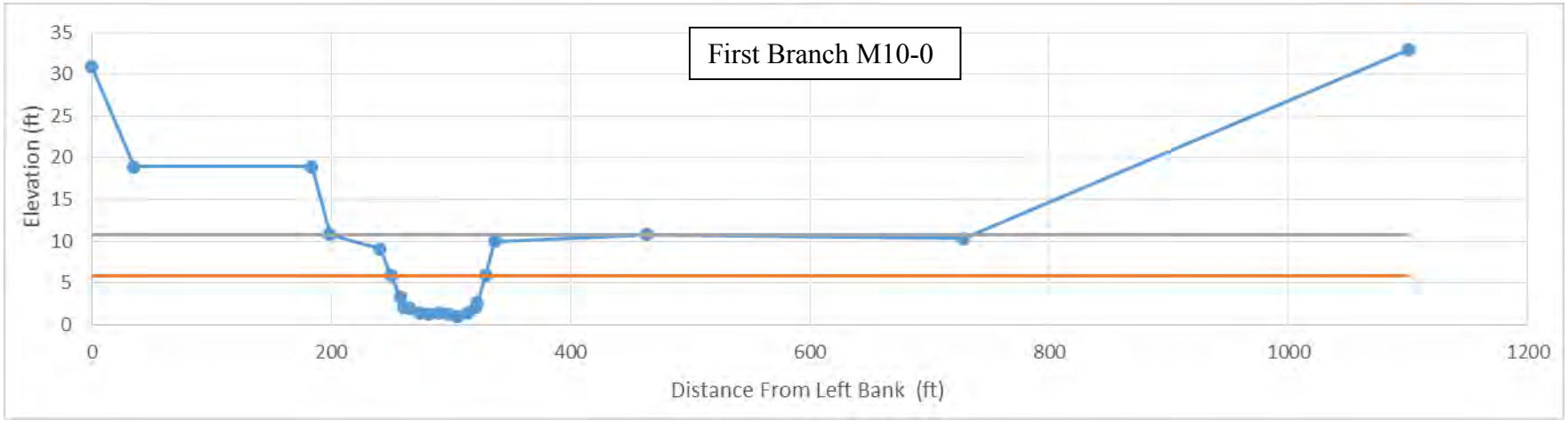
50
40
30
20
10
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M09-B
Elevation (ft)
40
35
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M10-0
Elevation (ft)
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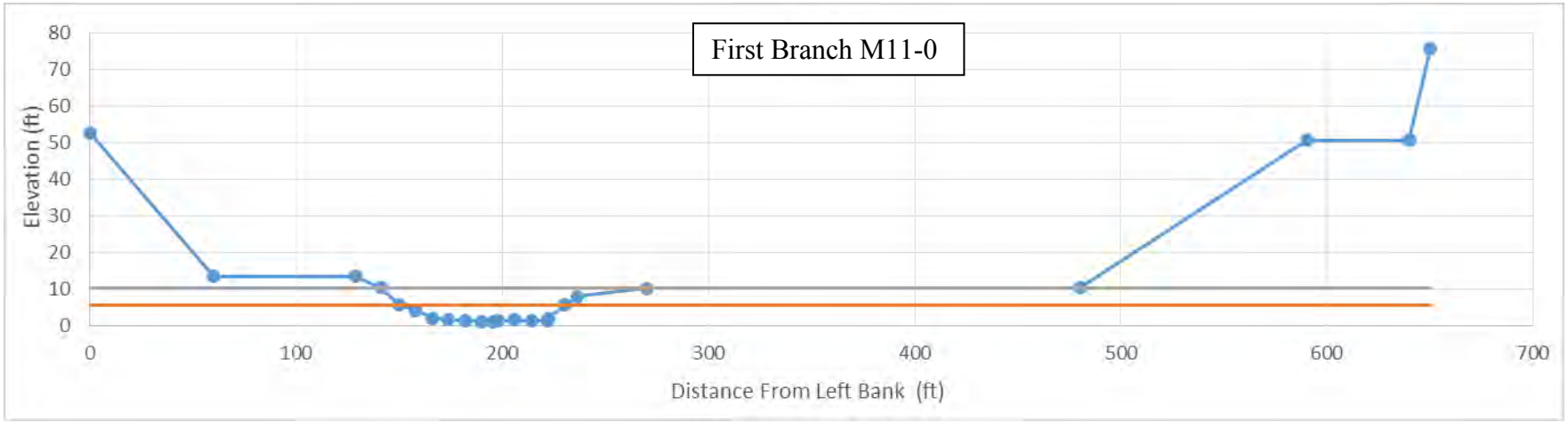
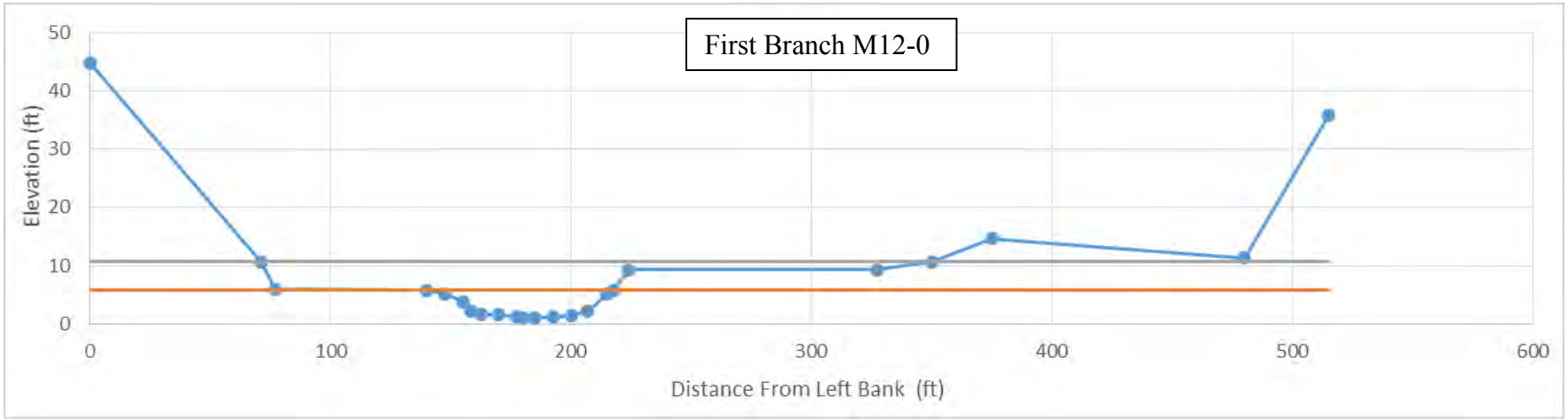
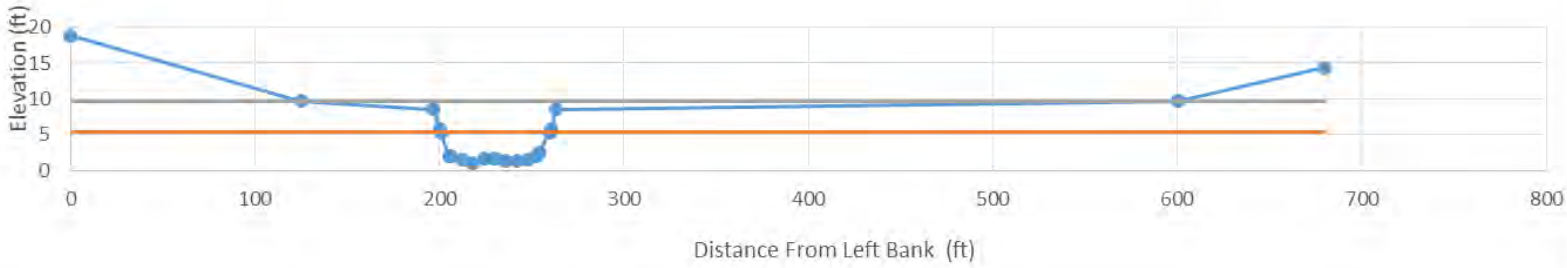
30
25
20
15
10
5
0
0
200
400
600
800
1000
1200
Distance From Left Bank (ft)


First Branch M11-0
Elevation (ft)
80
70
60
50
40
30
20
10
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)

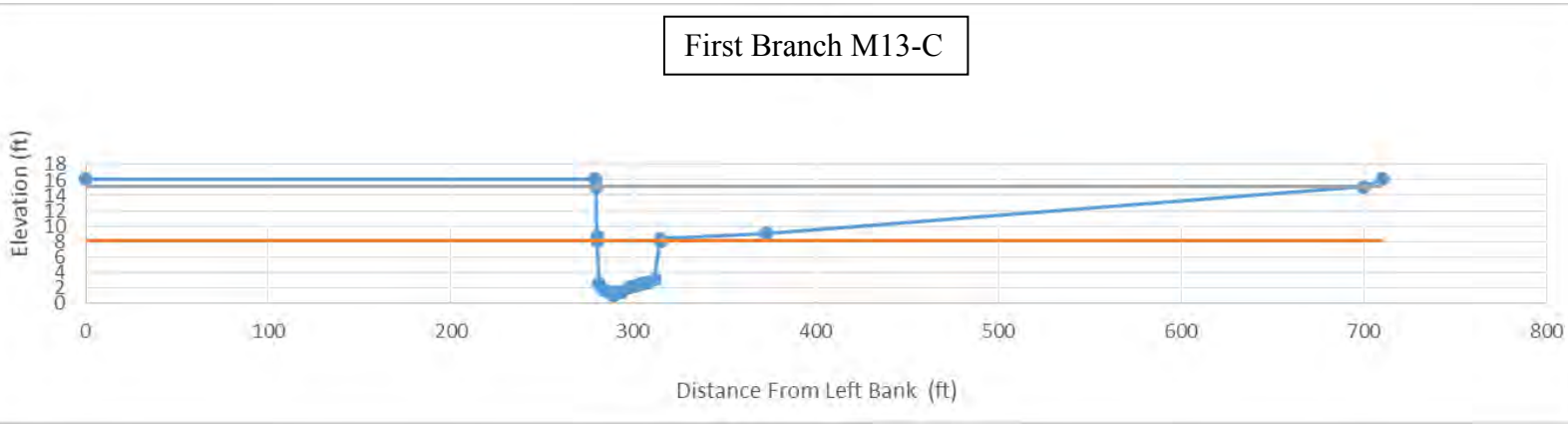

First Branch M12-0
Elevation (ft)
50
40
30
20
10
0
0
100
200
300
400
500
600
Distance From Left Bank (ft)

First Branch M13-A
Elevation (ft)
40
35
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)

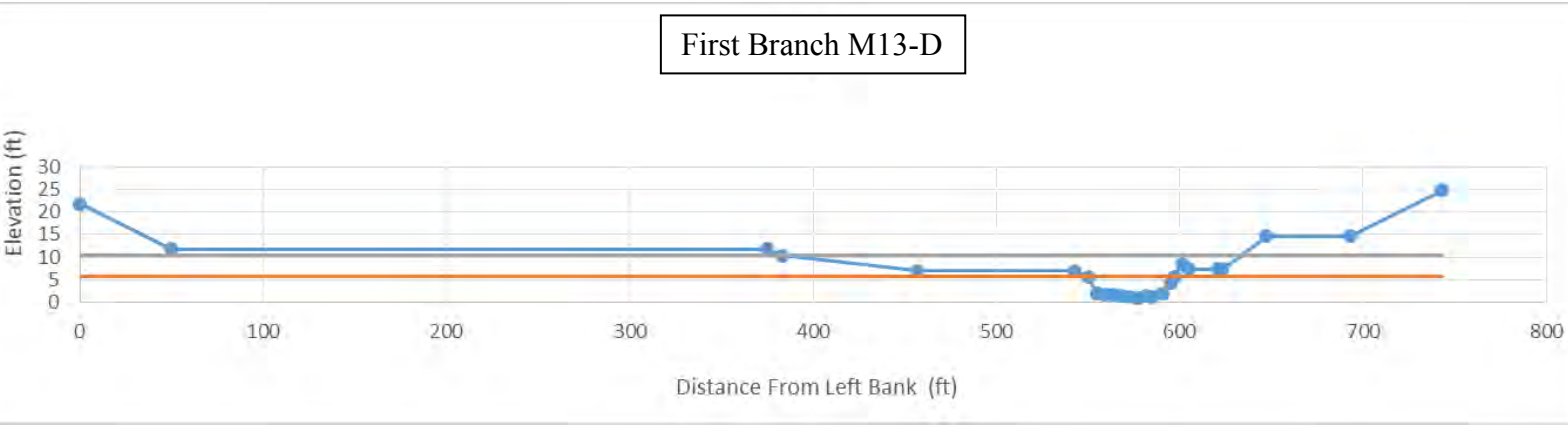
First Branch M13-B

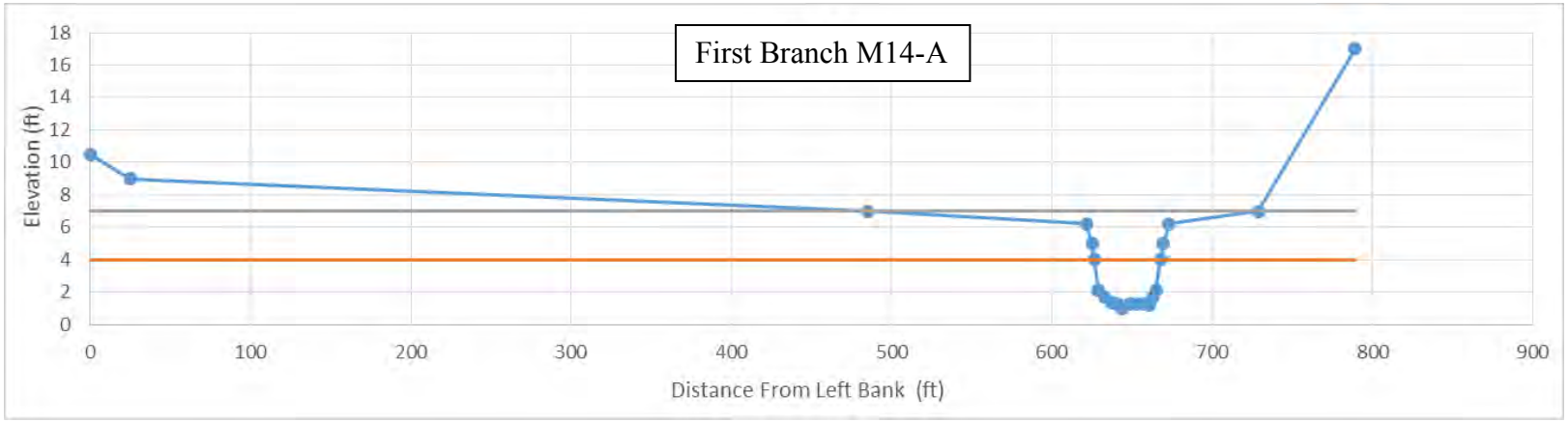


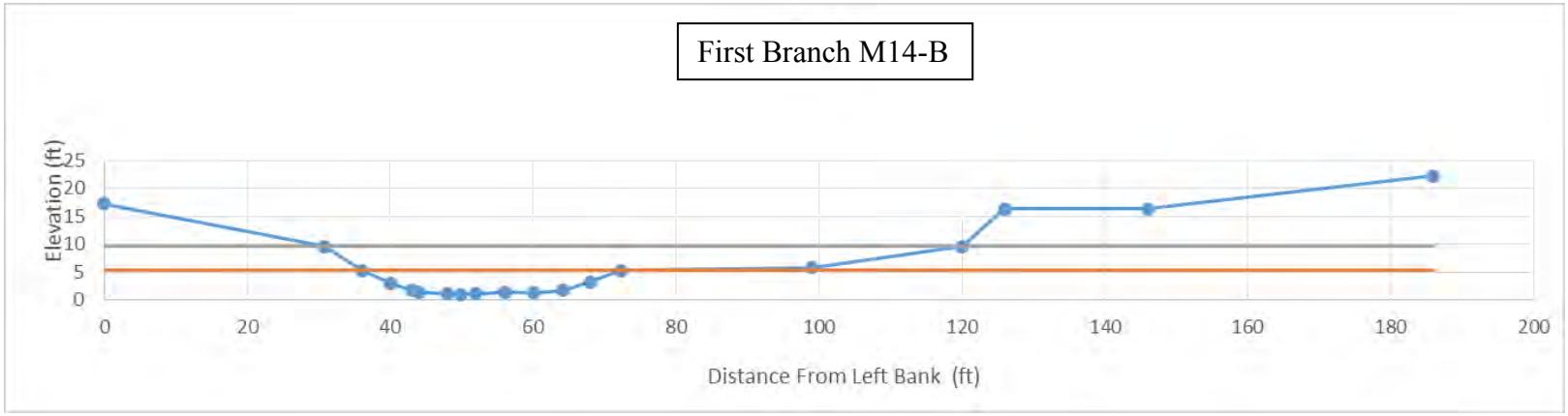
First Branch M13-C



First Branch M13-D




First Branch M14-A
Elevation (ft)
0
2
4
6
8
10
12
14
16
18
0
100
200
300
400
500
600
700
800
900
Distance From Left Bank (ft)


First Branch M14-B
Elevation (ft)
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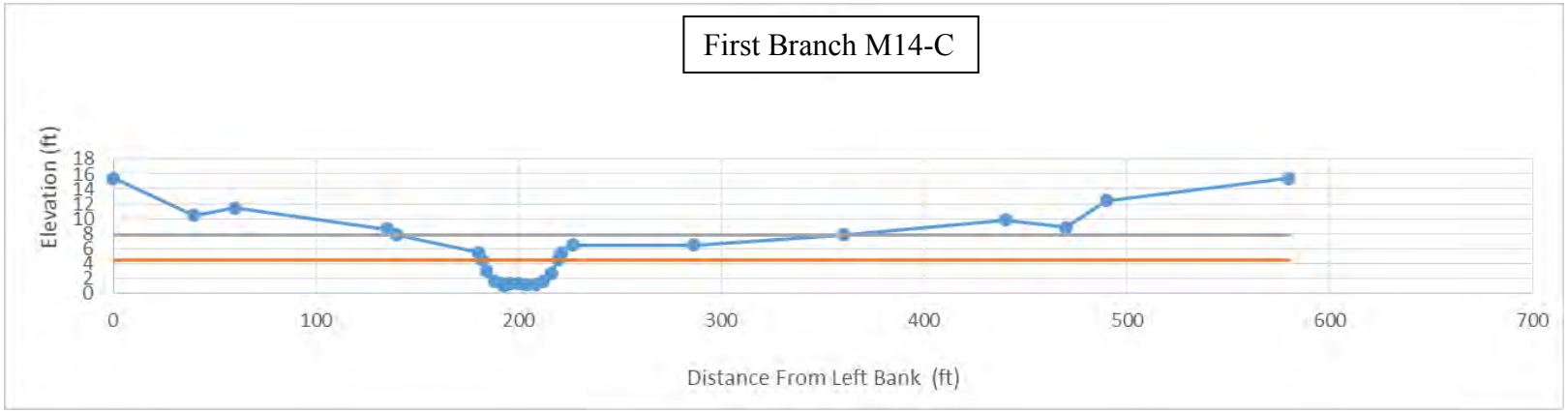
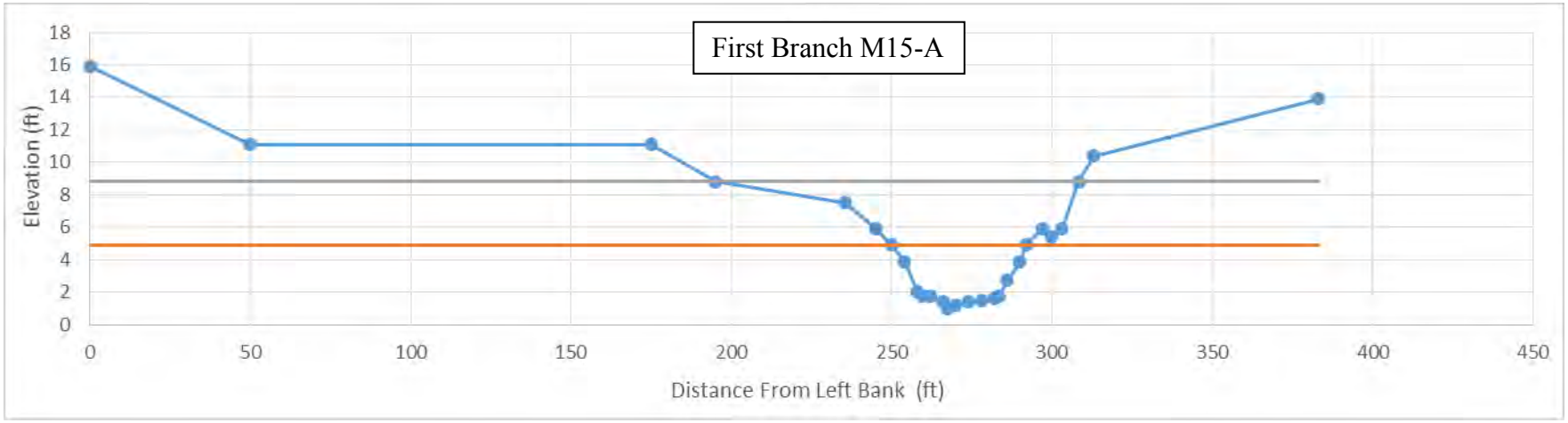
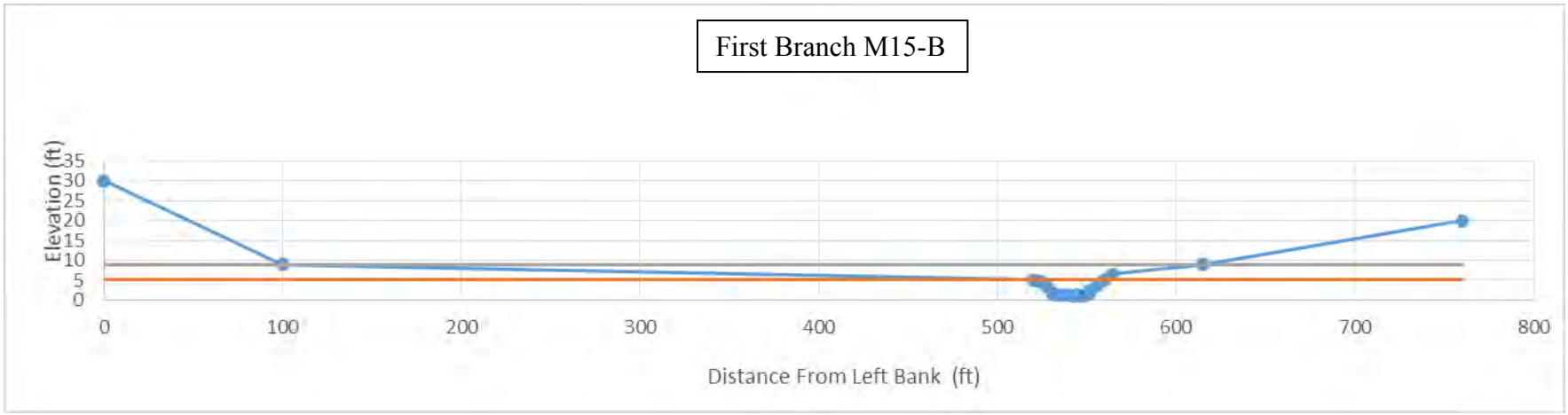
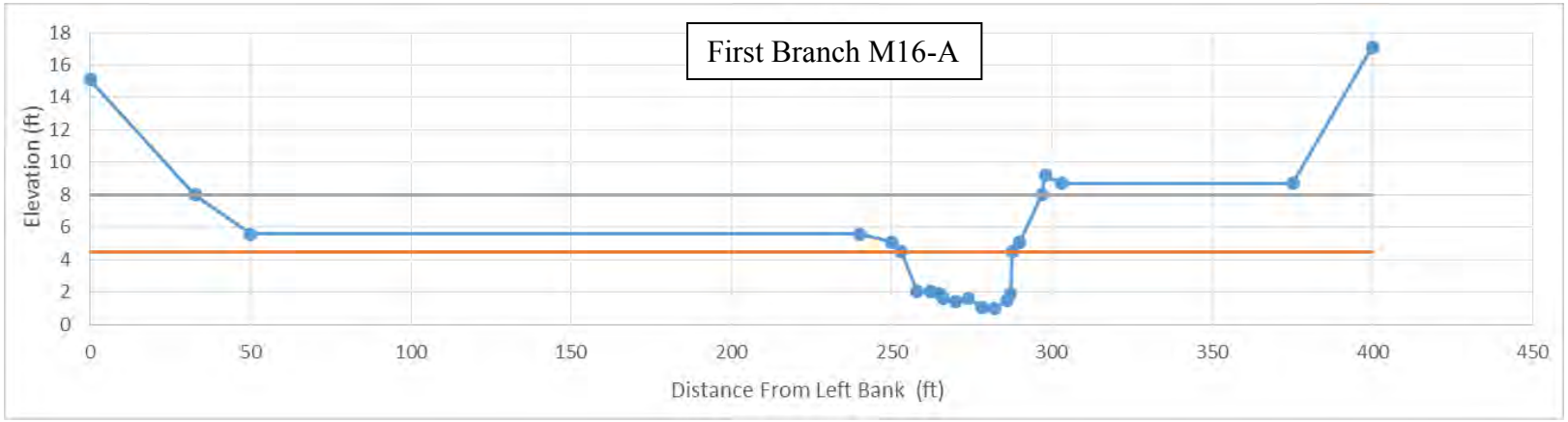
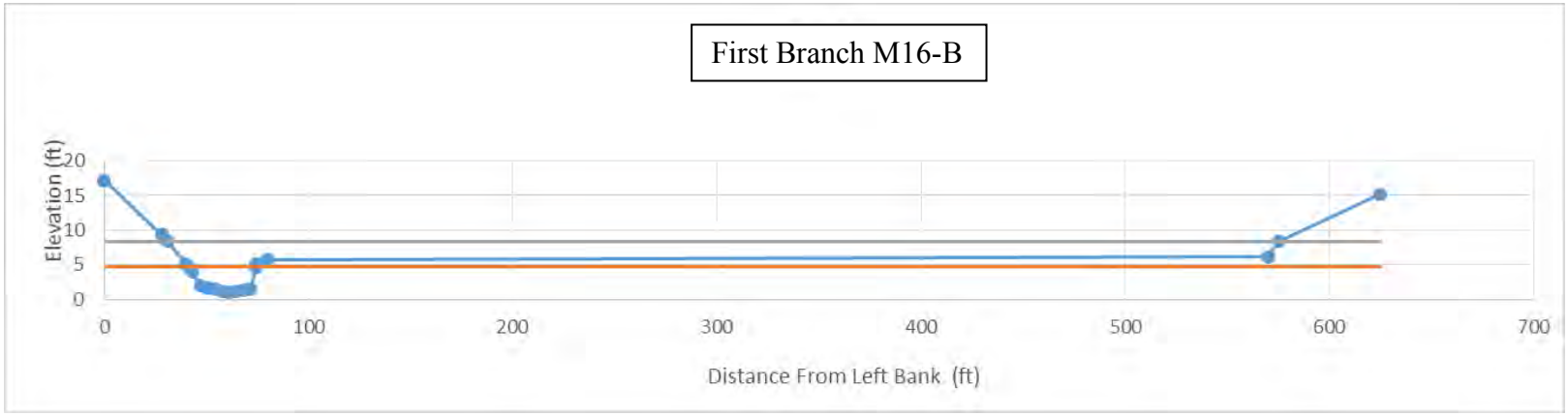
5
10
15
20
25
0
20
40
60
80
100
120
140
160
180
200
Distance From Left Bank (ft)

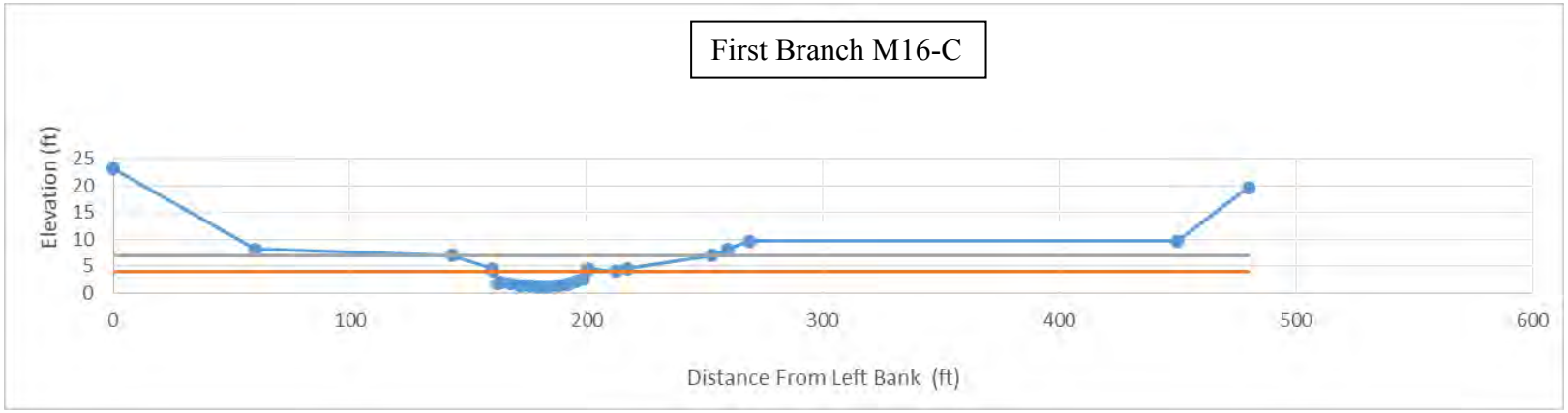

First Branch M14-C
Elevation (ft)
0
2
4
6
8
10
12
14
16
18
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)


First Branch M15-A
Elevation (ft)
18
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
450
Distance From Left Bank (ft)

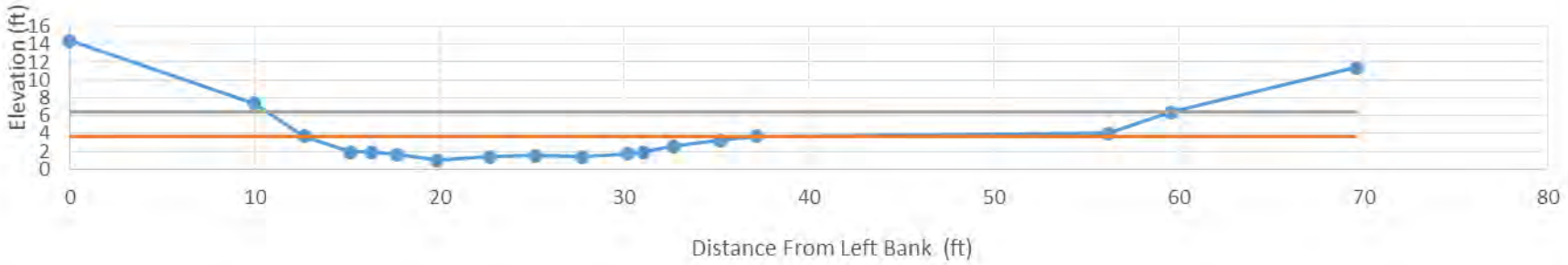

First Branch M15-B
Elevation (ft)
35
30
25
20
15
10
5
0
0
100
200
300
400
500
600
700
800
Distance From Left Bank (ft)


First Branch M16-A
Elevation (ft)
18
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
450
Distance From Left Bank (ft)

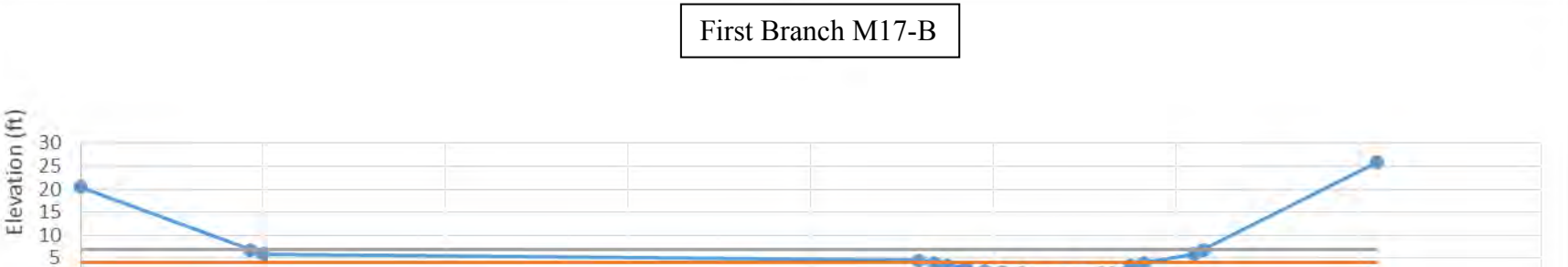

First Branch M16-B
Elevation (ft)
20
15
10
5
0
0
100
200
300
400
500
600
700
Distance From Left Bank (ft)

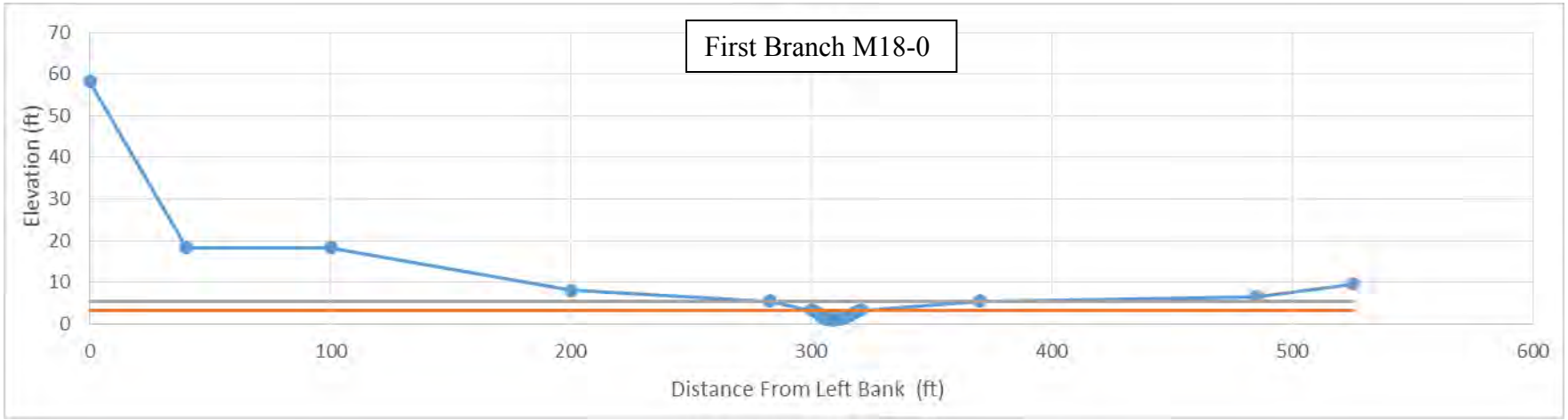

First Branch M16-C
Elevation (ft)
25
20
15
10
5
0
0
100
200
300
400
500
600
Distance From Left Bank (ft)

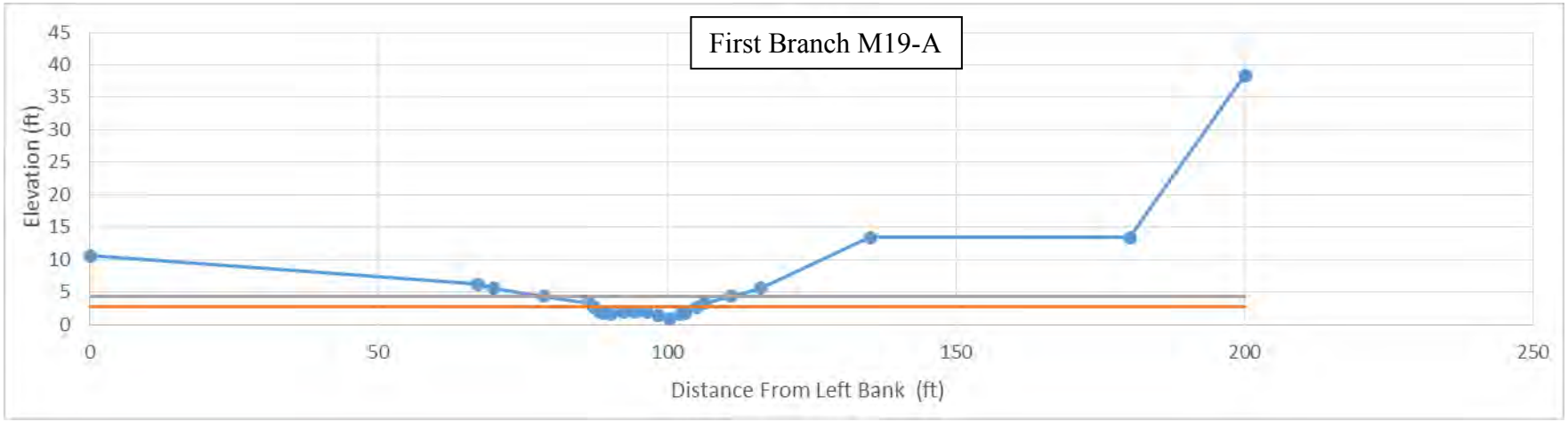
First Branch M17-A

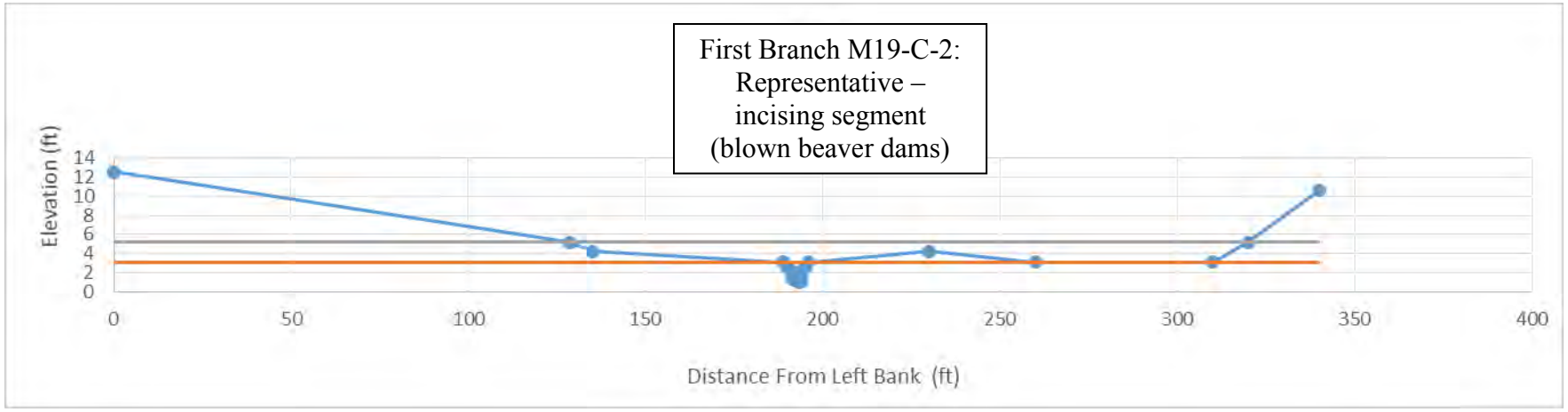


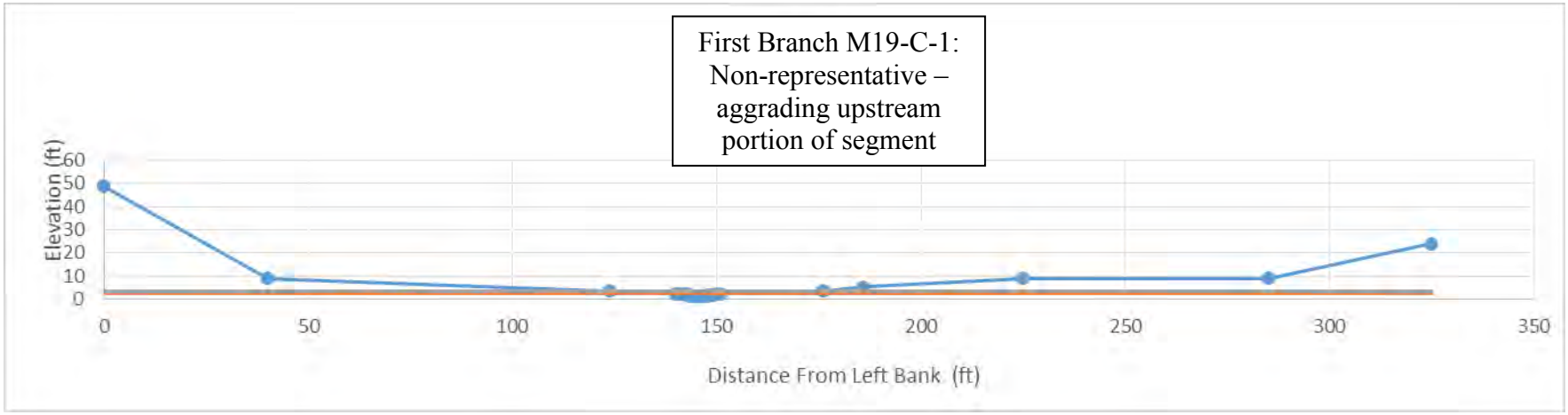
First Branch M17-B

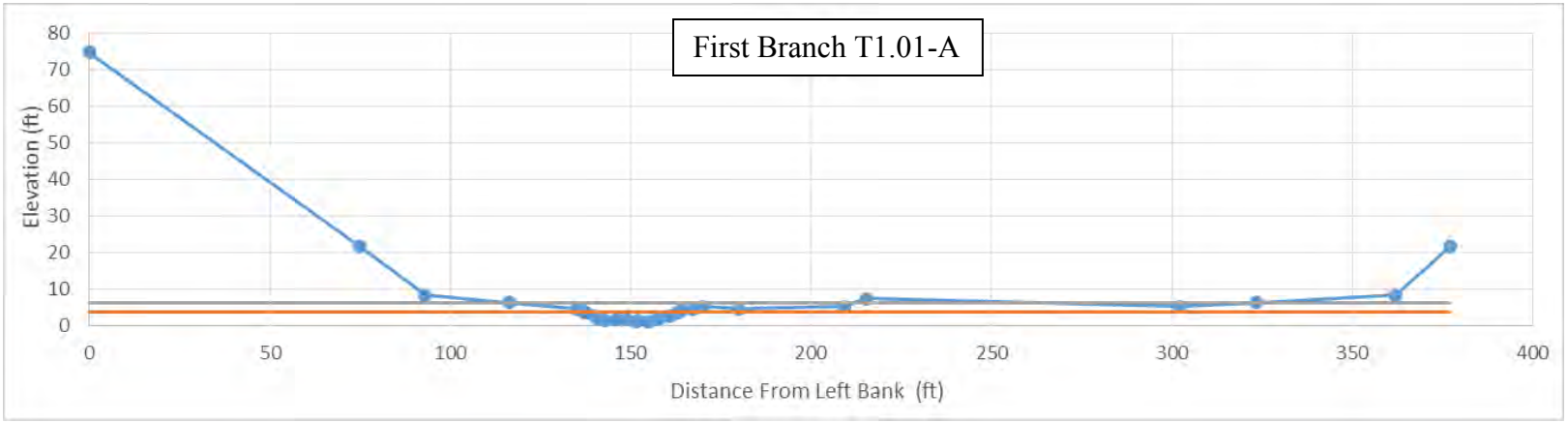


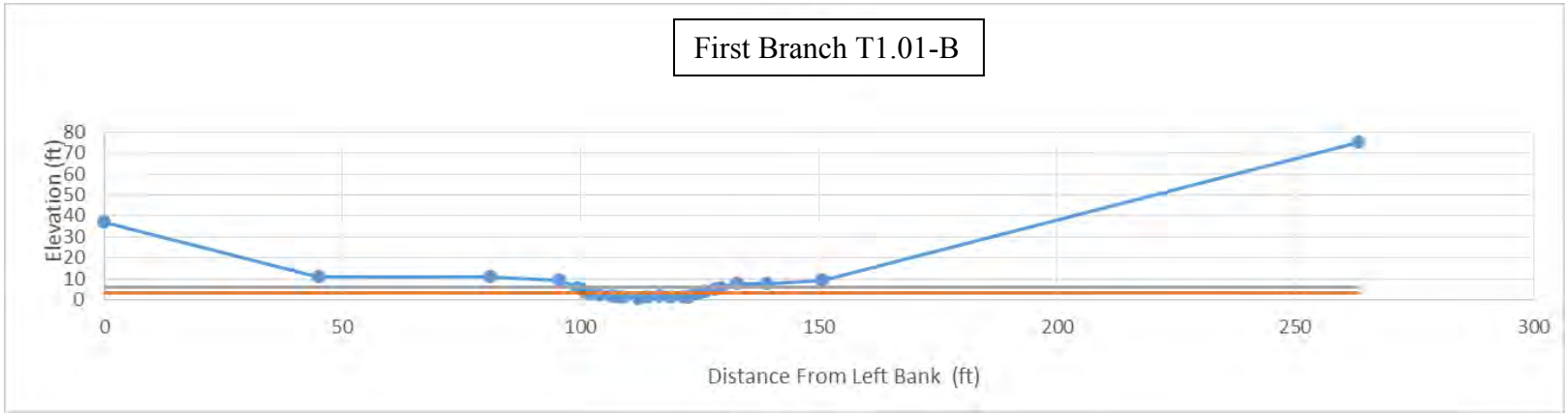

First Branch M18-0
Elevation (ft)
70
60
50
40
30
20
10
0
0
100
200
300
400
500
600
Distance From Left Bank (ft)

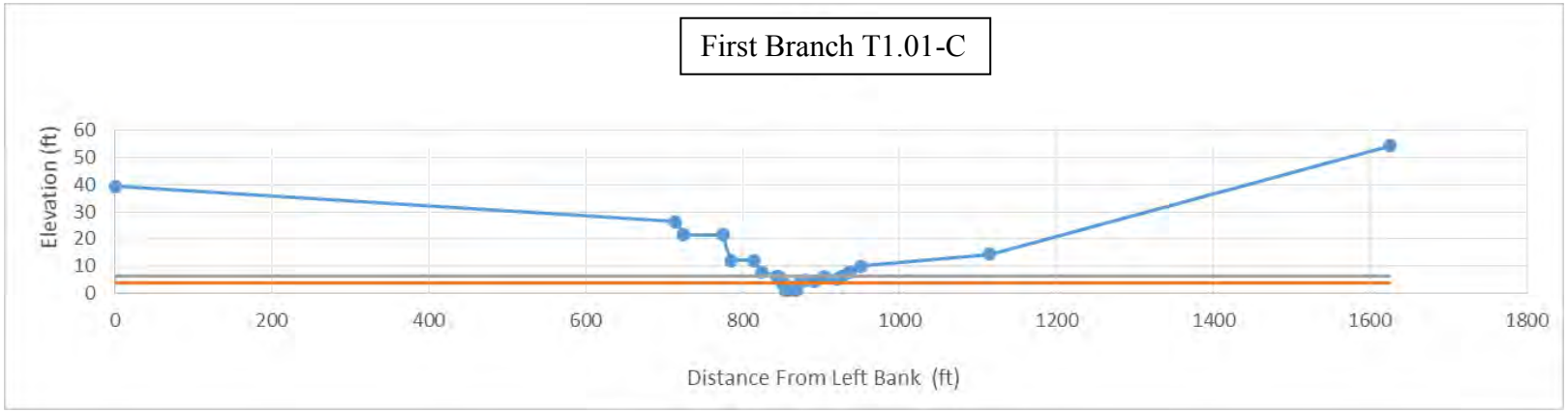

First Branch M19-A
Elevation (ft)
45
40
35
30
25
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)


First Branch M19-C-2: Representative – incising segment (blown beaver dams)
Elevation (ft)
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)

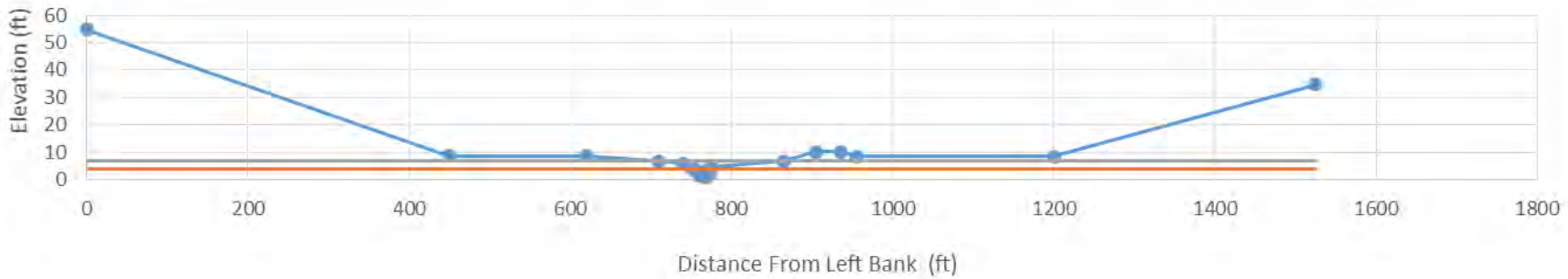

First Branch M19-C-1: Non-representative – aggrading upstream portion of segment
Elevation (ft)
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
Distance From Left Bank (ft)


First Branch T1.01-A
Elevation (ft)
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)

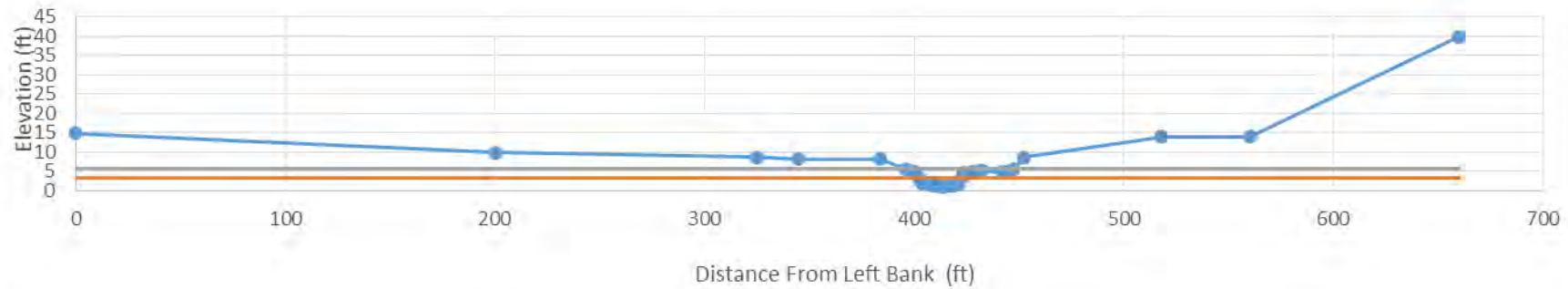

First Branch T1.01-B
Elevation (ft)
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
Distance From Left Bank (ft)

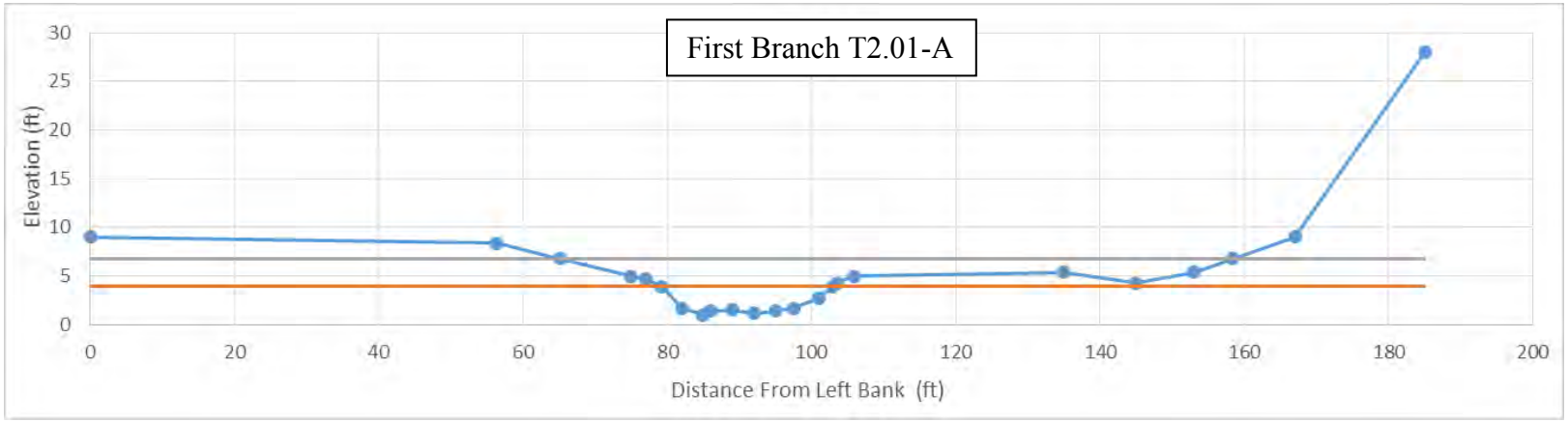

First Branch T1.01-C
Elevation (ft)
60
50
40
30
20
10
0
0
200
400
600
800
1000
1200
1400
1600
1800
Distance From Left Bank (ft)

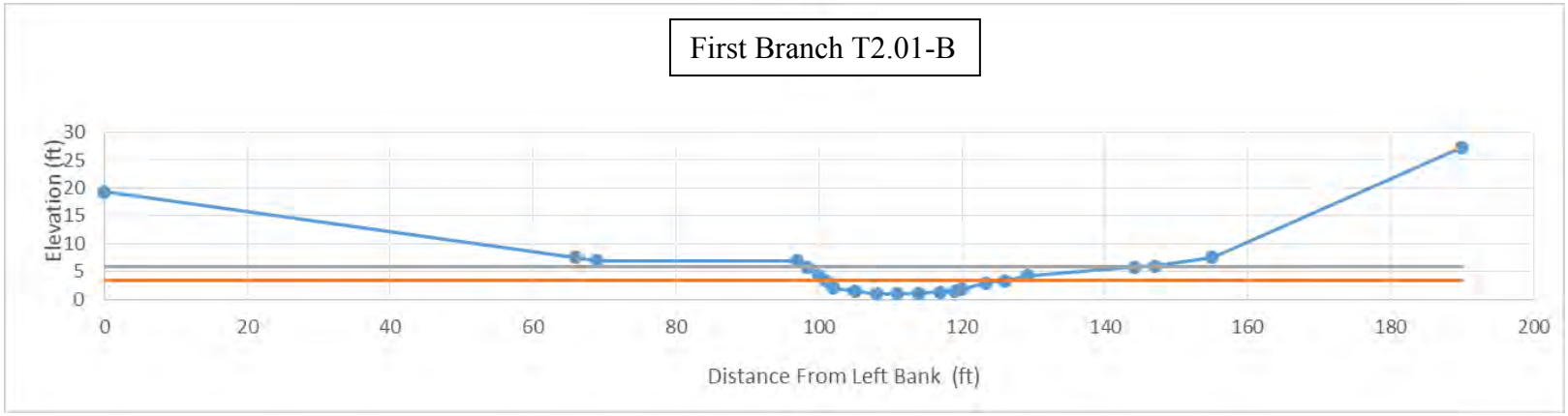
First Branch T1.01-D

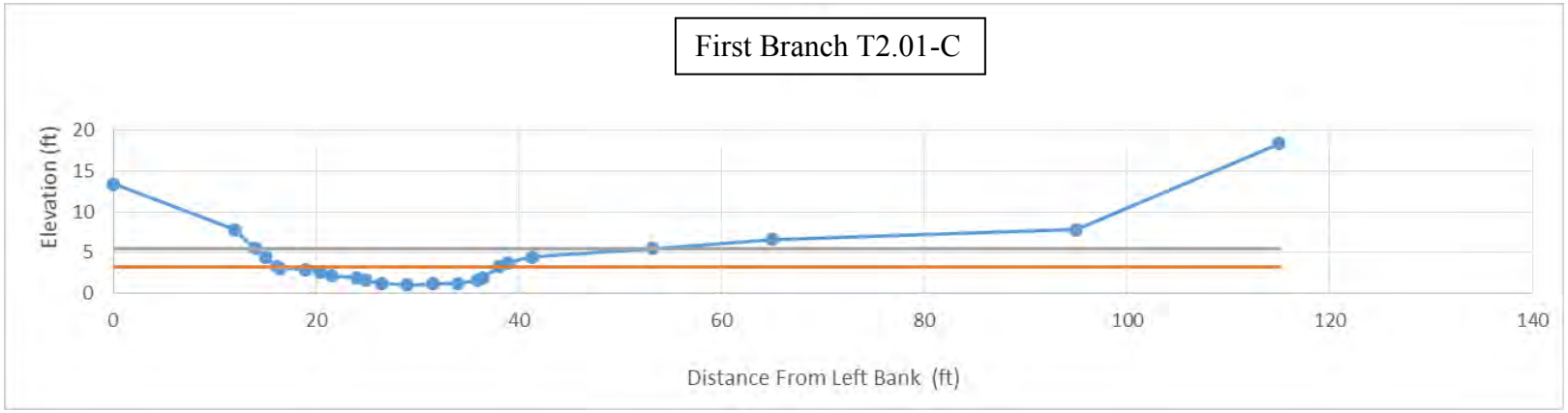


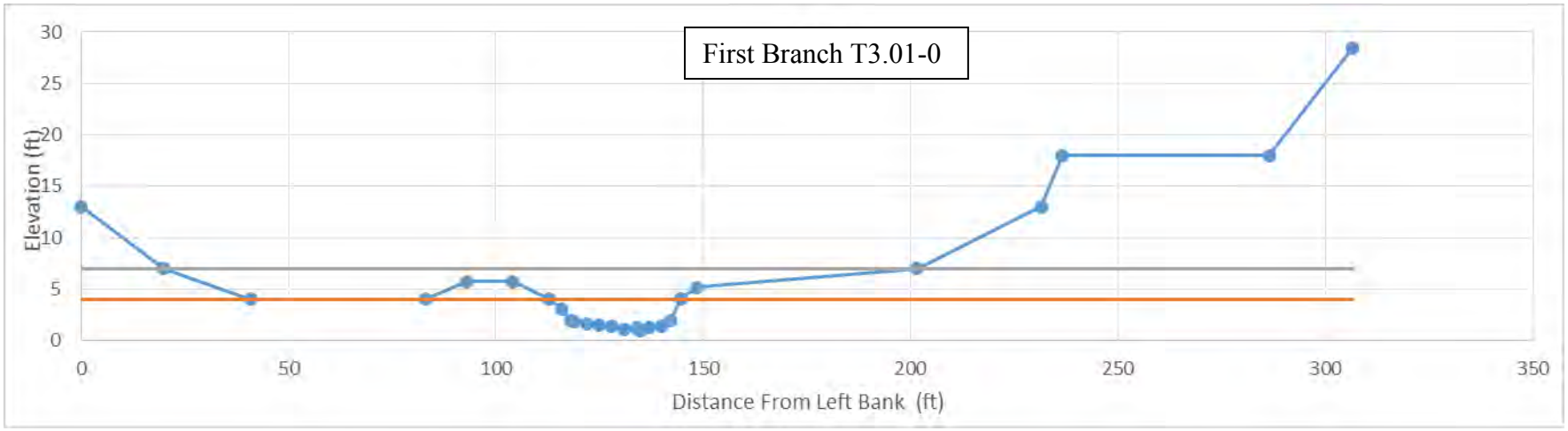
First Branch T1.01-E

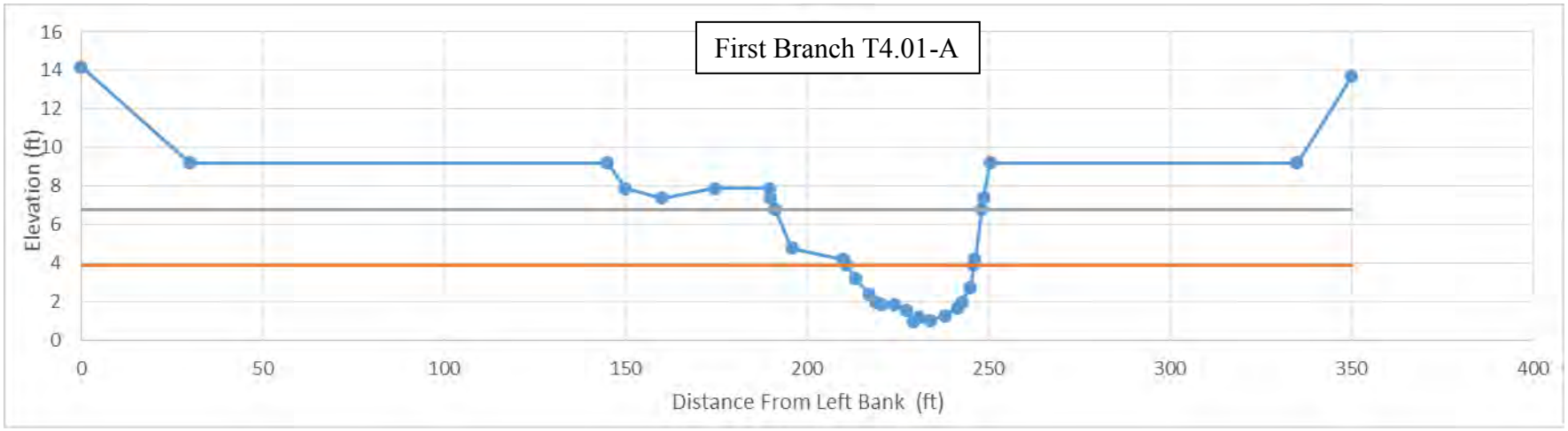


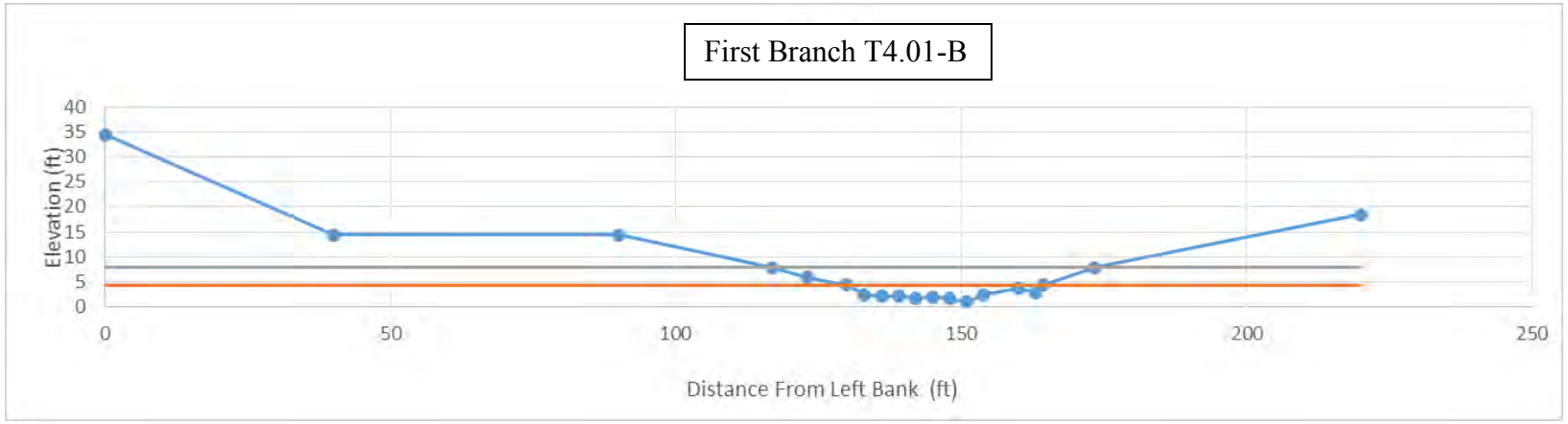

First Branch T2.01-A
Elevation (ft)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
180
200
Distance From Left Bank (ft)

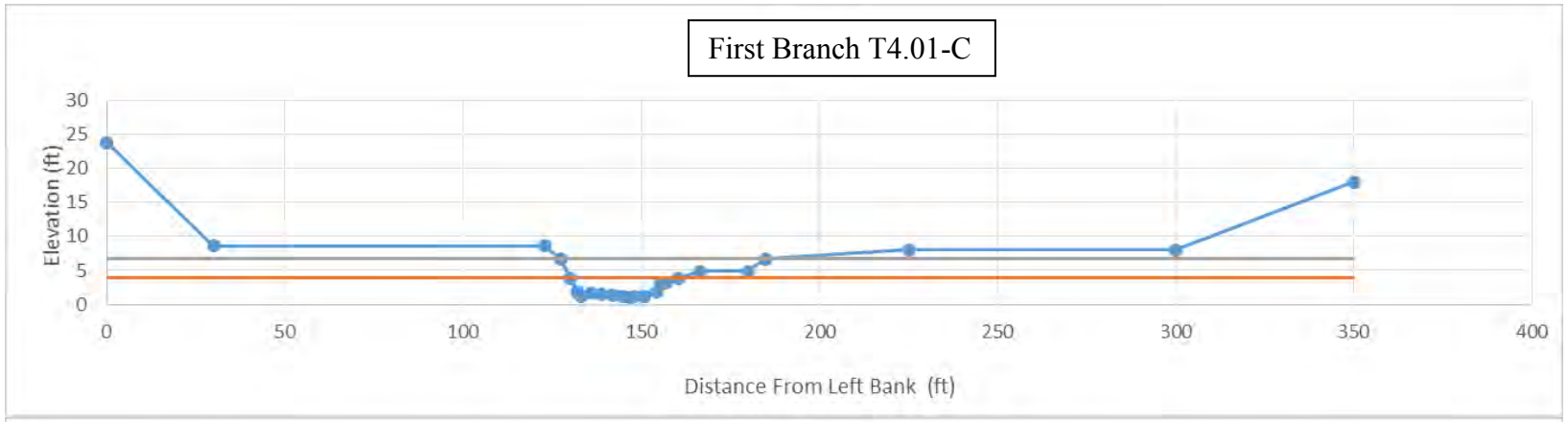

First Branch T2.01-B
Elevation (ft)
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
180
200
Distance From Left Bank (ft)

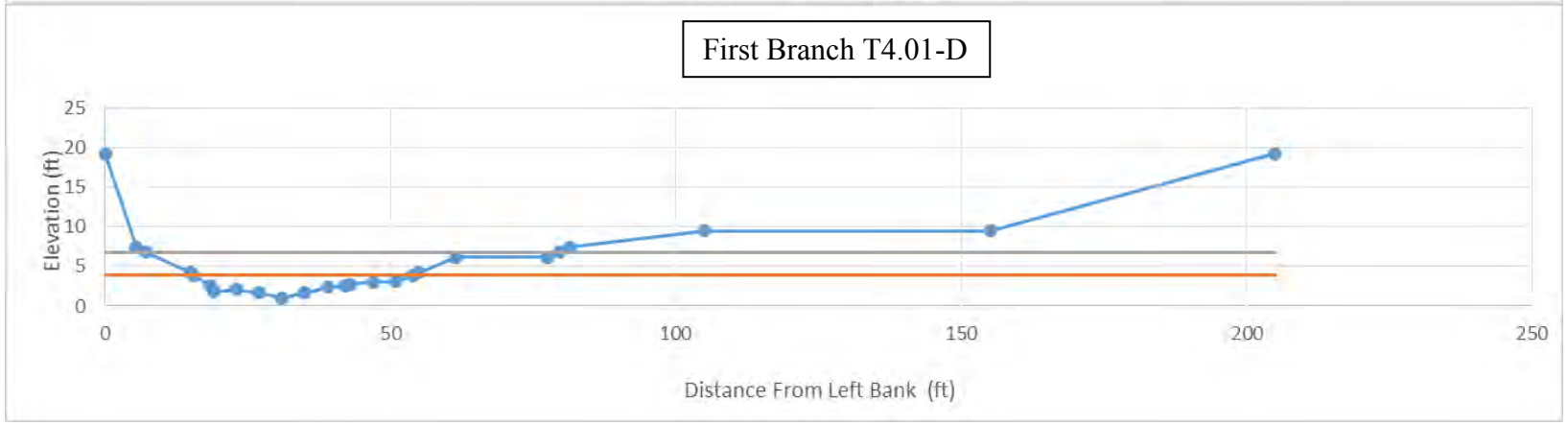

First Branch T2.01-C
Elevation (ft)
20
15
10
5
0
0
20
40
60
80
100
120
140
Distance From Left Bank (ft)


First Branch T3.01-0
Elevation (ft)
30
25
20
15
10
5
0
0
50
100
150
200
250
300
350
Distance From Left Bank (ft)

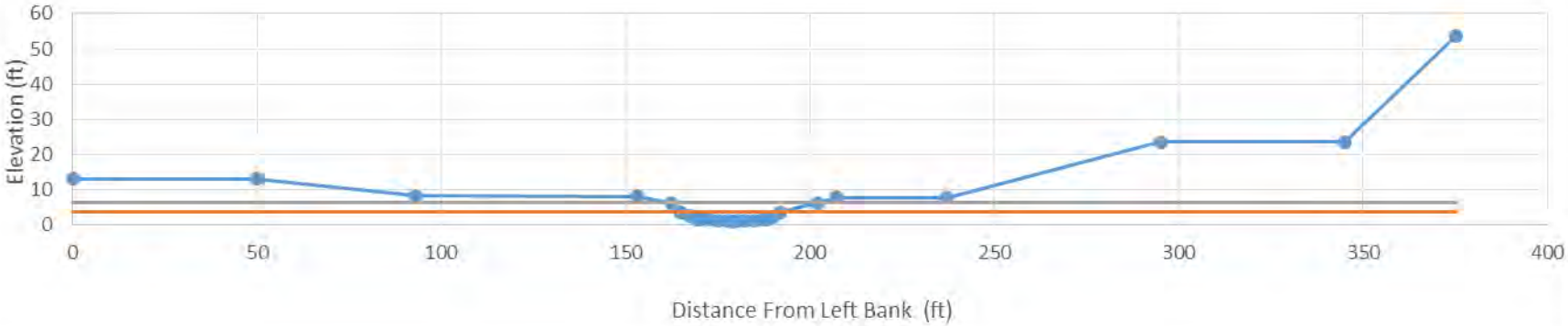

First Branch T4.01-A
Elevation (ft)
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)


First Branch T4.01-B
Elevation (ft)
40
35
30
25
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)

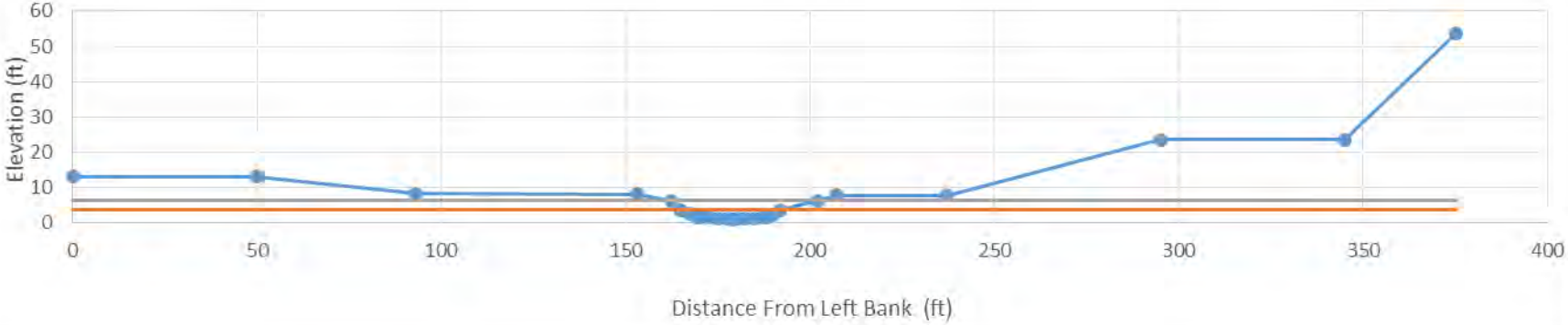

First Branch T4.01-C
Elevation (ft)
30
25
20
15
10
5
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)

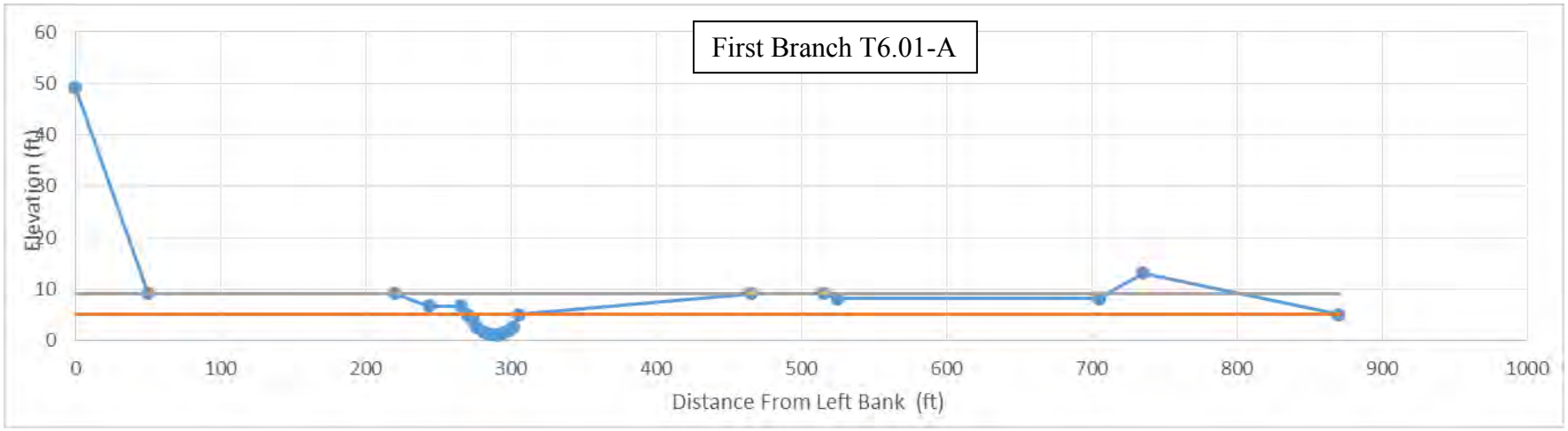

First Branch T4.01-D
Elevation (ft)
25
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)

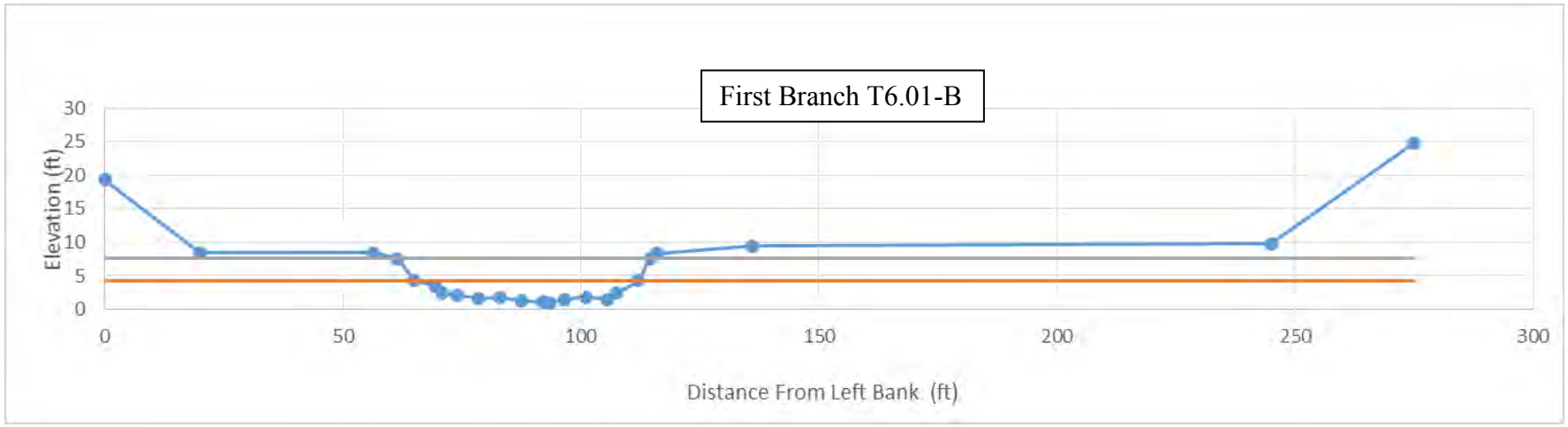
First Branch T5.01-A

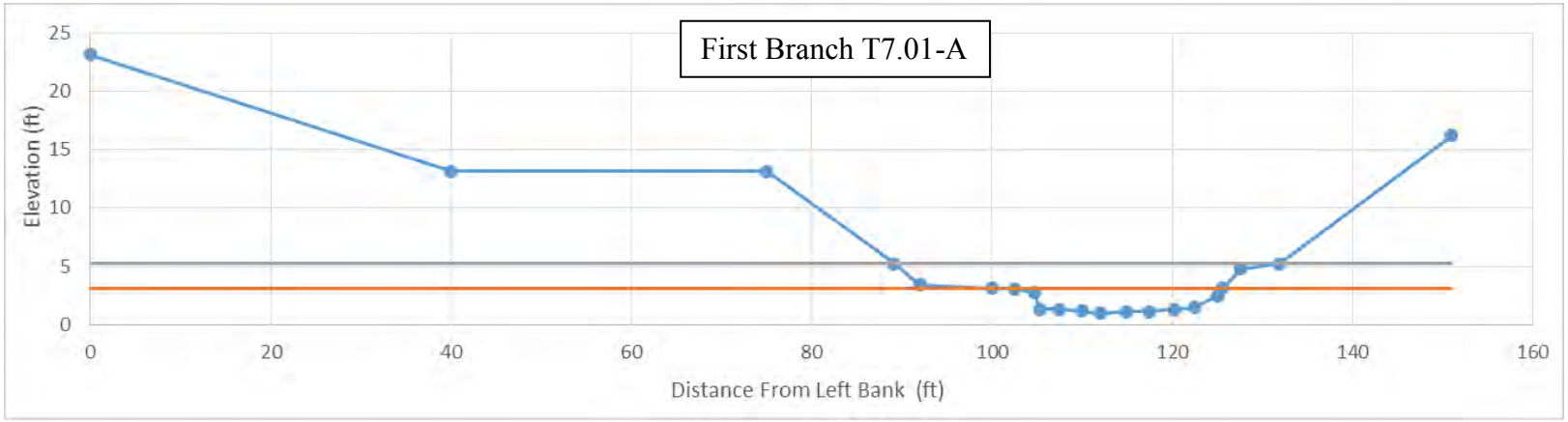


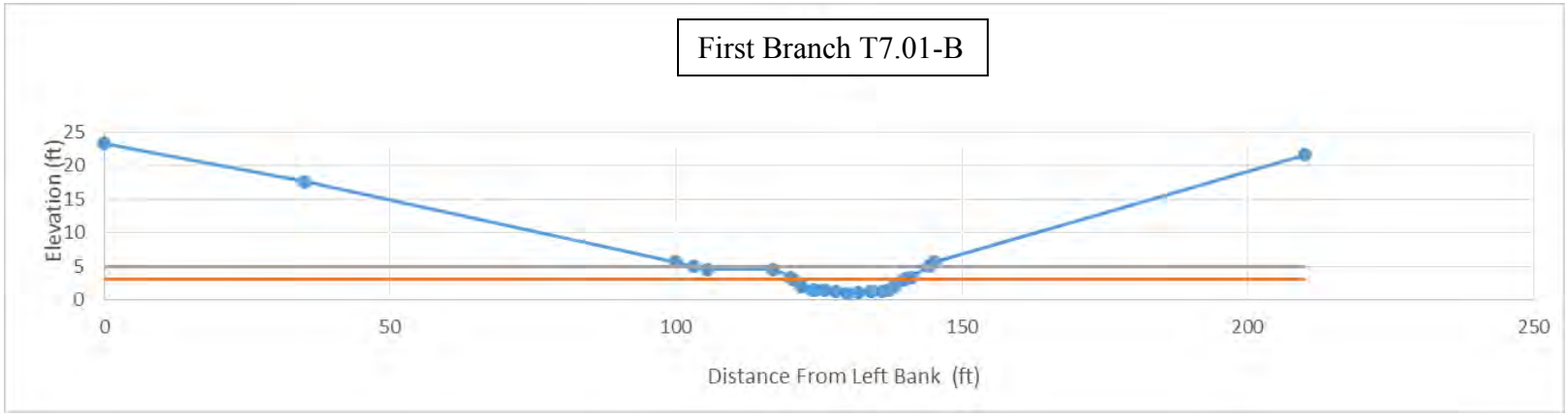
First Branch T5.01-B

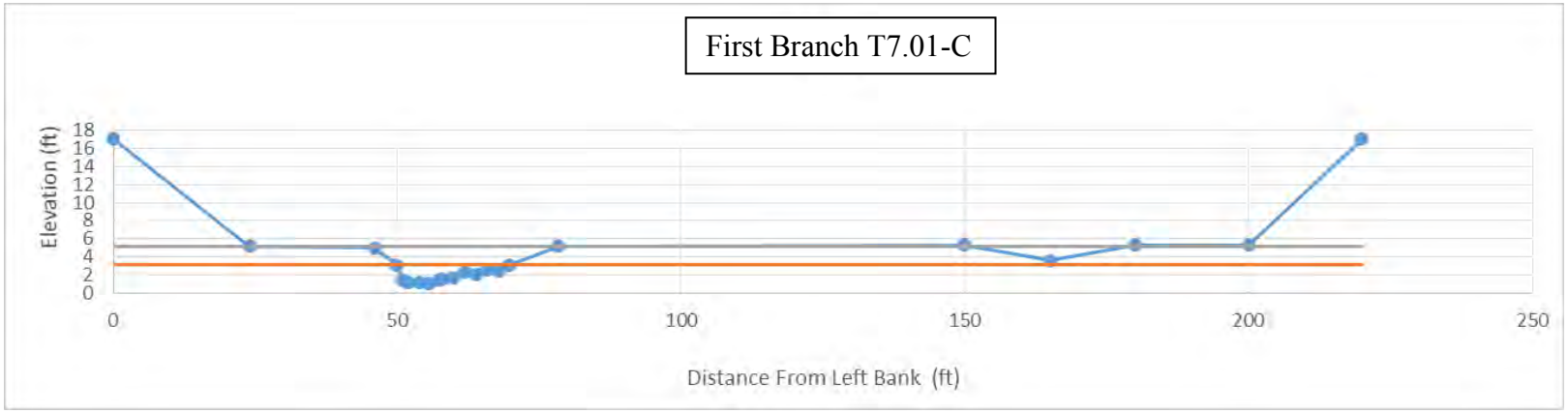


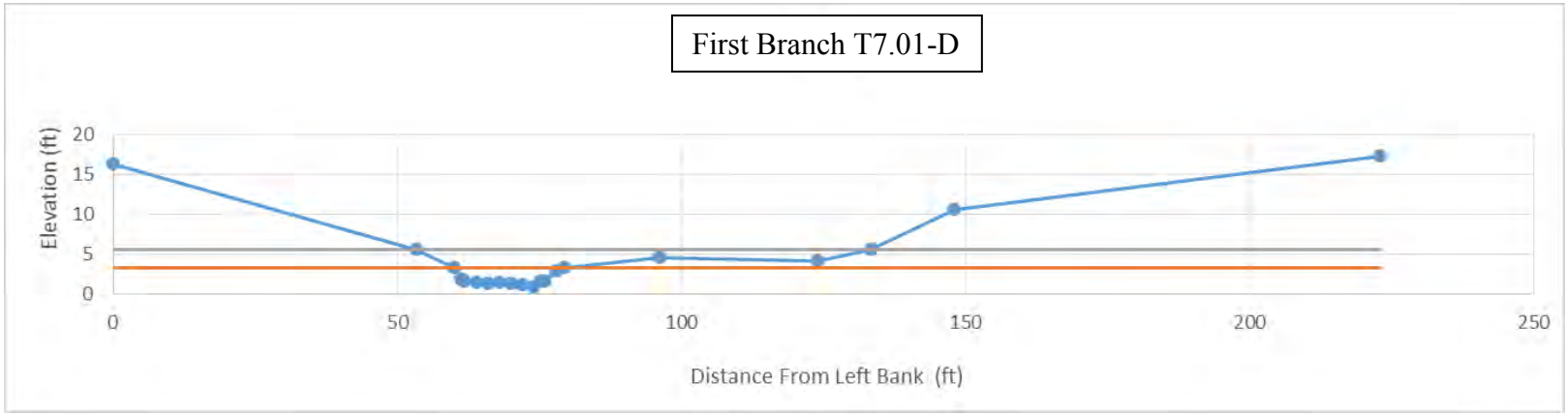

First Branch T6.01-A
Elevation (ft)
60
50
40
30
20
10
0
0
100
200
300
400
500
600
700
800
900
1000
Distance From Left Bank (ft)

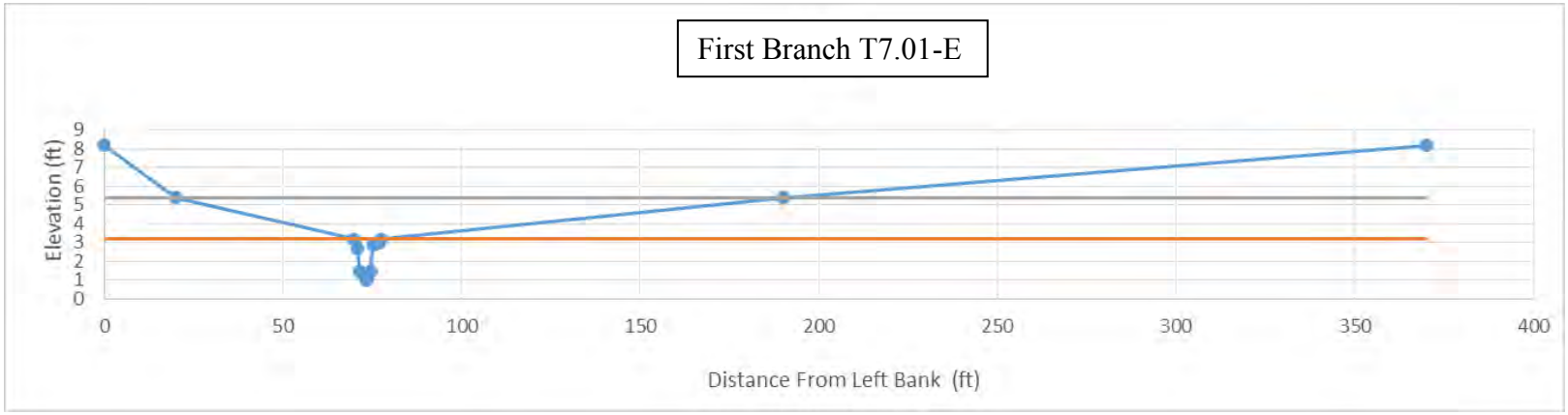

First Branch T6.01-B
Elevation (ft)
30
25
20
15
10
5
0
0
50
100
150
200
250
300
Distance From Left Bank (ft)

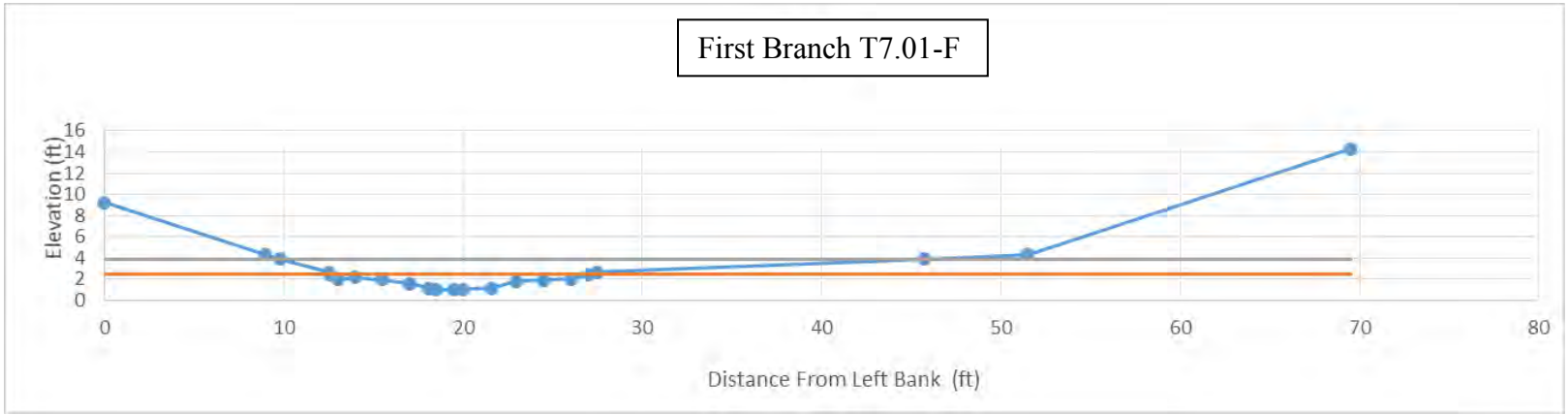

First Branch T7.01-A
Elevation (ft)
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
Distance From Left Bank (ft)


First Branch T7.01-B
Elevation (ft)
25
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)


First Branch T7.01-C
Elevation (ft)
18
16
14
12
10
8
6
4
2
0
0
50
100
150
200
250
Distance From Left Bank (ft)


First Branch T7.01-D
Elevation (ft)
20
15
10
5
0
0
50
100
150
200
250
Distance From Left Bank (ft)


First Branch T7.01-E
Elevation (ft)
9
8
7
6
5
4
3
2
1
0
0
50
100
150
200
250
300
350
400
Distance From Left Bank (ft)


First Branch T7.01-F
Elevation (ft)
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
Distance From Left Bank (ft)

– Appendix 5 –

Quality Assurance/Quality Control Documentation

Notes: M18-B and M19-B were excluded segments in Phase 2 (due to beaver impoundment influences); some parameters could not be assessed

M02-0 was a mistaken entry (not an assessed reach) that could not be cleared from reports

Phase 2 - Quality Control - X.1 Null Fields

White River - First Branch

Step Number	0	1.3	1.6	2.11	2.13	2.14	3.1			3.3		4.5	4.8	4.9	5.1
Description -> Reach	Assessed	Encroa-chments	Grade Controls	Riffle Spacing	Largest Particle	Stream Type	Texture	Erosion	Revet-ment	Failure Height	Gully Height	Impound-ment	Constricti ons	Beaver Dams	Bar Type
M01-A	Yes														
M01-B	Yes														
M01-C	Yes														
M02-0	Yes	X	X	X	X	X	X					X	X	X	X
M02-A	Yes														
M02-B	Yes														
M02-C	Yes														
M03-0	Yes														
M04-A	Yes														
M04-B	Yes														
M05-A	Yes														
M05-B	Yes														
M06-0	Yes														
M07-A	Yes														
M07-B	Yes														
M08-A	Yes														
M08-B	Yes														
M09-A	Yes														
M09-B	Yes														
M10-0	Yes														
M11-0	Yes														
M12-0	Yes														
M13-A	Yes														
M13-B	Yes														
M13-C	Yes														
M13-D	Yes														
M14-A	Yes														

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Step Number	0	1.3	1.6	2.11	2.13	2.14	3.1			3.3		4.5	4.8	4.9	5.1
Description -> Reach	Assessed	Encroa-chments	Grade Controls	Riffle Spacing	Largest Particle	Stream Type	Texture	Erosion	Revet-ment	Failure Height	Gully Height	Impound-ment	Constricti ons	Beaver Dams	Bar Type
M14-B	Yes														
M14-C	Yes														
M15-A	Yes														
M15-B	Yes														
M16-A	Yes														
M16-B	Yes														
M16-C	Yes														
M17-A	Yes														
M17-B	Yes														
M18-A	Yes														
M18-B	No			X	X	X						X			
M19-A	Yes														
M19-B	No	X		X	X	X						X		X	
M19-C	Yes														
T1.01-A	Yes														
T1.01-B	Yes														
T1.01-C	Yes														
T1.01-D	Yes														
T1.01-E	Yes														
T2.01-A	Yes														
T2.01-B	Yes														
T2.01-C	Yes														
T3.01-0	Yes														
T4.01-A	Yes														
T4.01-B	Yes														
T4.01-C	Yes														
T4.01-D	Yes														
T5.01-A	Yes														
T5.01-B	Yes														

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Step Number	0	1.3	1.6	2.11	2.13	2.14	3.1			3.3		4.5	4.8	4.9	5.1
Description -> Reach	Assessed	Encroa-chments	Grade Controls	Riffle Spacing	Largest Particle	Stream Type	Texture	Erosion	Revet-ment	Failure Height	Gully Height	Impound-ment	Constricti ons	Beaver Dams	Bar Type
T6.01-A	Yes														
T6.01-B	Yes														
T7.01-A	Yes														
T7.01-B	Yes														
T7.01-C	Yes														
T7.01-D	Yes														
T7.01-E	Yes														
T7.01-F	Yes														

x = Failed Test, blank = Passed Test

Phase 2 - Quality Control

White River - First Branch

X.2 Null Field Check and X.4 Conflicting Phase 1 vs Phase 2 Data

X.2 Null Fields Check **Status** Provisional

Reach v Step >	0	1	2	3	4	5
M01-A						
M01-B						
M01-C						
M02-0	X	X	X	X	X	X
M02-A						
M02-B						
M02-C						
M03-0						
M04-A						
M04-B						
M05-A						
M05-B						
M06-0						
M07-A						
M07-B						
M08-A						
M08-B						
M09-A						
M09-B						
M10-0						
M11-0						
M12-0						
M13-A						
M13-B						
M13-C						
M13-D						
M14-A						

X.4 Conflicting Phase 1 - Phase 2 data **Status** Provisional

Reach v Step >	P1 2.4 P2 0	P1 2.9 P2 1.5	P1 2.10 P2 1.5	P1 3.1 P2 1.2	P1 5.1 P2 4.5	P1 5.5 P2 5.5	P1 7.1 P2 2.14
M01-A							
M01-B							
M01-C							
M02-0		X	X	X	X	X	X
M02-A							
M02-B							
M02-C							
M03-0							
M04-A							
M04-B							
M05-A							
M05-B							
M06-0							
M07-A							
M07-B							
M08-A							
M08-B							
M09-A							
M09-B							
M10-0							
M11-0							
M12-0							
M13-A							
M13-B							
M13-C							
M13-D							

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Agency of Natural Resouces

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Reach v Step >	0	1	2	3	4	5
M14-B						
M14-C						
M15-A						
M15-B						
M16-A						
M16-B						
M16-C						
M17-A						
M17-B						
M18-A						
M18-B			X	X		X
M19-A						
M19-B			X		X	X
M19-C						
T1.01-A						
T1.01-B						
T1.01-C						
T1.01-D						
T1.01-E						
T2.01-A						
T2.01-B						
T2.01-C						
T3.01-0						
T4.01-A						
T4.01-B						
T4.01-C						
T4.01-D						
T5.01-A						
T5.01-B						
T6.01-A						
T6.01-B						

Reach v Step >	P1 2.4 P2 0	P1 2.9 P2 1.5	P1 2.10 P2 1.5	P1 3.1 P2 1.2	P1 5.1 P2 4.5	P1 5.5 P2 5.5	P1 7.1 P2 2.14
M14-A							
M14-B							
M14-C							
M15-A							
M15-B							
M16-A							
M16-B							
M16-C							
M17-A							
M17-B							
M18-A							
M18-B					X	X	
M19-A							
M19-B					X		
M19-C							
T1.01-A							
T1.01-B							
T1.01-C							
T1.01-D							
T1.01-E							
T2.01-A							
T2.01-B							
T2.01-C							
T3.01-0							
T4.01-A							
T4.01-B							
T4.01-C							
T4.01-D							
T5.01-A							
T5.01-B							

Reach v Step >	0	1	2	3	4	5
T7.01-A						
T7.01-B						
T7.01-C						
T7.01-D						
T7.01-E						
T7.01-F						

Reach v Step >	P1 2.4 P2 0	P1 2.9 P2 1.5	P1 2.10 P2 1.5	P1 3.1 P2 1.2	P1 5.1 P2 4.5	P1 5.5 P2 5.5	P1 7.1 P2 2.14
T6.01-A							
T6.01-B							
T7.01-A							
T7.01-B							
T7.01-C							
T7.01-D							
T7.01-E							
T7.01-F							

x = Failed Test, blank = Passed Test

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Phase 2 - Quality Control - X.3 Conflicting Phase 2 data

White River - First Branch

Passed X.3 Test: **Provisional**

Step Numbers		1.3 - 3.3	1.3 - 1.5	1.5 - 2.1	2.14 - 2.11	2.10 - 5.3	2.10 - 5.3	5.3 - 5.3	2.14 - 2.14	3.2 - 3.3	4.1 - 5.3
Reach v	Description >	Encroachments Industriall Land Use	Encroachments Human Caused Change	Valley Width Bankfull Width	Riffle Spacing Plane Bed	Riffle Type Steep Riffles	Riffle Type Head Cutts	Steep Riffles Head Cuts	Dune Ripple Bed Material	Buffer Type Industrial Land Use	Springs/Seeps Tributary Rejuvenation
M01-A											
M01-B											
M01-C											
M02-0				X	X	X	X	X	X		X
M02-A											
M02-B											
M02-C											
M03-0											
M04-A											
M04-B											
M05-A											
M05-B											
M06-0											
M07-A											
M07-B											
T1.01-A											
T1.01-B											
T1.01-C											
T1.01-D											
T1.01-E											
M08-A											
M08-B											
M09-A											
M09-B											
M10-0											

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

March, 09 2014

Step Numbers	1.3 - 3.3	1.3 - 1.5	1.5 - 2.1	2.14 - 2.11	2.10 - 5.3	2.10 - 5.3	5.3 - 5.3	2.14 - 2.14	3.2 - 3.3	4.1 - 5.3
Reach v Description >	Encroachments Industriall Land Use	Encroachments Human Caused Change	Valley Width Bankfull Width	Riffle Spacing Plane Bed	Riffle Type Steep Riffles	Riffle Type Head Cutts	Steep Riffles Head Cuts	Dune Ripple Bed Material	Buffer Type Industrial Land Use	Springs/Seeps Tributary Rejuvenation
M11-0										
M12-0										
T4.01-A										
T4.01-B										
T4.01-C										
T4.01-D										
M13-A										
M13-B										
M13-C										
M13-D										
T5.01-A										
T5.01-B										
T6.01-A										
T6.01-B										
M14-A										
M14-B										
M14-C										
M15-A										
M15-B										
M16-A										
M16-B										
M16-C										
M17-A										
M17-B										
M18-A										
M18-B			X	X				X		
M19-A										
M19-B			X	X				X		
M19-C										

Step Numbers		1.3 - 3.3	1.3 - 1.5	1.5 - 2.1	2.14 - 2.11	2.10 - 5.3	2.10 - 5.3	5.3 - 5.3	2.14 - 2.14	3.2 - 3.3	4.1 - 5.3
Reach v	Description >	Encroachments Industriall Land Use	Encroachments Human Caused Change	Valley Width Bankfull Width	Riffle Spacing Plane Bed	Riffle Type Steep Riffles	Riffle Type Head Cutts	Steep Riffles Head Cuts	Dune Ripple Bed Material	Buffer Type Industrial Land Use	Springs/Seeps Tributary Rejuvenation
T7.01-A											
T7.01-B											
T7.01-C											
T7.01-D											
T7.01-E											
T7.01-F											
T3.01-0											
T2.01-A											
T2.01-B											
T2.01-C											

x = Failed QC Test, blank = passed QC Test

To: Redstart Consulting
From: Gretchen Alexander, VT DEC River Management
Date: 3/21/13
Redstart responses in blue

New Comments from Gretchen on reaches T2.01, T3.01, T4.01, T5.01, and T6.01 submitted to Redstart on 10/18/13 – see page 21

First Branch White River Phase 2 QA (2012 reaches)

The questions raised in this Quality Assurance assessment are meant to address potential discrepancies within the data set, uncover data entry errors, or otherwise clarify and confirm those observations that might not have been expected. It is important to take into consideration how data might be viewed or interpreted by the myriad of users who are familiar with the science and protocols but may be unfamiliar with the assessed reaches. While providing notes and comments, try to anticipate the types of questions that may arise due to outliers and exceptions observed within the reach. While attempting to clarify the data for those users wishing to utilize it years after collected, it's better to err on the side of making excessive comments than it is for them to be insufficient.

After reviewing the comments below, please update this document in a second color with what steps were (or were not) taken to address the comments/questions.

General Comments:

There are a number of reaches where the cross sectional area resulting from your bankfull elevation selection is significantly higher than curve predicted area. I started a spreadsheet to help compare your cross sectional areas to the curve predicted areas to see if there is a general trend in this watershed. If the % difference is fairly consistent then there may be a watershed-scale explanation for this difference. For example, a lot of wetland storage in the watershed can result in lower cross sectional areas than the curve due to significant storage of flows. Likewise, a watershed may be flashier than average due to the underlying geology or impervious surfaces. However – I didn't see such a trend here… and I'm wondering if sometimes your bankfull indicators were being confounded by remnants of recent flood events that may have exceeded bankfull? I'm curious to know your thoughts on this. You'll see in my comments below specific reaches where I wondered about this.
I had run a spreadsheet for this as well and was a bit perplexed by fairly consistently (but not always) high x-sectional areas. Though the trend is not consistent, I do know that flash flooding (primarily in the headwaters, but floodplains were accessed downstream as a result in each event) was experienced in the First Branch basin in 2008, 2009, and 2010; Irene hit in 2011.

There were several spots where you noted the valley wall much closer to the stream than I would have guessed due to observations of terraces not apparent on the topos. I'm aware that there are many glacial terraces in this valley and it can be difficult to interpret what is truly confining channel migration in the long-term. It would likely be useful to spend some field time together

looking at some of these specific spots and make any potential adjustments in anticipation of creating the river corridor map.

Reach specific comments:

M01-A
Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.
Done, classed as High impact reach-wide

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, classed as Low impact reach-wide

Valley wall location – just looking at the topos, I would have guessed that the right valley wall would capture the area where there is a ball field and follow the base of the steep slope just to the west. Is it so entrenched here that you feel the location where you depicted it is truly confining – i.e. there's absolutely no way the river could ever access this area from upstream? From what I can see in the photos, it seems this could be the case, but wanted to double-check with you that this was deliberate.
Yes, felt it was so entrenched that the terrace was likely a glacial feature rather than historical, likely left when glacial Lake Hitchcock emptied; it was not accessed in Irene and did not seem likely to be any other time, with the possible exception of the very end of the reach by Rte. 14.

Additional, based on Phase 1 reference revision to C4 (see comments also for next two segments of M01, below): This segment (M01-A) classed as a Stream Type Departure, C→B, based on entrenchment and as a habitat type departure in Step 6 (Riffle-pool → Plane bed)

x.s worksheet – it seems strange to me that you have recorded bankfull above the top of bank. Wouldn't bankfull be at least at top of bank (or somewhere lower if the bed has incised?). Your cross sectional area is ~170% of what is predicted by the curves, so I'm wondering if you were keying on bankfull features that could have been a result of a flood of greater magnitude than bankfull?
Agreed on bkf; reworked spreadsheet to show that what had been indicated TOB is actually bkf; TOB is below, as bed is incised. X-sectional area is ~107% of curve.

M01-B
Step 2: Do you think this could be a Phase 1 sub-reach – C by reference? Does it seem accurate to you that Phase 1 bedform is planebed by reference? Did you consider whether it should be riffle-pool?
Updated Ph1 reference to C4 riffle-pool; segment M01A is actually an STD and this segment and segment C are consistent with reference type.

Again – your bankfull seems high based on cross sectional area. Thoughts?
Reworked x-sec worksheet with bkf at lower level feature observed and recorded in the field on both banks. x-sectional area comes in at 105.4% of curve; comfortable with this adjustment.

Step 6: If reference bedform is riffle-pool but existing dominant is planebed then you should record a SHTD in step 6.9. But your step 2 dominant bedform is recorded as riffle-pool, not planebed. At the moment these dominant bedforms do not agree – please address.
Reference bedform should be riffle-pool, now have noted SHTD in step 6.9.

M01-C
Step 2: Do you think this could be a Phase 1 sub-reach – C by reference? Your corss section dimensions fall more in the E range – what made you choose C? Does it seem accurate to you that Phase 1 bedform is planebed by reference? Did you consider whether it should be riffle-pool?
As for segment M01B, have updated Ph1 reference to C4 riffle-pool and noted SHTD in step 6.9.

Again – your bankfull seems high based on cross sectional area. Thoughts?
Reworked x-sec worksheet with bkf at lower level feature observed and recorded in the field on both banks. x-sectional area comes in at 101.5% of curve; comfortable with this adjustment.

Step 2.10 – can you explain your choice of "eroded" riffles in such an aggradational setting?
Believe this is largely due to the sand substrate, very little stability; it was striking that some of the most substantial deposition was organic matter (leaves and CPOM). Added notes to Steps 5 and 6 about this.

M02-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be point bar or multiple for this reach as a whole.
Updated to Point, with Low impact reach-wide.

A few small typos in step 7.5
Fixed.

Do you think Phase 1 dominant substrate needs revision? Do you think it's really sand by reference?
Hard call, as the reach is dominated by glaciolacustrine sediments (VCGI soils lithology layer: pebbly sand, silt, and more recent alluvium, with a kame terrace in the most DS segment providing some coarser materials within the reach). Did end up deciding to bump reference substrate up to gravel, but strong sand and fines presence is not surprising.

M02-B
VW shapefile: Are you indicating a terrace with valley floor on the backside with the donut hole in the vw shapefile in this segment?
No, this was a decision to re-map one of the funny high terraces that had been considered a valley wall previously, opting to push the valley wall further out; have now merged the resulting "donut" with the rest of the valley wall polygon. As you've noted elsewhere, some of these

terraces are high enough (and likely glacial features) that it's a tough call as to what is truly the valley wall.

Your channel dimensions are in E range – what made you choose C?
Reworked x-section based on lower elevation banfull observed on one bank in field, which brings w/d ratio up a bit more (10.98). Typos and poor phrasing fixed so Step 5 comments now read: "Used +/- 2 width/depth factor to class as C-type stream as bed degradation contributes to very low width/depth ratio but grade control is likely limiting further degradation, and sinuosity is low for E-type stream."

M02-C
Step 5.5: The upper end of this segment looks straightened to me along the right vw. What do you think?
Yes, this is the old South Tunbridge Shingle Mill site, with some of the old foundations still intact on both banks; added straightening to FIT in this area. Have actually added straightening in a number of other areas as well, as I forgot that the Phase 1 had not really accounted for this on this project. We had made sure to FIT windrowed areas, but I have now captured more of the straightening effects of armoring, abutments, road encroachments etc.

M03
Reworked x-section worksheet to reflect lower bankfull than originally recorded (original, as with other reaches, was more likely flood flows; pct of curve-predicted x-sectional area went from 141% → 97%). This also dropped entrenchment to 1.4; have recorded C→B STD and adjusted scores.

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be multiple for this reach as a whole.
Done, classed as Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, classed as Low impact.

M04-A
Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done.

Just looking at topo lines, I would have thought the farmstead on Belknap Brook Rd. would be within the valley of the FB. What features did you see that made you think otherwise? From the photos it looks like a high bank – was it higher than 20 ft?
Another example of funny high terraces related to the edges of glacial Lake Hitchcock; current "valley wall" abruptly departs further from current channel just upstream of the farmstead, but the high bank you note in the photos (on top of which the Howe Twin Farms sit) is roughly 35

feet high at this point. The banks are sand and certainly prone to mass failure, but its hard not to consider them the current valley wall.

Step 6 – if your dominant bedform differs from your reference bedform, this should be recorded as a SHTD in step 6.9.
Have updated the reference bedform to riffle-pool and substrate to gravel.

Do you think the Phase 1 E by reference is accurate?
Yes, believe this is accurate; easier to believe in US segment B, but terraces in segment A also suggest that under reference conditions the planform would be very different; have added a good bit of additional Straightening in this reach and reach M05 in FIT. It's possible that under reference conditions the portion of segment A south of Belknap Brook might have been a subreach due to a pinch point in the valley at the Howe Twin farms (farmstead at base of Belknap Brook), but it would have been a small portion of the overall reach and I'm not sure it wouldn't have been E-type as well. The departure from reference in all of segment A is long-standing enough that it's hard to say definitively, but I'm inclined to consider the entire reach an E → C STD as indicated.

M04-B
Step 0: small typo in segment location: "poink"
Fixed. The "pink house" is a well-known landmark in town.

Is the vw constriction in the middle of the segment a glacial terrace? Does not show up on topos, so just curious.
It is, and I believe the terrace has been augmented by ditching of the trib just north of the Rte. 110 bridge DS (south) of Town Farm Rd. Have remapped this VW a few times now, and am doing so again now, but this would likely be a good spot to observe together in the field. There is a house with large barn just south of the bridge that may be located on a knoll that forms what was drawn as the valley wall here. As with M05A, have moved the valley wall out to the abrupt change in elevation to the west and have not drawn any "islands" or donuts though the house by the Rte 110 bridge (on the "knoll") seems unlikely to flood.

Step 6 – if your dominant bedform differs from your reference bedform, this should be recorded as a SHTD in step 6.9.
Have updated the reference bedform to riffle-pool and substrate to gravel.

Small typo in step 7.5: "nect"
Fixed to indicate "neck" cut-off.

M05-A
Update Phase 1 step 4.4 (groundwater inputs) to minimal to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar or multiple for this reach as a whole.
Updated to multiple, Low impact for the overall reach.
Have also updated Ph1 Step 6.4 (Meander migration) to reflect flood chutes, High impact.

VW delineation: at the downstream end of the reach where Howe Lane intersects the valley wall, can you describe what feature you saw there? Based on the topos, there is an abrupt change in slope to the west (more in line with the Phase 1 valley wall), and I'm just curious what you are seeing here to make you want to move the line further in.
Similar to M04B, these appear to be low terraces that likely have been augmented by ditching of the tribs. Irene photos (just recently found) of the main farm in that area indicate that the buildings did not flood, but water filled the valley around the buildings. I have redrawn the valley wall out to the abrupt change on the west side of the valley but have not drawn any "island" or "donuts" in that valley, though it will take a flood significantly larger than Irene to flood those buildings.

I'm confused by your step 5 comment noting that the channel is incised and that floodplain is only accessed in large floods. In step 2 and on your cross section you show no incision and floodprone width is almost 800 ft! Did you get your notes confused with another reach or do you feel the cross section is not representative of other incision you observed in the reach?
Have reworked the x-section as field observations did likely key on flood-based features rather than channel-forming bankfull; adjusted measurements do reflect the incision, and the comments should be more accurately reflected by the x-section measurements.

Step 7: By definition, you can't be in CEM F3 if you have no incision. Are you confident that your bankfull was at top of bank, or is it possible it was lower? The x.sectional area based on tob (547) is much higher than the curve (360), so picking a lower bankfull might bring you closer to the expected x.sectional area. Sometimes it is helpful to develop a spreadsheet comparing your bankfull areas to the curve generated area so you get a feel for what the relationship might be for this watershed (sometimes the actual area is consistently lower than what the curve predicts if the watershed has a lot of wetlands/storage etc.). Have you done anything like this to help in aiding bankfull? Looking at your photos, the tape looks like it might not be at top of bank – so maybe something just got mislabeled in the x.s?
Have reworked the x-section.

M05-B
You do not appear to have indexed the cross section location for this segment.
Done.

Small typos in step 7.5 comments:
… channel filled with failred riprap our time;
Fixed.

How confident are you in bankfull here? Again, based on the cross sectional area curve, I wonder if it is too high?
Have reworked the x-section as field observations did likely key on flood-based features.

M06
Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done.

Step 6: In the RHA you note the dominant bedform as planebed, but in step 2 you note it as riffle-pool. Please make these agree, and if necessary, indicate a SHTD if existing bedform differs from reference.
Updated Ph1 to riffle-pool, as this appears to be reference and the subdominant plane bed indicates some departure from reference.

Again, your x.sectional area is coming out much higher than what would be expected based on the curve (~ 30% higher). Did you feel confident in bankfull indicators? Is it possible you might have been cueing in on flood remnants higher than bankfull? Did you consider the small feature visible on right bank at the break in slope at elevation ~4.8?
Have reworked the x-section as field observations did likely key on flood-based features

M07-A
Update Phase 1 step 4.4 (groundwater inputs) to minimal to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be point bar or multiple for this reach as a whole.
Done, multiple with High impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

M07-B
No comments

M08-A
Update Phase 1 step 4.4 (groundwater inputs) to minimal to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar or multiple for this reach as a whole.
Done: Multiple, High impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done: Low impact.
M08 segment mislabeled as "0" instead of "1" in seg01segptsproj shapefile to remain consistent with your naming convention. Ideally you would be using letters instead of numbers such that the labels are consistent with the reach/segment naming convention in the DMS.
Done. Had always assumed these needed to be numbers, as the SGAT User Manual makes it seem like the "1,2…" convention is required; will use letters in the future.

VW shapefile is problematic at the M08 reach break – either join the two polygons into one to make it seamless or ensure that both polygons capture the M08 reach break. Otherwise, SGAT will not recognize the presence of the valley wall when developing the river corridor.
Fixed, as well as similar gaps in other reaches.

Step 7 comment typo: "DW instolled"
Is DW short for driveway?
Yes, spelled driveway out for clarity; corrected typo.

Also reworked x-section for this segment, as x-sec area was 38.7% over reference. When adjusted bkf was accounted, STD changes from C→ B to C→F (1.14 ER, 2.16 IR). Driveway on LB does not really seem to elevate the floodplain, but likely did get pushed/graded closer to river; hard to know to what degree the grade was reshaped. Steps 2-6-7 parameters and scoring were adjusted to account for this change. Seg was assigned Condition rating of Poor (sensitivity Extreme) due to C→F STD, though scoring had it in Fair range.

M08-B
Step 4.4 – no photo of debris jam? Was it channel spanning? Would be significant on a channel this size.
Yes, channel-spanning and the major reason for an ice jam winter 2013 that backed up ice for nearly half a mile; pix P1030565, P1030566

Do you have a photo of the breached dam?
P1030538, P1030540

M09-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.
Actually used Multiple as the point and mid-channel bars, though small in number; were probably more significant than the side bars; Low impact overall.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done; Low impact.

Small typo in step 7 comments: "floolowing"
Fixed.

Have also reworked the x-sec for this seg as the x-sec area was 27% high; interpolated values from recorded field measurements.

M09-B

Vw shapefile: it looks like you drew the valley wall through the pit. On the ortho I see something that looks like standing water and the line goes through it – seems like maybe it should be adjusted further to the east to at least capture the entire pit area. Realize this is a very altered area and likely difficult to interpret on the ground, or perhaps different since ortho taken (I'm looking at 2011 at the moment)?

Neglected to move this section of the Ph1 valley wall; have now pushed it out beyond the pond, which appears to be at or below river level. This "Valley wall" has been excavated for sand, but should be drawn more accurately now.

M10

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.

Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.

Done, Low impact.

I think I would index straightening along the entire reach – seems pinned against left valley wall for length of reach.

Had indexed straightening in the upstream portion of the reach based on bank toe armoring and riprap in the vicinity of alluvial fan at the base of Bicknell Brook, which I believe is what pins it to the LVW, but there was no other evidence or encroachments in the reach and I'm hesitant to index it along the entire reach – there does not appear to be anything limiting migration. Did add additional length in midsection where there appears to have been ditching and extensive ag use over time.

M11

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar or multiple for this reach as a whole.

Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.

Done, Low impact.

Do you think the Phase 1 dominant bedform should be revised from bedrock to riffle-pool?

It was actually the bed material that was showing as bedrock, bedform was already listed as riffle-pool; have updated bed material to gravel. A bit unfortunate that x-sec did not capture the bedrock presence, but still believe gravel does represent overall reach d50.

M12

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.
Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

M13-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar or multiple for this reach as a whole.
Done, Low impact.

Update Phase 1 step 4.4 (groundwater inputs) to minimal to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, Low impact.

x.s. worksheet: did you consider the potential for the wide flat area on the left bank at elevation ~10 as being the RAF? Your x.s. spreadsheet says "excavated" at this point – what do you mean by that? This would give you an incision ration around 2, which seems plausible.
Yes, agreed. Excavated area is for pond embankment and was bulldozed from surrounding soil, creating a small "floodplain" at a lower elevation but raising the majority of it higher off LB. Have entered this as an IRhef; though not continuous throughout the segment it largely restricts access to former floodplain. Floodplain on other side of pond was in backyard and difficult to determine height, though appears to be at a similar elevation out to LVW.

M13-B
I think I would index straightening in the vicinity of your x.s as well – still pretty pinned against the vw there.
Done; included note that there is less direct evidence than US and DS of here but armoring has likely failed over time.

x.s. worksheet: the note in your x.s for this segment notes that Irene caused consistent high flow indicators around 5 ft. Do you think it is appropriate to use this flood as a bankfull indicator? Is it possible it was a greater magnitude flood than bankfull? I know Irene was not as severe in this area, so just not certain whether it is appropriate to use remnants from this flood as an indicator of bankfull elevation. Thoughts? Based on the curve, your about 20% greater cross sectional area in this particular segment based on your bankfull elevation choice.

Reworked x-sec with an interpolated value at 0.5 ft lower; x-sec area comes out at 104.6% of curve predicition. Re-entered Steps 2-6-7 parameters and scores based on these figures.

M13-C

Your cross section shows that the channel is super narrow compared to reference. The channel dimensions come out as an E – what made you choose C? Given the level of alteration, it is surprising that no incision is noted, but perhaps the grade control you note upstream and downstream are playing a significant role here. But it's somewhat problematic as lack of incision implies good floodplain access, which you note is not the case except for only in very large floods. Regardless, you can't really put it in stage II if you can't document incision. Is there perhaps a better spot for a cross section to capture the incision you describe in the step 7 notes? Do you feel confident in bankfull? Lowering it by ~6 inches would give you a x.s area closer to the curve and show some incision. Let me know your thoughts – tricky reach to characterize given the extent of human alteration.

Have reworked the notes to indicate that moderate or higher level floods will access the floodplain (and the adjacent neighborhood, as this is a repeat flooding area). Have also entered an 'Other STD', C→E, as it appears the only reason the channel dimensions are this narrow is because of the extensive walling; hard to consider it E by reference. Access to the floodplain in moderate level floods seems to preclude a more entrenched STD (C→B or C→F), which is what I thought we'd be looking at until we did the channel measurements – and this seems consistent with my understanding of the flood history in this area.

M13-D

No comments

M14-A

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.

Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.

Done, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.

Done.

Something funky going on with the vw shapefile – more so at the base of T6.01 – looks like an extra polygon in there…

Fixed. We (you, Sacha and myself) took a look at this area in the field as well, where there is a road-cut gap in the hill for Rte. 110 on the north end of Chelsea village. I have also redrawn the VW to include that gap as it seems like flood flows could pass through there; I did not draw in a 'donut' for the high ground left west of the road cut (I'm guessing this may be some sort of moraine)

Do you feel confident in bankfull? ~30% higher x.s area than would be predicted by curve. Lowering it by ~ 1 foot would bring you more in line with the curve and indicate greater incision, which is more in line with your narrative in step 7.
Low confidence due to repeat flooding over last 4 years; reworked x-sec with an interpolated value at 1 ft lower, as x-sec area had been 37.2% over curve prediction; x-sec area comes out at 95.9% of ref. This increases incision 1.7, which appears more consistent with field observations. Re-entered Steps 2-6-7 parameters and scores based on these figures.

Debris jam noted in photo P1030342 not recorded in step 4.4.
That debris jam is actually in M14B; pix thru P1030342-348 placed in wrong folder (seg break got moved further DS), all should have been in M14B; apologies. No debris jams in M14A.

M14-B
You did not choose a CEM model or stage in step 7.5. Presumably F-I given lack of incision and no evidence of an RAF. Yes?
Have entered F-IV as there are major planform adjustments in response to straightening; comments in Steps 5 and 7 already noted belief that RAF or other signs of historic incision have been obscured by reshaping of LVW (and probably RVW as well) due to heavy road encroachment and parking lot construction, and these comments have been fleshed out further.

Your channel dimensions are in E range – what made you choose C?
Primarily lack of E-type sinuosity and relatively coarse materials (pebble count indicated d50 was barely in Coarse gravel; believe reference would be cobble). Have inserted Step 5 comments to note these factors.

M14-C
No comments
Reworked x-sec with an interpolated value at 1 ft lower, as x-sec area had been 32.8% over curve prediction; x-sec area comes out at 94.8% of ref. This increases incision from 1.24 to 1.6 and decreases ER from 11+ to 5.9; this appears more consistent with field observations of both morphology and stream processes. Re-entered Steps 2-6-7 parameters and scores based on these figures.

M15-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar for this reach as a whole.
Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, Low impact.

M15-B
No comments

M16-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be point bar or multiple for this reach as a whole.
Multiple, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, Low impact.

x.s worksheet: What feature are you referring to with this note?:
“"Low Bank" (Irhef) is not a berm, but likely edge of plowed area= land furrow”
Feature was at Series 1 Point “240” (240, 5.6); should have read: “"Low Bank" (Irhef) is not a berm, but likely edge of plowed area (headland)”, and should have referred to RB feature now at (298, 9.2). Believe RAF has been obscured by cultivation on both sides, as through much of segment, and have removed former comment and replaced with a note to this effect.

Your bankfull seems high here (28% higher x.s area than expected by curve). Did you consider dropping it to the break in slope on the left bank at elevation ~4.3? What were you bankfull indicators here?
Bankfull indicators through segment almost all noted “fresh alluvium”, with exception of one depositional feature at about the same level as the break in slope you have noted. Given flood history, it’s likely we were keying on flood features rather than bankfull; have reworked x-sec with bankfull at the noted break in slope.

M16-B
Based on your comment in the x.s worksheet that this is likely an E by reference, do you think this should be a Phase 1 E subreach? This could be an important consideration as it would automatically increase the beltwidth to 8 channel widths for this segment. Your cross section comes out as an E and would support this – what made you want to bump it to a C?
Very difficult call on this. X-sec area was 17% over reference; have reworked x-sec (99.1% ref. x-sec area) and w/d ratio is 11.7. Soil types are the same as US and DS segments, so the real difference appears to be the broader floodplain (shared with a ditched intermittent trib) and the lack of tree cover, which may be what gives it the feel of an E stream. Sinuosity is low for E-type but clearly due in part to bank-toe armoring. In considering what reach would be like with full tree cover, have opted to leave C reference.

M16-C
No comments
Reworked the x-section on this, which had been 25% over reference x-sec area; this made only minor difference in parameters and scoring.

M17-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be side bar or multiple for this reach as a whole.
Multiple, Low impact.

Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Flood chutes, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done; Low impact.

Your segmentation reason is listed as changes in planform and slope – why is this different from the upstream reason of changes in valley width?
Had both VW and PS circled on field form for this seg, with a star next to PS; have changed to VW for both.

Your channel dimensions are in E range – what made you choose C?
Combination of low sinuosity and geologic materials; have added Step 5 notes to this effect.

M17-B
If you think the bedform should be riffle-pool by reference in this segment, create a subreach in step 2 noting this difference. Otherwise, you would need to indicate a SHTD in step 6 from step-pool to riffle-pool.
Have noted an SHTD in step 6; riffle-pool features likely related to significant post-Irene sedimentation; tributary just US of M18 reach break was particularly hard hit in Irene.

Also reworked x-section for this segment as it had been at 78% of curve; increases IR to 1.7, which appears consistent with observations of stream processes in field. Re-entered Steps 2-6-7 data based on these changes.

M18-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be point bar for this reach as a whole.
Done, Low impact.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

M18-B – not assessed
No comments

M19-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be multiple for this reach as a whole.
Done, Low impact.
Also added Low impact for flood chutes in Phase 1 Step 6.4 (meander migration).

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, High impact.

Step 7.7: Sensitivity should be Very High instead of High (C4 in fair condition)
Done.

M19-B – not assessed
No comments

M19-C
In step 6 you chose dune-ripple as the reference stream type – but this does not agree with Phase 1 reference bedform of riffle-pool. Please create a subreach indicating the difference in bedform if you feel this should be dune-ripple by reference. Also, please indicate a SHTD from dune-ripple (reference) to riffle-pool (existing) in the step 6.9 for data consistency sake. Either that or switch to the riffle-pool reference bedform habitat form if you think it is not dune-ripple by reference – important thing is that the data is consistent.
Have switched to riffle-pool habitat form, as believe this should be reference (there would likely be more gravel present in channel without damming and subsequent recent beaver pond blowout/current degradation process).

Both of your cross sections note incision as the dominant process, and yet neither cross section demonstrates incision (IR=1). Please explain. All other indicators point to a degradation process (headcuts and blown out beaver dam/wooden structures), but it is difficult to justify stage F-II CEM without documenting incision. Thoughts?
Have updated both of these x-sections (segment A had been 64% over curve prediction and was likely based on observation of flood flows rather than typical bankfull; seg C had been at 29% of curve prediction and was likely related to missed bankfull due to rapid incision going on in this area) and uploaded the re-worked Excel workbook; both indicate incision.

QA RESPONSES TO MAINSTEM REACHES (ABOVE THIS POINT) SUBMITTED TO GRETCHEN ALEXANDER 6/10/2013; 2012 TRIBUTARIES (BELOW HERE) SUBMITTED 08/05/2013.

T1.01-A
Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.

Done, High impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, High impact.

I think your bankfull elevation may be high for this cross-section. You have a resulting cross sectional area that is more than twice what would be expected based on the curves (216%). Although the curves may underestimate cross sectional area in this setting, this seems extreme. Is it possible you keyed in on flood features from a flow that exceeded bankfull? From one of the cross section photos, it looks like you chose a point above where large woody vegetation is established, which is atypical of bankfull. Granted, this is an extremely complex (alluvial fan) and altered (lower section) segment. Thoughts?
Likely that we were keying on flood features; repeat flooding over the last several years has definitely confounded identification of bankfull. Have reworked the x-sections for all of the segments on this reach and uploaded the workbook again:
T1.01:

seg	Wbkf (ft)	Xsarea (sq ft)	pct_curve		Pct StreamStats XS area
A	25.5	44.74	131.9%		
B	23.9	40.24	118.6%	Streamstats: bkfw 23.4 and x-sec area 33.2 at this point	121.20%
C	20.4	40.12	118.3%	Streamstats: bkfw 22.4 and x-sec area 30.7 at this point	130.68%
D	18.5	33.72	99.4%	Streamstats: bkfw 21.3 and x-sec area 28.4 at this point	118.73%
E	20.7	36.1	106.4%	Streamstats: bkfw 21.4 and x-sec area 28.6 at this point	127.11%

T1.01-B
Again – I wonder if your bankfull is high here – x.s. area is even higher than downstream and more than twice as large as the curve-predicted area. Picking a lower feature would increase your w/d ratio and bring your more definitively into B stream type territory (currently it is an incongruent stream type). Thoughts?
Adjusted bkf as indicated in table above, and resultant entrenchment and w/d actually indicate a B to F STD, which appears consistent with other field observations. Have adjusted stream type, STD, and scoring.

T1.01-C
Again – I wonder if your bankfull is high here. Thoughts? What indicators were you keying-in on? It may not be terribly important because you're likely going to stay a C channel here either way (if anything it will increase your w/d ratio and get you out of E territory), but it's been a trend on this project and I'm just wondering if it is particular to the geology of this watershed or if recent past floods that are higher than bankfull have confounded indicators for you.
Adjusted bkf as indicated in table above, resultant entrenchment and w/d still indicate C4b, which appears consistent with field observations. Have adjusted Step 2 and Steps 6-7 scoring to reflect changes.

T1.01-D

I'm not sure I understand your note on your cross section worksheet regarding the feature on the right bank. Please explain.
Removed comment concerning moving bkf, tried to clarify presence of sediment levees that appear to be remnants of Irene flooding; have adjusted Step 2 and Steps 6-7 scoring to reflect changes.

Photos look to be a riffle-pool dominant bedform instead of step-pool. Were there other step-pool features not captured in the photos?
Believe the step-pool dominant you are referring to is in Phase 2 Step 6, which is pulling that from the Phase 1 for the overall reach. This segment is a subreach with a riffle-pool dominant bedform (GIS-calculated slope of 1.4 pct for the segment) and has been entered as such in Phase 2 Step 2.

Is this where Fred used to live?
Ha! Yes, indeed it is.

T1.01-E
From the photos, the bed does not appear particularly bony. What did you observe to guide your selection of the D model CEM? It seems there has been plenty of incision (1.87) to support use of the F-model. Plus, I think your bankfull may be high based on the photos (which would mean even greater incision present). Do you think it's possible the sediment line you observed is from a flood greater than bankfull?

The decision to use the D-model was for segment T1.01 D, the next segment DS, where the IR was 1.7 after lowering the bkf to account for having keyed originally on flood features. The decision was primarily based on the very high erodibility of the banks in comparison with the bed, something that has been suggested to us in the past on E-type streams with high sand banks in particular, and a supposition that the channel will continue to widen rather than incising. Given the degree of incision when the bkf height was adjusted, reversed that decision and used F-model.

For T1.01E, adjusted bkf as indicated in table above; resultant entrenchment and w/d still indicate C4b, which appears consistent with field observations. Adjusted Step 2 and Steps 6-7 scoring to reflect changes.

Your channel dimensions are in E range – what made you choose C?
Used +/-2 w/d ratio 'fudge factor' to classify as a C-type stream due to these primary factors: lower than expected sinuosity for an E-type stream; lack of characteristic verticality in bank morphology; alternating pockets of floodplain rather than a broader more well-developed floodplain; and woody rather than herbaceous vegetation. Have added this note to step 5 comments.

T2.01-A

Update Phase 1 step 4.4 (groundwater inputs) to abundant to jive with Phase 2 data in steps 4.1/4.2.
Done.

Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be multiple for this reach as a whole.
Agreed and Done, Low impact overall as deposits were not huge.

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, High impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, High impact.

I wonder if your bankfull is high here – what do you think about the feature on the left bank at elevation 3.8 where there is a change in slope? This would bring you down to a more reasonable cross sectional area… Thoughts?
Agreed, likely keying on flood flows rather than bankfull (which are less evident after annual flash flooding over the last 3 or 4 years).
Have reworked the bankfulls for all segments in this reach, which had been 150-200% over curve predictions:

T2.01

seg	Wbkf (ft)	Xsarea (sq ft)	pct_curve		Pct StreamStats XS area
A	23.7	49.21	124.3%		
B	25	41.09	103.8%	Streamstats: bkfw 22.1 and x-sec area 30.1 at this point	136.51%
C	21.8	31.91	80.6%	Streamstats: bkfw 21.1 and x-sec area 28.0 at this point	113.96%

For step 6 you chose the riffle-pool reference bedform, yet Phase 1 reference bedform is step pool – please address.
Step-pool dominant in Phase 2 Step 6 is being pulled from the Phase 1 for the overall reach (Seg B, 4350 ft). This segment (T201A) is a subreach with a riffle-pool dominant bedform and has been entered as such in Phase 2 Step 2; also added Step 6 note to this effect.

T2.01-B
No comments

T2.01-C
For step 6 you chose the riffle-pool reference bedform, yet Phase 1 reference bedform is step pool – please address. From photos it looks like riffle-pool by reference, so would just need a subreach to address this difference.
This segment (T201C) is a subreach with a riffle-pool dominant bedform and has been entered as such in Phase 2 Step 2; also added Step 6 note to this effect.

Your channel dimensions are in E range – what made you choose C?
Bankfull adjustments noted in table above brought w/d ratio into C range.

T7.01 x-sec QA changes were made for segments B and F (other segments were not changed from original upload, although true VW on RB was added for seg C). Believe this reach was particularly hard hit in Irene; bankfulls were tough to read

seg	Wbkf (ft)	Xsarea (sq ft)	pct_curve		Pct StreamStats XS area
B	19.3	28.57	104.6%	Streamstats: bkfw 17.8 and x-sec area 20.9 at this point	136.70%
F	14.4	11.44	41.9%	Streamstats: bkfw 8.8 and x-sec area 6.2 at this point	184.52%

T7.01 x-sec with no QA changes:

seg	Wbkf (ft)	Xsarea (sq ft)	pct_curve		Pct StreamStats XS area
A	25.6	37.09	135.7%		
C	19.8	24.68	90.3%	Streamstats: bkfw 16.0 and x-sec area 17.3 at this point	142.66%
D	19.3	31	113.5%	Streamstats: bkfw 14.9 and x-sec area 15.3 at this point	202.61%
E	7.5	8.2	30.0%	Streamstats: bkfw 11.2 and x-sec area 9.5 at this point	86.32%

T7.01-A
Update Phase 1 step 6.3 (bars) with the dominant bar noted in Phase 2 – appears to be multiple for this reach as a whole.
Done, as noted (multiple).

Update Phase 1 Step 6.4 (meander migration) to reflect flood chutes noted in Phase 2.
Done, Low impact.

Update Phase 1 step 7.2 to account for debris jams observed in Phase 2.
Done, but listed as multiple as there have also been culvert failures at different locations along the reach.

Did you map the location of the valley wall for T7? Was not included with the updated shapefile.
Shapefile now includes all VWs for Ph2 reaches.

Just curious – is your step 6 comment regarding the presence of a healthy Brook Trout population based on observations of fish while you were conducting the assessment, or knowledge of a fish survey done here (or maybe both)? Maybe just good to clarify the comment so that if a person from the public views this they have an understanding as to whether this is anecdotal or based on data. Nice to know BT are finding at least some cool spots in this watershed!
Anecdotal; have clarified this in Step 6 comments.

T7.01-B
No comments

T7.01-C
x.s worksheet: consistent flat feature at elevation 5 – why did you not consider this to be the RAF (step 5 comment indicates no indication of an RAF)? You can't put it in stage F-III of the CEM without presence of incision.
Reworked x-sec and counted this feature as RAF, as rapid floodplain abandonment following beaver dam blow-outs was apparent.

Also, are your last VW elevations on the x.s spreadsheet on the right bank correct? You indicate the "top of valley wall" at elevation 5.3, but then your next point is lower and labeled "mid vw". Should these be flipped? And do you really think the right vw is only 4 ft. above the thalweg? Is this the base of a steep feature not noted on the x.s?
Entire description was likely not appearing in the cell: this feature was "VW" of neighboring trib; have added features that clarify position of true VW, which is beyond the trib.

Your x.s location does not appear to be noted in FIT for this segment.
Yes, looks like it got missed – added this x-sec to FIT.

T7.01-D
No comments

T7.01-E
No comments

T7.01-F
You can't put it in F3 without documentation of incision. Do you feel confident in your bankfull location? Was the x.s location not representative of the incised condition implied by the selection of F-III CEM? What are your thoughts on this?
Few good places to locate a x-sec, and the area where it was done is fairly close to a long run of steep ledge grade controls in the next reach US. Reworked x-sec as indicated in table above, however; adjusted bankfull did indicate some historical incision, which has likely been offset by subsequent aggradation – added Step 7 comment to this effect.

Comments below for reaches T3.01 – T6.01 for fieldwork completed in 2013:

T3.01-0
VW – there is one spot on this reach where the cost-slope derived vw differs a bit from the field verified version that I'd like to check-out and/or get your thoughts on. It is a site that the town is pursuing purchase of for relocating the town garage, so would be good to verify that it will be outside of the river corridor.

Please update Phase 1 step 4.4 to "abundant" to reflect the presence of springs/seeps noted in Phase 2 step 4.1.

Please update Phase 1 step 6.3 to reflect the presence of bars noted in Phase 2.

T4.01-A
Please update Phase 1 step 6.3 to reflect the presence of bars noted in Phase 2.

No valley wall drawn – please update.

T4.01-B
No valley wall drawn – please update.

X.S location not included in FIT – please update.

T4.01-C
No valley wall drawn – please update.

X.S location not included in FIT – please update.

T4.01-D
No valley wall drawn – please update.

X.S location not included in FIT – please update.

T5.01-A
Please update Phase 1 step 4.4 to "minimal" to reflect the presence of springs/seeps noted in Phase 2 step 4.1.

Please update Phase 1 step 7.2 to reflect the presence of a debris jam noted in Phase 2.

Please update Phase 1 step 6.3 to reflect the presence of bars noted in Phase 2.

There is no RAF recorded in your cross section, and therefore no incision ratio calculated. I'm not certain if this was intentional or not given the highly altered conditions of the surroundings. Looking at the x.s spreadsheet, it seems like it would be prudent to indicate the TOB (lawn edge

@ 6.5 ft.) as the RAF to indicate the existing level of incision. This will need updating in the x.s. spreadsheet as well as in step 2 of the DMS.

T5.01-B
What made you want to classify this segment as an "A" stream type, as the x.s comes out as a B. I do see some bedrock cascade features captured in the photos, but in general the phonots look more like a "B". Thoughts? If you stick with the "A" classification, please provide some justification in the comments section.

T6.01-A
No comments

T6.01-B

Please update Phase 1 step 4.4 to "abundant" to reflect the presence of springs/seeps noted in Phase 2 step 4.1.

Please update Phase 1 step 7.2 to reflect the presence of a debris jam noted in Phase 2.

ADDENDUM 4/23/2014 submitted by Redstart (d. ruddell)

April 23, 2014
To: Gretchen Alexander
From: d. ruddell, Redstart Fixes noted in blue, submitted 4/23/2014

First Branch missing or incorrect data in SGAT FIT
(These came up while working through the project identification for the First Branch Corridor Plan)

FIT point features (if applicable, these are in DMS constrictions but not FIT):

T4.01D - 1 bridge (on Town Farm Rd) is missing -72.41718, 43.96083
Entered , re-segmented and uploaded to DMS 4/23/3014

T5.01A - DS "bridge" shouldn't be there - it was an abutment on the mainstem, not a constriction at all (only one side) IMACTID 2726 -72.44854, 43.98802
Deleted 4/23/3014

T6.01A - Richardson's bridge on Upper Village Rd is missing -72.44891, 43.99952
Entered , re-segmented and uploaded to DMS 4/23/3014

T7.01A Schoolhouse Rd was entered as bridge in FIT – was only abutments and is a stream ford; remove bridge from FIT (low priority but technically shouldn't be there as constrictions that are not actual structures are not FIT'd at this point in time; I'd suggest we might want to consider doing this in the long run though) IMPACTID 2046 -72.50548, 44.04366
Left this in

– Appendix 6 –

Consolidated Project Identification

(sorted by priority - watershed priority first, then reach, then river segment;
11x17 format – digital appendix includes Excel file that can be sorted by field)

River Segment	*Project*	*Reach Priority*	*Watershed Priority*	*Completed Independent of Other Practices*	*Next Steps and Other Project Notes*	reach-scale restoration rank
M14A	Watershed Strategies	Very High	Very High	N	Floodplain and River Corridor Protection and Planning (WHPA, FEH, NFIP), stream buffers; consider dam removal with full recognition of social constraints and need to evaluate potential impacts to downstream encroachments in corridor (sedimented above, likelihood of bed elevation changes)	1
M14A	Protect River Corridors	Very High	Very High	Y	Explore easement status and possibilities, relationship to WHPA. Attenuation asset US of Chelsea village area, which has limited attenuation assets and concentrated development; also location of recent town well project, includes both zone 1 and 2 groundwater source protection areas	1
M14A	Stream Buffers	Very High	Very High	Y	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous veg is intact and would facilitate some larger stock for outside edge of belt-width; explore possibility of moving trail between hayfields off right bank further away from stream	1
M14A	Remove/Replace Structures	Next Highest	Very High	Y	Consider dam removal with full recognition of social constraints and need to evaluate potential impacts to downstream encroachments in corridor (sedimented above, likelihood of bed elevation changes)	1
M14B	Stream Buffers	Very High	Very High	Y	Plant buffer with native woody vegetation; 1 of only 2 relatively stable segments in entire study area. Conditions challenging along Bobbinshop parking area, consider shrubs and low-cost smaller trees	1
M14B	Watershed Strategies	Next Highest	Very High	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; relatively stable segment US of high-priority attenuation asset	1
M14B	Remove/Replace Structures	Next Highest	Very High	Y	Replace or remove (if other access is feasible): footbridge (or VAST?) at north end of Brookhaven soccer field and new Town well structure is undersized and contributes to straightening but is relatively minimal floodplain constriction; priority increased by location in priority restoration reach; replace: Bobbinshop Rd bridge also undersized, blocks floodplain entirely	1
M16A	Watershed Strategies	Next Highest	Very High	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale; high priority reach due to alluvial fans,value as attenuation asset downstream of M16B, where there is potential for rapid widening, and location at base of Jones Pond Brook), stream buffers (high priority planting area).	2
M14C	Stream Buffers	Next Highest	Very High	Y	Create/protect buffer, inquire about watering system for horses at Braman Farm (not clear if there is free access); plant in limited areas where banks are stable (much is still widening - stage III); low-cost due to lateral instability; may need fencing; priority increased by location in priority restoration reach	1
M16A	Remove/Replace Structures	Next Highest	Next Highest	N	Replace: four bridges in this segment, all undersized and channel constrictions contributing to straightening/ elevated streampower; most downstream farm bridge is not a significant floodplain constriction but has a check dam installed upstream of it, indicative of effects of straightening/heightened streampower - monitor and MAINTAIN if necessary - current IR 1.3 in comparison with IR 2.0 in M16C; driveway bridge is only partial floodplain but also channel constriction. State structure effective width reduced by angle of alignment, private driveway structure half bankfull width and entirely blocks floodplain access. None appear to pose high risk to nearby structures or infrastructure due to replacement	2
M16B	Protect River Corridors	Next Highest	Next Highest	Y	Explore easement possibilities - Attenuation asset DS of moraine and alluvial fan at trib confluence at end of Chelsea-Williamstown Rd, where stream has lost historic floodplain access in vicinity of old mill	2
M16A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; may be largely passive as limited buffers exist in much of corridor, though there are several areas completely lacking - may need fencing. Passive or low-cost as channel is actively widening - localized erosion can be rapid around toppled riprap but overall sensitivity High (not Very High or Extreme) due to geology; establish at outside edge of belt-width where possible	2
M08B	Protect River Corridors	Next Highest	Very High	Y	Explore easement possibilities (US of school) - Attenuation asset US of converted transport reaches with limited attenuation assets and concentrated development (N. Tunbridge village); US of Larkin bridge lower priority due to distance, should probably be part of watershed strategies. Explore possibility of driveway relocation on upstream end east side of bridge further upslope (M08A-B). discuss elevation/buyout options now available through FEMA (TRORC) for house downstream of breached dam; house at head of reach is not in current mapped floodplain, thus not eligible	3

M08B	Watershed Strategies	Next Highest	Very High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP, discuss elevation/buyout options now available through FEMA for houses at upstream end of reach, relocation discussion with camp owner upstream of Larkin bridge); stream buffers. Priority attenuation asset in this segment (US of school); assess possible floodplain gain from abutment removal upstream Larkin bridge. Attenuation asset DS of Bicknell Brook (M10) and gravel pit (M09B).	3
M16B	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; likely needs to be part of corridor planning, as trees along the banks have been systematically cut due to concerns about them toppling into the stream. Low-cost as channel is actively widening; establish trees at outside edge of belt-width	2
M08A	Watershed Strategies	Medium	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (attenuation asset DS of Bicknell Brook (M10) and gravel pit (M09B), priority for attenuation asset in M08B (US of school), stream buffers	3
M08B	Remove/Replace Structures	Medium	Medium	N	Remove: Explore moving hayfield access US of school further downstream, to permit better floodplain access on RB - include potential impacts to Rte 110 and house on opposite bank. Lower priority: assessment of abutments and breached dam at upstream end of reach have barn now converted to house just downstream that would be at risk with removal. Old abutments ~400 ft upstream Larkin Bridge need further investigation as its not clear how much floodplain access would be gained and how covered bridge would be affected. Replace: Larkin covered bridge undersized, contributes to straightening; low priority - strong social constraints (Historic Register)	3
M16C	Stream Buffers	Medium	Next Highest	Y	Create/protect buffer; should be part of corridor planning, can be mostly passive as buffers are generally in existence but can use augmentation as stream is widening and re-establishing floodplain access	2
M10-0	Watershed Strategies	Next Highest	Very High	N	Floodplain and River Corridor Protection and Planning (FEH, NFIP; corridor is all in SFHA); stream buffers low-hanging fruit but very important	4
M10-0	Protect River Corridors	Next Highest	Next Highest	Y	Attenuation asset downstream of High Hazard dam (Bicknell Brook) and US of pond in gravel pit; still stage III channel evolution so needs watershed strategies, but still recommended as priority	4
M08B	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; frequent ice jam area	3
T1.01D	Watershed Strategies	Very High	Very High	N	Floodplain and River Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and protection, Drainage and Stormwater Management (overland flow as much as erosion, ry to mitigate peak flow impacts). Reach and watershed priority increased by E. coli readings with Town Pool downstream, heavy social constraints for project implementation in T1.01A and M07A plus Strafford Rd issues downstream.	5
T1.01A	Watershed Strategies	Next Highest	Very High	N	Floodplain and River Corridor Planning and Protection (FEH, NFIP,explore moving Recreation Rd further back from First Branch),Buffer Establishment and protection, Road-Stream Crossing Retrofits and Replacements (replace culvert with bridge), Drainage and Stormwater Management (overland flow as much as erosion). High priority segment with heavy social constraints for project implementation.	5
M10-0	Stream Buffers	Very High	Very High	N	Create/protect buffer, plant; few signs of active erosion, vertically stable, so could use mixed stock but still signs of lateral instability: tend toward low-cost	4
T1.01A	Remove Berms	Next Highest	Next Highest	Y	Upstream of culvert; ideally part of reach-scale restoration	5
T1.01A	Remove/Replace Structures	Next Highest	Next Highest	N	Replace: Culvert by Rec field (25 pct bankfull, entirely blocks floodplain, perched, potential to trigger mass failure beneath Rte. 110). Ideal would be bridge, not sure about constraints of heavy trafffic with loaded trucks (Town Garage access)	5
T1.01B	Watershed Strategies	Next Highest	Medium	N	Consider upgrading road further upslope; try to mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (high priority to attenuation assets US), Buffer Establishment and protection	5
T1.01D	Stream Buffers	Very High	Very High	N	Create/protect buffer; low cost due to both widening and aggrading, may need fencing; trees to outside edge of belt width in anticipation of widening. Reach and watershed priority increased by E. coli readings with Town Pool downstream, heavy social constraints for project implementation in T1.01A and M07A plus Strafford Rd issues downstream.	5

T1.01C	Remove/Replace Structures	Next Highest	Medium	N	Replace: Highest priority is stone culvert on Strafford Rd (sized at 21 pct bankfull, entirely blocks floodplain; repeat failures, high likelihood for future failure as well). Private bridge lower priority: 80 pct bankfull, partial floodplain constriction; structure looks relatively new and is substantial enough that outflanking and driveway failure is more likely than structure failure	5
T1.01C	Stream Buffers	Very High	Next Highest	N	Create/protect buffer; explore moving horse paddock and shed further back from stream; passive augmentation, let existing seed out or low cost due to both widening and aggrading; may need fencing.Reach and watershed priority increased by E. coli readings with Town Pool downstream, heavy social constraints for project implementation in T1.01A and M07A plus Strafford Rd issues downstream.	5
T1.01C	Watershed Strategies	Next Highest	Medium	N	Try to mitigate peak flow impacts: Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (high priority to attenuation assets US), Buffer Establishment and protection	5
T1.01E	Watershed Strategies	Medium	Medium	N	Try to mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and protection	5
T1.01D	Remove/Replace Structures	Low	Low	N	Replace: VAST bridge is 83 pct of bankfull but not a significant floopdplain constriction, contributes to straightening largely due to bank armoring up and downstream	5
M02A	Protect River Corridors	Very High	Next Highest	N	FEH or Easement - Attenuation asset US of South Royalton and DS of trib delta and converted transport mainstem reach transferring sediments; rugby fields and some minor recreational development in Floodway; high enough value to be worth exploring despite lateral instability (Stage III); development pressure, Floodway does not correspond to FEH	6
M02A	Watershed Strategies	Very High	Next Highest	N	Possibilities for floodplain restoration would greatly benefit from corridor protection (FEH and/or corridor easement to limit bank armoring and permit meander development), Floodplain and River Corridor Planning and Protection (priority attenuation assets in this segment - by rugby fields) buffer establishment/protection to help with erosion control	6
T1.01A	Stream Buffers	Medium	Medium	N	Create/protect buffer; passive augmentation, let existing seed out but would benefit from removal of windrows and corridor protection	5
M02B	Watershed Strategies	Next Highest	Next Highest	N	FEH; drainage and stormwater management; prioritization of structure replacement and capital budget planning, buffer establishment to help with erosion control	6
M02C	Remove/Replace Structures	Next Highest	Next Highest	Y	Remove: old abutment upstream of current Rte. 110 bridge, some of wall DS of bridge; needs careful evaluation of possible impacts to houses and barn off LB Replace: Rte. 110 bridge prone to plugging due to pier, limiting floodplain access, contributing to straightening/confinement/conversion to Transport reach (may be reduced by removal above)	6
M02C	Watershed Strategies	Next Highest	Next Highest	N	FEH and/or corridor easement to limit bank armoring and permit meander development, buffer establishment to help with erosion control, prioritization of structure replacement and capital budget planning	6
M02B	Remove/Replace Structures	Medium	Medium	Y	Replace: both Vezina and Dodge Rd (TH 92 and TH 93) bridges undersized, limiting floodplain access, showing structural problems due to scour, and contributing to straightening/confinement/conversion to Transport reach	6
M02A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer, then probably enough currently exisiting to allow natural regen if excluded from mowing (avoid high-cost stock due to depositional zone and Very High sensitivity); recommend at least 100 ft; clarify stable planform (FEH zone) is even further out; treat honeysuckle	6
M07A	Protect River Corridors	Very High	Very High	Y	Explore easement possibilities ((across river from Town Garage plus just downstream on same side as garage) - Attenuation asset US of converted transport reaches with limited attenuation assets and concentrated development; increasing encroachment pressures and access to Town garage on opposite bank; protect class 2 wetland US of cemetery; explore removal of materials restricting access to plugged flood chute; high enough value to be worth exploring despite lateral instability (Stage III)	7
M07A	Watershed Strategies	Next Highest	Very High	N	Reach-scale Restoration including removal of Old Meetinghouse bridge abutments, Floodplain and River Corridor Protection and Planning (FEH, NFIP, discuss elevation/buyout options now available through FEMA for former camp now house by rec field); Buffer Establishment and protection. High priority segment with heavy social constraints for project implementation.	7

M07A	Remove/Replace Structures	Next Highest	Next Highest	N	Remove Old Meetinghouse bridge abutment; buffer establishment and corridor protection important downstream	7
M02C	Stream Buffers	Next Highest	Next Highest	N	Create/protect buffer; will likely need active establishment, recommend low-cost stock only due to vertical and lateral instability; FEH zone is at least 100 ft off RB, often 200 ft or more, and 170-400 ft or more off LB - NFIP Floodway is at least this wide; lower priority until US impacts are addressed	6
M02B	Stream Buffers	Medium	Next Highest	N	Create/protect buffer; will likely need active establishment, recommend low-cost stock due to vertical and lateral instability; priority would be higher with increased stability	6
T6.01A	Watershed Strategies	Very High	Very High	N	Floodplain and River Corridor Planning and Protection (FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; clarify and administer jurisdicition of WHPO and flood hazard bylaw; discuss new buyout and elevation options from FEMA), Drainage and Stormwater Management, Buffer Establishment and Protection (high priority shrub plantation in this segment near old mill at a minimum; encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention). High priority reach with heavy social constraints for project implementation. May need further discussion on whether this segment is being managed as a modified reach while watershed BMPs are being implemented, assessment of need to access dam for remediation (increasingly plugged) or removal, with careful eye to impacts on surrounding structures and infrastructure.	8
T6.01B	Watershed Strategies	Next Highest	Very High	N	Floodplain and River Corridor Planning and Protection (weigh new buyout options from FEMA against costs of repeat remediation; FEH and some sort of stream setbacks for upstream areas lacking data to create FEH), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention). Priority increased by WHPA.	8
T6.01A	Remove/Replace Structures	Medium	Very High	N	Replace: Five bridges and one culvert in this segment, all undersized and mostly floodprone constrictions; prioirty increased by WHPA. Lower priority because the three private vehicular bridges have been somewhat recently replaced or shored up and all but the most upstream (sized the largest and the least restriciting for the floodplain) have significant development encroachments nearby that would need to be considered for potential impacts. The most downstream is a footbridge at Brookhaven and has development encroachments as well; Rte 110 bridge is adequately sized but effective width reduced by angle of alignment. Any of these replacements would be recommended for upsizing or reconfiguration (recommend adoption of new VT Bridge and Culvert Standards for watershed strategies) as opportunities arise but would need design and impact assessments beyond the scope of this study. Culvert (virtually a dam) is a channel constriction but appears it may be playing a valuable attenuation role in a less developed section of the stream than further downstream where there are extensive development encroachments; removal would entail bed elevation changes.	8
M07A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; may need fencing in som areas	7
T6.01B	Remove Berms	Low	Very High	N	Berm/windrow removal at upstream alluvial fan likely only becomes feasible if owner just downstream ever opts for buyout, otherwise removal poses risk.Watershed priority increased by WHPA.	8
T6.01B	Remove/Replace Structures	Next Highest	Next Highest	N	Replace: Four bridges in this segment, three undersized and channel constrictions contributing to straightening/ elevated streampower; fourth is footbridge with minimal impact on stream. Bridge by Baraw Hill and Hillside housing units is highest priority because most constricted, in part due to angle of alignment, but is substantial concrete structure more likely to outflank; replacement costs should be weighed against potential repeat damage to roads and/or downstream residences. VAST bridge sits on roadside and valley pinch point and is essentially at same risk as road. For both, priority increased by WHPA. Upstream private bridge is sized approaching bankfull but located on alluvial fan, blocks access to floodplain (but has house in floodplain downstream); recommend upsizing above bankfull and design to allow at least some right bank floodplain access if opportunity arises.	8

T6.01A	Stream Buffers	Very High	Very High	Y	Create/protect buffer; priority increased by WHPA; passive (some areas have decent existing buffer) or low-cost due to high lateral and vertical instability. High priority for area in vicinity of old mill site on north end of village, even if just dense native shrub buffer for sediment retention and streampower diffusion, and trees upstream of there; high likelihood for repeat flooding running along Rt 110 downstream of here. Opportunities may be limited by social constraints.	8
M14C	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale), stream buffers, Stream X-ings retrofits and replacements; priority increased by location in priority restoration reach but reduced by degree of incision and lower sensitivity	9
M14C	Remove/Replace Structures	Medium	Next Highest	Y	Replace or remove: Rte. 110 bridge on DS end shows signs of scour and is both channel and floodplain constriction (entirely blocks floodplain) US of Chelsea village, high priority; VAST bridge (next US) is 100 pct bankfull width, but effective width is reduced by riprap and structure blocks access to floodplain - lower priority with no structures nearby, but higher due to floodplain issue; farm bridge US is lower priority - channel constriction but only partial floodplain constriction, is modular replacement placed on concrete on top of old abutments - old abutments show signs of scour and strucuture is likely at risk for failure again but is not a risk for other structures or infrastructure; priority increased by location in priority restoration reach but reduced by degree of incision and lower sensitivity	9
M16C	Protect River Corridors	Medium	Next Highest	Y	Explore easement possibilities - Segment is on moraine and alluvial fan at trib confluence at end of Chelsea-Williamstown Rd; stream has lost historic floodplain access in vicinity of old mill, has some vertical agradation and may be able to rebuild access off right bank with large woody debris and more aggradation. Priority increased by location on priority reach but reduced by degree of incision and lower sensitivity.	10
M16C	Remove/Replace Structures	Next Highest	Next Highest	Y	Replace: Chelsea-Williamstown Rd bridge is sized at 38 pct bankfull width, further reduced by angle of alignment, is located on moraine just upstream of tributary confluence, and has trib that has been rerouted to enter above the structure rather than below it - all increase risk of failure. Priority increased by location on priority reach but reduced by degree of incision, lower sensitivity and absence of nearby structures.	10
T6.01B	Stream Buffers	Medium	Next Highest	Y	Create/protect buffer; priority increased by WHPA; opportunities limited by social constraints and location largely along road embankments; encourage retention where feasible, passive (many areas have decent existing buffer) or low-cost otherwise due to high lateral and vertical instability.	8
M07B	Protect River Corridors	Next Highest	Very High	Y	Explore possibility of relocating driveway entrance east of Foundry bridge further upslope. Structures on either end of bridge and outbuildings further downstream: discuss buyout/elevation options now available through FEMA	
T2.01C	Watershed Strategies	Very High	Next Highest	N	FEH high priority, important for protecting small but important floodplain attenuation assets - history of streamside development along much of road; try to mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in this segment), Buffer Establishment and Protection (difficult due to primarily roadside embankments)	
T7.01D	Remove/Replace Structures	Very High	Next Highest	Y	Replace or remove: Side by side culvert set-up under bridge upstream of beaver area is half-filled with sediment, almost completely obstructed by debris and shrubs on upstream end; bridge is not functional; this structure lies between beaver pond area where a number of small brookies were observed in pools during low-water stretch of dry weather and upstream network	
T7.01E	Watershed Strategies	Very High	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (high priority attenuation assets here and beaver area; large parcel under single ownership includes these smaller high priority attenuation assets (T7.01C and E) up and downstream of longer length of relatively undeveloped corridor with more limited attenuation assets), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention along road and protect Class 2 wetland buffers, streamside buffers in riding trail areas)	
M09B	Stream Buffers	Very High	Next Highest	Y	Create/protect buffer; incorporate design considerations to limit possibility of capture of pond but encourage access to floodplain downstream in event of a breached dam surge from Bicknell Brook; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; knotweed control at pit access rd- frequent inundation point - relatively small population currently, high potential for dispersal	

M01C	Watershed Strategies	Next Highest	Next Highest	N	Removal of bridge abutment on US end and two dams at DS end would all be likely to affect development within corridor; removal of Lower Eaton dam has been extensively discussed in the past (info: David Deen, CT River Steward); social constraints (landowner priorities, Historic Register); constraints increase value of floodplain and corridor protection in US reaches	
M03-0	Watershed Strategies	Low	Low	N	FEH and/or corridor easement upstream, buffer establishment to help with erosion control, prioritization of structure replacement and capital budget planning	
M04A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; will likely need active establishment, recommend low-cost stock only due to vertical and lateral instability; NFIP Floodway is 85 ft at narrowest point; recommend at least 100 ft, clarify stable planform accomodation (FEH zone) is even further out; may need fencing also	
M04A	Watershed Strategies	Medium	Next Highest	N	FEH and/or corridor easement to limit bank armoring and permit meander development, buffer establishment to help with erosion control, prioritization of structure replacement and capital budget planning	
M04B	Protect River Corridors	Next Highest	Next Highest	Y	Explore easement status or possibilities - Attenuation asset US of converted transport reaches with limited attenuation assets, previous multiple project implementations	
M04B	Stream Buffers	Medium	Medium	Y	Create/protect buffer; has had multiple plantings and is largely regenerating, not sure what protections are in place; active erosion has taken some buffers that could use replacement but are at high risk for loss and might restrict access to most US field portion - but bank failure is also starting to approach Rte 110	
M04B	Watershed Strategies	Next Highest	Next Highest	N	FEH and/or corridor easement to limit bank armoring and permit meander development US, buffer establishment to help with erosion control	
M05A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; frequently lined by box elder, adequate start for natural regeneration in many areas but numerous areas completely absent and would require establishment; low-cost due to vertical and lateral instability; may need fencing and some knotweed control. Establish near animal barns at fairground; higher priority DS Cilley Bridge.	
M05A	Watershed Strategies	Next Highest	Next Highest	N	FEH and/or corridor easement here (DS end of reach) and US (reach M07), buffer establishment to help with erosion control	
M05B	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer, allow natural regeneration for augmentation and re-establish by fairgrounds animal barns; low-cost due to vertical and lateral instability; riprapped areas very difficult planting conditions; may need some knotweed control; frequent ice jam area	
M05B	Remove Berms	Next Highest	Medium	Y	Needs further investigation; not clear there is actually a berm, but riprap just downstream of Mill Bridge is elevated, tapers quickly; seems like this area should have better floodplain access in high flow events than it seems to (why repeat mass failures downstream?). May require too much disturbance, but priority increased due to extent of recent streambank armoring.	
M05B	Watershed Strategies	Next Highest	Next Highest	N	Project implentation highly influenced by upstream impacts; high priority to corridor protection and floodplain restoration in reach M07	
M06-0	Watershed Strategies	Low	Next Highest	N	Project implentation highly influenced by upstream impacts; high priority to corridor protection and floodplain restoration in reach M07. Dam removal at breached Farnham Bros. mill would require analysis of impacts on upstream camp converted to house as well as Recreation Rd and houses at Hayward & Noble dam; could have significant channel bed elevation changes. Discuss elevation and buyout options now available from FEMA with owners in floodplain.	
M07B	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; plant to augment or establish buffer, low-cost stock due to lateral and vertical instability; frequent ice jam area	
M07B	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning, priority for attenuation asset in M08B (US of school); discuss elevation/buyout options now available through FEMA; stream buffers	
M09A	Stream Buffers	Medium	Medium	Y	Create/protect buffer; plant to augment or establish buffer; frequently flooded chute along Rte 110 has herbaceous veg, trees tolerant of inundation and ice would benefit shading of channel and physical dissipation of streampower; low cost due to lateral instability	
M09A	Watershed Strategies	Next Highest	Next Highest	N	Floodplain and River Corridor Protection and Planning (FEH; corridor is all in SFHA); stream buffers	

M09B	Watershed Strategies	Next Highest	Next Highest	N	Recommend careful analysis of possibility of allowing floodplain access on downstream end, whether opportunities for floodplain access are outweighed by possibility of stream capturing pond in middle of gravel pit, and potential risk of that capture under current configuration. Highly recommend establishment of buffer at downstream end of Bicknell Brook (reach M10) as precursor.Would need more detailed survey (not sure if this already exists); 1991 SCS study indicates 500-yr flood at river-side edge of pond.	
M11-0	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (SFHA is significantly smaller than FEH in this reach); stream buffers low-hanging fruit but important	
M12-0	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (FEH generally smaller in this reach)	
M13A	Remove/Replace Structures	Next Highest	Next Highest	Y	Replace: Jenkins Brook Rd bridge undersized and contributes to straightening, appears to be area that has needed repeat clean-outs,windrowing or riprap that has toppled into stream; potential for outflanking to impact adjacent development and capture small downstream pond, further impacting house built in floodway 0.3 mi downstream	
M13A	Watershed Strategies	Next Highest	Next Highest	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers upstream	
M13B	Stream Buffers	Next Highest	Next Highest	N	Create/protect buffer, plant; low-cost due to lateral and vertical instability though herbaceous veg is intact in numerous areas and might facilitate some larger stock for outside edge of belt-width	
M13B	Watershed Strategies	Next Highest	Next Highest	N	Floodplain and River Corridor Protection and Planning (FEH); discuss elevation/buyout options now available through FEMA; stream buffers	
M13C	Remove/Replace Structures	Next Highest	Next Highest	Y	Replace: Maple Ave bridge is undersized, contributes to straightening, and has significant signs of scour, but is only a partial floodplain constriction	
M13C	Watershed Strategies	Next Highest	Next Highest	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; critical to prevent floodplain encroachment downstream of Maple Ave; discuss elevation/buyout options now available through FEMA (TRORC)	
M13D	Watershed Strategies	Next Highest	Next Highest	N	Floodplain and River Corridor Protection and Planning (FEH), stream buffers; critical to prevent floodplain encroachment downstream of Maple Ave; discuss elevation/buyout options now available through FEMA	
M15B	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale; higher priority here than M15A due to alluvial fan and value as attenuation asset downstream of M16B, where there is potential for rapid widening, and string of converted transport reaches), stream buffers. May be social constraints due to high degree of streamside horticultural plantings. Recommend bittersweet control due to low current presence and high potential for dispersal.	
M16B	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale, consider easement here; high priority reach due to alluvial fans and loss of floodplain access in M16C; Stream Buffers (priority planting area).	
M16C	Watershed Strategies	Next Highest	Next Highest	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale, consider easement here; high priority reach due to moraine and alluvial fan, loss of floodplain accessbut potential to rebuild it (particularly off right bank); Stream Buffers (largely passive).	
M17A	Watershed Strategies	Next Highest	Next Highest	N	FEH, Drainage and Stormwater Management, Road-Stream Crossing Retrofits and Replacements	
M17B	Watershed Strategies	Next Highest	Next Highest	N	FEH, Drainage and Stormwater Management, Road-Stream Crossing Retrofits and Replacements, Stream Buffers	
M18A	Watershed Strategies	Next Highest	Next Highest	N	FEH, Road-Stream Crossing Retrofits and Replacements	
M19C	Watershed Strategies	Next Highest	Next Highest	N	FEH, Drainage and Stormwater Management (upstream especially), Floodplain and River Corridor Planning and Protection, Buffer Establishment and protection (maintain existing, passive reseeding)	
T2.01A	Watershed Strategies	Next Highest	Next Highest	N	FEH high priority (house at confluence is mapped outside SFHA, not eligible for FEMA elevation or buyout funding); try to mitigate peak flow impacts: Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in T2.01C), Buffer Establishment and Protection	

T2.01B	Watershed Strategies	Next Highest	Next Highest	N	FEH high priority, history of streamside development along much of road; try to mitigate peak flow impacts: Road-Stream Xing Retrofits and Replacements, Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in T2.01C), Buffer Establishment and Protection (difficult due to primarily roadside embankments)	
T3.01-0	Watershed Strategies	Next Highest	Next Highest	N	FEH high priority, important for protecting small but important floodplain attenuation assets. Area around power substation appears to have had some sort of wetland delineation and may already have maps of some vital assets; undetermined where this info resides. Try to mitigate peak flow impacts: Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation assets US in this segment), Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape)	
T3.01-0	Remove Berms	Next Highest	Next Highest	Y	"Berm" appears to be bark tailings pushed to one side of former Meadowbrook Lumber yard; not clear how restrictive this would be in a high flow, but cuffing out could provide some floodplain access downstream of the buildings in one of the broader portions of this valley with relatively limited attenuation assets	
T4.01A	Watershed Strategies	Next Highest	Next Highest	N	Alluvial fan with high potential for sudden channel shifts though currently entrenched; FEH zone indicates clear risk in floodplain shared with First Branch. FEMA Floodway limits on mainstem end just upstream apparently due to limits of BFE measurements, shifts to only mapping of SFHA. Drainage and Stormwater Management, Floodplain and River Corridor Planning and Protection (priority attenuation asset here), Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape)	
T4.01A	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; buffers generally >25 ft, but location on alluvial fan would benefit from augmentation; passive reseeding from existing buffers - both lateral and vertical instability	
T4.01B	Watershed Strategies	Next Highest	Next Highest	N	FEH; Floodplain and River Corridor Planning and Protection (priority attenuation assets both downstream and upstream), Drainage and Stormwater Management, Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape - encourage retention as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention)	
T4.01C	Watershed Strategies	Next Highest	Next Highest	N	FEH; Floodplain and River Corridor Planning and Protection (priority attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape - encourage retention as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	
T4.01C	Remove Berms	Next Highest	Next Highest	Y	Berm by one of Redrock's x-mas tree plantations needs further assessment of potential impacts to plantings and structures but has potential to free up a decent amount of floodplain	
T4.01D	Watershed Strategies	Next Highest	Next Highest	N	FEH; Floodplain and River Corridor Planning and Protection (priority attenuation DS), Drainage and Stormwater Management, Buffer Establishment and Protection (primarily protection as buffers are generally in decent shape - encourage retention as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	
T5.01A	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (discuss buyout and elevation options now available through FEMA; most structures downstream of Court St are in FEMA zone B), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	
T5.01B	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (discuss buyout and elevation options, but largely not in FEMA mapped flood zone), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	

T7.01A	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (priority attenuation assets upstream, particularly beaver area), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	
T7.01B	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (lower priority limited attenuation assets here, higher priority upstream - particularly beaver area), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention in upstream areas as much as possible; large woody debris plays major role in diffusion of streampower and sediment retention, possibility of rebuilding floodplain access)	
T7.01B	Remove/Replace Structures	Next Highest	Next Highest	Y	Replace or remove: figure out status of former bridge at Old Schoolhouse (aka Brick Schoolhouse) Rd (now a legal trail). Remove abutments if not being rebuilt, remove abutments and replace with larger structure (recommend latest VTrans Bridge and Culvert Standards) if being rebuilt	
T7.01C	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (high priority attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention along road and protect Class 2 wetland buffers)	
T7.01C	Protect River Corridors	Next Highest	Next Highest	Y	Class 2 Wetland is mapped but does not appear to be fully captured by current VSWI maps and is not captured by FEH; possible that part of NETRA motocross course is laid out through wetland and buffers; check with owners on knowledge of the issue. Beaver-controlled area plays important role in flow and sediment attenuation, habitat for fish population (in-field observations)	
T7.01D	Watershed Strategies	Next Highest	Next Highest	N	FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Floodplain and River Corridor Planning and Protection (high priority limited attenuation assets here), Drainage and Stormwater Management, Buffer Establishment and Protection (encourage retention along road and protect Class 2 wetland buffers, streamside buffers in riding trail areas)	
T7.01D	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; primarily protection - current buffers good, but several stream fords and numerous small incipient knotweed and chervil populations post-Irene pose potential for distribution	
T7.01E	Stream Buffers	Next Highest	Next Highest	Y	Create/protect buffer; yard setting and likely altered wetland area - focus particularly on shrub establishment; may need chervil and reed canary grass control in order to establish native shrubs; low cost due to lateral instability	
T7.01F	Watershed Strategies	Next Highest	Next Highest	Y	High priority Drainage and Stormwater Management project (Better Backroads?): sediment inputs along road edge upstream side of Williamstown Rd; FEH and some sort of stream setbacks for upstream areas lacking data to create FEH; Buffer Establishment and Protection (encourage retention along road)	
M01B	Watershed Strategies	Medium	Next Highest	Y	FEMA maps already updated for Windsor County; include encroachments in Pre-disaster Mitigation Planning, consider FEH overlay; drainage and stormwater management in US reaches	
M11-0	Stream Buffers	Medium	Next Highest	N	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous veg is intact in numerous areas and might facilitate some larger stock for outside edge of belt-width	
M17A	Stream Buffers	Medium	Next Highest	Y	Create/protect buffer; should be part of corridor planning, can be mostly passive as buffers are generally in existence - mostly a matter of protecting existing buffers as missing areas are largely roadside and difficult to establish	
M18A	Watershed Strategies	Medium	Next Highest	N	FEH, Road-Stream Crossing Retrofits and Replacements: Floodplain and River Corridor Protection and Planning (priority protection area here only given lower priority because it's largely mapped Class 2 wetland and technically protected already)	
M18B	Watershed Strategies	Medium	Next Highest	N	Not assessed - beaver controlled; high priority protection area (mapped Class 2 wetland)	
M19C	Protect River Corridors	Medium	Next Highest	Y	Appears there was a house before - no signs of it now - and property used to be farmed; beaver occupation does much to mitigate sediment and peak discharges from headwaters streams. Floodplain and River Corridor Protection and Planning (priority protection area here only given lower priority because it's largely mapped Class 2 wetland and technically protected already)	

T7.01A	Stream Buffers	Medium	Next Highest	Y	Create/protect buffer; primarily protection-limited areas lacking buffer, but camp at 54 Edwards Rd would benefit due to impacts from undersized culvert upstream, and alluvial fan at base of reach is an important one- benefits for sediment retention especially; encourage buffer retention along roadsides where feasible, passive establishment (most areas have decent existing buffer) or low-cost otherwise due to high lateral and vertical instability. Woody debris recruitment important for stream dynamics in this setting - diffusion of stream power, sediment retention, transient grade controls and rebuilding of floodplain access, habitat	
T7.01B	Stream Buffers	Low	Next Highest	Y	Create/protect buffer; mostly protection-limited areas lacking buffer, primarily areas of recent roadside mass failures. Retention important for availablility of large woody debris, very important to stream dynamics in this setting	
T7.01C	Stream Buffers	Low	Next Highest	Y	Create/protect buffer; primarily protection - current native scrub-shrub buffers good, but next reach up had several stream fords and numerous small incipient knotweed and chervil populations post-Irene	
M04B	Remove/Replace Structures	Next Highest	Medium	Y	Replace: Rte 110 bridge is technically sized adequately but alignment reduces effective width, increases straightening and erosive power downstream. Primary issue is complete restricition of floodplain access; difficult to remedy - feasible to lower abutments? Structurally sound	
M12-0	Remove Berms	Next Highest	Medium	Y	Berm off left bank in wooded area with no apparent further encroachments, ~1000 ft US of E Randolph Rd., likely associated with former bridge (road across river on 1944 and 1949 USGS topos); is opposite recent mass failures along Rte 110; watershed priority lower because stream would still be incised, but would like to see this site re-evaluated considering impacts further downstream as well	
M12-0	Remove/Replace Structures	Next Highest	Medium	Y	Remove: old abutments at breached dam remains from J. Waterson Carding Factory - high priority for reach, low for watershed - run floodprone constriction but removal would only free up a small amount of floodplain, but would likely permit better meander establishment. Remove: old bridge	
M13D	Stream Buffers	Next Highest	Medium	Y	Create/protect buffer, plant; low-cost due to lateral instability though herbaceous veg is intact and would facilitate some larger stock for outside edge of belt-width; priority increases if trying to implement footbridge project	
M13D	Remove/Replace Structures	Next Highest	Medium	N	Replace or remove: footbridge to Cemetery restricts access to pocket of high-value floodplain in repeat flooding area with few other attenuation assets; needs careful evaluation of potential impacts to encroachments downstream as well as social constraints	
M15A	Remove/Replace Structures	Next Highest	Medium	N	Remove (higher priority): old bridge abutments upstream of old AC and MW Button farm (489 VT Rte 110) appear no longer in use - should have corridor protection in place first as rapid adjustments are feasible; Replace (lower priority): two farm bridges both undersized, contribute to straightening and show signs of scour on abutments, but both are only partial floodplain constrictions	
M17A	Remove/Replace Structures	Next Highest	Medium	N	Replace: State bridge on Rte. 110 and town bridge on Poor Farm Rd are typical of a series of 1920s bridges in this area of watershed, sized at ~half bankfull with low clearance, significant signs of scour, check dams placed at downstream end; Poor Farm Rd bridge is partial floodplain constriction, Rte 110 at Pray Rd bridge entirely blocks floodplain access	
M17B	Remove/Replace Structures	Next Highest	Medium	N	Replace: Sky Acres Rd culvert at corner of Rte 110 is sized at 27 pct bankfull, entirely blocks floodplain access, is perched and appeared to have plugged upstream and been cleaned out - high priority replacement (ideally bridge).Rte. 110 bridge south of Tilton Rd sized at 50 pct bankfull, effective width significantly reduced from that due to alignment; signs of scour, partial floodplain restriction	
T2.01B	Remove/Replace Structures	Next Highest	Medium	N	Replace: Two bridges and one culvert are all undersized and full floodplain constrictions; highest priority to upstream culvert, 47 pct bankfull and potential to trigger mass failure that could undermine house at 98 Dickerman Hill; most downstream bridge is smallest (30 pct bankfull) but is substantial concrete structure and primary threat is to road	
T2.01C	Remove Berms	Next Highest	Medium	Y	Not technically a berm, but post-Irene snagging/dredging/windrowing plugged what is now a flood chute in vicinity of channel avulsion; avulsion is beneficial in lengthening meander (reducing slope and stream power) but unplugging floodchute may be beneficial in flood conditions - needs further scoping	

T3.01-0	Remove/Replace Structures	Next Highest	Medium	N	Replace: Highest priority: Culvert mid-reach is 30 pct bankfull width and floodprone constriction, appears to have plugged in Irene and has scour pool below; Mid- priority: private bridge toward upstream end of reach is 43 pct bankfull, looks like it may have been replaced once already, appeared to have plugged in Irene. Lower: Rte 110 bridge at base of reach is less than half bankfull, signs of scour but has grade control just upstream; DS end empties almost directly into mainstem. Low priority: VAST bridges are new, sized above channel width but some floodplain restriction. No apparent risks.	
M06-0	Stream Buffers	Medium	Medium	Y	Create/protect buffer; generally OK - allow natural regen in missing areas	
M15A	Stream Buffers	Medium	Medium	Y	Create/protect buffer; may be largely passive as limited buffers exist in much of corridor - may need fencing, and invasives control is highly recommended in vicinity of old AC and MW Button farm	
M15A	Watershed Strategies	Medium	Medium	N	FEH, Floodplain and River Corridor Protection and Planning (reach-scale; higher priority in M14 due to broader valley and likelihood of more floodplain protection), stream buffers	
M15B	Stream Buffers	Medium	Medium	Y	Create/protect buffer; low cost or passive as stream has possibility of rapid widening and planform adjustments	
T3.01-0	Stream Buffers	Medium	Medium	Y	Create/protect buffer; buffers generally good, but free cattle access to stream US of VAST bridge toward DS end of reach	
T4.01B	Remove/Replace Structures	Medium	Medium	N	Replace: Higher priority: culvert at US end of segment (Hall Rd) is channel constriction and completely blocks access to floodplain, high contribution to straightening and heightened streampower; assess potential impact to downstream house in floodplain as bed elevation adjustments are likely. Lower priority: Concrete bridge at DS end of segment is channel constricition and low clearance, but only partial floodplain constricition; risk for plugging but poses little threat to other structures - primary risk to road (weigh cost-benefit of number of road repairs needed vs. cost of upsizing).	
T4.01C	Remove/Replace Structures	Medium	Medium	N	Two bridges in segment are both channel constrictions contributing to straightening and heightened streampower; DS one is only partial floodplain constriction but could allow even better access plus channel accomodation if sized at bankfull plus. US bridge is full floodprone constriction but has camp immediately downstream that would be at much greater risk. Dam US of Hall Rd is channel constricition contributing to straightening and heightened stream power at low to moderate flows but is outflanked at LB breach in higher flows; structure may actually increase the value of the attenuation assets US and be contributing to rebuild of floodplain access, recommended low priority for removal	
T4.01D	Remove/Replace Structures	Medium	Medium	N	Town Farm Rd bridge is channel constriction and largely blocks access to floodplain, contributing to heightened stream power, as is true for culvert immediately US as well; however, current configuration of culvert entering directly US of bridge diffuses stream power in flood situation and makes right bank outflanking more of a possibility, potentially mitigating damage to downstream LB house but increasing risk to Town Farm Rd; sediment dropouts more likely at confluence which may require more frequent "clean-outs" and potentially ramp up streampower if windrowing continues to constrict channel	
T7.01A	Remove/Replace Structures	Medium	Medium	Y	Replace: Culvert on Edwards Rd is both channel and floodprone constriction likely contributing to heightened erosion and mass failures downstream, footbridge at Jones Pond only constricts floodplain but likely contributing to heightened erosion as well; lower priority due to impacts not being immediate threat to nearby structures or infrastructure, though culvert may contribute to outflanking/road damage and should be upsized if opportunity arises.	
T7.01B	Protect River Corridors	Medium	Medium	Y	Explore easement possibilities if FEH is not adopted - corridor is largely undeveloped and unconstrained but priority is reduced to some degree, from a geomorphic standpoint, by relatively limited amounts of floodplain to be protected	
T7.01F	Stream Buffers	Medium	Medium	Y	Create/protect buffer; primarily protection - current buffers good, but believe this area may be source knotweed population for plants that are being distributed further downstream and is not that large a population in and of itself; lower priority due to ecologic rather than geomorphic import, but need to weigh potential long-term impact on overall buffer conditions and lower costs to control early	

M01A	Watershed Strategies	Low	Medium	N	High priority protection on White mainstem reaches in South Royalton; FEMA maps already updated for Windsor County; include encroachments in Pre-disaster Mitigation Planning, consider FEH overlay; drainage and stormwater management in US reaches	
M04A	Remove/Replace Structures	Low	Medium	Y	Replace: Howe covered bridge undersized, contributes to straightening; low priority due to valley pinch point anyway, only partial floodplain constriction, strong social constraints (Historic Register)	
M05A	Remove/Replace Structures	Low	Medium	Y	Replace: Cilley covered bridge undersized, contributes to straightening; low priority due to only partial floodplain constriction, strong social constraints (Historic Register)	
M05B	Remove/Replace Structures	Low	Medium	Y	Replace: Hayward & Noble (Mill) covered bridge undersized, contributes to straightening; low priority due to only partial floodplain constriction, strong social constraints (Historic Register); was replaced in 2000	
M11-0	Remove/Replace Structures	Low	Medium	Y	Replace: Flint covered bridge (DS end of reach) blocks floodplain entirely but is sized close to channel width; Moxley covered bridge is channel constriction (half bankfull width) but only partial floodplain constriction; both contribute to straightening; low priority due to social constraints (National Register)	
M01B	Stream Buffers	Next Highest	Low	Y	Create/protect buffer, then probably enough currently exisiting to allow natural regen if excluded from mowing; recommend Royalton NFIP Floodway map for minimum width (~100 ft), clarify stable planform (FEH zone) is even further out; treat honeysuckle	
M05B	Stabilize Stream Bank	Next Highest	Low	N	Extend downstream end of riprap placed in 2013 with design similar to Hurricane Flats; animal barns at high risk due to taper of current riprap. High-profile educational opportunity for alternatives to riprap, but risk due to lateral and vertical instability and wall of riprap along Rte 110 upstream. High priority to corridor protection and floodplain restoration in reach M07 to reduce risks.	
M12-0	Stream Buffers	Next Highest	Low	N	Create/protect buffer, plant; likely could be largely natural regen from existing buffers with some low-cost supplementation; field at downstream end of reach, largely riprapped, is higher priority (riprap will likely be prone to failure due to stream adjustments) - low-cost due to lateral and vertical instability; willow stakes at toe of mass failure across from this to give time for natural seeding of bank above	
M19A	Remove/Replace Structures	Next Highest	Low	N	Replace: Rte 110 bridge is 62 pct bankfull width, contributes to straightening and increased depth at high flows, impacts of heightened stream power, entirely blocks access to floodplain	
M03-0	Stream Buffers	Medium	Low	N	Create/protect existing buffer, augment RB buffer; recommend low-cost shrub stock due to vertical and lateral instability, location largely along Rte 110	
M13B	Remove/Replace Structures	Medium	Low	Y	Replace: Footbridge behind old Shire Inn and VAST bridge downstream of Maple Ave. are both channel constrictions contributing to straightening but are not significant floodplain constrictions. Rte. 110 bridge at south end of Chelsea village is 96% bankfull width (a bit less due to sloped embankments inside structure) and also only a partial floodplain constriction. Periodic maintenance of check dams downstream of Maple Ave to limit incision	
M17B	Stream Buffers	Medium	Low	Y	Create/protect buffer; augment buffer upstream of Sky Acres culvert (passive, let existing seed out)	
T2.01A	Remove/Replace Structures	Medium	Low	N	Replace: Rte 110 bridge at base of Dickerman Hill is 59 pct bankfull width and entirely blocks access to floodplain, appears to have plugged in past; needs careful assessment of relationship to downstream house	
T4.01D	Stream Buffers	Medium	Low	Y	Create/protect buffer; buffers generally >25 ft, but augmenting buffer US of house at top of reach would benefit flood mitigation for the house as well as stream health; passive reseeding of exisitng buffer or low-cost due to lateral and vertical instability	
T5.01A	Stream Buffers	Medium	Low	Y	Create/protect buffer; important to stream health but opportunities may be limited by social constraints in this setting; native shrubs close to stream would help, may need knotweed control	
T5.01B	Stream Buffers	Medium	Low	Y	Create/protect buffer; important to stream health but opportunities may be limited by social constraints; may need knotweed and chervil control, which may preclude passive approach; low-cost due to lateral and vertical instability	
T7.01D	Protect River Corridors	Medium	Low	Y	Encourage replacement of wooden bridges, setback of trails from stream, and protection of downstream Class 2 wetland at a minimum if corridor is intended for continued use for racing	
M01A	Stream Buffers	Low	Low	Y	Create/protect buffer; LB largely Rte 110 embankment; Blanketed by honeysuckle - convert to native veg	
M01C	Stream Buffers	Low	Low	Y	Create/protect buffer, then probably enough currently exisiting to allow natural regen if excluded from mowing; recommend Royalton NFIP Floodway map for minimum width (additional 65 ft; recommend 100 ft min), clarify stable planform (FEH zone) is even further out; treat honeysuckle	

M07B	Remove/Replace Structures	Low	Low	Y	Replace: Foundry Rd bridge undersized, contributes to straightening; low priority - flanked by houses on both sides, replaced in 2011, strong social constraints (Historic Register)	
T2.01A	Stream Buffers	Low	Low	N	Create/protect buffer, primarily DS end missing; passive or low cost due to both widening and aggrading; trees to outside edge of belt width in anticipation of widening	
T4.01A	Remove/Replace Structures	Low	Low	N	Replace: Wooden bridge placed on riprap/windrow that is both channel and floodplain constriction contributing to straightening and heightened streampower, but stream is also deeply incised in this area and structure replacement would not be likely to change much at this time	
T5.01A	Remove/Replace Structures	Low	Low	N	Replace: Both Court St and Rte 110 bridges are undersized and contribute to straightening and heightened stream power, but replacement of either is severely constrained by development up and downstream; not likely to become feasible unless there are substantial changes	
T7.01F	Remove/Replace Structures	Low	Low	N	Replace or remove: Culvert under Williamstown Rd is broken midway under road, may dictate need for replacement on its own terms; consider whether limited span may make bridge cost-effective - steeper slope upstream means this will likely continue to be a sediment drop-out point. Replacement culvert under driveway will require assessment of impact to nearby structures; bed elevation changes likely	

– Appendix 7 –

Large Format (11x17) Maps

Reach maps

Analysis maps

Overview
Land cover/ Land use
Hydrologic alterations
Sediment load indicators
Channel slope modifiers
Channel depth modifiers
Boundary condition and riparian modifiers
Constraints to channel evolution
Sediment regime departure
Stream sensitivity

FB-M01

N

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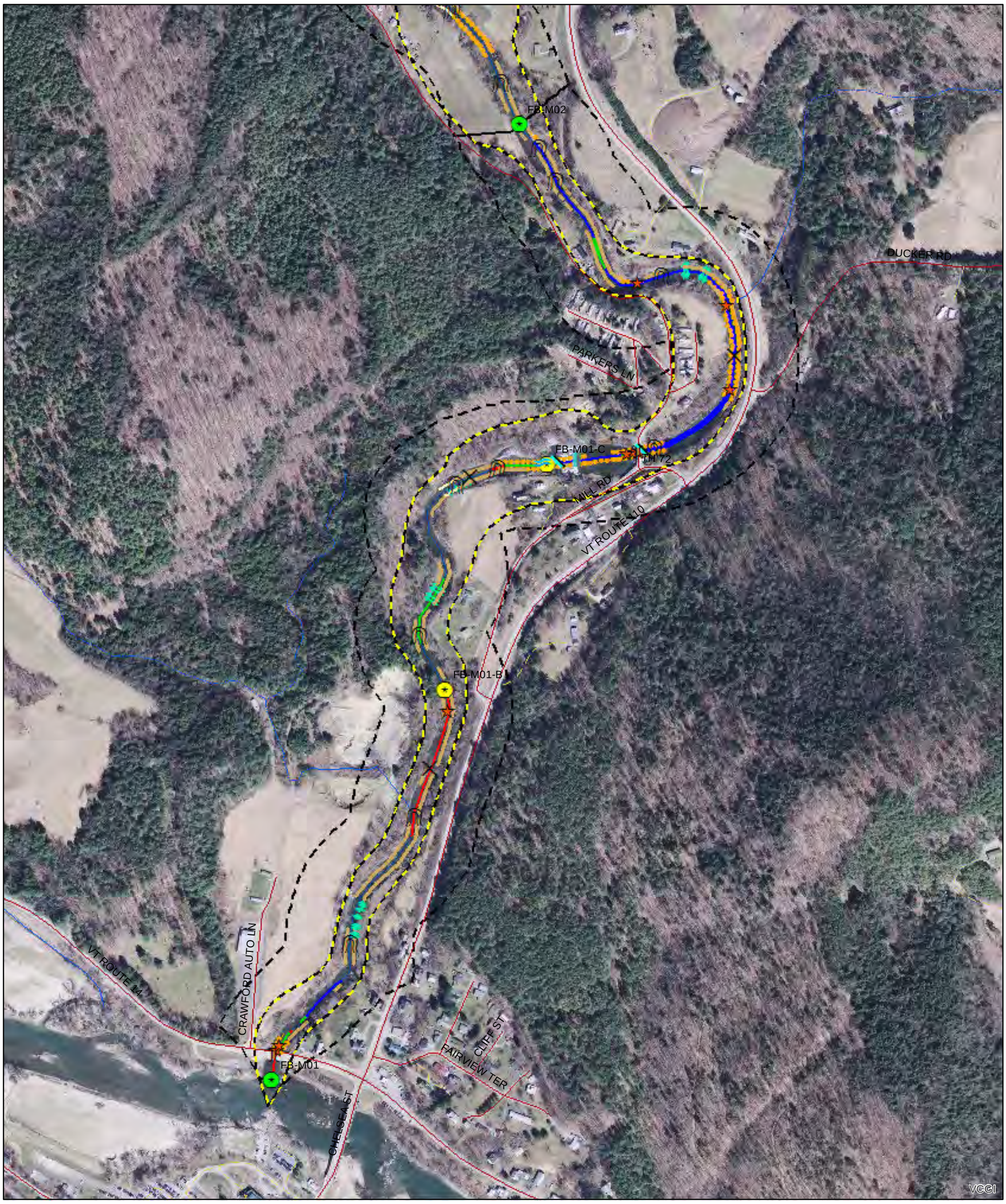

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M02

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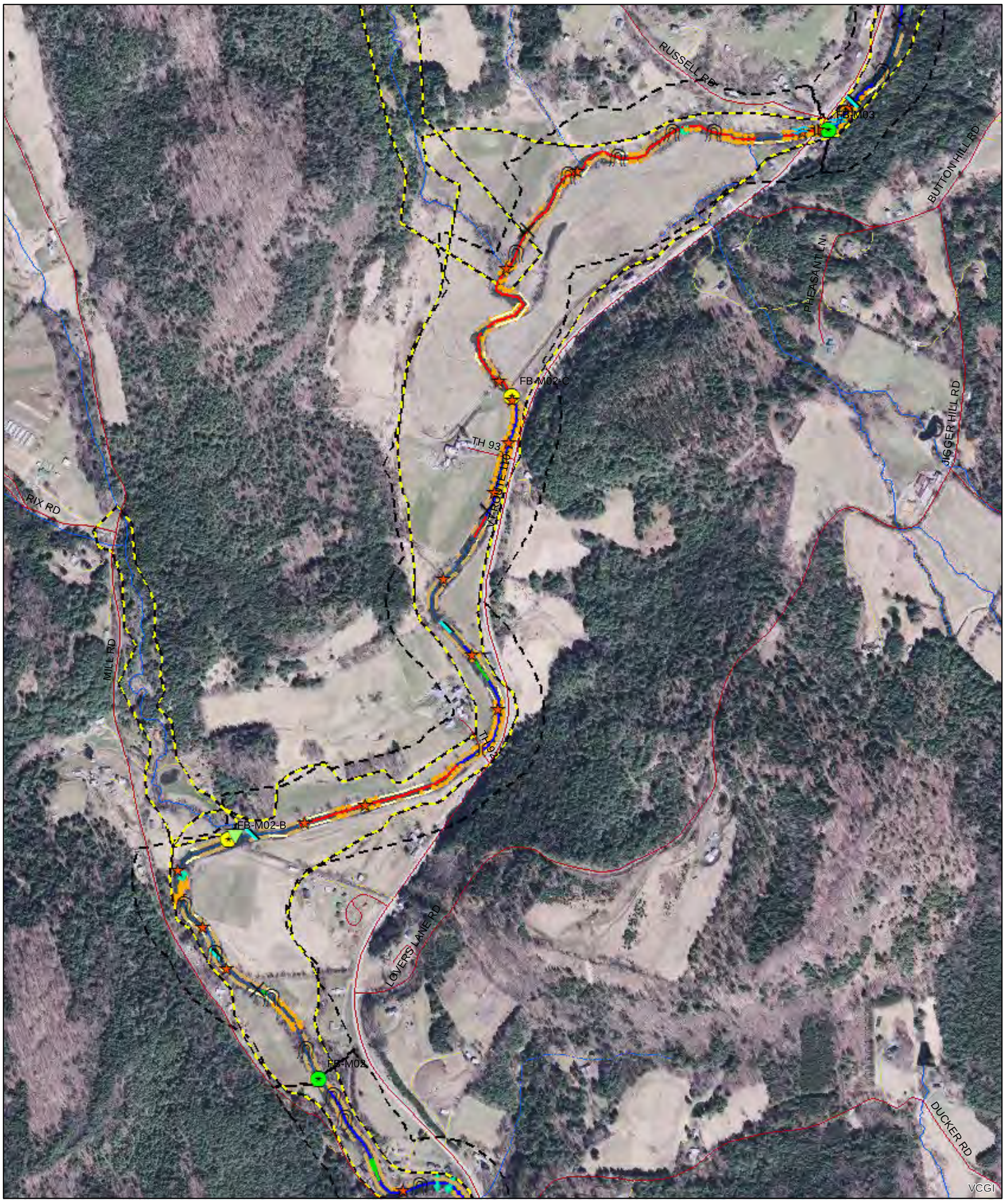

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
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Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M03

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0 500 Feet

FB-M04

FB-M03

RUSSELL RD

VT ROUTE 110

BUTTON HILL RD

VCGI

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M04

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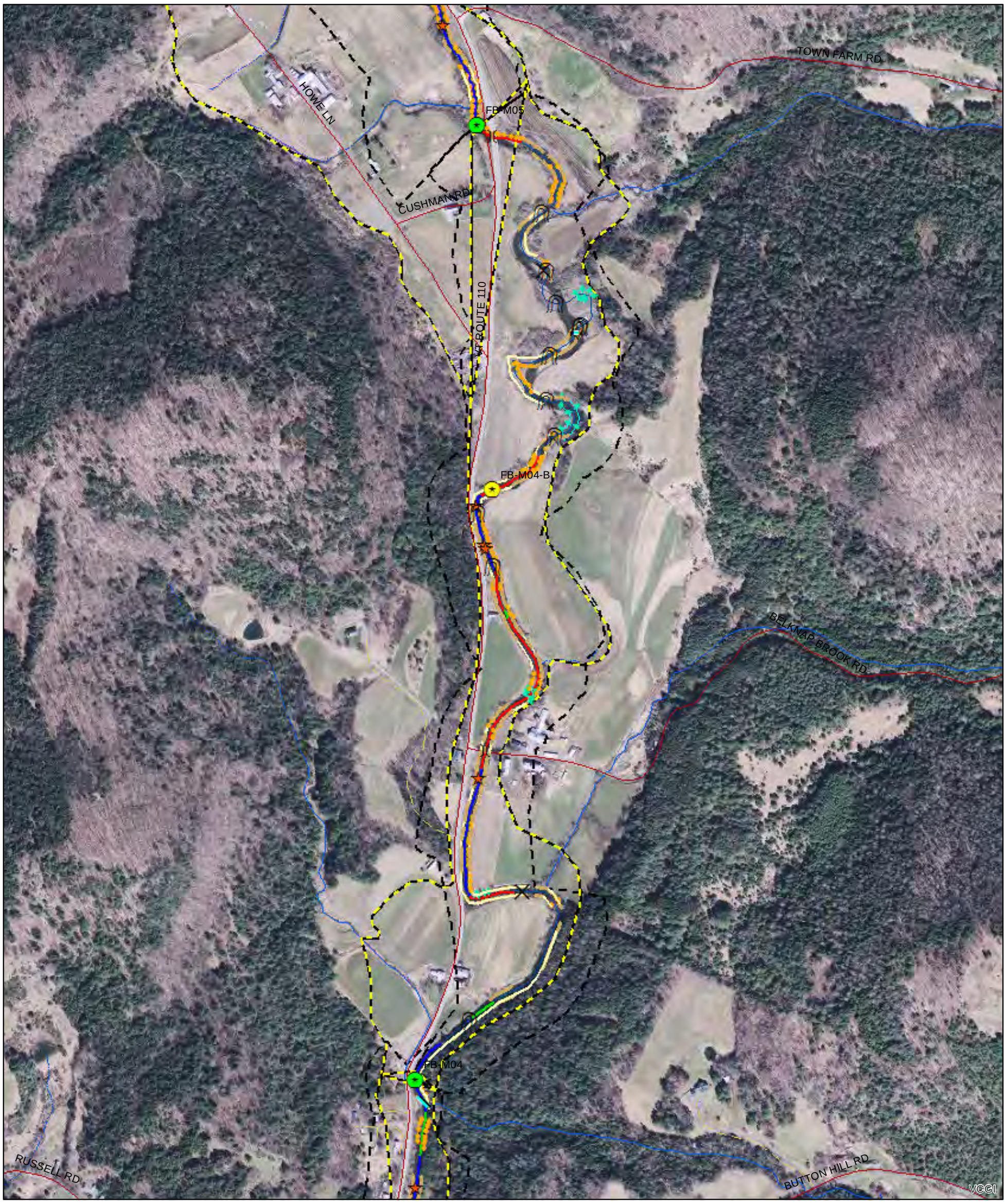

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
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Waterfall
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Beaver Dam
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Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M05

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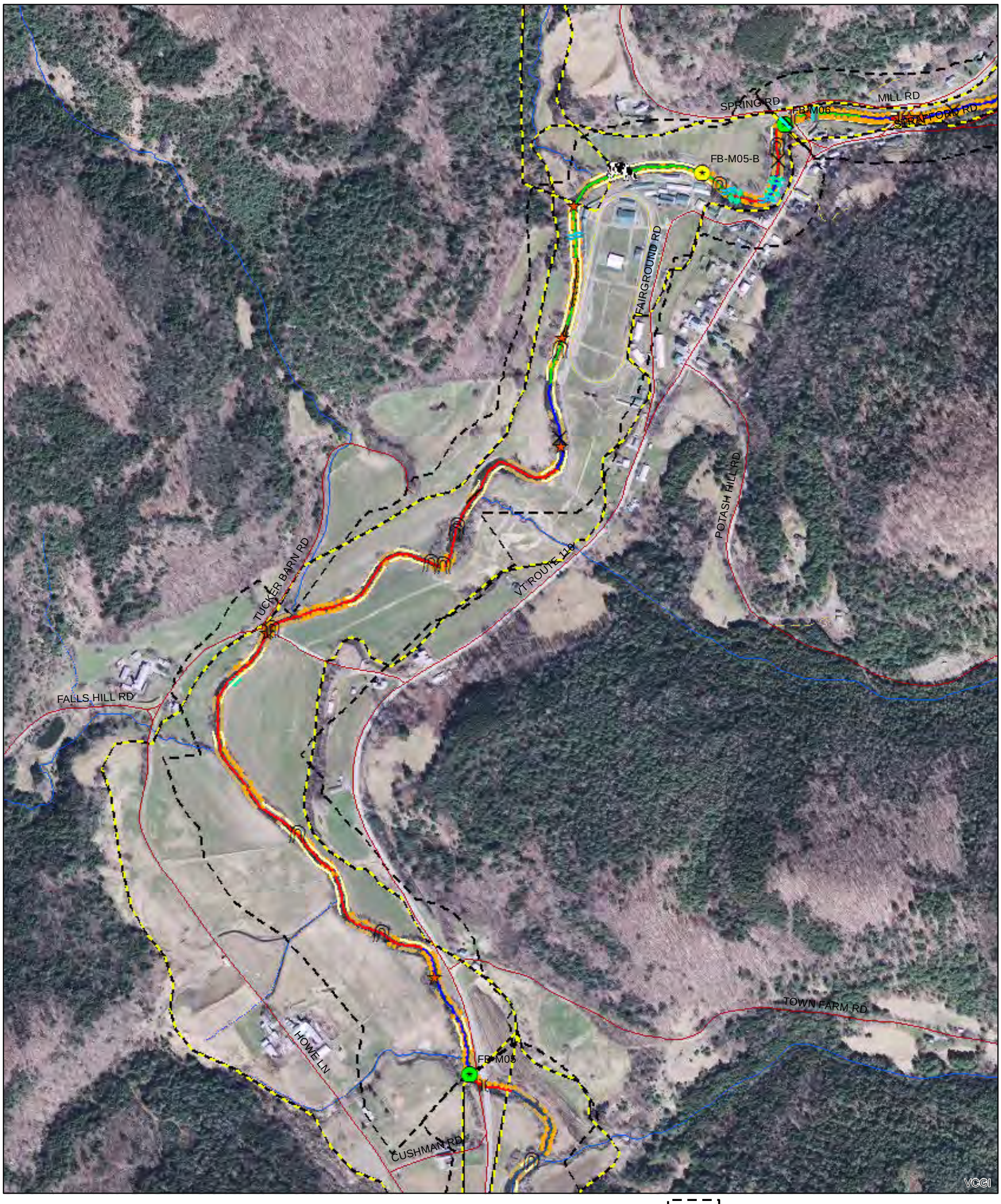

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing	Head Cut	Alluvial Fan	Bank Armoring	Development
Avulsion	Ledge	Beaver Dam	Buffers <25 ft	Encroachment
Braiding	Migration	Cross Section	Erosion	Straightening
Bridge	Neck Cutoff	Debris Jam	Mass Failure	With Windrowing
Culvert	Steep Riffle	Withdrawals	Berm Both Sides	
Dam	Stream Ford	Gully	Berm One Side	
Dredging	Waterfall	Stormwater Input		
Flood Chute	Weir	Stream Crossing		

FB-M06

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Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
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Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M07

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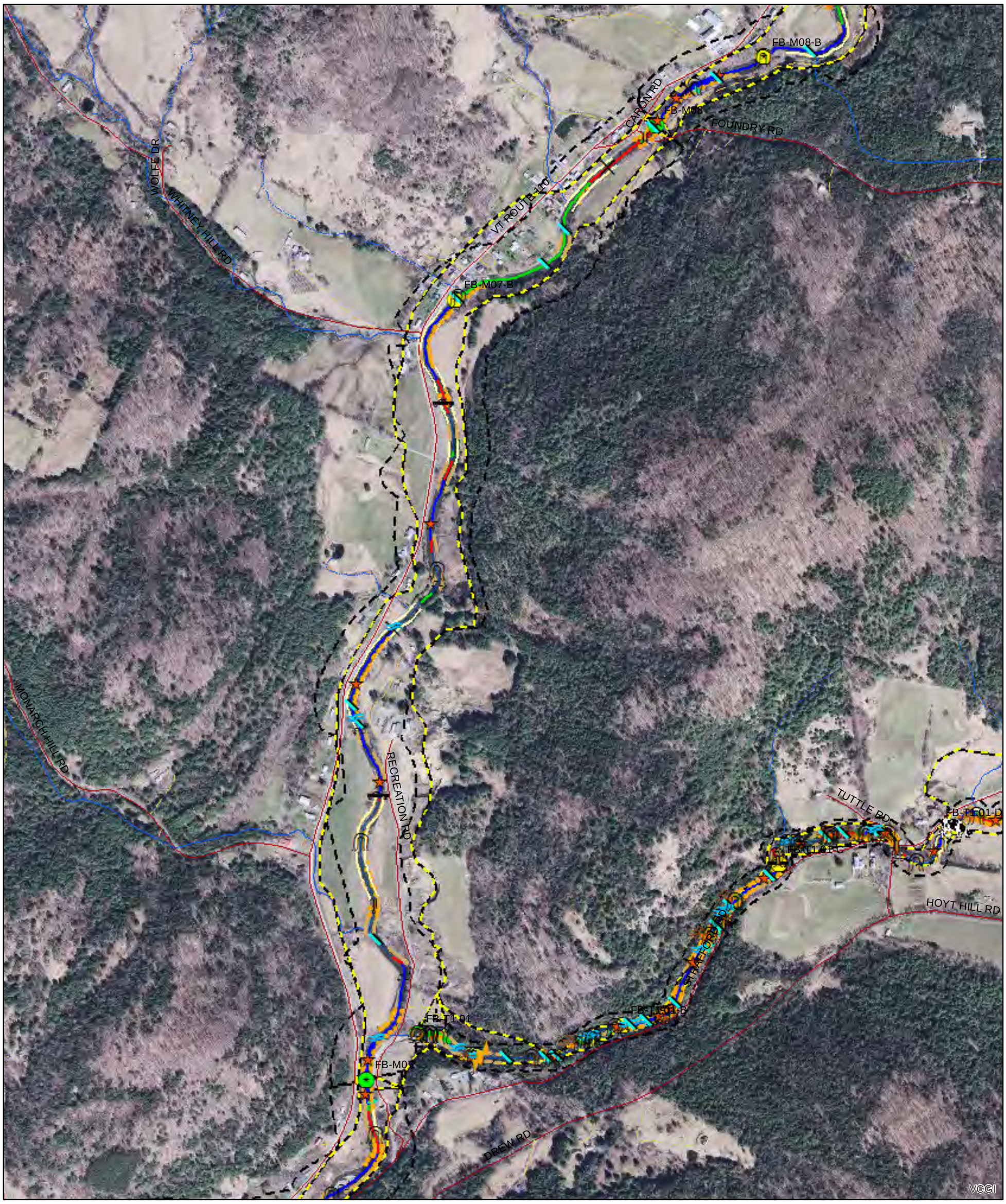

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Braiding
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Culvert
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Cross Section
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Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M08

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Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
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Stream Ford
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Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M09

N

0 500 1,000 Feet

HANSON RD
FB-M10
FB-M09-B
VT ROUTE 110
FB-T2.01-B
FB-M09
DICKERMAN HILL RD
FB-T2.01
VCGI

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
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Culvert
Dam
Dredging
Flood Chute
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Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M10

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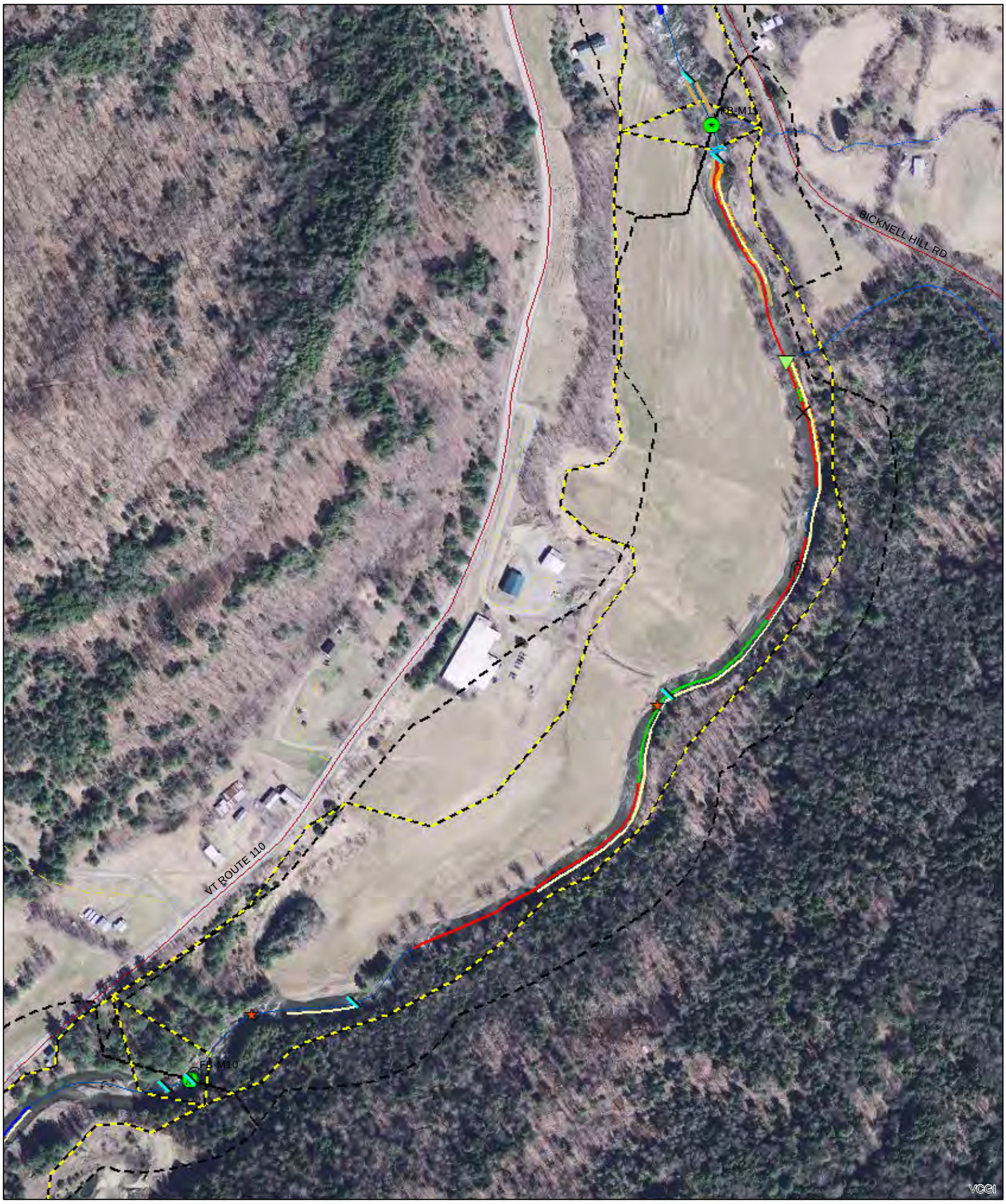

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Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M11

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Seg breaks
Reach breaks
Driveway
Other roads
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Valley wall

Animal Crossing
Avulsion
Braiding
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Culvert
Dam
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Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M12

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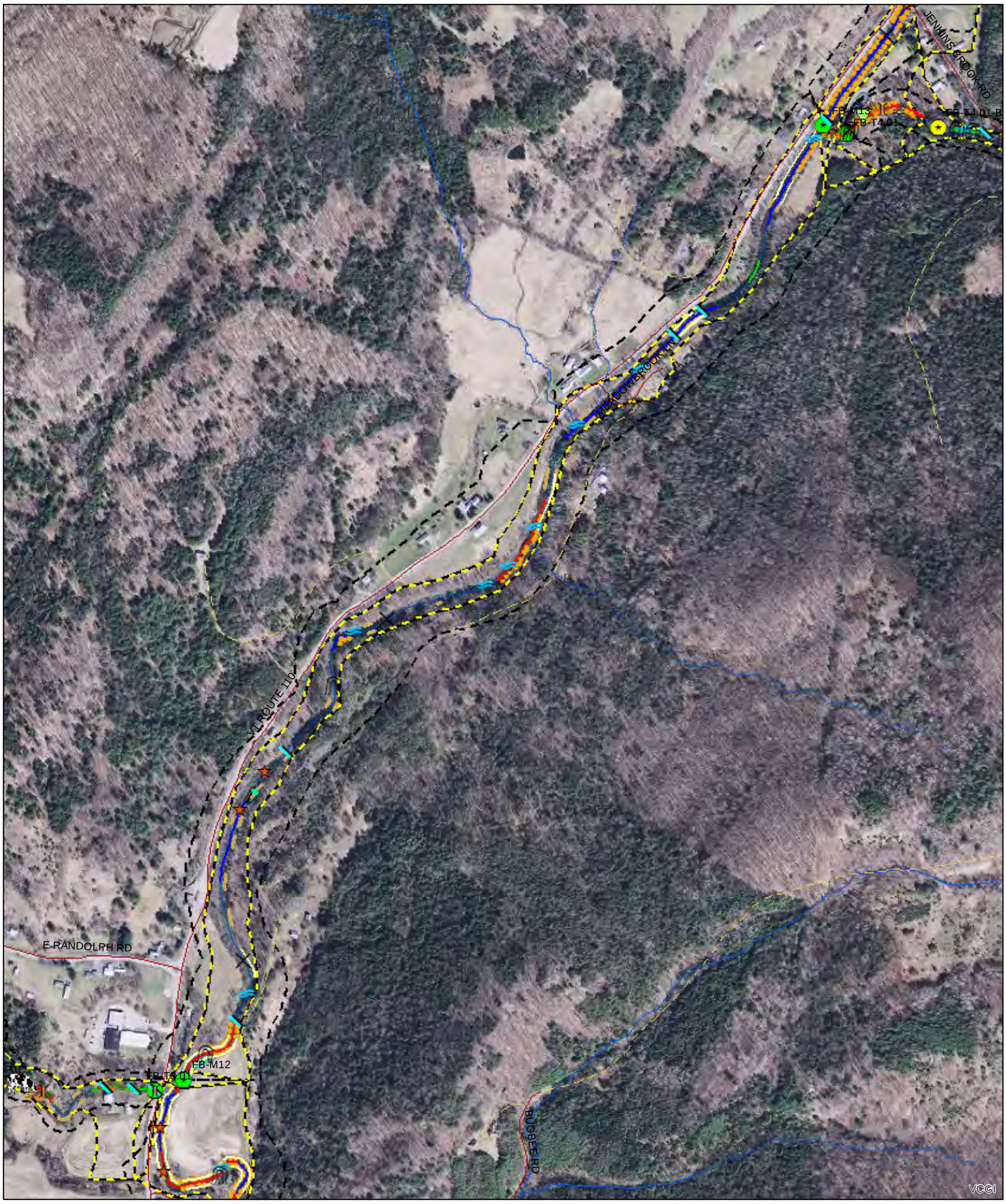

Seg breaks
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Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
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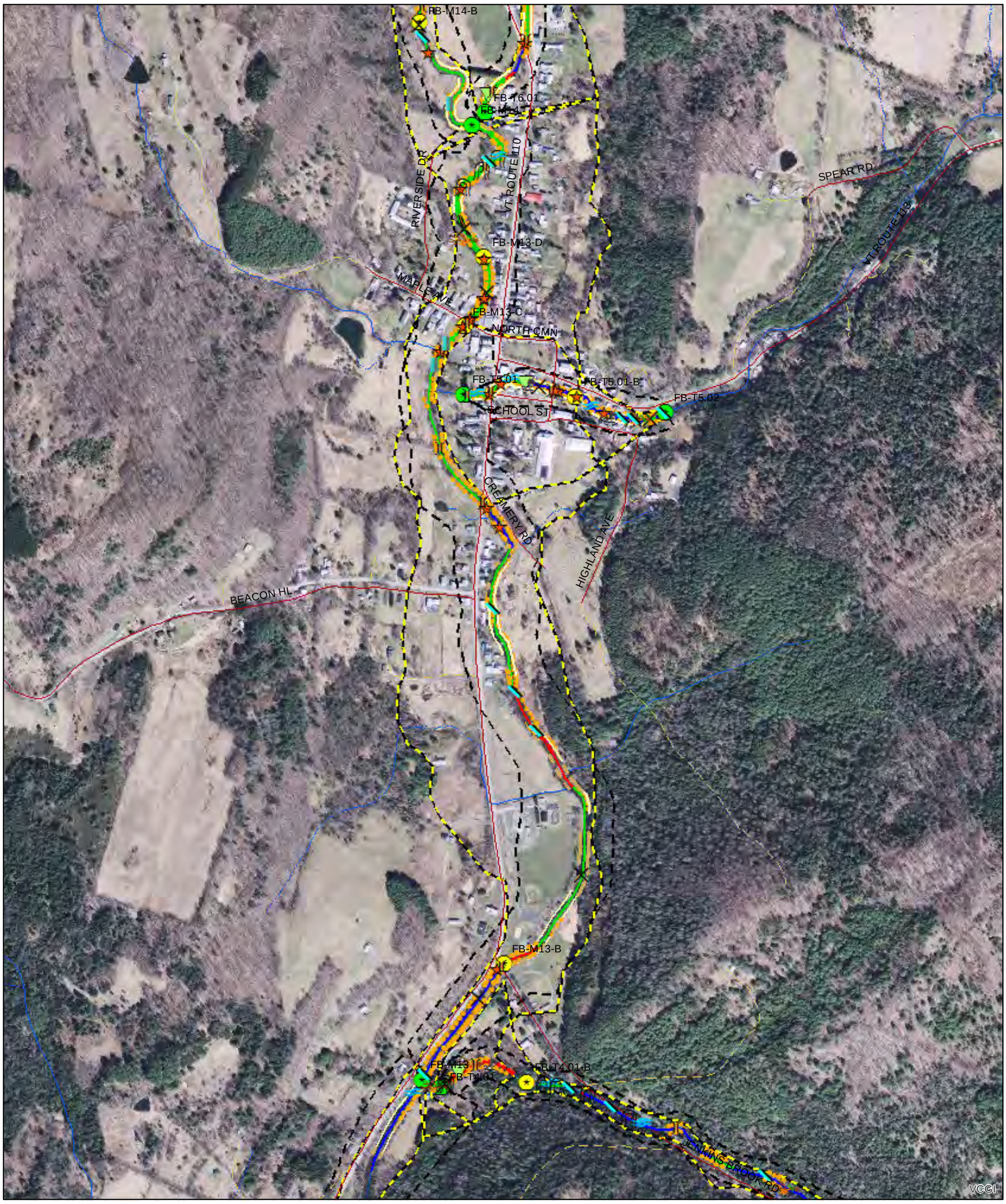
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M13

N

0 500 1,000 1,500 2,000 2,500 Feet



Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M14

N

0 500 1,000 1,500 2,000 2,500 Feet

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M15

N

0 500 1,000 1,500 Feet

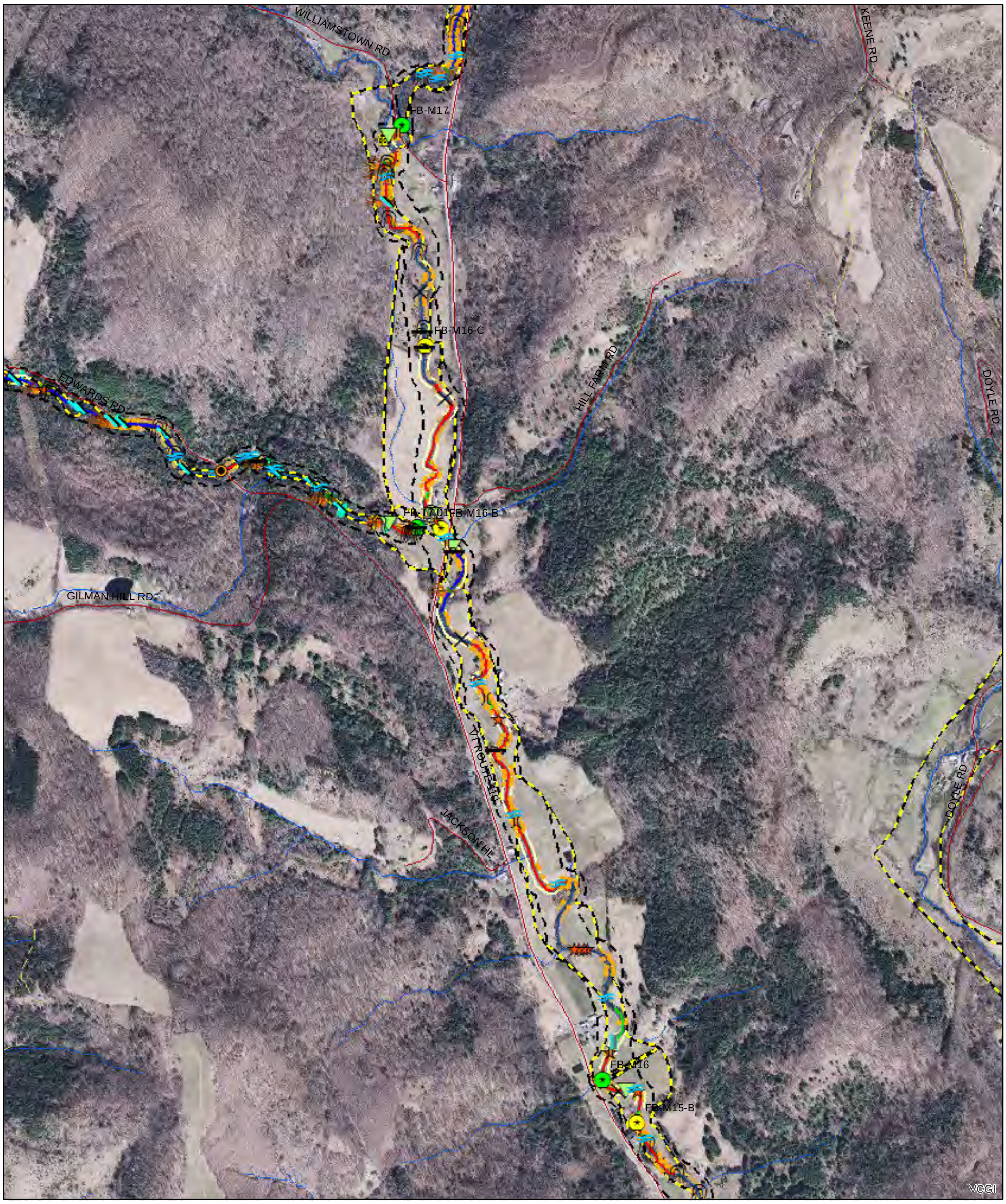
Seg breaks	Driveway	Intermittent stream	Phase 1 corridor	
Reach breaks	Other roads	Perennial stream	Valley wall	

Animal Crossing	Head Cut	Alluvial Fan	Bank Armoring	Development
Avulsion	Ledge	Beaver Dam	Buffers <25 ft	Encroachment
Braiding	Migration	Cross Section	Erosion	Straightening
Bridge	Neck Cutoff	Debris Jam	Mass Failure	With Windrowing
Culvert	Steep Riffle	Withdrawals	Berm Both Sides	
Dam	Stream Ford	Gully	Berm One Side	
Dredging	Waterfall	Stormwater Input		
Flood Chute	Weir	Stream Crossing		

FB-M16

N

0 500 1,000 1,500 2,000 2,500 3,000 3,500 Feet



Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M17

N

0 500 1,000 1,500 2,000 2,500 Feet

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M18

N

0 500 Feet

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-M19

N

0 500 1,000 1,500 Feet

FB-M20

MT ROUT 1-10

FB-M19-C

FB-M19-B

FB-M19

VCGI

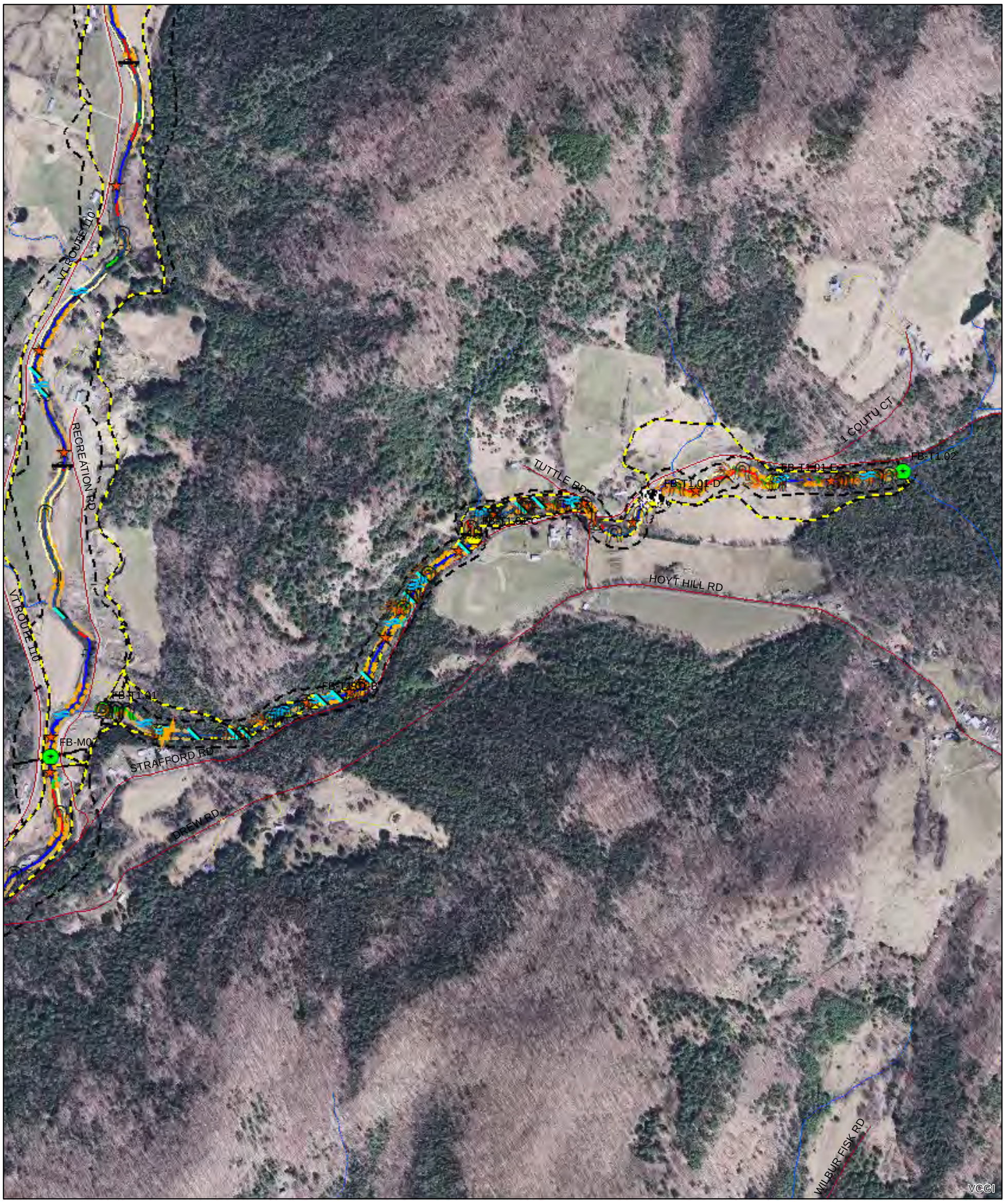
Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T1.01

N

0 500 1,000 1,500 2,000 2,500 3,000 Feet



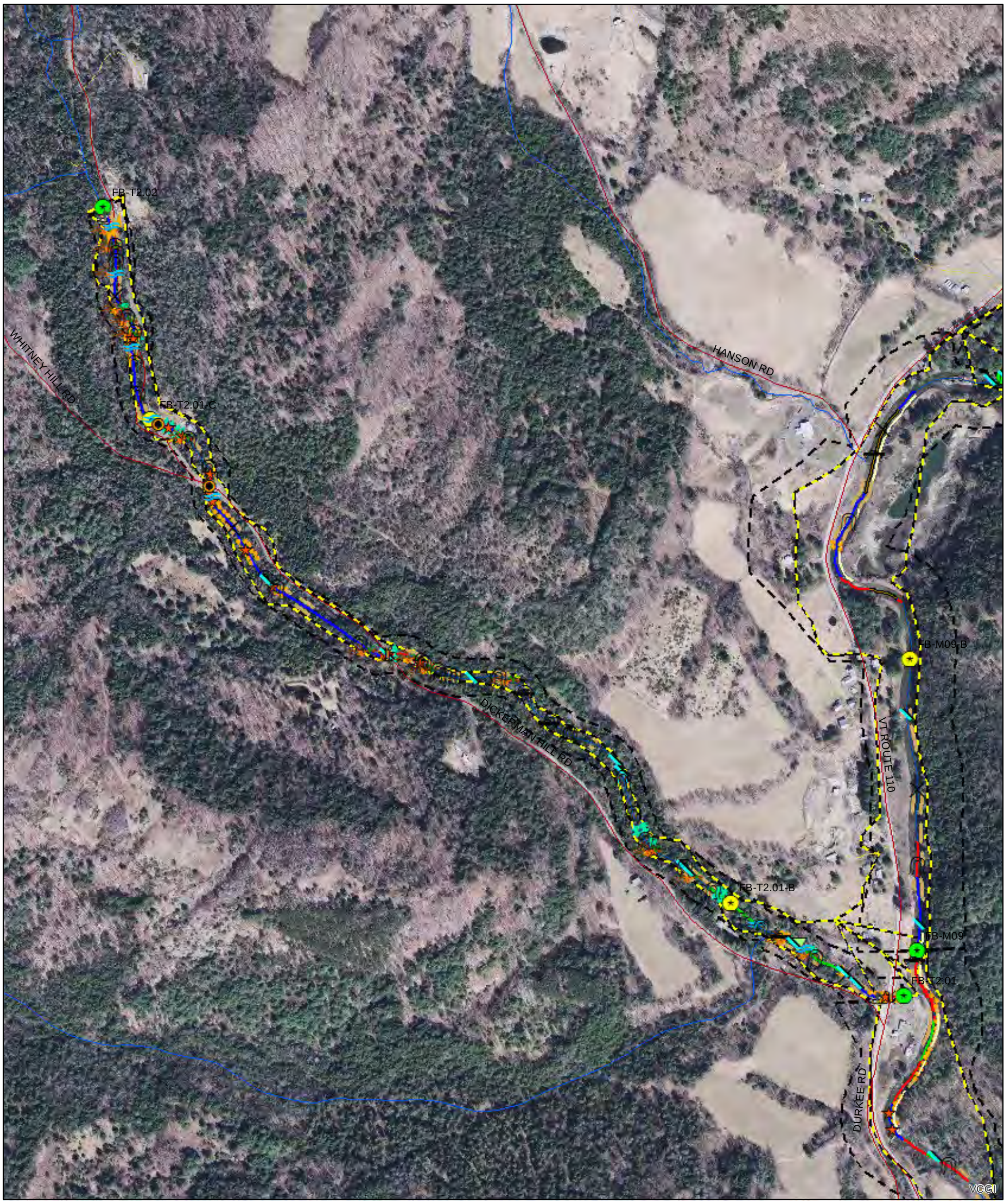
Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T2.01

N

0 500 1,000 1,500 2,000 Feet



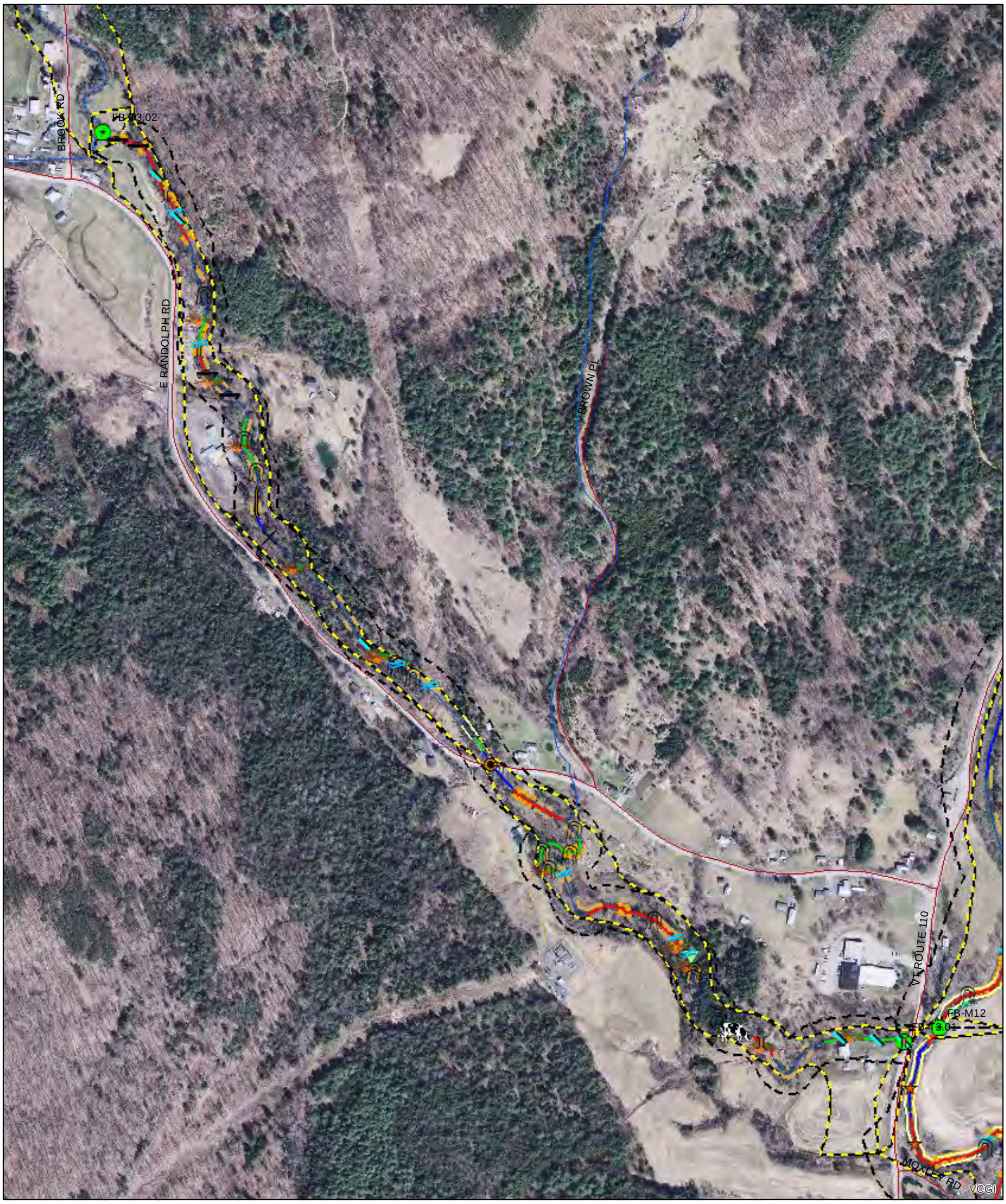
Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T3.01

N

0 500 1,000 1,500 Feet



Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T4.01

N

0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 Feet

Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T5.01

N

0 500 Feet

FB-M13-D
VT ROUTE 110
MAPLE AVE
FB-M13-C
NORTH CMN
VT ROUTE 113
COURT ST
FB-T5.01
FB-T5.01-B
N COURT ST
FB-T5.02
SCHOOL ST
CREAMERY RD
HIGHLAND AVE
VCGI

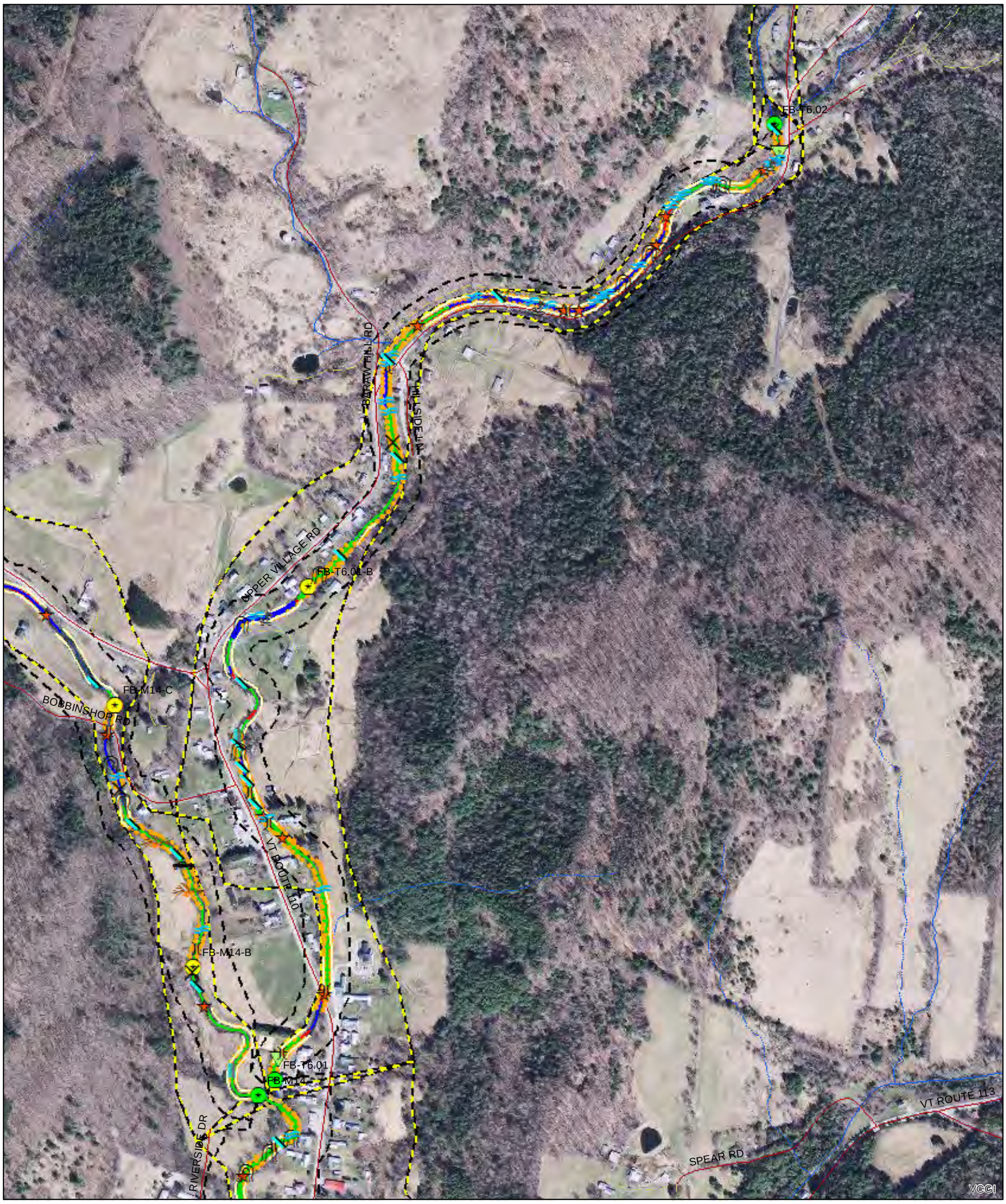
Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T6.01

N

0 500 1,000 1,500 2,000 Feet



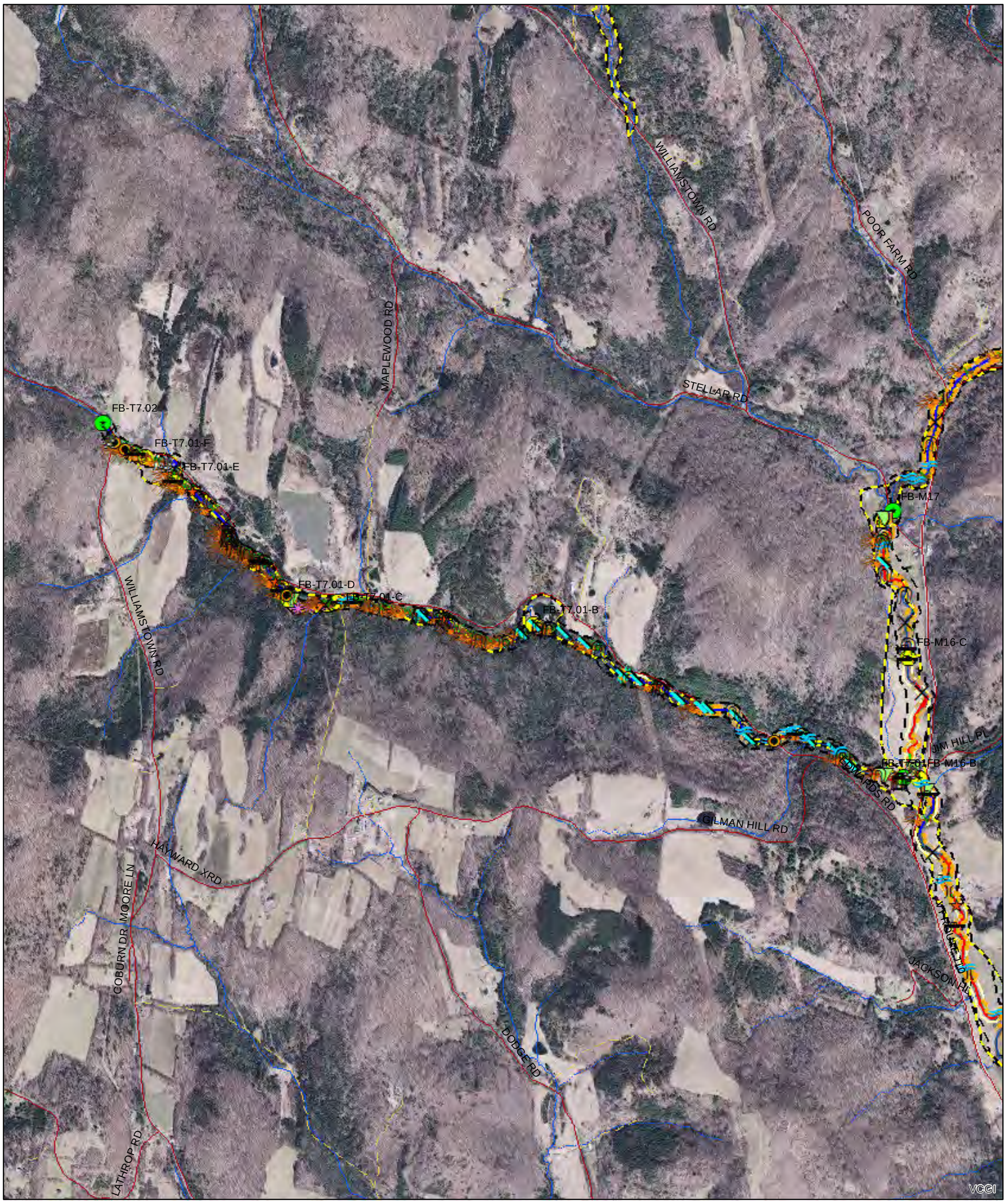
Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

FB-T7.01

N

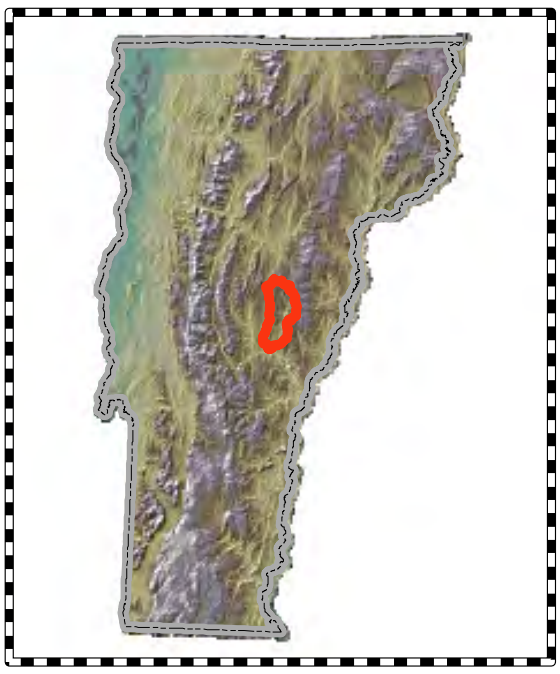
0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000 5,500
Feet

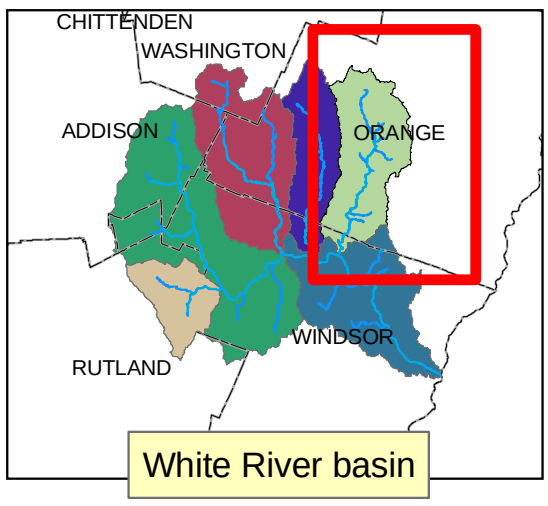


Seg breaks
Reach breaks
Driveway
Other roads
Intermittent stream
Perennial stream
Phase 1 corridor
Valley wall

Animal Crossing
Avulsion
Braiding
Bridge
Culvert
Dam
Dredging
Flood Chute
Head Cut
Ledge
Migration
Neck Cutoff
Steep Riffle
Stream Ford
Waterfall
Weir
Alluvial Fan
Beaver Dam
Cross Section
Debris Jam
Withdrawals
Gully
Stormwater Input
Stream Crossing
Bank Armoring
Buffers <25 ft
Erosion
Mass Failure
Berm Both Sides
Berm One Side
Development
Encroachment
Straightening
With Windrowing

First Branch watershed
SGA 2012-2013
Overview





First Branch White River
Second Branch White River
Third Branch White River
Lower White
Upper-Mid White
Tweed River
Counties

Reach break
Roads (911)
Phase 2 reaches
Phase 1 streams
Towns
Protected lands

White labels indicate downstream end of assessed reach

WILLIAMSTOWN
CORINTH
CHELSEA
BROOKFIELD
RANDOLPH
VERSHIRE
TUNBRIDGE
STRAFFORD
ROYALTON
South Royalton

Corner
South Washington
Kennedy Corners
Chelsea
North Tunbridge
Tunbridge
South Tunbridge

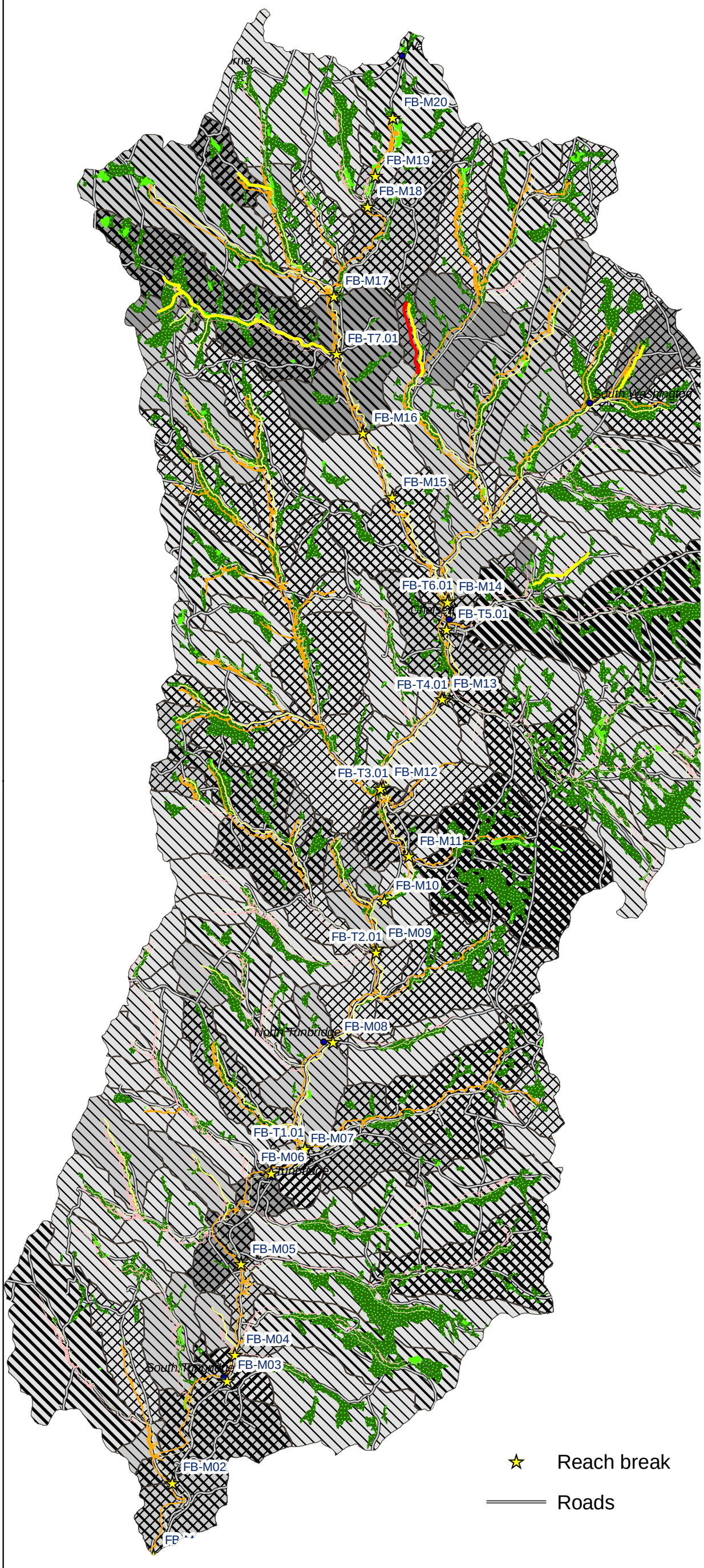
FB-M20
FB-M19
FB-M18
FB-T7.02
FB-M17
FB-T7.01
FB-M16
FB-M15
FB-T6.02
FB-M14
FB-T6.01
FB-T5.02
FB-T5.01
FB-M13
FB-T3.02
FB-M12
FB-T3.01
FB-T4.02
FB-M11
FB-T2.02
FB-M10
FB-M09
FB-T2.01
FB-M08
FB-T1.02
FB-M07
FB-M06
FB-M05
FB-M04
FB-M03

N

0 0.5 1 2 3 Miles

First Branch White River Watershed: Land use - land cover stressors 2005 Phase 1 SGA*

*SGA: Stream Geomorphic Assessment



Crop - Cumulative effect

- Low (< 5%)
- Moderate (>= 5% and < 10%)
- High (>= 10% and < 20%)

Urban - Cumulative effect

- Low (< 5%)
- Moderate (>= 5% and < 10%)
- High (>= 10% and < 20%)

- Existing wetland
- Possible lost wetland

rds_sqmi

- 0 - 2
- 3 - 4
- 5 - 6
- >=7

Urban by subwatershed

- Moderate (>= 5% and < 10%)
- High (>= 10% and < 20%)
- Extreme (>= 20%)

Crop by subwatershed

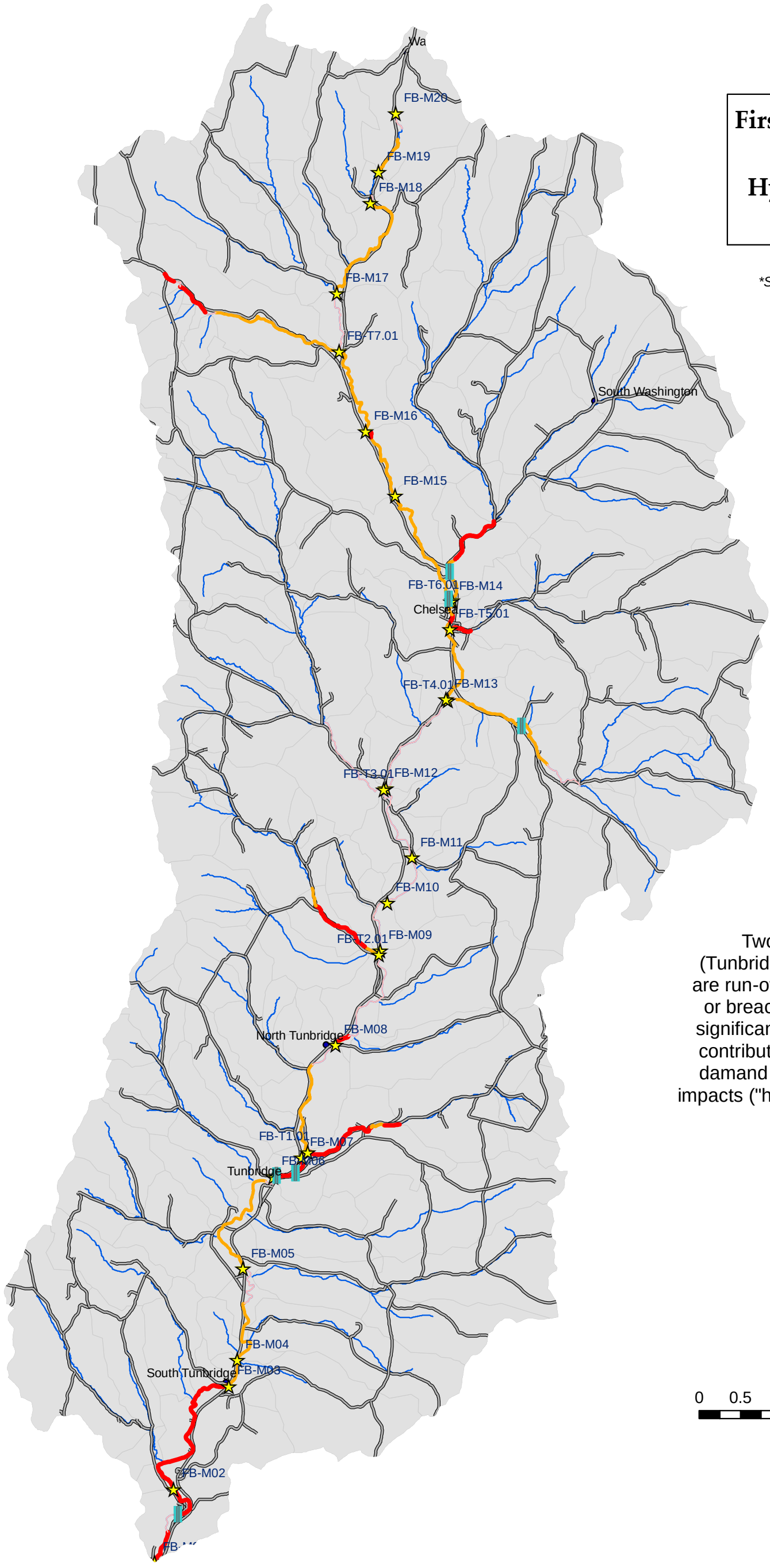
- Low (< 5%)
- Moderate (>= 5% and < 10%)
- High (>= 10% and < 20%)

N

0 0.5 1 2 3 4 Miles

First Branch White River Watershed: Hydrologic Alterations 2012-2013 SGA*

*SGA: Stream Geomorphic Assessment



Dam

Reach break

Ph2 - Stormwater/mi

<=2

>2 <= 5

> 5

Roads

Subwatershed

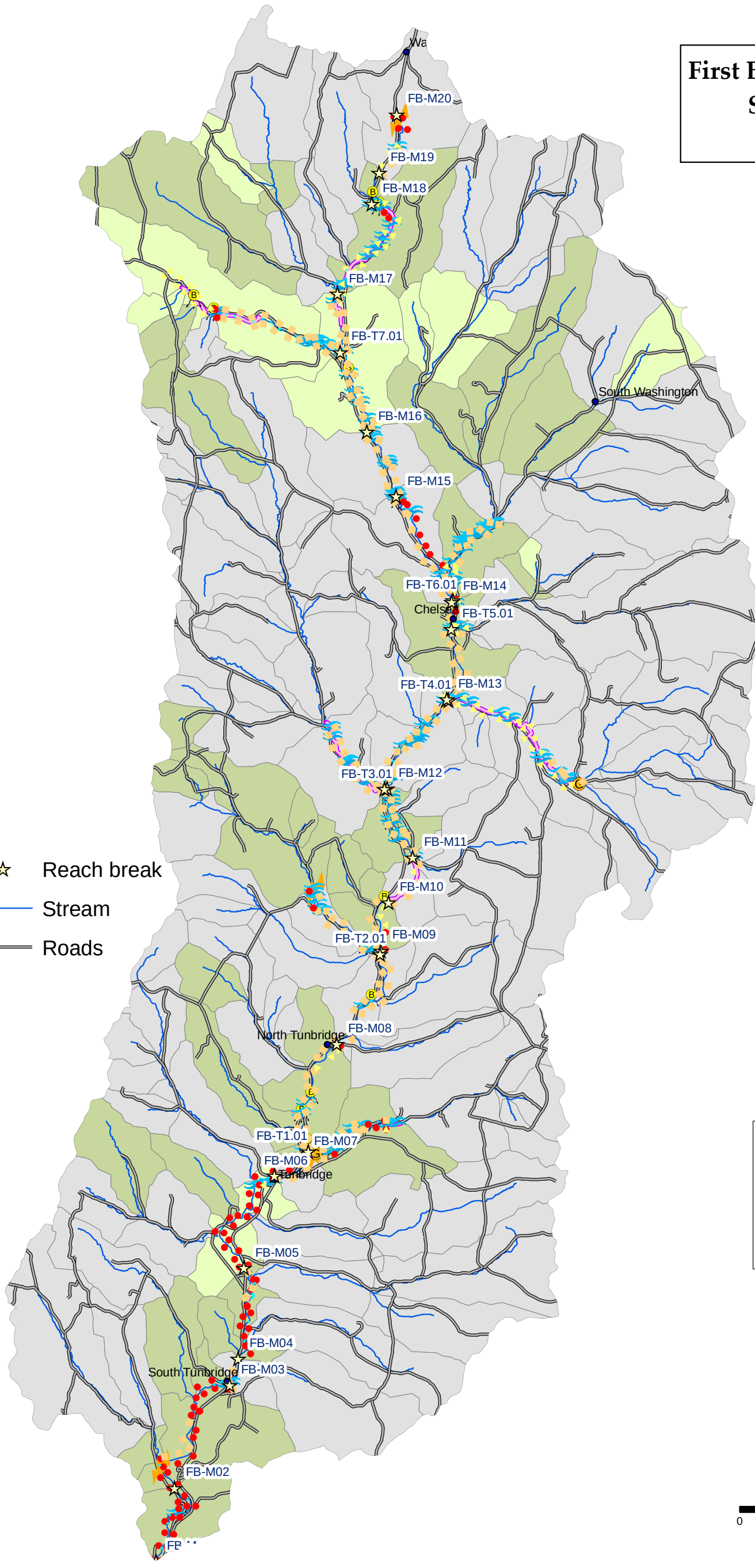
Two intact dams in the basin (Tunbridge village and South Royalton) are run-of-river; all other dams are small or breached. None of these dams are significant flow regulations, but all likely contribute to "sediment starving" at the damand thus heightened stream power impacts ("hungry water effect") downstream.

N

0 0.5 1 2 3 4 Miles

First Branch White River watershed: Sediment Load Indicators 2012-2013 SGA*

*SGA: Stream Geomorphic Assessment



Mass Failure

Left bank erosion range

- Low (<5%)
- Moderate (>5% <=20%)
- High (>20%)

Right bank erosion range

- Low (<5%)
- Moderate (>5% <=20%)
- High (>20%)
- Gully
- Avulsion
- Steep Riffle
- Braiding
- Trib rejuvenation

Crop by subwatershed

- Low (< 5%)
- Moderate (>= 5% and < 10%)
- High (>= 10% and < 20%)

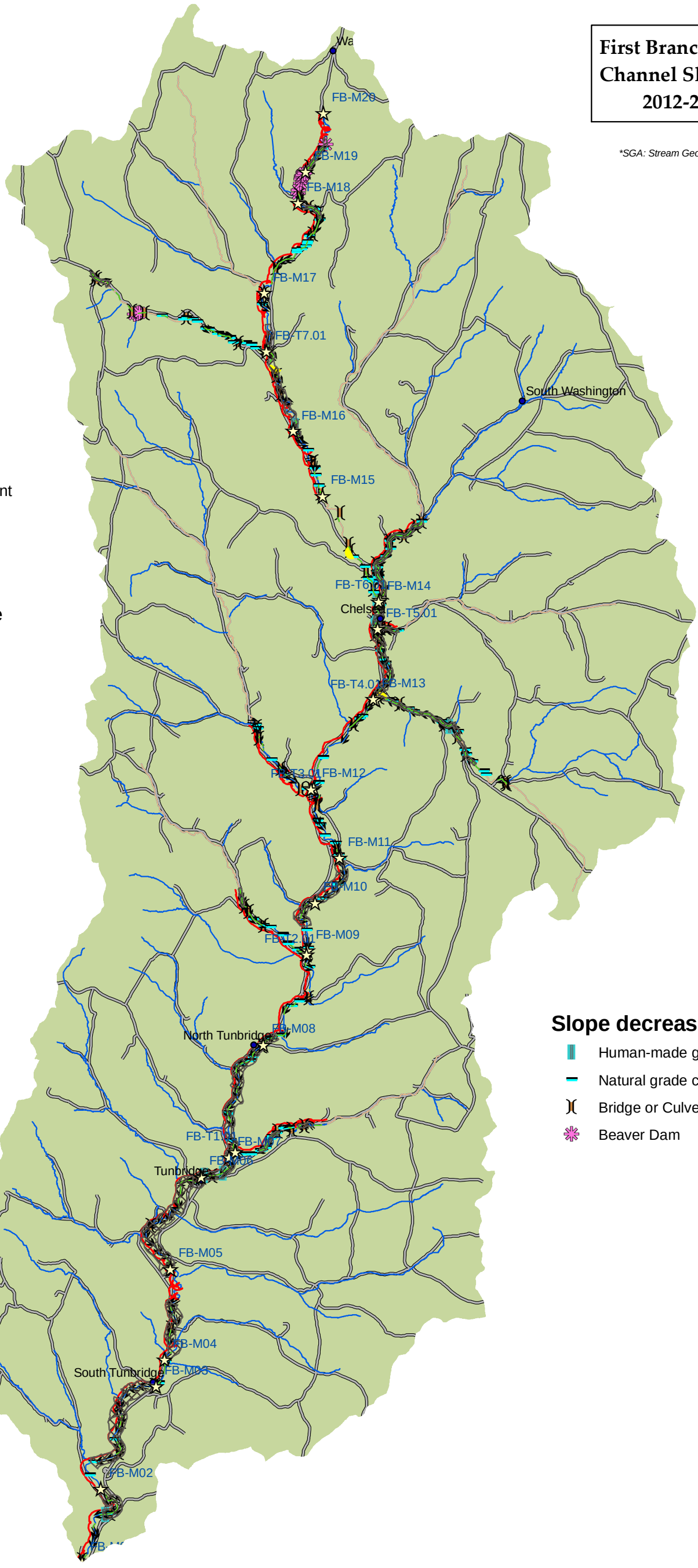
Every reach had at least one segment with >5 depositional features/mi (26 of 26 reaches, 54 of 61 segments). To simplify the map, no color coding along the streamlines is shown to indicate this - almost all would be red

N

0 1 2 4 Miles

First Branch White River: Channel Slope Modifiers 2012-2013 SGA*

*SGA: Stream Geomorphic Assessment



Slope increases

- Development/encroachment

Ph2 Straightening

- Straightening
- With Windrowing
- >=50%

Ph1 Straightening range

- < 5%
- >= 5% and < 20%
- >= 20%
- Roads

Slope decreases

- Human-made grade control
- Natural grade control
- Bridge or Culvert
- Beaver Dam

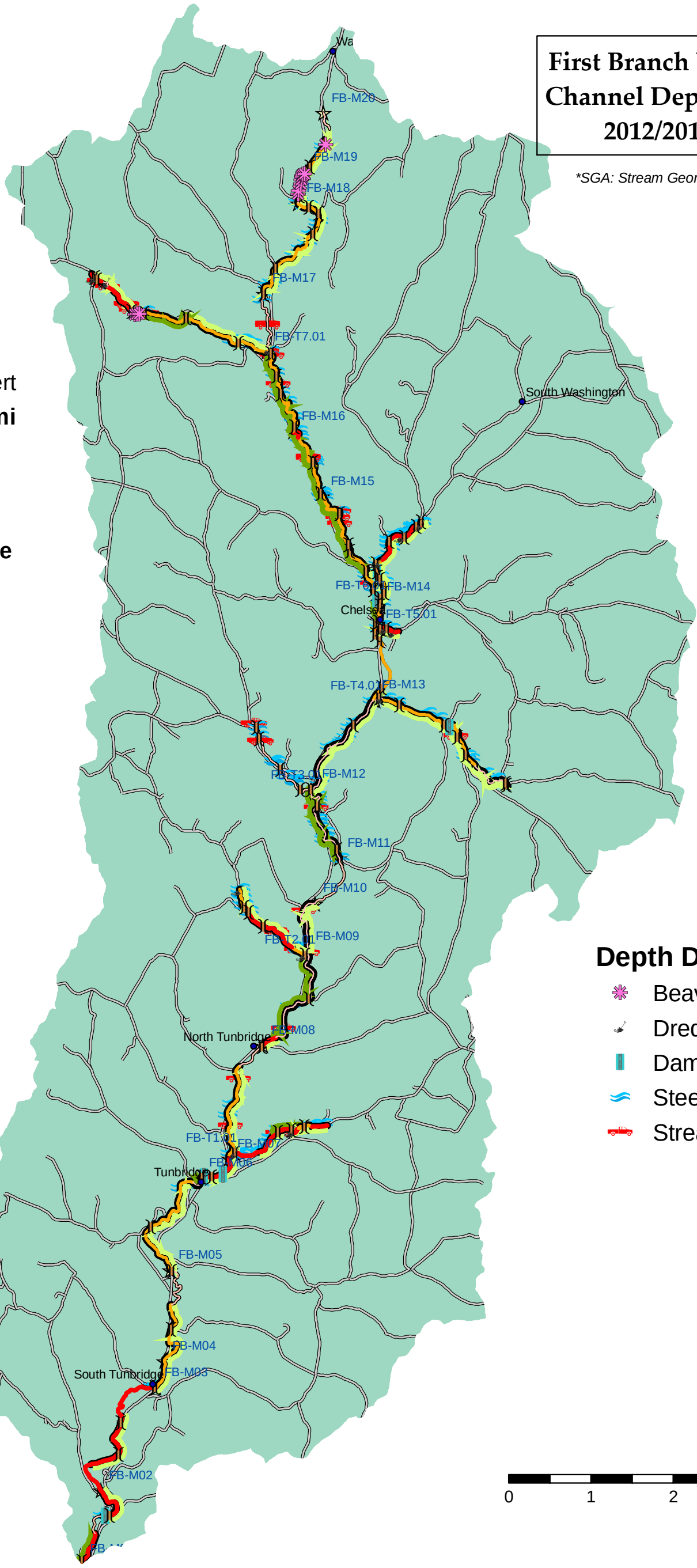
- Reach break
- Roads

0 0.5 1 2 Miles

N

First Branch White River: Channel Depth Modifiers 2012/2013 SGA*

*SGA: Stream Geomorphic Assessment



Depth Increases

- Bridge or Culvert

Ph2 - Stormwater/mi

- <=2
- >2 <= 5
- > 5

Encroachment range

- <5%
- >5% <=20%
- >20%

Depth Decreases

- Beaver Dam
- Dredging
- Dam
- Steep Riffle
- Stream Ford

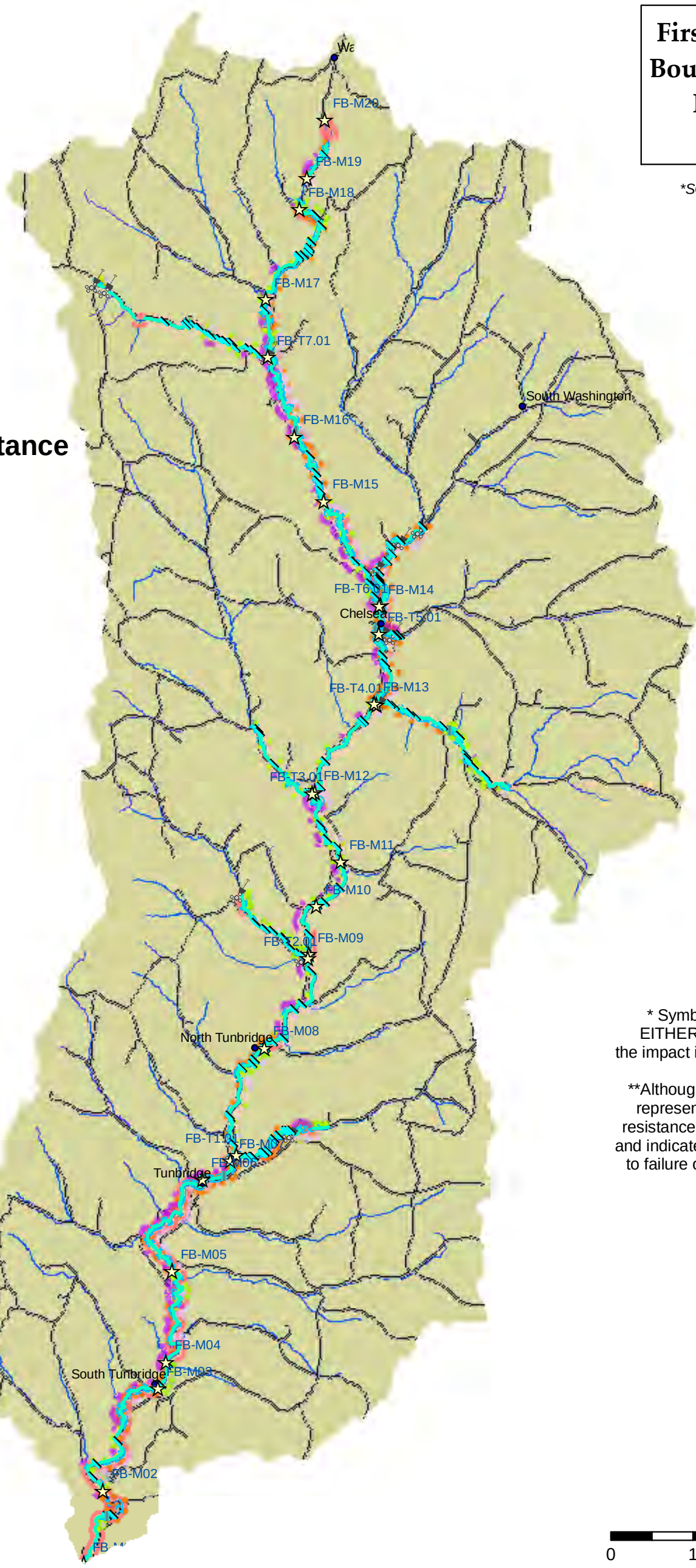
- Reach break
- Roads
- Stream

N

0 1 2 4 Miles

First Branch White River: Boundary Conditions and Riparian Modifiers 2012/2013 SGA*

**SGA: Stream Geomorphic Assessment*



Increased resistance

Grade controls

- Human-made
- Natural
- Coarse bed

Bank armoring**

- Left Bank
- Right Bank

Armoring_range*

- >20%
- >5% <=20%

Decreased resistance

- Dredging

Bank armoring**

- Left Bank
- Right Bank

Buffers <25 ft

- Left Bank
- Right Bank

Erosion range*

- >5% <=20%
- >20%

* Symbol indicates range on EITHER left or right bank, and the impact is displayed on each side.

**Although bank armoring usually represents increased boundary resistance, it requires maintenance and indicates where banks are prone to failure or erosion if not armored

- Reach break
- Roads
- Stream

N

0 1 2 4 Miles

First Branch White River: Constraints to Channel Evolution

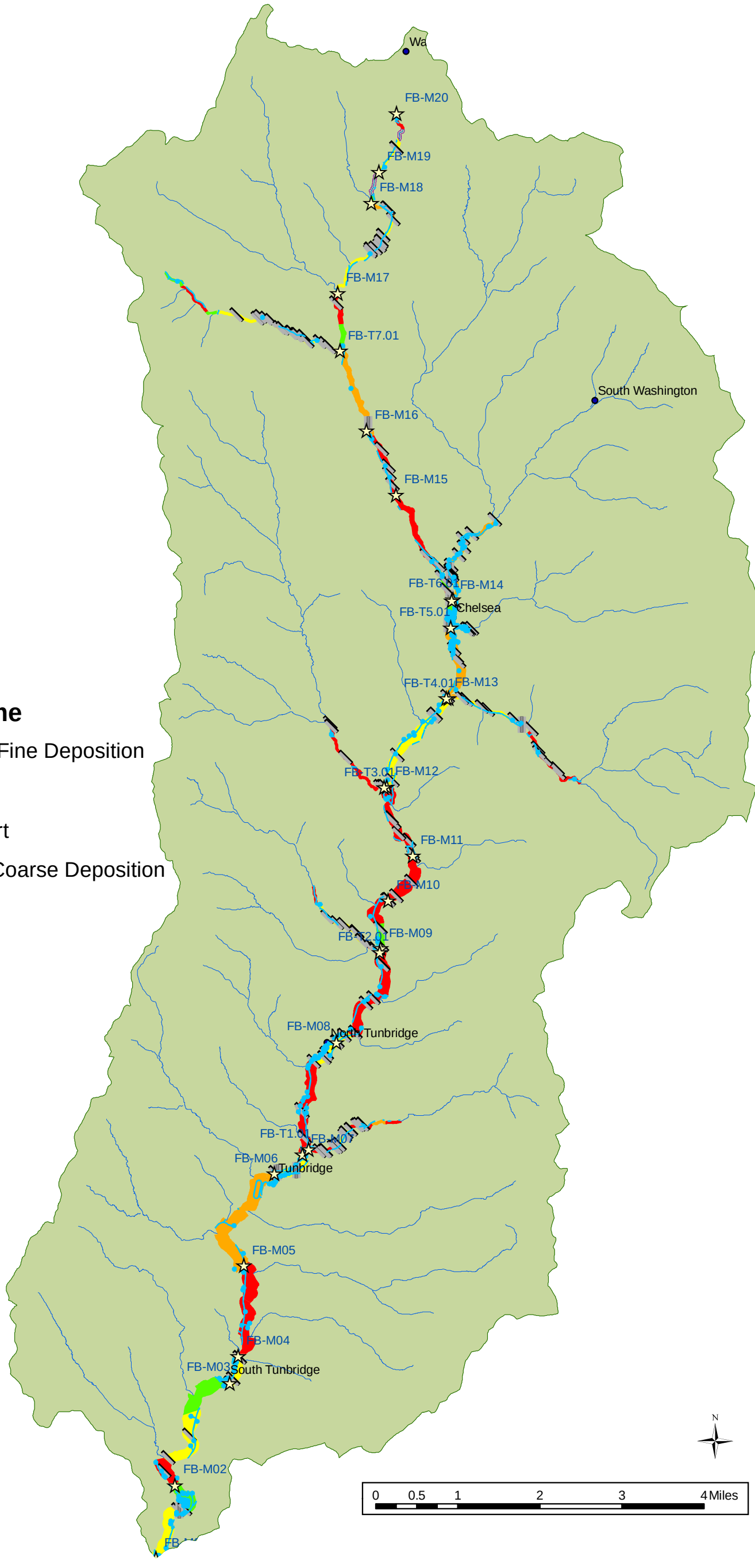
Lateral constraints
Vertical constraints
Grade controls
- **Human-made**
- **Natural**

Stream

Unassessed

Exisiting (Ph 2) Sediment Regime

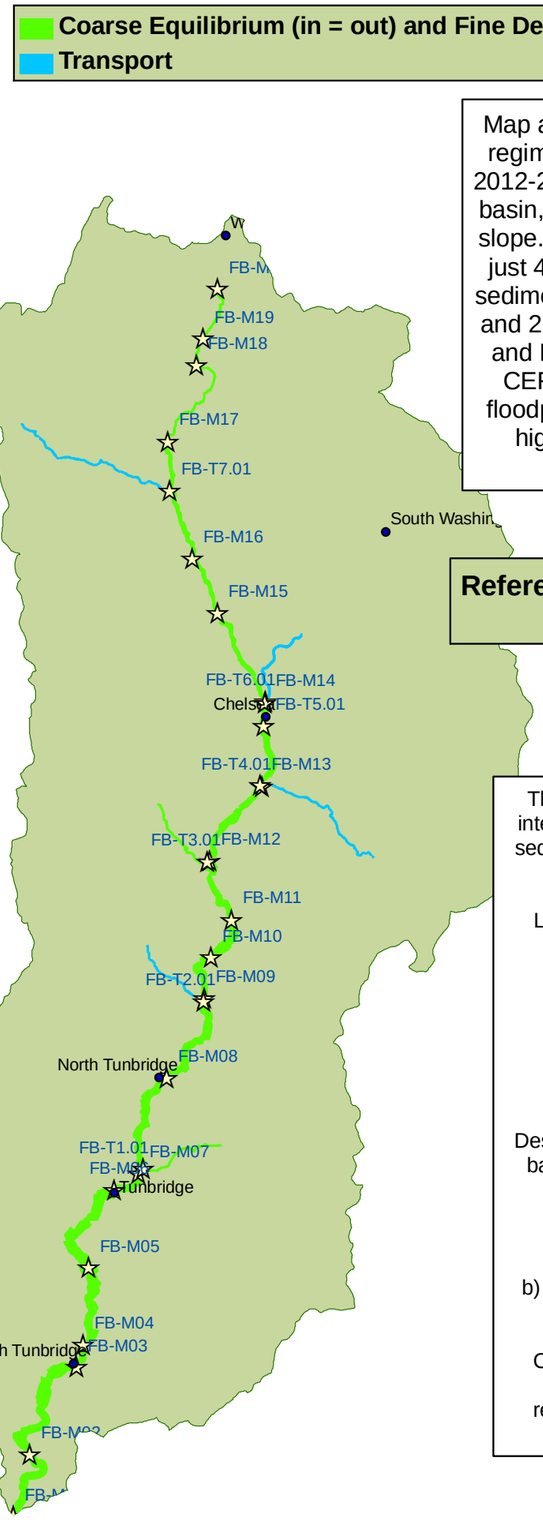
- Coarse Equilibrium (in=out) and Fine Deposition
- Confined Source and Transport
- Unconfined Source and Transport
- Fine Source and Transport and Coarse Deposition
- Transport
- Stream
- ☆ Reach break



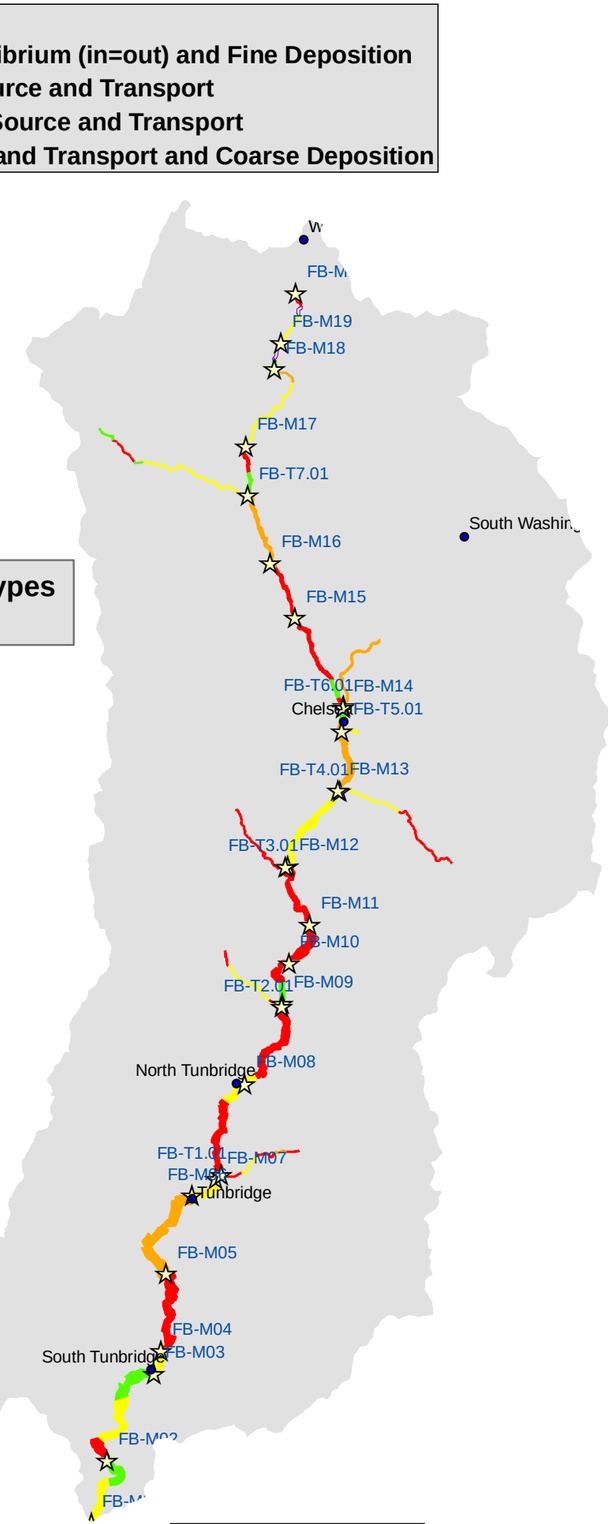
First Branch White River Sediment Regime Departure

Map at left indicates reference sediment regimes for the 26 reaches selected for 2012-2013 assessment in the First Branch basin, based primarily on valley type and slope. This Phase 1 assessment showed just 4 reaches with reference Transport sediment regimes (all of them tributaries), and 22 reaches with "Coarse equilibrium and Fine Deposition" (CEFD) regimes. CEFD streams utilize access to their floodplains as a primary means to store high flows, sediment and nutrients in the basin.

Due particularly to changes in hydrology and attendant changes in sediment storage and transport, existing stream types and dynamics identified in Phase 2 field work (map at right) indicate that just 11 segments in 8 reaches retain a CEFD sediment regime. 50 segments - including at least some portion of every reach - have been converted to some type of Transport regime.



Reference Sediment Regime Types (Phase 1 assessment)



Existing Sediment Regime Types (Phase 2 assessment)

The good news for flood resilience and stream health is that the remaining CEFD segments are dispersed intermittently throughout the watershed. Because of the extensive ledge grade controls present in the basin, sediment deposition and large woody debris have the possibility of rebuilding access to restricted floodplains in areas where floodplain encroachments don't conflict with these highly valuable processes.

Ledge grade controls have helped limit downcutting throughout the watershed, and important floodplains appear to be accessible in high level floods (such as Irene). Current stream adjustments (particularly in more moderate flood events) primarily include channel widening and appear strongly related to elevated stream power,with a strong predisposition to flash flooding and ice jams in the watershed.

These impacts are intesified by: a) extensive straightening and changes in hydrology (esp. a reduction of the time it takes water to reach the streams), increasing stream power in floods; and
b) extensive encroachment in the naturally narrow valleys of the watershed

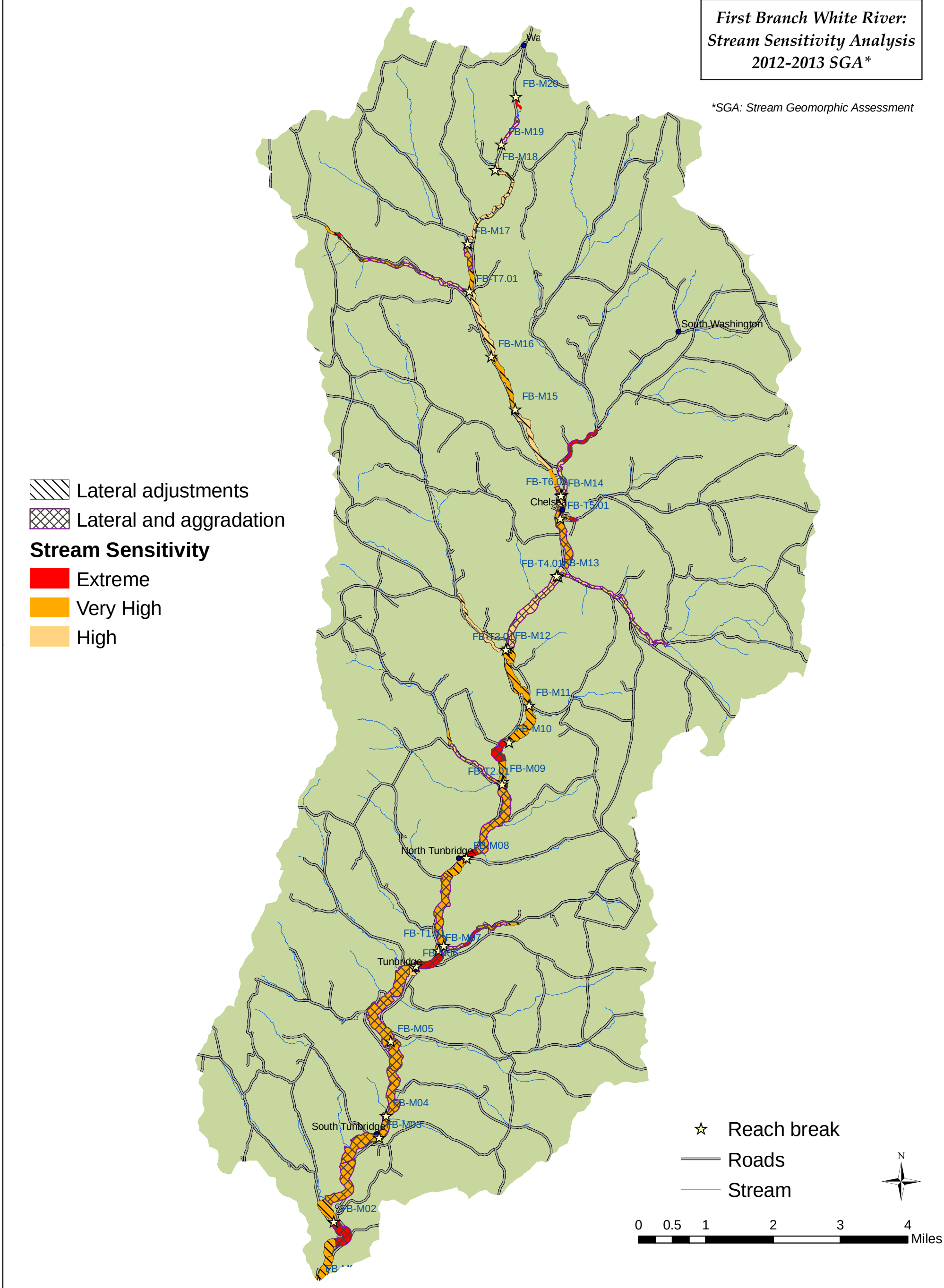
Despite current somewhat restricted access to floodplains, the extent of floodplain access in the First Branch basin during Irene did much to mitigate the impacts of further flood damages in South Royalton and points further downstream along the White mainstem, which were plenty high enough at it was.

Conversion to Transport sediment regimes means that most sediment entering the stream is either:
a) transported long distances (fines) and frequently contributing to infilling of planebeds; or
b) is being dropped out when: i) floodplain can be accessed; or ii) the load reaches a point the stream cannot carry (particularly at channel constrictions such as undersized bridge abutments or old dam remains).

Corridor protection to allow unrestricted stream access to remaining floodplains (and permit an important role for beaver activity) is the highest priority in the First Branch basin, particularly given the difficulty of remediating the degree of pre-existing road and development encroachments and increasing stormwater inputs related to their maintenance.

*First Branch White River: Stream Sensitivity Analysis 2012-2013 SGA**

**SGA: Stream Geomorphic Assessment*



- Appendix 8 –

Bridge and Culvert Survey Reports

Structure summary reports
Failure modes: Geomorphic incompatibility
Failure modes: Problem causes
Aquatic organism passage (AOP) ratings:
Passage, geomorphic compatibility, retrofit potential
Wildlife passage

(also see https://anrnode.anr.state.vt.us/SGA/datasets/structures/reports.aspx?did=31 and select 'Bridge and Culvert Summary Report' from the drop down list; then select 'All' or any one structure of interest)

Easiest method to find summary report for a bridge or culvert:
Use interactive Vermont Agency of Natural Resources Atlas, http://anrmaps.vermont.gov/websites/anra/: ANR Atlas layers→Fish and Wildlife→Stream Crossings, then use the Identify/Query toolbars, click on the structure of interest and a link to the Bridge or Culvert Summary report will be summoned by clicking on the blue highlighted Stream Crossing (Fig. Apx8-1, reverse side of this page)

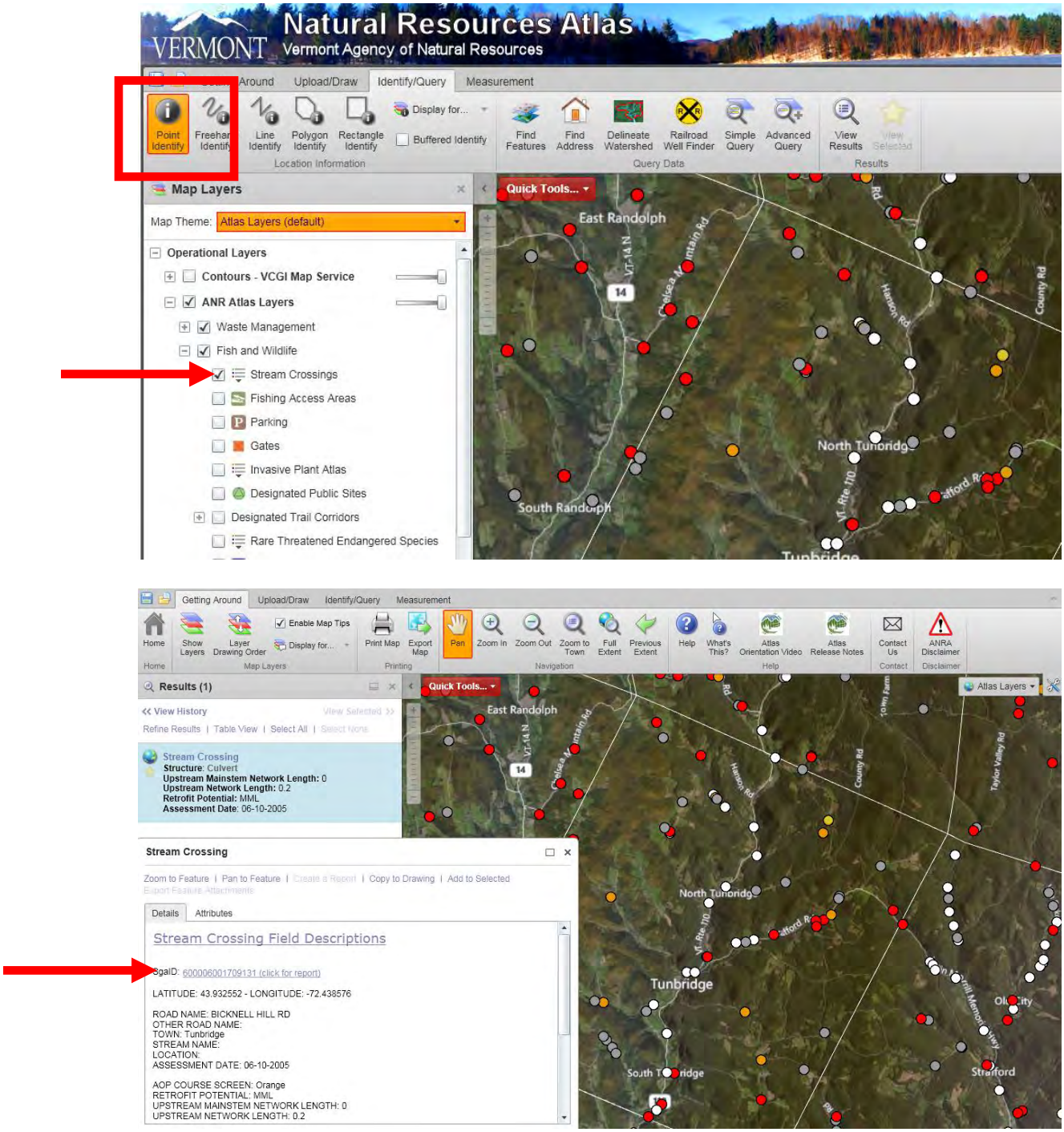


Figure Apx8-1. Easiest method for obtaining Bridge and Culvert summary for a particular structure is through the Natural Resource Atlas hosted by the Vermont Agency of Natural Resources.

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Stream Geomorphic Assessment

Agency of Natural Resouces

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July, 17 2014

Bridge Summary Report

White River

General Information

SgaID	200014000014162	Local SgaID		VOBCIT struct_num	200147002114162
Observers	DR, AS (Redstart)	Assessment Date	10/26/2012	Project Name	White River - First Branch
Town	Royalton	Latitude	43.82392	Longitude	-72.52063
Location	Just East of Rte. 110/Rte. 14 intersection on Rte. 14			Reach VTID	M01
Road Name	ROUTE 14	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	101.3

Bridge Information

Bridge Width	37	Material	Concrete
Bridge Clearance	18	Number of bridge piers/arches	0
Bridge/Arch Span	130		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure		Yes	
Downstream bank heights are substantially higher than upstream bank heights		No	
Pool Depth at point of streamflow entry		No 0 ft.	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Point	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Downstream of bridge is confluence w/ White River. Heavily rip rapped inside structure likely since Irene. Debris from Irene wedged into girders.**

Bridge Summary Report

White River

General Information

SgaID	200110000009132	Local SgaID		VOBCIT struct_num	200169001A09132
Observers	DR, AS (Redstart)	Assessment Date	10/22/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.85468	Longitude	-72.50278
Location	Where First Branch crosses Rte. 110 just S. of Russell Rd.			Reach VTID	M02
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	100

Bridge Information

Bridge Width	40	Material	Concrete
Bridge Clearance	20	Number of bridge piers/arches	1
Bridge/Arch Span	90		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	200
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Cobble
Bedrock Present	No	Yes	No
Type of Sediment Deposits	Side	Side	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Shrub/Sapling	
Dominant Vegetation Type - Right	Herbaceous/Grass	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Mink - Tracks	Mink - Tracks

Other Information

Spatial location data collected with GPS?	Yes	Photos taken?	Yes

Comments

Old abutment just upstream of current bridge on left bank reduces effective width to 60'; debris jam from left bank to pier mostly blocks water's upstream access to left half of channel through bridge; old breached dam and abutments downstream of bridge.

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Stream Geomorphic Assessment

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Bridge Summary Report

White River

General Information

SgaID	100002000009131	Local SgaID		VOBCIT struct_num	100913000509131
Observers	DR, AS (Redstart)	Assessment Date	10/2/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.8917	Longitude	-72.49139
Location	Tunbridge Village off Rte. 110 on Spring Rd.			Reach VTID	M06
Road Name	SPRING RD	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	113

Bridge Information

Bridge Width	19	Material	Timber
Bridge Clearance	13.2	Number of bridge piers/arches	0
Bridge/Arch Span	60		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	Yes

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	100
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Bedrock	Bedrock	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Road Embankment	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Rip rap failure downstream is not bad. Hard bank armoring is failing on the right bank but is intact on the left bank.**

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Bridge Summary Report

White River

General Information

SgaID	100068000009041	Local SgaID		VOBCIT struct_num	100904004609041
Observers	DR, AS (Redstart)	Assessment Date	9/4/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.95685	Longitude	-72.46345
Location	~0.3 mi. S. of East Randolph Rd./Rte. 110 intersection off Rte. 110 on Moxley Rd.			Reach VTID	M11
Road Name	MOXLEY RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	90

Bridge Information

Bridge Width	17.5	Material	Timber
Bridge Clearance	11	Number of bridge piers/arches	0
Bridge/Arch Span	47		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Cobble	Sand
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Side	Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Effective width is reduced to 42' by alignment and upstream rip rap**

Bridge Summary Report

White River

General Information

SgaID	100044000009041	Local SgaID		VOBCIT struct_num	100904004509041
Observers	DR, HW, AS (Redstart)	Assessment Date	8/23/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.98927	Longitude	-72.4486
Location	In Chelsea Village just N. of Rte. 110/Rte. 113 intersection off Rte. 110 on Maple Ave.			Reach VTID	M13
Road Name	MAPLE AV	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	45

Bridge Information

Bridge Width	21	Material	Concrete
Bridge Clearance	8	Number of bridge piers/arches	0
Bridge/Arch Span	26.2		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	Footers,Wing walls	Footers,Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

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Bridge Summary Report

White River

General Information

SgaID	700000000309043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW, AS (Redstart)	Assessment Date	8/23/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99212	Longitude	-72.44803
Location	0.2 mi N. of Rte. 113/Rte. 110 intersection in Chelsea Village behind 321 Rte. 110.			Reach VTID	M13
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	45

Bridge Information

Bridge Width	5	Material	Timber
Bridge Clearance	7.75	Number of bridge piers/arches	0
Bridge/Arch Span	50		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Bedrock	Bedrock	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Side	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Footbridge, no structure number. Effective width is reduced by sloping abutments to ~44'.**

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Bridge Summary Report

White River

General Information

SgaID	700000000709043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/14/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.01194	Longitude	-72.46248
Location	1.2 mi N. of Rte. 110/Upper Village Rd. intersection just S. and across road from 489 Rte. 110.			Reach VTID	M15
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	44

Bridge Information

Bridge Width	12.3	Material	Timber
Bridge Clearance	6.2	Number of bridge piers/arches	0
Bridge/Arch Span	22		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Mid-channel	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Farm bridge, no structure number.**

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Bridge Summary Report

White River

General Information

SgaID	100092000014161	Local SgaID		VOBCIT struct_num	101416002914161
Observers	DR, AS (Redstart)	Assessment Date	10/24/2012	Project Name	White River - First Branch
Town	Royalton	Latitude	43.84294	Longitude	-72.51162
Location	~1 mi S. of Royalton/Tunbridge town line off Rte. 110 on Vezina Rd.			Reach VTID	M02
Road Name	TH 92	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	98

Bridge Information

Bridge Width	15	Material	Timber
Bridge Clearance	12.5	Number of bridge piers/arches	0
Bridge/Arch Span	60		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Footers,Wing walls	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Road Embankment	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Rip rap failing upstream and downstream of bridge on right bank, mostly intact upstream and downstream on left bank- looks newer on left bank.

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Bridge Summary Report

White River

General Information

SgaID	200110000009042	Local SgaID		VOBCIT struct_num	200169000909042
Observers	DR, HW, AS (Redstart)	Assessment Date	8/23/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.98609	Longitude	-72.44823
Location	In Chelsea Village 0.1 mi N. of Beacon Hill Rd. where Rte. 110 crosses over First Branch			Reach VTID	M13
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	52

Bridge Information

Bridge Width	27	Material	Concrete
Bridge Clearance	7.6	Number of bridge piers/arches	0
Bridge/Arch Span	50		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	None	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Road Embankment	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Effective width reduced by sloped bank armoring (reduced to 45')**

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July, 17 2014

Bridge Summary Report

White River

General Information

SgaID	100045000009131	Local SgaID		VOBCIT struct_num	100913003309131
Observers	DR, AS (Redstart)	Assessment Date	10/9/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.88297	Longitude	-72.50377
Location	South of Tunbridge Village off Rte. 110 on Howe Ln.			Reach VTID	M05
Road Name	HOWE LN	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	80

Bridge Information

Bridge Width	8	Material	Timber
Bridge Clearance	11.4	Number of bridge piers/arches	0
Bridge/Arch Span	50		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	50
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Side	Point
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	None	
Stream bed scour causing undermining around or under structure	Wing walls	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Upstream left bank newly rip-rapped**

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Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	700000000109043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW, AS (Redstart)	Assessment Date	8/23/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.98699	Longitude	-72.44926
Location	Behind 279 Rte. 110 0.2 mi N. of Beacon Hill in Chelsea Village			Reach VTID	M13
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	52

Bridge Information

Bridge Width	9	Material	Timber
Bridge Clearance	6.8	Number of bridge piers/arches	0
Bridge/Arch Span	38		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	Side	Point
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Shrub/Sapling	
Dominant Vegetation Type - Right	Shrub/Sapling	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Private footbridge, no structure number. Planks overhang structure width by 1.5' on each side.**

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Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	100013000009131	Local SgaID		VOBCIT struct_num	100913003409131
Observers	DR (Redstart)	Assessment Date	9/17/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.9231	Longitude	-72.46542
Location	~0.7 mi N. of N. Tunbridge Village off Rte. 110 on Larkin Rd.			Reach VTID	M08
Road Name	LARKIN RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	90

Bridge Information

Bridge Width	16	Material	Timber
Bridge Clearance	12	Number of bridge piers/arches	0
Bridge/Arch Span	60		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	Sand
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Point	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Footers	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Covered bridge

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Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	300110000109152	Local SgaID		VOBCIT struct_num	300169001609151
Observers	DR, HW (Redstart)	Assessment Date	7/12/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.06211	Longitude	-72.46513
Location	0.2 mi S. of Rte. 110/Tilton Rd. intersection where Rte. 110 crosses over First Branch.			Reach VTID	M17
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	26.1

Bridge Information

Bridge Width	30	Material	Concrete
Bridge Clearance	4.2	Number of bridge piers/arches	0
Bridge/Arch Span	13.8		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	700
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Point	Point
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments,Footers,Wing walls	Footers,Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Bridge Summary Report

White River

General Information

SgaID	100012000014161	Local SgaID		VOBCIT struct_num	101416002714161
Observers	DR, AS (Redstart)	Assessment Date	10/26/2012	Project Name	White River - First Branch
Town	Royalton	Latitude	43.8322	Longitude	-72.51354
Location	~0.5 mi N. of Rte. 110/Rte. 14 intersection off Rte. 110 on Mill Rd.			Reach VTID	M01
Road Name	MILL RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	104

Bridge Information

Bridge Width	21	Material	Concrete
Bridge Clearance	10	Number of bridge piers/arches	0
Bridge/Arch Span	75		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	400
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Bedrock	Sand	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Side	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Footers,Wing walls	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Road Embankment	
Dominant Vegetation Type - Right	Herbaceous/Grass	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Mink - Sighting	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Breached dam 25' upstream of bridge, current dam 300' downstream of bridge. Upstream left bank/downstream right bank hard bank armoring failing, upstream right bank/downstream left bank intact (looks new, done after Irene?) Wood debris collected on breached dam upstream of bridge, dam likely to increase chance of debris jams occurring. Dominant bed material is bedrock between the breached dam and bridge (just upstream of bridge) but is sand upstream of the breached dam.

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Stream Geomorphic Assessment

Agency of Natural Resouces

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Bridge Summary Report

White River

General Information

SgaID	700000001009043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/6/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.02949	Longitude	-72.4722
Location	0.3 mi S. of Rte. 110/Edwards Rd. intersection just S. of and behind 620 Rte. 110			Reach VTID	M16
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	6.1	Number of bridge piers/arches	0
Bridge/Arch Span	16.5		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Boulder	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Farm bridge, no structure number.

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Bridge Summary Report

White River

General Information

SgaID	700000000209043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW, AS (Redstart)	Assessment Date	8/23/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.9889	Longitude	-72.44908
Location	Behind The Pines (1 Maple Ave) in Chelsea Village off Rte. 110.			Reach VTID	M13
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	45

Bridge Information

Bridge Width	6	Material	Timber
Bridge Clearance	7	Number of bridge piers/arches	0
Bridge/Arch Span	50		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Deciduous Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments VAST Trail/footbridge, no structure number.

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Bridge Summary Report

White River

General Information

SgaID	400003000009151	Local SgaID		VOBCIT struct_num	
Observers	DR (Redstart)	Assessment Date	7/19/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.04691	Longitude	-72.47643
Location	0.8 mi N. of Rte. 110/Edwards Rd. intersection off Rte. 110 0.1 mi down Williamstown Rd.			Reach VTID	M16
Road Name	WILLIAMSTOWN RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	25

Bridge Information

Bridge Width	30	Material	Concrete
Bridge Clearance	7.1	Number of bridge piers/arches	0
Bridge/Arch Span	9.5		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Wing walls	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Shrub/Sapling	
Dominant Vegetation Type - Right	Road Embankment	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Small intermittent trib comes in immediately upstream of structure on left bank. Granite slab at downstream end as check dam

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Bridge Summary Report

White River

General Information

SgaID	700000000609043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/16/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00842	Longitude	-72.45779
Location	0.8 mi N. of Rte. 110/Upper Village Rd. intersection off Rte. 110			Reach VTID	M14
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	39

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	7.6	Number of bridge piers/arches	0
Bridge/Arch Span	19		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Boulder
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Farm bridge, no structure number. Modular replacement bridge placed on concrete (footers on top of old abutments)**

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Bridge Summary Report

White River

General Information

SgaID	100093000014161	Local SgaID		VOBCIT struct_num	101416002814161
Observers	DR, AS (Redstart)	Assessment Date	10/23/2012	Project Name	White River - First Branch
Town	Royalton	Latitude	43.8485	Longitude	-72.51118
Location	~0.6 mi S. of Tunbridge/Royalton town line off Rte. 110 on Dodge Rd.			Reach VTID	M02
Road Name	TH 93	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	65

Bridge Information

Bridge Width	16	Material	Timber
Bridge Clearance	12	Number of bridge piers/arches	0
Bridge/Arch Span	63		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Road Embankment	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Bridge looks relatively new.**

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Bridge Summary Report

White River

General Information

SgaID	100060000009131	Local SgaID		VOBCIT struct_num	100913003209131
Observers	DR, AS (Redstart)	Assessment Date	10/11/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.86483	Longitude	-72.49884
Location	~1 mi S. of Tunbridge at Howe Twin Farms on Belknap Brook Rd.			Reach VTID	M04
Road Name	BELKNAP BROOK RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	80

Bridge Information

Bridge Width	14	Material	Timber
Bridge Clearance	11.2	Number of bridge piers/arches	0
Bridge/Arch Span	64		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	270
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	None	None	
Stream bed scour causing undermining around or under structure	Wing walls	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Used frequently for farm equipment.**

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Bridge Summary Report

White River

General Information

SgaID	200110000209132	Local SgaID		VOBCIT struct_num	200169000409132
Observers	DR, AS (Redstart)	Assessment Date	10/2/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.8918	Longitude	-72.48865
Location	N. end of Tunbridge Village where Rte. 110 crosses over First Branch.			Reach VTID	M06
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	113

Bridge Information

Bridge Width	24	Material	Concrete
Bridge Clearance	12	Number of bridge piers/arches	1
Bridge/Arch Span	180		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	50
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Road Embankment	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Beaver - Feeding Signs	Mink - Tracks

Other Information

Spatial location data collected with GPS?	Yes	Photos taken?	Yes

Comments **Effective width is reduced by 10-12' on each side due to rip rap and alignment. New structure**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

July, 17 2014

Bridge Summary Report

White River

General Information

SgaID	700000000509043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/20/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00299	Longitude	-72.45583
Location	0.4 mi N. of Rte. 110/Upper Village Rd. intersection where VAST trail crosses First Branch off Rte. 110			Reach VTID	M14
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	38

Bridge Information

Bridge Width	12	Material	Timber
Bridge Clearance	7.3	Number of bridge piers/arches	0
Bridge/Arch Span	38		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?	Yes	Photos taken?	Yes

Comments **Rip rap reduces effective width to 30'.**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

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Bridge Summary Report

White River

General Information

SgaID	700000000909043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/6/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.02366	Longitude	-72.46885
Location	0.8 mi S. of Rte. 110/Edwards Rd. intersection behind 574 Rte. 110			Reach VTID	M16
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	9	Material	Timber
Bridge Clearance	6.7	Number of bridge piers/arches	0
Bridge/Arch Span	26.8		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Not Significant	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	Mid-channel	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Farm bridge, no structure number.**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	300110000209152	Local SgaID		VOBCIT struct_num	300169001709151
Observers	DR, HW (Redstart)	Assessment Date	7/10/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.06933	Longitude	-72.46524
Location	0.4 mi N. of Rte. 110/Tilton Rd. intersection where Rte. 110 crosses over First Branch			Reach VTID	M19
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	15.7

Bridge Information

Bridge Width	30	Material	Concrete
Bridge Clearance	5.9	Number of bridge piers/arches	0
Bridge/Arch Span	9.75		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	None	
Stream bed scour causing undermining around or under structure	Abutments,Wing walls	None	
Beaver Dam near Structure	No	Yes	
Beaver Dam distance (ft.)	0	200	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Road Embankment	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Mink - Tracks	Mink - Tracks

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Some unclear small mammal tracks, phoebe nest inside**

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Bridge Summary Report

White River

General Information

SgaID	700000000009043	Local SgaID		VOBCIT struct_num	
Observers	DR, AS (Redstart)	Assessment Date	8/30/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.97107	Longitude	-72.45454
Location	~0.6 mi S. of Jenkins Brook Rd./Rte. 110 intersection off Rte. 110 on Meadowbrook Ln.			Reach VTID	M12
Road Name	MEADOWBROOK LN	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	78

Bridge Information

Bridge Width	15	Material	Timber
Bridge Clearance	9.2	Number of bridge piers/arches	0
Bridge/Arch Span	48		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	Yes	No	No
Type of Sediment Deposits	Side	Side	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Intact	
Stream bed scour causing undermining around or under structure	Footers,Wing walls	Footers,Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Deciduous Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Privately owned bridge, no structure number.**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	100004000009041	Local SgaID		VOBCIT struct_num	100904004409041
Observers	DR, HW (Redstart)	Assessment Date	8/20/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99826	Longitude	-72.45143
Location	0.6 mi N. of Rte. 113/Rte. 110 intersection off Rte. 110 0.1 mi up Bobbinshop Rd.			Reach VTID	M14
Road Name	BOBBINSHOP RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	44

Bridge Information

Bridge Width	19	Material	Steel
Bridge Clearance	12.5	Number of bridge piers/arches	0
Bridge/Arch Span	31		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Fisher - Tracks	Fisher - Tracks

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Buffer on downstream right bank only broken by VAST trail, gives decent cover.**

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Bridge Summary Report

White River

General Information

SgaID	400028000009151	Local SgaID		VOBCIT struct_num	400028001909151
Observers	DR (Redstart)	Assessment Date	7/16/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.05145	Longitude	-72.4735
Location	Rte. 110/Poor Farm Rd. intersection on Poor Farm Rd.			Reach VTID	M17
Road Name	POOR FARM RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	20.7

Bridge Information

Bridge Width	16	Material	Masonary (arches) & Slabs
Bridge Clearance	4.6	Number of bridge piers/arches	0
Bridge/Arch Span	8.9		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments,Wing walls	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Large granite slabs in downstream end as check dam.**

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Bridge Summary Report

White River

General Information

SgaID	100025000009131	Local SgaID		VOBCIT struct_num	100913003109131
Observers	DR, AS (Redstart)	Assessment Date	9/25/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.9147	Longitude	-72.47675
Location	Carton Rd./Foundry Rd. intersection in N. Tunbridge Village off Rte. 110			Reach VTID	M07
Road Name	FOUNDRY RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	90

Bridge Information

Bridge Width	13	Material	Steel
Bridge Clearance	13.3	Number of bridge piers/arches	0
Bridge/Arch Span	70		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Bedrock	Sand	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Mid-channel	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Historic bridge (Civil War era), replaced 2011 with same type.**

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Stream Geomorphic Assessment

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Bridge Summary Report

White River

General Information

SgaID	100006000009131	Local SgaID		VOBCIT struct_num	100913003509131
Observers	DR, AS (Redstart)	Assessment Date	9/6/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.94931	Longitude	-72.4586
Location	0.2 mi. S. of Chelsea/Tunbridge town line off Rte. 110 on Bicknell Hill Rd.			Reach VTID	M11
Road Name	BICKNELL HILL RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	80

Bridge Information

Bridge Width	17	Material	Timber
Bridge Clearance	21	Number of bridge piers/arches	0
Bridge/Arch Span	77		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	125
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Bedrock	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Point	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

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Bridge Summary Report

White River

General Information

SgaID	300110000009152	Local SgaID		VOBCIT struct_num	300169001509151
Observers	DR (Redstart)	Assessment Date	7/16/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.05751	Longitude	-72.4646
Location	Rte. 110/S. end of Pray Rd. intersection on Rte. 110.			Reach VTID	M17
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	20.7

Bridge Information

Bridge Width	30	Material	Concrete
Bridge Clearance	6	Number of bridge piers/arches	0
Bridge/Arch Span	11		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	Point,Mid-channel	Point,Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Wing walls	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Road Embankment	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes** Photos taken? **Yes**

Comments **1921 bridge, likely cleaned out upstream in past; stepped footers on upstream end; 6x6 in downstream end as check dam.**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	200110000109132	Local SgaID		VOBCIT struct_num	200169000209132
Observers	DR, AS (Redstart)	Assessment Date	10/10/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.87532	Longitude	-72.499
Location	Just S. of Town Farm Rd. (S. of Tunbridge Village) where First Branch crosses Rte. 110			Reach VTID	M04
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	87

Bridge Information

Bridge Width	45	Material	Concrete
Bridge Clearance	12.4	Number of bridge piers/arches	0
Bridge/Arch Span	115		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	350
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Mid-channel	Point
Elevation of sediment deposits >= 1/2 bankfull	No	No	Yes
Bank Erosion	High	Low	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	Mink - Tracks

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Effective width is reduced to 100' due to alignment, many animal tracks present on side bar inside bridge.**

VERMONT

Stream Geomorphic Assessment

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VT DEC

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Bridge Summary Report

White River

General Information

SgaID	100003000009041	Local SgaID		VOBCIT struct_num	100904001109041
Observers	DR, AS (Redstart)	Assessment Date	8/27/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.97777	Longitude	-72.44756
Location	0.5 mi S. of Beacon Hill Rd./Rte. 110 intersection at Rte. 110/Jenkins Brook Rd. intersection on Jenkins Brook Rd.			Reach VTID	M13
Road Name	JENKINS BROOK RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	54

Bridge Information

Bridge Width	20	Material	Concrete
Bridge Clearance	7.8	Number of bridge piers/arches	0
Bridge/Arch Span	29.5		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	50
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Gravel	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Point	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	Low	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	None	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Mixed Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

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Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	700000000409043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/21/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.995	Longitude	-72.44963
Location	0.3 mi N. of Rte. 113/Rte. 110 intersection in Chelsea Village behind Brookhaven (331 Rte. 110)			Reach VTID	M14
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	5.5	Material	Timber
Bridge Clearance	6.4	Number of bridge piers/arches	0
Bridge/Arch Span	26		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Point	Side	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Shrub/Sapling	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Deer - Tracks	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Footbridge, no structure number.**

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Bridge Summary Report

White River

General Information

SgaID	200110000109042	Local SgaID		VOBCIT struct_num	200169001209042
Observers	DR, HW (Redstart)	Assessment Date	8/20/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00174	Longitude	-72.45541
Location	0.4 mi N. of Rte. 110/Upper Village Rd. intersection where Rte. 110 crosses over First Branch			Reach VTID	M14
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	25	Material	Steel
Bridge Clearance	6.3	Number of bridge piers/arches	0
Bridge/Arch Span	24		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Mid-channel	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Wing walls	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Debris jam just downstream of bridge**

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Bridge Summary Report

White River

General Information

SgaID	700000001109043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/6/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.03264	Longitude	-72.47329
Location	0.1 mi S. of Rte. 110/Edwards Rd. intersection, on driveway for 636 Rte. 110			Reach VTID	M16
Road Name		Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	8.2	Number of bridge piers/arches	0
Bridge/Arch Span	22.5		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Unknown	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Driveway, no structure number.

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Bridge Summary Report

White River

General Information

SgaID	700000000809043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	8/13/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.01735	Longitude	-72.46432
Location	1.4 mi N. of Rte. 110/Upper Village Rd. intersection behind 516 Rte. 110			Reach VTID	M15
Road Name		Road Type	Trail	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	44

Bridge Information

Bridge Width	11	Material	Timber
Bridge Clearance	7.1	Number of bridge piers/arches	0
Bridge/Arch Span	18.5		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Farm bridge, no structure number.**

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Stream Geomorphic Assessment

Agency of Natural Resouces

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Bridge Summary Report

White River

General Information

SgaID	200110000209042	Local SgaID		VOBCIT struct_num	200169001309042
Observers	DR, GR (Redstart)	Assessment Date	7/19/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.03652	Longitude	-72.47472
Location	0.2 mi N. of Rte. 110/Edwards Rd. intersection where Rte. 110 crosses over First Branch			Reach VTID	M16
Road Name	ROUTE 110	Road Type	Paved	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	42

Bridge Information

Bridge Width	26.5	Material	Concrete
Bridge Clearance	8.8	Number of bridge piers/arches	0
Bridge/Arch Span	25		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	100
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point,Side,Mid-channel	None	Point
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Deciduous Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Unsure - Tracks	Unsure - Tracks

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Granite slab in mouth as check dam; scour pool continues on right footer.**

VERMONT

Stream Geomorphic Assessment

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Culvert Summary Report

White River

General Information

SgaID	100029000009151	Local SgaID		VOBCIT struct_num	400029002109151
Observers	DR, HW (Redstart)	Assessment Date	7/12/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.06128	Longitude	-72.46308
Location	Rte. 110/Sky Acres Rd. intersection on Sky Acres Rd.			Reach VTID	M17
Road Name	SKY ACRES RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	20.7

Culvert Information

Culvert Length	60	Material	Unknown
Culvert Height	6.3	Number of culverts	1
Culvert Width	5.6	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.5
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	Cascade
Stepped Footers	1.3 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	2.2 ft.	Backwater Length (measured from outlet)	1

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	None
Bedrock Present	No	No	
Type of Sediment Deposits	None	Delta,Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Culvert,Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Mixed Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

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Culvert Summary Report

White River

General Information

SgaID	600043000609151	Local SgaID		VOBCIT struct_num	
Observers	DR, HW, CH (Redstart)	Assessment Date	7/9/2012	Project Name	White River - First Branch
Town	Washington	Latitude	44.06434	Longitude	-72.46764
Location	Rte. 110/Tilton Rd. intersection on Tilton Rd.			Reach VTID	M18
Road Name	TILTON RD	Road Type	Gravel	Stream Name	First Branch Mainstem
High Flow Stage	No			Channel Width	20.3

Culvert Information

Culvert Length	40	Material	Steel Corrugated
Culvert Height	5.2	Number of culverts	1
Culvert Width	5.2	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	50
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.3
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Partially Backwatered
Stepped Footers	1 ft.	Backwater Length (measured from outlet)	30
Maximum pool depth	3.2 ft.	Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	None
Bedrock Present	No	No	
Type of Sediment Deposits	None	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	None	Intact	
Stream bed scour causing undermining around or under structure	Footers,Wing walls	None	
Beaver Dam near Structure	Yes	No	
Beaver Dam distance (ft.)	200	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Shrub/Sapling	
Dominant Vegetation Type - Right	Shrub/Sapling	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No
Vegitation Band -Right	Yes	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Beaver - Feeding Signs	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Structure is buckling under roadway midway through culvert; human dam downstream pool**

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Bridge Summary Report

White River

General Information

SgaID	700000000109133	Local SgaID		VOBCIT struct_num	
Observers	DR, AS (Redstart)	Assessment Date	11/6/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.89964	Longitude	-72.47308
Location	0.1 mi W. of Strafford Rd./Drew Rd. intersection off Strafford Rd. on driveway.			Reach VTID	T1.01
Road Name		Road Type	Gravel	Stream Name	Strafford Rd. trib
High Flow Stage	No			Channel Width	24

Bridge Information

Bridge Width	16	Material	Timber
Bridge Clearance	6.5	Number of bridge piers/arches	0
Bridge/Arch Span	17		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	Point	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	Abutments,Footers	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Coniferous Forest	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Driveway, no structure number. Fairly new bridge.

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Culvert Summary Report

White River

General Information

SgaID	100001000009131	Local SgaID		VOBCIT struct_num	
Observers	DR, AS (Redstart)	Assessment Date	11/5/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.89987	Longitude	-72.46964
Location	Strafford Rd./Drew Rd./Tuttle Rd. intersection on Strafford Rd.			Reach VTID	T1.01
Road Name	STRAFFORD RD	Road Type	Paved	Stream Name	Strafford Rd. trib
High Flow Stage	No			Channel Width	24

Culvert Information

Culvert Length	50	Material	Stone
Culvert Height	5	Number of culverts	1
Culvert Width	5	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Higher

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	750
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	1.5
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	Partially Backwatered
Stepped Footers	1.5 ft.	Backwater Length (measured from outlet)	20
Maximum pool depth	2.1 ft.	Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	Cobble
Bedrock Present	No	No	
Type of Sediment Deposits	Point	Mid-channel	None
Material Present throughout			Yes
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Culvert,Wing walls,Abutments	Culvert,Abutments,Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Road Embankment	
Dominant Vegetation Type - Right	Road Embankment	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Looks like it plugged in Irene and ponded quite a way upstream. Water may have come across Strafford Rd. and taken out downstream rip rap/abutments. Informal interviews with townspeople indicate this has plugged before, 1973 and other times.

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Bridge Summary Report

White River

General Information

SgaID	700000000009133	Local SgaID		VOBCIT struct_num	
Observers	DR, AS (Redstart)	Assessment Date	11/5/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.90046	Longitude	-72.46655
Location	0.2 mi E. of Strafford Rd./Drew Rd. intersection where VAST trail crosses Strafford Rd. trib.			Reach VTID	T1.01
Road Name		Road Type	Trail	Stream Name	Strafford Rd. trib
High Flow Stage	No			Channel Width	24

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	2.4	Number of bridge piers/arches	0
Bridge/Arch Span	20		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Not Significant	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Gravel	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	None	None	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	Deer - Carcass	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments VAST bridge, no structure number. Deer was shot and left behind (doe).

VERMONT

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Culvert Summary Report

White River

General Information

SgaID	100065000009131	Local SgaID		VOBCIT struct_num	990065002209131
Observers	DR, AS (Redstart)	Assessment Date	11/8/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.89591	Longitude	-72.48389
Location	0.2 mi down Recreation Rd. from Strafford Rd./Recreation Rd. intersection.			Reach VTID	T1.01
Road Name	RECREATION RD	Road Type	Gravel	Stream Name	Strafford Rd. trib
High Flow Stage	No			Channel Width	24

Culvert Information

Culvert Length	24	Material	Steel Corrugated
Culvert Height	5.7	Number of culverts	1
Culvert Width	6	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	400
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.3
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Free Fall
Stepped Footers	2.5 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	3.3 ft.	Backwater Length (measured from outlet)	2

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	None
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Delta	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	Wing walls	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Road Embankment	
Dominant Vegetation Type - Right	Deciduous Forest	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Round culvert slightly compressed. Significant berming upstream; erosion downstream across First Branch mainstem amplified.

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Stream Geomorphic Assessment

Agency of Natural Resouces

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July, 17 2014

Culvert Summary Report

White River

General Information

SgaID	100007000009131	Local SgaID		VOBCIT struct_num	990007000809131
Observers	DR, AS (Redstart)	Assessment Date	11/14/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.93872	Longitude	-72.48087
Location	Just S. of 98 Dickerman Hill Rd. where Dickerman Hill Rd. crosses over Dickerman Brook.			Reach VTID	T2.01
Road Name	DICKERMAN HILL RD	Road Type	Gravel	Stream Name	Dickerman Brook
High Flow Stage	No			Channel Width	26

Culvert Information

Culvert Length	30	Material	Steel Corrugated
Culvert Height	7.4	Number of culverts	1
Culvert Width	12.3	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	400
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.4
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	Free Fall
Stepped Footers	1.9 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	3 ft.	Backwater Length (measured from outlet)	0.7

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	
Type of Sediment Deposits	Point	Side	None
Material Present throughout			Yes
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	Low	High	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Mixed Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Looks like a fairly new culvert. Angle of approach is very sharp; appears stream may have been straightened upstream. House downstream of culvert on the left bank is 18' height above water.

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Stream Geomorphic Assessment

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Bridge Summary Report

White River

General Information

SgaID	100007000209131	Local SgaID		VOBCIT struct_num	990007000909131
Observers	DR, AS (Redstart)	Assessment Date	11/15/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.93623	Longitude	-72.47714
Location	~0.3 mi S. of Whitney Hill Rd./Dickerman Hill Rd. intersection where Dickerman Hill Rd. crosses over Dickerman brook again.			Reach VTID	T2.01
Road Name	DICKERMAN HILL RD	Road Type	Gravel	Stream Name	Dickerman Brook
High Flow Stage	No			Channel Width	26

Bridge Information

Bridge Width	80	Material	Concrete
Bridge Clearance	6.7	Number of bridge piers/arches	0
Bridge/Arch Span	7.8		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Bedrock	Bedrock
Bedrock Present	No	Yes	Yes
Type of Sediment Deposits	Side	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	Wing walls	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Unusual design placed on bedrock. effective width reduced to 7.8 by bend in middle of structure.**

Bridge Summary Report

White River

General Information

SgaID	200110000309132	Local SgaID		VOBCIT struct_num	300169000709131
Observers	DR, AS (Redstart)	Assessment Date	11/19/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.93073	Longitude	-72.46645
Location	Just N. of Dickerman Hill Rd./Rte. 110 intersection where Rte. 110 crosses over Dickerman Brook.			Reach VTID	T2.01
Road Name	ROUTE 110	Road Type	Paved	Stream Name	Dickerman Brook
High Flow Stage	No			Channel Width	26

Bridge Information

Bridge Width	50	Material	Concrete
Bridge Clearance	7.7	Number of bridge piers/arches	0
Bridge/Arch Span	15.3		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	200
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Side	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Road Embankment	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Built in 1979, bridge # T050169(2) on plaque**

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Stream Geomorphic Assessment

Agency of Natural Resouces

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Culvert Summary Report

White River

General Information

SgaID	100007000109131	Local SgaID		VOBCIT struct_num	990007002009131
Observers	DR, AS (Redstart)	Assessment Date	11/14/2012	Project Name	White River - First Branch
Town	Tunbridge	Latitude	43.93822	Longitude	-72.4802
Location	Just S. of Whitney Hill Rd/Dickerman Hill Rd. intersection where Dickerman Hill Rd. crosses over Dickerman Brook.			Reach VTID	T2.01
Road Name	DICKERMAN HILL RD	Road Type	Gravel	Stream Name	Dickerman Brook
High Flow Stage	No			Channel Width	26

Culvert Information

Culvert Length	45	Material	Steel Corrugated
Culvert Height	7.9	Number of culverts	1
Culvert Width	12.5	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	150
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.4
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers	0.5 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	1.7 ft.	Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	None
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Delta	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Road Embankment	
Dominant Vegetation Type - Right	Road Embankment	Road Embankment	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **Road intersection was reconfigured when culvert was put in,**

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Culvert Summary Report

White River

General Information

SgaID	400913002909131	Local SgaID		VOBCIT struct_num	990007002009131
Observers	Josh Gorman	Assessment Date	1/1/0001	Project Name	
Town	Tunbridge	Latitude	43.93828	Longitude	-72.4802
Location	Map # 4152			Reach VTID	
Road Name	DICKERMAN HILL RD	Road Type	Gravel	Stream Name	Dickerman Brook
High Flow Stage	No			Channel Width	21

Culvert Information

Culvert Length	41	Material	Steel Corrugated
Culvert Height	8	Number of culverts	1
Culvert Width	13	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	No	Water depth in culvert (at outlet)	0.4167
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Gravel	Cobble
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	None	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Road Embankment	
Dominant Vegetation Type - Right	Road Embankment	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments **culvert crushed to form and arch**

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Culvert Summary Report

White River

General Information

SgaID	200000000109042	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/17/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.96338	Longitude	-72.47234
Location	Located on Randolph Road in Chelsea below power lines			Reach VTID	T3.01
Road Name	E RANDOLPH RD	Road Type	Paved	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	37.5

Culvert Information

Culvert Length		Material	Aluminum Corrugated
Culvert Height	11.5	Number of culverts	1
Culvert Width	11.5	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.3
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	Free Fall
Stepped Footers	1.5 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	> 4.0 ft.	Backwater Length (measured from outlet)	0.5

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	None
Bedrock Present	No	No	
Type of Sediment Deposits	Mid-channel	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Shrub/Sapling	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	Yes	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

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Many heavy trucks pass over this culvert everyday- maybe this culvert should be a bridge?
Photos #124-128

Bridge Summary Report

White River

General Information

SgaID	700000001609043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	5/23/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.9708	Longitude	-72.47809
Location	Farm/logging bridge located off Randolph-Chelsea Road			Reach VTID	T3.01
Road Name		Road Type	Trail	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	37.5

Bridge Information

Bridge Width	12	Material	Timber
Bridge Clearance	6.5	Number of bridge piers/arches	1
Bridge/Arch Span	40		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	Yes	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?	No	Photos taken?	Yes

Comments **Brand new structure.**
Photos #076-081

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Bridge Summary Report

White River

General Information

SgaID	700000001509043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	5/23/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.96878	Longitude	-72.47755
Location	Farm bridge located off the Randolph-Chelsea Road			Reach VTID	T3.01
Road Name		Road Type	Trail	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	37.5

Bridge Information

Bridge Width	12	Material	Timber
Bridge Clearance	9	Number of bridge piers/arches	1
Bridge/Arch Span	37		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Point	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Mixed Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Previous bridge likely created large upstream debris jam and caused major undercut and large deposition. Photos #085-088**

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Stream Geomorphic Assessment

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Culvert Summary Report

White River

General Information

SgaID	400904000909041	Local SgaID		VOBCIT struct_num	990001000409041
Observers	Josh Gorman	Assessment Date	6/6/2005	Project Name	
Town	Chelsea	Latitude	43.96339	Longitude	-72.47224
Location	Map # 3965			Reach VTID	
Road Name	E RANDOLPH RD	Road Type	Paved	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	19

Culvert Information

Culvert Length	104	Material	Steel Corrugated
Culvert Height	15	Number of culverts	1
Culvert Width	12	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.91667
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Cascade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	None
Bedrock Present	No	Yes	
Type of Sediment Deposits	Mid-channel,Side	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	None	None	
Hard Bank Armoring	None	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Road Embankment	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

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Culvert Summary Report

White River

General Information

SgaID	400904001509041	Local SgaID		VOBCIT struct_num	400003028409041
Observers	Josh Gorman	Assessment Date	6/8/2005	Project Name	
Town	Chelsea	Latitude	44.00448	Longitude	-72.49468
Location				Reach VTID	
Road Name	BROOK RD	Road Type	Gravel	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	17

Culvert Information

Culvert Length	50	Material	Steel Corrugated
Culvert Height	4	Number of culverts	1
Culvert Width	6	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.35
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Free Fall
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0.6667

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	None
Bedrock Present	Yes	No	
Type of Sediment Deposits	None	Mid-channel,Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	None	
Stream bed scour causing undermining around or under structure	None	Culvert	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Road Embankment	
Dominant Vegetation Type - Right	Road Embankment	Coniferous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Arch Summary Report

White River

General Information

SgaID	400904002009041	Local SgaID		VOBCIT struct_num	990003000809041
Observers	Josh Gorman	Assessment Date	6/8/2005	Project Name	
Town	Chelsea	Latitude	43.99615	Longitude	-72.48876
Location				Reach VTID	
Road Name	BROOK RD	Road Type	Gravel	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	17

Arch Information

Bridge Width	24.4167	Material	Steel
Bridge Clearance	96	Number of bridge piers/arches	1
Bridge/Arch Span	178		No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild bend
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	No
Downstream bank heights are substantially higher than upstream bank heights	No
Pool Depth at point of streamflow entry	

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Gravel	Sand
Bedrock Present	No	No	Yes
Type of Sediment Deposits	Side	None	Mid-channel
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	Yes	
Beaver Dam distance (ft.)		75	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Deciduous Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments **Another stream enters about 50ft upstream with a channel width of 10 ft**

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Stream Geomorphic Assessment

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Culvert Summary Report

White River

General Information

SgaID	400904002809041	Local SgaID		VOBCIT struct_num	990004001109041
Observers		Assessment Date	6/8/2005	Project Name	
Town	Chelsea	Latitude	44.0179	Longitude	-72.49414
Location				Reach VTID	
Road Name	BOBBINSHOP RD	Road Type	Gravel	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	7

Culvert Information

Culvert Length	20.5	Material	Steel Corrugated
Culvert Height	6	Number of culverts	1
Culvert Width	5.75	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	No	Water depth in culvert (at outlet)	0.1667
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	Sand
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Shrub/Sapling	
Dominant Vegetation Type - Right	Shrub/Sapling	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

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Culvert Summary Report

White River

General Information

SgaID	400904004009041	Local SgaID		VOBCIT struct_num	
Observers	Josh Gorman	Assessment Date	6/6/2005	Project Name	
Town	Chelsea	Latitude	43.99482	Longitude	-72.48816
Location	Map # 3978			Reach VTID	
Road Name	BEACON HILL	Road Type	Gravel	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	16

Culvert Information

Culvert Length	77	Material	Steel Corrugated
Culvert Height	11.5	Number of culverts	1
Culvert Width	11.5	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.75
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Gravel
Bedrock Present	Yes	No	
Type of Sediment Deposits	None	Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	Culvert	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Shrub/Sapling	
Dominant Vegetation Type - Right	Shrub/Sapling	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

Culvert Summary Report

White River

General Information

SgaID	400904005009041	Local SgaID		VOBCIT struct_num	990004002209041
Observers	Josh Gorman	Assessment Date	6/8/2005	Project Name	
Town	Chelsea	Latitude	44.01977	Longitude	-72.50135
Location				Reach VTID	
Road Name	BOBBINSHOP RD	Road Type	Gravel	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	12

Culvert Information

Culvert Length	50	Material	Tank
Culvert Height	6	Number of culverts	1
Culvert Width	6.166667	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild bend
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.6667
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	None
Bedrock Present			
Type of Sediment Deposits	Mid-channel,Side	Side	None
Material Present throughout			
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	None	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	Yes	
Beaver Dam distance (ft.)		150	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Mixed Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

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Bridge Summary Report

White River

General Information

SgaID	700000001709043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/20/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.95986	Longitude	-72.46738
Location	Farm bridge located off East Randolph Road			Reach VTID	T3.01
Road Name		Road Type	Trail	Stream Name	Cram Brook
High Flow Stage	No			Channel Width	37.5

Bridge Information

Bridge Width	12	Material	Timber
Bridge Clearance	5.3	Number of bridge piers/arches	1
Bridge/Arch Span	19.5		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Shrub/Sapling	
Dominant Vegetation Type - Right	Deciduous Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	Yes	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Very new bridge- located in a cow pasture where cows have access to stream. Photos #140-143**

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Bridge Summary Report

White River

General Information

SgaID	100000000009041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/1/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.97467	Longitude	-72.44333
Location	Jenkins Brook Road			Reach VTID	T4.01
Road Name	JENKINS BROOK RD	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	Yes			Channel Width	31.1

Bridge Information

Bridge Width	22	Material	Concrete
Bridge Clearance	6.5	Number of bridge piers/arches	0
Bridge/Arch Span	19.6		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	600
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Point,Side	Side
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	Yes
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Wing walls	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Mixed Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	Yes	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments 1931 Bridge.
Photos #225-228

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Bridge Summary Report

White River

General Information

SgaID	400000000009041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/24/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.96083	Longitude	-73.4
Location	Town farm road			Reach VTID	T4.01
Road Name	TOWN FARM RD	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	No			Channel Width	31.1

Bridge Information

Bridge Width	19.5	Material	Concrete
Bridge Clearance	7.1	Number of bridge piers/arches	0
Bridge/Arch Span	11.5		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	100
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side,Mid-channel	Side,Mid-channel	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #167-170

Bridge Summary Report

White River

General Information

SgaID	400000000109041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/27/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.96585	Longitude	-72.42722
Location	On Red Rock lane of Vershire Center Road			Reach VTID	T4.01
Road Name	REDROCK LN	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	Yes			Channel Width	31.1

Bridge Information

Bridge Width	14.2	Material	Concrete
Bridge Clearance	7	Number of bridge piers/arches	0
Bridge/Arch Span	12.3		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Boulder	Gravel
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Mid-channel	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Intact	
Stream bed scour causing undermining around or under structure	Abutments,Footers,Wing walls	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Mixed Forest	
Dominant Vegetation Type - Right	Deciduous Forest	Bare	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Cabin on right bank is just below bridge and is right on waters edge. Grade control through bridge (ledge)
Photos #188-191

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Bridge Summary Report

White River

General Information

SgaID	700000001909043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/9/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.9759	Longitude	-72.44838
Location	Private farm bridge off Jenkins Brook Road			Reach VTID	T4.01
Road Name	JENKINS BROOK RD	Road Type	Trail	Stream Name	Jenkins Brook
High Flow Stage	Yes			Channel Width	31.1

Bridge Information

Bridge Width	9	Material	Timber
Bridge Clearance	7.3	Number of bridge piers/arches	0
Bridge/Arch Span	27		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #244-247

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Culvert Summary Report

White River

General Information

SgaID	100000000209041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/27/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.97102	Longitude	-72.43256
Location	On Hall Road off Vershire Center Road			Reach VTID	T4.01
Road Name	HALL RD	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	Yes			Channel Width	31.1

Culvert Information

Culvert Length	30	Material	Aluminum Corrugated
Culvert Height	11.7	Number of culverts	1
Culvert Width	10.5	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	500
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	1.6
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	At Grade
Stepped Footers	2 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	> 4.0 ft.	Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	None
Bedrock Present	No	No	
Type of Sediment Deposits	Point,Mid-channel	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Culvert	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Mixed Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	Yes

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments **likely excavated for dry hydrant w/d**
Photos #208-211

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Stream Geomorphic Assessment

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Culvert Summary Report

White River

General Information

SgaID	400904003809041	Local SgaID		VOBCIT struct_num	990058001809041
Observers	Josh Gorman	Assessment Date	6/8/2005	Project Name	
Town	Chelsea	Latitude	43.97117	Longitude	-72.43246
Location				Reach VTID	
Road Name	HALL RD	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	No			Channel Width	32

Culvert Information

Culvert Length	30.6667	Material	Steel Corrugated
Culvert Height	11	Number of culverts	1
Culvert Width	11	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.83
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	None
Bedrock Present	No	No	
Type of Sediment Deposits	Mid-channel	Mid-channel,Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Mixed Forest	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?		Photos taken?	Yes

Comments

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Culvert Summary Report

White River

General Information

SgaID	100000000109041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/24/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.9608	Longitude	-72.41705
Location	On Vershire Center road			Reach VTID	T4.01
Road Name	VERSHIRE CTR RD	Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	No			Channel Width	31.1

Culvert Information

Culvert Length	26	Material	Other
Culvert Height	5	Number of culverts	1
Culvert Width	5	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	330
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.2
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Free Fall
Stepped Footers	0.7 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	1.4 ft.	Backwater Length (measured from outlet)	0.7

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	None
Bedrock Present	No	No	
Type of Sediment Deposits	Point	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Culvert	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Shrub/Sapling	
Dominant Vegetation Type - Right	Mixed Forest	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	Yes	
Vegitation Band -Right	Yes	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Photos #163-166**

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

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Bridge Summary Report

White River

General Information

SgaID	700000001809043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	6/27/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.96883	Longitude	-72.42937
Location	Private drive off Vershire Center Road			Reach VTID	T4.01
Road Name		Road Type	Gravel	Stream Name	Jenkins Brook
High Flow Stage	Yes			Channel Width	31.1

Bridge Information

Bridge Width	16	Material	Concrete
Bridge Clearance	6	Number of bridge piers/arches	0
Bridge/Arch Span	22		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Not Significant	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Naturally Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	Boulder
Bedrock Present	No	No	Yes
Type of Sediment Deposits	Side	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Shrub/Sapling	
Dominant Vegetation Type - Right	Shrub/Sapling	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	Yes	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes** Photos taken? **Yes**

Comments **Photos #195-198**

VERMONT

Stream Geomorphic Assessment

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VT DEC

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Bridge Summary Report

White River

General Information

SgaID	200000000209042	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	5/22/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.98821	Longitude	-72.44768
Location	On Route 110 in Chelsea Village			Reach VTID	T5.01
Road Name	ROUTE 110	Road Type	Paved	Stream Name	Jail Brook
High Flow Stage	No			Channel Width	26

Bridge Information

Bridge Width	75	Material	Concrete
Bridge Clearance	5.6	Number of bridge piers/arches	1
Bridge/Arch Span	13.3		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	Point	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments,Footers,Wing walls	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Shrub/Sapling	
Dominant Vegetation Type - Right	Deciduous Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Repeat ice jams here in addition to flooding.
Photos #059-062

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

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Culvert Summary Report

White River

General Information

SgaID	600049001509041	Local SgaID		VOBCIT struct_num	
Observers	JG	Assessment Date	6/3/2005	Project Name	
Town	Chelsea	Latitude	43.99006	Longitude	-72.40215
Location	Map # 1031b			Reach VTID	
Road Name	BURGER RD	Road Type	Gravel	Stream Name	Jail Brook
High Flow Stage	No			Channel Width	12

Culvert Information

Culvert Length	28	Material	Tank
Culvert Height	5	Number of culverts	1
Culvert Width	4.833333	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild bend
If channel avulses, stream will	Cross road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	1
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers		Backwater Length (measured from outlet)	
Maximum pool depth		Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	None
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Side	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	Yes	No
Bank Erosion	Low	None	
Hard Bank Armoring	None	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)			

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Mixed Forest	
Dominant Vegetation Type - Right	Coniferous Forest	Coniferous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?	No	Photos taken?	Yes

Comments

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Bridge Summary Report

White River

General Information

SgaID	100000000309041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	5/22/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.98811	Longitude	-72.44628
Location	On Court Street off of Route 113, almost into Chelsea Village			Reach VTID	T5.01
Road Name	COURT ST	Road Type	Paved	Stream Name	Jail Brook
High Flow Stage	No			Channel Width	26

Bridge Information

Bridge Width	25	Material	Concrete
Bridge Clearance	6.3	Number of bridge piers/arches	1
Bridge/Arch Span	20		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	Yes

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	400
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Boulder	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	Mid-channel	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species			

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Steps upstream and downstream have large stones which may have been placed as check dams but it isn't obvious
Almost looks as if check dams were placed upstream and downstream and bed filled under bridge, has this been scoured?
Photos #055-058

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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July, 17 2014

Culvert Summary Report

White River

General Information

SgaID	700000002609043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/16/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99809	Longitude	-72.44875
Location	Mill site in Chelsea village			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	No			Channel Width	43.7

Culvert Information

Culvert Length	6	Material	Stone
Culvert Height	4	Number of culverts	1
Culvert Width	4	Culvert Overflow Pipe	Yes
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Higher

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	1.5
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	At Grade
Stepped Footers	2 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	2.5 ft.	Backwater Length (measured from outlet)	0

	Upstream	Downstream	In Structure
Dominant Bed Material	Sand	Sand	None
Bedrock Present	No	Yes	
Type of Sediment Deposits	Point	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	High	None	
Hard Bank Armoring	None	Failing	
Stream bed scour causing undermining around or under structure	None	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Mixed Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Photos #6005-6007**

VERMONT

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Bridge Summary Report

White River

General Information

SgaID	700000002209043	Local SgaID		VOBCIT struct_num	
Observers	DR/SL (Redstart)	Assessment Date	7/10/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99952	Longitude	-72.44891
Location	Richardson Bridge, just upstream of intersection of Route 110 and Upper Village Road			Reach VTID	T6.01
Road Name	UPPER VILLAGE RD	Road Type	Gravel	Stream Name	Hart Hollow Brook
High Flow Stage	Yes			Channel Width	43.7

Bridge Information

Bridge Width	13	Material	Concrete
Bridge Clearance	5.8	Number of bridge piers/arches	0
Bridge/Arch Span	36		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	None	
Hard Bank Armoring	Failing	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Road Embankment	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #465-468

VERMONT

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Bridge Summary Report

White River

General Information

SgaID	700000002009043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/9/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00429	Longitude	-72.44217
Location	VAST Bridge off Upper Village Road			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	Yes			Channel Width	43.7

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	8.5	Number of bridge piers/arches	0
Bridge/Arch Span	48		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Cobble	Cobble
Bedrock Present	Yes	No	Yes
Type of Sediment Deposits	None	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Shrub/Sapling	Shrub/Sapling	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #6037-6040

VERMONT

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Bridge Summary Report

White River

General Information

SgaID	100000000409041	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/10/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00345	Longitude	-72.44598
Location	On Upper Village Road and Hillside Road			Reach VTID	T6.01
Road Name	UPPER VILLAGE RD	Road Type	Paved	Stream Name	Hart Hollow Brook
High Flow Stage	Yes			Channel Width	43.7

Bridge Information

Bridge Width	40	Material	Concrete
Bridge Clearance	8.5	Number of bridge piers/arches	0
Bridge/Arch Span	32.5		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	300
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Cobble
Bedrock Present	Yes	No	No
Type of Sediment Deposits	Point,Side	None	Side
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Deciduous Forest	
Dominant Vegetation Type - Right	Mixed Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **Yes**

Photos taken? **Yes**

Comments **Photos #453-456**

VERMONT

Stream Geomorphic Assessment

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July, 17 2014

Bridge Summary Report

White River

General Information

SgaID	700000002109043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/9/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.00692	Longitude	-72.43796
Location	Driveway to house #85 on Upper Village Road			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	Yes			Channel Width	43.7

Bridge Information

Bridge Width	12	Material	Timber
Bridge Clearance	5.5	Number of bridge piers/arches	0
Bridge/Arch Span	18		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Boulder	Cobble	Boulder
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Delta	Side	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	Low	
Hard Bank Armoring	Intact	Failing	
Stream bed scour causing undermining around or under structure	Abutments,Footers,Wing walls	Footers,Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments

Concrete poured in 2008
Just below convergence with tributary.
Bridge also has pipes (or wires?) on the side for house
Photos #252-255

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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July, 17 2014

Bridge Summary Report

White River

General Information

SgaID	700000002409043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/16/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99683	Longitude	-72.44821
Location	Private driveway off Route 110, in Chelsea Village			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	No			Channel Width	43.7

Bridge Information

Bridge Width	13	Material	Timber
Bridge Clearance	6	Number of bridge piers/arches	0
Bridge/Arch Span	36		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Not Significant	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Boulder	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	Mid-channel	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Coniferous Forest	Coniferous Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #6016-6019

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Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

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Bridge Summary Report

White River

General Information

SgaID	700000002309043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/16/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.9973	Longitude	-72.44854
Location	Private farm bridge off Route 110			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	No			Channel Width	43.7

Bridge Information

Bridge Width	14	Material	Timber
Bridge Clearance	6	Number of bridge piers/arches	0
Bridge/Arch Span	35		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	Yes 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Sand	Gravel
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	None	None	Side
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	Footers	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Herbaceous/Grass	
Dominant Vegetation Type - Right	Deciduous Forest	Herbaceous/Grass	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #6011-6015

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Bridge Summary Report

White River

General Information

SgaID	700000002509043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/16/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99347	Longitude	-72.44784
Location	Foot bridge behind Brook Haven			Reach VTID	T6.01
Road Name		Road Type	Trail	Stream Name	Hart Hollow Brook
High Flow Stage	No			Channel Width	43.7

Bridge Information

Bridge Width	7.5	Material	Steel
Bridge Clearance	6.7	Number of bridge piers/arches	0
Bridge/Arch Span	25		
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Not Significant	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Herbaceous/Grass	
Dominant Vegetation Type - Right	Herbaceous/Grass	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #6025-6028

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Bridge Summary Report

White River

General Information

SgaID	200000000309042	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/16/2013	Project Name	White River - First Branch
Town	Chelsea	Latitude	43.99438	Longitude	-72.44685
Location	On Route 110 near Health Center			Reach VTID	T6.01
Road Name	ROUTE 110	Road Type	Paved	Stream Name	Hart Hollow Brook
High Flow Stage	No			Channel Width	43.7

Bridge Information

Bridge Width	35	Material	Concrete
Bridge Clearance	5.3	Number of bridge piers/arches	0
Bridge/Arch Span	70		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Partially	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	400
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	No		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Boulder	Boulder
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	Point
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	None	None	
Hard Bank Armoring	Intact	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Deciduous Forest	
Dominant Vegetation Type - Right	Herbaceous/Grass	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

Comments Photos #6022-6024

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Culvert Summary Report

White River

General Information

SgaID	100004000109041	Local SgaID		VOBCIT struct_num	600004009409041
Observers	DR, GR (Redstart)	Assessment Date	7/19/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.04987	Longitude	-72.51759
Location	Just S. of Edwards Rd./Williamstown Rd. intersection on Williamstown Rd.			Reach VTID	T7.01
Road Name	WILLIAMSTOWN RD	Road Type	Gravel	Stream Name	Unnamed tributary that runs along Edwards Rd.
High Flow Stage	No			Channel Width	10

Culvert Information

Culvert Length	60	Material	Steel Corrugated
Culvert Height	2	Number of culverts	2
Culvert Width	3.5	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	Yes
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Mild Bend
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.2
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Cascade
Stepped Footers	1 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	1.2 ft.	Backwater Length (measured from outlet)	3.5

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	None
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Mid-channel	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	Low	
Hard Bank Armoring	Failing	None	
Stream bed scour causing undermining around or under structure	Culvert	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Coniferous Forest	
Dominant Vegetation Type - Right	Mixed Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	Yes	No

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? Yes

Photos taken? Yes

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Comments **2 culverts at crossing because it broke in half under the road; top half is tank and bottom half is steel corrugated. The old tank is 15' long and the steer corrugated bottom half is 45' long (totaling 60')**

Culvert Summary Report

White River

General Information

SgaID	100008000009041	Local SgaID		VOBCIT struct_num	990008001609041
Observers	DR, HW (Redstart)	Assessment Date	7/30/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.03838	Longitude	-72.48253
Location	0.1 mi E. of Edwards Rd./Gilman Hill Rd. intersection where Edwards Rd. crosses over trib.			Reach VTID	T7.01
Road Name	EDWARDS RD	Road Type	Gravel	Stream Name	Unnamed tributary that runs along Edwards Rd.
High Flow Stage	No			Channel Width	20.9

Culvert Information

Culvert Length	65	Material	Steel Corrugated
Culvert Height	9.8	Number of culverts	1
Culvert Width	8.4	Culvert Overflow Pipe	No
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	Yes
		Culvert slope as compared with channel slope is significantly	Lower

Upstream

Obstructions at the opening of the structure	Wood debris,Sediment	Estimated distance avulsion would follow road	50
Steep riffle present immediately upstream of structure	Yes	Angle of stream flow approaching structure	Sharp Bend
If channel avulses, stream will	Follow Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.5
Downstream bank heights are substantially higher than upstream bank heights	No	Culvert outlet invert	Cascade
Stepped Footers	2 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	> 4.0 ft.	Backwater Length (measured from outlet)	1.5

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	None
Bedrock Present	No	Yes	
Type of Sediment Deposits	Side,Mid-channel	None	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	Yes	No	No
Bank Erosion	Low	High	
Hard Bank Armoring	Failing	Intact	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Deciduous Forest	Mixed Forest	
Dominant Vegetation Type - Right	Mixed Forest	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	Yes	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS? **No** Photos taken? **Yes**

Comments **Downstream banks don't seem higher because upstream banks are high.**

Culvert Summary Report

White River

General Information

SgaID	**700000001309043**	Local SgaID		VOBCIT struct_num	
Observers	**DR, HW (Redstart)**	Assessment Date	**7/23/2012**	Project Name	**White River - First Branch**
Town	**Chelsea**	Latitude	**44.04412**	Longitude	**-72.50809**
Location	**0.8 mi E. of Edwards Rd./Williamstown Rd. intersection on VAST trail**			Reach VTID	**T7.01**
Road Name		Road Type	**Trail**	Stream Name	**Unnamed tributary that runs along Edwards Rd.**

High Flow Stage	**No**	Channel Width	**24**

Culvert Information

Culvert Length	**20**	Material	**Tank**
Culvert Height	**4.7**	Number of culverts	**2**
Culvert Width	**5.5**	Culvert Overflow Pipe	**No**
		Skewed to roadway?	**No**

Geomorphic Information

General

Floodplain filled by roadway approaches	**Entirely**	Structure is located at significant break in valley slope	**No**
		Culvert slope as compared with channel slope is significantly	**Same**

Upstream

Obstructions at the opening of the structure	**Wood debris,Sediment**	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	**No**	Angle of stream flow approaching structure	**Mild Bend**
If channel avulses, stream will	**Cross Road**		

Downstream

Pool present immediately downstream of structure	**Yes**	Water depth in culvert (at outlet)	**1.95**
Downstream bank heights are substantially higher than upstream bank heights	**No**	Culvert outlet invert	**Entirely Backwatered**
Stepped Footers	**1.95 ft.**	Backwater Length (measured from outlet)	**20**
Maximum pool depth	**2 ft.**	Backwater Length (measured from outlet)	**0**

	Upstream	Downstream	In Structure
Dominant Bed Material	**Gravel**	**Gravel**	**None**
Bedrock Present	**No**	**No**	
Type of Sediment Deposits	**Point**	**Point**	**None**
Material Present throughout			**No**
Elevation of sediment deposits >= 1/2 bankfull	**No**	**No**	**No**
Bank Erosion	**High**	**High**	
Hard Bank Armoring	**None**	**None**	
Stream bed scour causing undermining around or under structure	**Culvert**	**Culvert**	
Beaver Dam near Structure	**No**	**No**	
Beaver Dam distance (ft.)	**0**	**0**	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	**Mixed Forest**	**Mixed Forest**	
Dominant Vegetation Type - Right	**Mixed Forest**	**Shrub/Sapling**	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	**Yes**	**Yes**	
Vegitation Band -Right	**Yes**	**Yes**	

Wildlife

Roadkill	Outside Structure	Inside Structure

Species	None	Deer - Tracks	None

Other Information

Spatial location data collected with GPS? **Yes** Photos taken? **Yes**

Comments **Smaller culvert is made of smooth metal, larger is tank. Debris jam and then outflashed likely during Irene; smaller culvert is half filled with sediment.**

Culvert Summary Report

White River

General Information

SgaID	700000001209043	Local SgaID		VOBCIT struct_num	
Observers	DR, GR (Redstart)	Assessment Date	7/19/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.04949	Longitude	-72.51711
Location	0.05 mi E. of Edwards Rd./Williamstown Rd. intersection on driveway off Edwards Rd.			Reach VTID	T7.01
Road Name		Road Type	Gravel	Stream Name	Unnamed tributary that runs along Edwards Rd.
High Flow Stage	No			Channel Width	10

Culvert Information

Culvert Length	20	Material	Other
Culvert Height	5	Number of culverts	1
Culvert Width	5	Culvert Overflow Pipe	No
		Skewed to roadway?	No

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No
		Culvert slope as compared with channel slope is significantly	Same

Upstream

Obstructions at the opening of the structure	Wood debris	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	Yes	Water depth in culvert (at outlet)	0.1
Downstream bank heights are substantially higher than upstream bank heights	Yes	Culvert outlet invert	Free Fall
Stepped Footers	0.3 ft.	Backwater Length (measured from outlet)	0
Maximum pool depth	0.9 ft.	Backwater Length (measured from outlet)	0.5

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	None
Bedrock Present	No	No	
Type of Sediment Deposits	Side	Point	None
Material Present throughout			No
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	Low	Low	
Hard Bank Armoring	None	None	
Stream bed scour causing undermining around or under structure	None	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Road Embankment	Herbaceous/Grass	
Dominant Vegetation Type - Right	Shrub/Sapling	Deciduous Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No
Vegitation Band -Right	No	No

Wildlife

Species	Roadkill	Outside Structure	Inside Structure
	None	None	None

Other Information

Spatial location data collected with GPS? **Yes** Photos taken? **Yes**

Comments **Private driveway, no structure number.**

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Bridge Summary Report

White River

General Information

SgaID	700000001409043	Local SgaID		VOBCIT struct_num	
Observers	DR, HW (Redstart)	Assessment Date	7/25/2012	Project Name	White River - First Branch
Town	Chelsea	Latitude	44.04278	Longitude	-72.49525
Location	Just W. of 121 Edwards Rd. across road from Jones Pond.			Reach VTID	T7.01
Road Name		Road Type	Trail	Stream Name	Unnamed tributary that runs along Edwards Rd.

High Flow Stage	No	Channel Width	26

Bridge Information

Bridge Width	5	Material	Timber
Bridge Clearance	8.7	Number of bridge piers/arches	0
Bridge/Arch Span	30		
		Skewed to roadway?	Yes

Geomorphic Information

General

Floodplain filled by roadway approaches	Entirely	Structure is located at significant break in valley slope	No

Upstream

Obstructions at the opening of the structure	None	Estimated distance avulsion would follow road	
Steep riffle present immediately upstream of structure	No	Angle of stream flow approaching structure	Channelized Straight
If channel avulses, stream will	Cross Road		

Downstream

Pool present immediately downstream of structure	No		
Downstream bank heights are substantially higher than upstream bank heights	Yes		
Pool Depth at point of streamflow entry	No 0 ft.		0

	Upstream	Downstream	In Structure
Dominant Bed Material	Bedrock	Gravel	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	None	Mid-channel	None
Elevation of sediment deposits >= 1/2 bankfull	No	No	No
Bank Erosion	High	High	
Hard Bank Armoring	Failing	Failing	
Stream bed scour causing undermining around or under structure	Abutments	Abutments	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	0	0	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Mixed Forest	Mixed Forest	

Does a band of shrub/forest vegetation 50 ft. wide start within 25 ft. of the structure and extend at least 500 ft. up/downstream?

Vegitation Band - Left	No	No	
Vegitation Band -Right	Yes	Yes	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	None	None

Other Information

Spatial location data collected with GPS?	Yes	Photos taken?	Yes

Comments **Footbridge, no structure number. Located at bedrock grade control, leads to cabin on right bank.**

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Footpath	First Branch Mainstem	700000000109043	Bridge	-	X	X	X	-	X	-	X	X	-	-	-	X	73 %
Chelsea	VAST Trail	First Branch Mainstem	700000000209043	Bridge	-	-	X	-	-	X	-	X	X	X	-	-	X	111 %
Chelsea	Footpath	First Branch Mainstem	700000000309043	Bridge	-	-	X	-	-	X	-	X	X	X	-	-	X	111 %
Chelsea	Footpath	First Branch Mainstem	700000000409043	Bridge	-	X	X	X	-	X	X	X	X	-	-	-	X	62 %
Chelsea	VAST Trail	First Branch Mainstem	700000000509043	Bridge	-	-	-	X	-	X	X	X	X	-	-	-	X	100 %
Chelsea	Farm road	First Branch Mainstem	700000000609043	Bridge	-	X	X	X	-	X	X	X	X	-	-	-	X	49 %
Chelsea	Farm road	First Branch Mainstem	700000000709043	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	50 %
Chelsea	Farm road	First Branch Mainstem	700000000809043	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	42 %
Chelsea	Farm road	First Branch Mainstem	700000000909043	Bridge	-	X	X	X	-	X	-	X	X	X	-	-	-	64 %
Chelsea	Farm road	First Branch Mainstem	700000001009043	Bridge	-	X	X	X	-	X	X	X	X	-	-	-	X	39 %

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Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Driveway	First Branch Mainstem	700000001109043	Bridge	-	X	X	X	X	X	X	X	X	-	-	-	X	54 %
Chelsea	BOBBINSHOP RD	First Branch Mainstem	100004000009041 100904004409041	Bridge	-	X	X	X	X	X	X	X	X	-	-	-	X	70 %
Chelsea	JENKINS BROOK RD	First Branch Mainstem	100003000009041 100904001109041	Bridge	-	X	X	X	X	X	-	-	X	X	X	-	X	55 %
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	-	X	X	X	-	X	-	X	X	-	X	-	X	58 %
Chelsea	MEADOW BROOK LN	First Branch Mainstem	700000000009043	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	62 %
Chelsea	MOXLEY RD	First Branch Mainstem	100068000009041 100904004609041	Bridge	-	X	X	X	X	X	X	-	X	X	-	-	X	52 %
Chelsea	ROUTE 110	First Branch Mainstem	200110000009042 200169000909042	Bridge	-	X	X	X	-	X	-	X	X	-	X	-	X	96 %
Chelsea	ROUTE 110	First Branch Mainstem	200110000109042 200169001209042	Bridge	-	X	X	X	X	X	-	X	X	X	-	-	X	57 %
Chelsea	ROUTE 110	First Branch Mainstem	200110000209042 200169001309042	Bridge	-	X	X	X	X	X	X	X	X	X	X	-	X	60 %
Royalton	MILL RD	First Branch Mainstem	100012000014161 101416002714161	Bridge	-	X	X	X	-	X	-	X	X	-	X	-	X	72 %
Royalton	ROUTE 14	First Branch Mainstem	200014000014162 200147002114162	Bridge	-	-	-	-	-	X	-	-	-	X	-	-	X	128 %
Royalton	TH 92	First Branch Mainstem	100092000014161 101416002914161	Bridge	-	X	X	X	X	X	-	X	X	X	-	-	X	61 %
Royalton	TH 93	First Branch Mainstem	100093000014161 101416002814161	Bridge	-	-	X	-	X	X	-	X	X	X	-	-	X	97 %
Tunbridge	BELKNAP BROOK RD	First Branch Mainstem	100060000009131 100913003209131	Bridge	-	X	X	X	-	X	-	X	-	-	X	-	X	80 %
Tunbridge	BICKNELL HILL RD	First Branch Mainstem	100006000009131 100913003509131	Bridge	-	X	X	X	-	X	X	X	X	-	X	-	X	96 %
Tunbridge	FOUNDRY RD	First Branch Mainstem	100025000009131 100913003109131	Bridge	-	-	-	X	X	X	X	-	-	X	-	-	X	78 %
Tunbridge	HOWE LN	First Branch Mainstem	100045000009131 100913003309131	Bridge	-	X	X	X	-	X	X	X	X	-	X	-	X	63 %

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Tunbridge	LARKIN RD	First Branch Mainstem	100013000009131 100913003409131	Bridge	-	X	X	X	X	X	-	X	X	X	X	-	X	67 %
Tunbridge	ROUTE 110	First Branch Mainstem	200110000009132 200169001A09132	Bridge	-	X	-	X	-	X	X	X	X	-	X	-	X	90 %
Tunbridge	ROUTE 110	First Branch Mainstem	200110000109132 200169000209132	Bridge	-	-	-	X	-	X	X	X	X	-	X	-	X	132 %
Tunbridge	ROUTE 110	First Branch Mainstem	200110000209132 200169000409132	Bridge	-	-	-	X	-	X	-	-	-	X	X	-	X	159 %
Tunbridge	SPRING RD	First Branch Mainstem	100002000009131 100913000509131	Bridge	-	X	X	X	X	X	-	X	X	X	X	-	X	53 %
Washington	POOR FARM RD	First Branch Mainstem	400028000009151 400028001909151	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	43 %
Washington	ROUTE 110	First Branch Mainstem	300110000009152 300169001509151	Bridge	-	X	X	X	X	X	-	X	X	X	-	-	X	53 %
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	-	X	X	X	-	X	X	X	X	-	X	-	X	53 %
Washington	ROUTE 110	First Branch Mainstem	300110000209152 300169001709151	Bridge	-	X	X	X	X	X	-	X	X	X	X	-	X	62 %
Washington	SKY ACRES RD	First Branch Mainstem	100029000009151 400029002109151	Culvert	-	X	X	X	X	X	-	X	X	X	-	-	X	27 %
Washington	TILTON RD	First Branch Mainstem	600043000609151	Culvert	-	X	X	X	X	X	-	-	-	X	X	-	X	26 %
Washington	WILLIAMS TOWN RD	First Branch Mainstem	400003000009151	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	38 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Tunbridge	VAST trail	Strafford Rd. trib	700000000009133	Bridge	-	X	X	X	-	X	-	X	X	-	X	-	-	83 %
Tunbridge	Driveway	Strafford Rd. trib	700000000109133	Bridge	-	X	X	X	-	-	X	X	X	-	-	-	X	71 %
Tunbridge	RECREATION RD	Strafford Rd. trib	100065000009131 990065002209131	Culvert	-	X	X	X	X	X	-	-	-	X	X	-	X	25 %
Tunbridge	STRAFFORD RD	Strafford Rd. trib	100001000009131	Culvert	-	X	X	X	X	X	X	X	X	-	X	-	X	21 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000009131 990007000809131	Culvert	-	X	X	X	X	X	X	-	-	-	X	-	X	47 %
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000109131 990007002009131	Culvert	-	X	X	X	X	X	X	-	-	X	X	-	X	48 %
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000209131 990007000909131	Bridge	-	X	X	X	X	X	X	X	X	X	X	-	X	30 %
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	400913002909131 990007002009131	Culvert	-	X	X	X	X	X	X	-	-	X	-	-	X	62 %
Tunbridge	ROUTE 110	Dickerman Brook	200110000309132 300169000709131	Bridge	-	X	X	X	X	X	X	X	X	-	X	-	X	59 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Private	Cram Brook	700000001509043	Bridge	-	X	-	X	-	X	X	X	X	-	-	-	X	99 %
Chelsea	Private	Cram Brook	700000001609043	Bridge	-	-	-	X	-	X	X	X	X	-	-	-	X	107 %
Chelsea	Private	Cram Brook	700000001709043	Bridge	-	X	X	X	X	X	-	X	X	X	-	-	X	52 %
Chelsea	BEACON HILL	Cram Brook	400904004009041	Culvert	-	X	X	X	X	X	X	-	X	X	-	-	X	72 %
Chelsea	BOBBINSHOP RD	Cram Brook	400904002809041 990004001109041	Culvert	-	-	-	X	X	X	X	X	X	X	-	-	X	82 %
Chelsea	BOBBINSHOP RD	Cram Brook	400904005009041 990004002209041	Culvert	-	X	X	X	X	X	X	-	-	X	-	-	X	51 %
Chelsea	BROOK RD	Cram Brook	400904001509041 400003028409041	Culvert	-	X	X	X	X	X	X	-	X	X	-	-	X	35 %
Chelsea	BROOK RD	Cram Brook	400904002009041 990003000809041	Arch	-	-	MD	-	-	X	X	-	-	X	-	-	X	1,04 % 7
Chelsea	E RANDOLPH RD	Cram Brook	200000000109042	Culvert	-	X	X	X	X	X	X	-	-	-	X	-	X	31 %
Chelsea	E RANDOLPH RD	Cram Brook	400904000909041 990001000409041	Culvert	-	X	X	X	X	X	X	-	-	X	-	-	X	63 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Private	Jenkins Brook	700000001809043	Bridge	-	X	X	X	-	X	X	X	X	X	-	-	-	71 %
Chelsea	HALL RD	Jenkins Brook	100000000209041	Culvert	-	X	X	X	X	X	X	X	X	-	X	-	X	34 %
Chelsea	HALL RD	Jenkins Brook	400904003809041 990058001809041	Culvert	-	X	X	X	X	X	X	-	-	X	-	-	X	34 %
Chelsea	JENKINS BROOK RD	Jenkins Brook	100000000009041	Bridge	-	X	X	X	-	X	X	X	X	-	X	-	X	63 %
Chelsea	JENKINS BROOK RD	Jenkins Brook	700000001909043	Bridge	-	X	-	X	-	X	X	X	X	-	-	-	X	87 %
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	-	X	X	X	-	X	X	X	X	-	-	-	X	40 %
Chelsea	TOWN FARM RD	Jenkins Brook	400000000009041	Bridge	-	X	X	X	X	X	X	X	X	X	X	-	X	37 %
Chelsea	VERSHIRE CTR RD	Jenkins Brook	100000000109041	Culvert	-	X	X	X	X	X	X	X	X	-	X	-	X	16 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	BURGER RD	Jail Brook	600049001509041	Culvert	-	X	X	X	X	X	X	-	-	-	-	-	X	40 %
Chelsea	COURT ST	Jail Brook	100000000309041	Bridge	-	X	-	X	-	X	X	X	X	-	X	-	X	77 %
Chelsea	ROUTE 110	Jail Brook	200000000209042	Bridge	-	X	X	X	-	X	X	X	X	-	X	-	X	51 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Private	Hart Hollow Brook	700000002009043	Bridge	-	-	-	X	-	X	X	X	X	-	-	-	X	110 %
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	-	X	X	X	X	X	X	X	X	X	-	-	X	41 %
Chelsea	Private	Hart Hollow Brook	700000002309043	Bridge	-	-	X	X	X	X	X	-	X	X	-	-	X	80 %
Chelsea	Private	Hart Hollow Brook	700000002409043	Bridge	-	-	-	X	-	X	X	X	X	X	-	-	-	82 %
Chelsea	Private	Hart Hollow Brook	700000002509043	Bridge	-	X	X	X	-	X	-	X	X	X	-	-	-	57 %
Chelsea	Private	Hart Hollow Brook	700000002609043	Culvert	-	X	X	X	-	X	X	X	X	-	-	-	X	9 %
Chelsea	ROUTE 110	Hart Hollow Brook	200000000309042	Bridge	-	-	-	-	-	X	X	-	-	X	X	-	X	160 %
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	100000000409041	Bridge	-	X	X	X	X	X	X	X	X	X	X	-	X	74 %
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	700000002209043	Bridge	-	-	-	X	X	X	X	X	X	X	-	-	X	82 %

Structure Failure Modes

White River

Explanation of codes used in table header

Failure Modes		Existing Problems	
F1	Concern for structure due to fluvial condition or process	P1	Upstream sediment deposit
F2	Potential failure due to out-flanking	P2	Upstream Scour and/or erosion present
F3	Potential failure due to scour	P3	Downstream Scour and/or erosion present
F4	Potential failure due to ice or debris jam	P4	Inlet obstruction present
F5	Structure related damage due to flooding of adjacent property	P5	Poor location or alignment
F6	Structure related damage due to erosion of adjacent property	P6	Beaver activity
Width	Structure width divided by channel width as a percent (% bankfull width)	P7	Floodplain filled entirely or partially by roadway approaches

X = meets criteria MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	F1	F2	F3	F4	F5	F6	P1	P2	P3	P4	P5	P6	P7	Width
Chelsea	Driveway	Unnamed tributary that runs along Edwards Rd.	700000001209043	Culvert	-	X	X	X	X	-	-	-	-	-	-	-	X	50 %
Chelsea	VAST trail	Unnamed tributary that runs along Edwards Rd.	700000001309043	Culvert	-	X	X	X	X	X	X	X	X	-	-	-	X	23 %
Chelsea	Footpath	Unnamed tributary that runs along Edwards Rd.	700000001409043	Bridge	-	-	X	-	-	X	-	X	X	X	-	-	X	115 %
Chelsea	EDWARDS RD	Unnamed tributary that runs along Edwards Rd.	100008000009041 990008001609041	Culvert	-	X	X	X	X	X	X	X	X	-	X	-	X	40 %
Chelsea	WILLIAMS TOWN RD	Unnamed tributary that runs along Edwards Rd.	100004000109041 600004009409041	Culvert	-	X	X	X	X	X	X	X	X	-	X	-	X	35 %

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Footpath	First Branch Mainstem	700000000109043	Bridge	73 %	No	No	No	No	No	Yes	Yes	Yes	Yes	No		No	No	No
Chelsea	VAST Trail	First Branch Mainstem	700000000209043	Bridge	111 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Footpath	First Branch Mainstem	700000000309043	Bridge	111 %	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No		No	No	No
Chelsea	Footpath	First Branch Mainstem	700000000409043	Bridge	62 %	Yes	No	Yes	Yes	No	No	Yes	No	No	No		No	No	No
Chelsea	VAST Trail	First Branch Mainstem	700000000509043	Bridge	100 %	No	No	No	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	VAST Trail	First Branch Mainstem	700000000509043	Bridge	100 %	Yes	No	No	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	Farm road	First Branch Mainstem	700000000609043	Bridge	49 %	No	No	Yes	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Farm road	First Branch Mainstem	700000000709043	Bridge	50 %	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes		No	No	No

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Farm road	First Branch Mainstem	700000000809043	Bridge	42 %	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	No	No
Chelsea	Farm road	First Branch Mainstem	700000000909043	Bridge	64 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Farm road	First Branch Mainstem	700000001009043	Bridge	39 %	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Driveway	First Branch Mainstem	700000001109043	Bridge	54 %	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No		No	No	No
Chelsea	BOBBINSHOP RD	First Branch Mainstem	100004000009041 100904004409041	Bridge	70 %	No	No	No	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	BOBBINSHOP RD	First Branch Mainstem	100004000009041 100904004409041	Bridge	70 %	Yes	No	No	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	JENKINS BROOK RD	First Branch Mainstem	100003000009041 100904001109041	Bridge	55 %	No	No	No	No	No	No	Yes	No	Yes	No		No	No	Yes
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	58 %	No	No	No	No	No	Yes	Yes	Yes	Yes	No		No	No	Yes
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	58 %	No	No	No	No	No	Yes	Yes	Yes	Yes	No		No	No	Yes
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	58 %	No	No	No	No	No	Yes	Yes	Yes	Yes	No		No	No	Yes
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	58 %	No	No	No	No	No	Yes	Yes	Yes	Yes	No		No	No	Yes
Chelsea	MEADOW BROOK LN	First Branch Mainstem	700000000009043	Bridge	62 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	MEADOW BROOK LN	First Branch Mainstem	700000000009043	Bridge	62 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	MEADOW BROOK LN	First Branch Mainstem	700000000009043	Bridge	62 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	MEADOW BROOK LN	First Branch Mainstem	700000000009043	Bridge	62 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	MOXLEY RD	First Branch Mainstem	100068000009041 100904004609041	Bridge	52 %	No	No	Yes	No	No	No	No	No	Yes	No		No	No	No

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

July, 17 2014

					Bankfull Width	Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	ROUTE 110	First Branch Mainstem	200110000009042 200169000909042	Bridge	96 %	No	No	No	Yes	No	No	Yes	No	No	No		No	No	Yes
Chelsea	ROUTE 110	First Branch Mainstem	200110000109042 200169001209042	Bridge	57 %	No	No	No	Yes	Yes	Yes	Yes	Yes	No	No		No	No	No
Chelsea	ROUTE 110	First Branch Mainstem	200110000209042 200169001309042	Bridge	60 %	No	No	Yes	Yes	No	No	Yes	No	Yes	Yes		No	No	Yes
Royalton	MILL RD	First Branch Mainstem	100012000014161 101416002714161	Bridge	72 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	Yes
Royalton	MILL RD	First Branch Mainstem	100012000014161 101416002714161	Bridge	72 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	Yes
Royalton	ROUTE 14	First Branch Mainstem	200014000014162 200147002114162	Bridge	128 %	No	No	No	No	No	No	No	No	No	No		No	No	No
Royalton	TH 92	First Branch Mainstem	100092000014161 101416002914161	Bridge	61 %	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes		No	No	No
Royalton	TH 92	First Branch Mainstem	100092000014161 101416002914161	Bridge	61 %	No	No	No	Yes	Yes	Yes	Yes	No	Yes	Yes		No	No	No
Royalton	TH 93	First Branch Mainstem	100093000014161 101416002814161	Bridge	97 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Tunbridge	BELKNAP BROOK RD	First Branch Mainstem	100060000009131 100913003209131	Bridge	80 %	No	No	No	No	No	Yes	No	No	No	No		No	No	Yes
Tunbridge	BICKNELL HILL RD	First Branch Mainstem	100006000009131 100913003509131	Bridge	96 %	Yes	No	No	Yes	No	No	Yes	No	Yes	No		No	No	Yes
Tunbridge	FOUNDRY RD	First Branch Mainstem	100025000009131 100913003109131	Bridge	78 %	No	No	Yes	No	No	No	No	No	No	No		No	No	No
Tunbridge	HOWE LN	First Branch Mainstem	100045000009131 100913003309131	Bridge	63 %	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No		No	No	Yes
Tunbridge	LARKIN RD	First Branch Mainstem	100013000009131 100913003409131	Bridge	67 %	No	No	No	Yes	No	Yes	Yes	No	No	Yes		Yes	No	No
Tunbridge	ROUTE 110	First Branch Mainstem	200110000009132 200169001A09132	Bridge	90 %	No	No	Yes	Yes	No	No	Yes	No	No	No		Yes	No	Yes
Tunbridge	ROUTE 110	First Branch Mainstem	200110000109132 200169000209132	Bridge	132 %	Yes	No	No	No	Yes	No	No	No	No	No		Yes	No	Yes

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Tunbridge	ROUTE 110	First Branch Mainstem	200110000209132 200169000409132	Bridge	159 %	No	No	No	No	No	No	No	No	No	No		No	No	Yes
Tunbridge	SPRING RD	First Branch Mainstem	100002000009131 100913000509131	Bridge	53 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	Yes	Yes
Washington	POOR FARM RD	First Branch Mainstem	400028000009151 400028001909151	Bridge	43 %	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes		No	No	No
Washington	POOR FARM RD	First Branch Mainstem	400028000009151 400028001909151	Bridge	43 %	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes		No	No	No
Washington	ROUTE 110	First Branch Mainstem	300110000009152 300169001509151	Bridge	53 %	No	No	No	Yes	No	Yes	Yes	No	Yes	No		No	No	No
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	53 %	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000209152 300169001709151	Bridge	62 %	No	No	No	Yes	Yes	Yes	No	No	No	Yes		Yes	No	Yes
Washington	ROUTE 110	First Branch Mainstem	300110000209152 300169001709151	Bridge	62 %	No	No	No	Yes	Yes	Yes	No	No	No	Yes		Yes	No	Yes
Washington	SKY ACRES RD	First Branch Mainstem	100029000009151 400029002109151	Culvert	27 %	No	No	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No	No
Washington	SKY ACRES RD	First Branch Mainstem	100029000009151 400029002109151	Culvert	27 %	No	No	No	Yes	Yes	No	Yes	No	No	Yes	Yes	No	No	No
Washington	TILTON RD	First Branch Mainstem	600043000609151	Culvert	26 %	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes

					Bankfull Width	Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Washington	TILTON RD	First Branch Mainstem	600043000609151	Culvert	26 %	No	No	No	No	No	No	No	No	No	No	No	Yes	No	Yes
Washington	WILLIAMS TOWN RD	First Branch Mainstem	400003000009151	Bridge	38 %	No	No	Yes	Yes	No	Yes	Yes	No	No	No		No	No	No

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Tunbridge	VAST trail	Strafford Rd. trib	700000000009133	Bridge	83 %	No	No	No	No	No	Yes	No	Yes	Yes	No		Yes	No	No
Tunbridge	Driveway	Strafford Rd. trib	700000000109133	Bridge	71 %	Yes	No	Yes	No	No	Yes	No	No	Yes	No		No	No	No
Tunbridge	Driveway	Strafford Rd. trib	700000000109133	Bridge	71 %	Yes	No	Yes	No	No	Yes	No	No	Yes	No		No	No	No
Tunbridge	RECREATION RD	Strafford Rd. trib	100065000009131 99006500220913 1	Culvert	25 %	No	No	No	No	No	No	Yes	No	No	No	Yes	No	No	Yes
Tunbridge	STRAFFORD RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Tunbridge	STRAFFORD RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
Tunbridge	STRAFFORD RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes
Tunbridge	STRAFFORD RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Tunbridge	STRAFFO RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Tunbridge	STRAFFO RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Tunbridge	STRAFFO RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Tunbridge	STRAFFO RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Tunbridge	STRAFFO RD RD	Strafford Rd. trib	100001000009131	Culvert	21 %	No	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	Upstream Sediment Deposition C1	C2	C3	Upstream Scour and Erosion C4	C5	C6	Downstream Scour and Erosion C7	C8	C9	C10	C11	Poor Location or Alignment C12	C13	C14
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000009131 990007000809131	Culvert	47 %	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes	No	Yes
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000109131 990007002009131	Culvert	48 %	No	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000209131 990007000909131	Bridge	30 %	No	No	Yes	No	No	Yes	No	Yes	Yes	Yes		Yes	No	No
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	400913002909131 990007002009131	Culvert	62 %	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No
Tunbridge	ROUTE 110	Dickerman Brook	200110000309132 300169000709131	Bridge	59 %	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No		No	No	Yes

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Private	Cram Brook	700000001509043	Bridge	99 %	Yes	No	Yes	Yes	No	No	Yes	Yes	No	No		No	No	No
Chelsea	Private	Cram Brook	700000001609043	Bridge	107 %	No	No	Yes	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	Private	Cram Brook	700000001609043	Bridge	107 %	Yes	No	Yes	Yes	Yes	No	Yes	No	No	No		No	No	No
Chelsea	Private	Cram Brook	700000001709043	Bridge	52 %	No	No	No	Yes	No	No	Yes	No	No	No		No	No	No
Chelsea	BEACON HILL	Cram Brook	400904004009041	Culvert	72 %	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	No
Chelsea	BOBBINSHOP RD	Cram Brook	400904002809041 990004001109041	Culvert	82 %	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No
Chelsea	BOBBINSHOP RD	Cram Brook	400904005009041 990004002209041	Culvert	51 %	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No
Chelsea	BROOK RD	Cram Brook	400904001509041 400003028409041	Culvert	35 %	No	No	Yes	No	No	No	No	No	Yes	No	Yes	No	No	No
Chelsea	BROOK RD	Cram Brook	400904002009041 990003000809041	Arch	1,047 %	No	Yes	No	No	No	No	No	No	No	No		No	No	No

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	E RANDOLPH RD	Cram Brook	200000000109042	Culvert	31 %	No	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	No	No	Yes
Chelsea	E RANDOLPH RD	Cram Brook	400904000909041 990001000409041	Culvert	63 %	No	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	No

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Private	Jenkins Brook	700000001809043	Bridge	71 %	No	No	Yes	Yes	No	No	No	No	No	Yes		No	No	No
Chelsea	HALL RD	Jenkins Brook	100000000209041	Culvert	34 %	No	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	No	Yes
Chelsea	HALL RD	Jenkins Brook	100000000209041	Culvert	34 %	Yes	No	Yes	Yes	No	Yes	Yes	No	No	Yes	No	No	No	Yes
Chelsea	HALL RD	Jenkins Brook	400904003809041 990058001809041	Culvert	34 %	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No
Chelsea	JENKINS BROOK RD	Jenkins Brook	100000000009041	Bridge	63 %	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No		No	No	Yes
Chelsea	JENKINS BROOK RD	Jenkins Brook	700000001909043	Bridge	87 %	Yes	No	No	Yes	No	No	Yes	No	No	No		No	No	No
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	No	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	40 %	Yes	No	Yes	Yes	No	Yes	No	No	Yes	No		No	No	No
Chelsea	TOWN FARM RD	Jenkins Brook	400000000009041	Bridge	37 %	No	No	Yes	Yes	No	No	Yes	No	Yes	Yes		No	No	Yes
Chelsea	VERSHIRE CTR RD	Jenkins Brook	100000000109041	Culvert	16 %	Yes	No	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	No	Yes

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
				C11	Culvert outlet is cascade or freefall		

Yes = Condtion exists No = Condition does not exist MD = missing data

					Bankfull Width	Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	BURGER RD	Jail Brook	600049001509041	Culvert	40 %	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No	No
Chelsea	COURT ST	Jail Brook	100000000309041	Bridge	77 %	Yes	No	Yes	Yes	No	No	Yes	No	No	No		No	Yes	Yes
Chelsea	ROUTE 110	Jail Brook	200000000209042	Bridge	51 %	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No		Yes	No	Yes
Chelsea	ROUTE 110	Jail Brook	200000000209042	Bridge	51 %	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No		Yes	No	Yes
Chelsea	ROUTE 110	Jail Brook	200000000209042	Bridge	51 %	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No		Yes	No	Yes

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
C2	Sediment deposits >= half bankfull	C5	Bank erosion high	C8	Bank erosion high	C13	Located at significant valley break
C3	Steep riffle upstream	C6	Scour under structure	C9	Scour under structure	C14	Avulsion follow road
				C10	Banks higher downstream than upstream		
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						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Private	Hart Hollow Brook	700000002009043	Bridge	110 %	Yes	No	Yes	No	Yes	No	Yes	Yes	No	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	41 %	No	No	Yes	No	No	Yes	Yes	No	Yes	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002309043	Bridge	80 %	No	No	Yes	No	No	No	No	No	Yes	No		No	No	No

Agency of Natural Resouces

July, 17 2014

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Private	Hart Hollow Brook	700000002409043	Bridge	82 %	No	No	Yes	Yes	No	No	Yes	No	No	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002509043	Bridge	57 %	No	No	No	Yes	No	No	Yes	No	No	No		No	No	No
Chelsea	Private	Hart Hollow Brook	700000002609043	Culvert	9 %	Yes	Yes	No	No	Yes	No	Yes	No	No	No	No	No	No	No
Chelsea	ROUTE 110	Hart Hollow Brook	200000000309042	Bridge	160 %	No	No	Yes	No	No	No	No	No	No	No		No	No	Yes
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	100000000409041	Bridge	74 %	No	Yes	Yes	Yes	No	No	Yes	No	Yes	No		No	No	Yes
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	700000002209043	Bridge	82 %	No	No	Yes	Yes	No	No	No	No	No	No		No	No	No

Failure Modes - Problems and Causes

White River

Explanation of codes used in table header

Upstream Sediment Deposition		Upstream Scour and Erosion		Downstream Scour and Erosion		Poor Locacation or Aligment	
C1	Opening obstructed by sediment	C4	Bank armoring failing	C7	Bank armoring failing	C12	Stream approach angle is sharp bend
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Yes = Condtion exists No = Condition does not exist MD = missing data

						Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Bankfull Width Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	Driveway	Unnamed tributary that runs along Edwards Rd.	700000001209043	Culvert	50 %	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No
Chelsea	VAST trail	Unnamed tributary that runs along Edwards Rd.	700000001309043	Culvert	23 %	No	No	No	No	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Chelsea	VAST trail	Unnamed tributary that runs along Edwards Rd.	700000001309043	Culvert	23 %	Yes	No	No	No	Yes	Yes	No	Yes	Yes	No	No	No	No	No
Chelsea	Footpath	Unnamed tributary that runs along Edwards Rd.	700000001409043	Bridge	115 %	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes		No	No	No

					Bankfull Width	Upstream Sediment Deposition			Upstream Scour and Erosion			Downstream Scour and Erosion					Poor Location or Alignment		
Town	Road	Stream Name	SgaID / struct_num	Type	Percent	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
Chelsea	EDWARDS RD	Unnamed tributary that runs along Edwards Rd.	100008000009041 990008001609041	Culvert	40 %	No	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes
Chelsea	EDWARDS RD	Unnamed tributary that runs along Edwards Rd.	100008000009041 990008001609041	Culvert	40 %	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes
Chelsea	WILLIAMS TOWN RD	Unnamed tributary that runs along Edwards Rd.	100004000109041 600004009409041	Culvert	35 %	No	No	No	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No
Chelsea	WILLIAMS TOWN RD	Unnamed tributary that runs along Edwards Rd.	100004000109041 600004009409041	Culvert	35 %	Yes	No	No	Yes	Yes	Yes	No	No	No	No	Yes	No	Yes	No

VERMONT

Stream Geomorphic Assessment

Agency of Natural Resouces

VT DEC

Vermont.gov

July, 17 2014

Aquatic Organism Passage

White River

Geomorphic Compatibility

Retrofit Potential

Explanation of codes used in table header

Explanation of data acquisition (link)

AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Washington	SKY ACRES RD	First Branch Mainstem	100029000009151 400029002109151	Reduced AOP	Mostly Incompatable	LLL	27 %
Washington	TILTON RD	First Branch Mainstem	600043000609151	Reduced AOP	Partially Compatable	LLL	26 %

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Retrofit Potential

Explanation of codes used in table header

Explanation of data acquisition (link)

AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Tunbridge	RECREATION RD	Strafford Rd. trib	100065000009131 990065002209131	No AOP Including Adult Salmonids	Mostly Incompatable	LLL	25 %
Tunbridge	STRAFFORD RD	Strafford Rd. trib	100001000009131	Reduced AOP	Fully Incompatable	LLL	21 %

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AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000009131 990007000809131	No AOP Except Adult Salmonids	Fully Incompatable	MLL	47 %
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000109131 990007002009131	Reduced AOP	Partially Compatable	MLL	48 %
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	400913002909131 990007002009131	Reduced AOP	Mostly Compatable	MML	62 %

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AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Chelsea	BEACON HILL	Cram Brook	400904004009041	Reduced AOP	Mostly Compatable	MML	72 %
Chelsea	BOBBINSHOP RD	Cram Brook	400904002809041 990004001109041	Reduced AOP	Mostly Compatable	HHM	82 %
Chelsea	BOBBINSHOP RD	Cram Brook	400904005009041 990004002209041	Unknown	Mostly Compatable	MML	51 %
Chelsea	BROOK RD	Cram Brook	400904001509041 400003028409041	No AOP Except Adult Salmonids	Mostly Compatable	MLL	35 %
Chelsea	E RANDOLPH RD	Cram Brook	200000000109042	No AOP Except Adult Salmonids	Mostly Incompatable	Missing Data	31 %
Chelsea	E RANDOLPH RD	Cram Brook	400904000909041 990001000409041	Reduced AOP	Mostly Compatable	MLL	63 %

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Explanation of data acquisition (link)

AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Chelsea	HALL RD	Jenkins Brook	100000000209041	Reduced AOP	Partially Compatable	MLL	34 %
Chelsea	HALL RD	Jenkins Brook	400904003809041 990058001809041	Reduced AOP	Partially Compatable	MLL	34 %
Chelsea	VERSHIRE CTR RD	Jenkins Brook	100000000109041	No AOP Including Adult Salmonids	Mostly Incompatable	LLL	16 %

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AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
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Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Chelsea	BURGER RD	Jail Brook	600049001509041	Reduced AOP	Mostly Compatable	MLL	40 %

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AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
Gray	Reduced AOP for all aquatic organisms	**Light Green**	Structure is mostly compatable geomorphically 15 < GC < 20	**M**	Medium probablity the existing culvert can be retrofited
Orange	No AOP for all aquatic organisms except adult salmonids	**Yellow**	Structure is partially compatable geomorphically 10 < GC < 15	**L**	Low probablity the existing culvert can be retrofited
Red	No AOP for all aquatic organisms including adult salmonids	**Orange**	Structure is mostly incompatable geomorphically 5 < GC < 10	**Pos 1 (left)**	For strong swimmers
		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Chelsea	Private	Hart Hollow Brook	700000002609043	Reduced AOP	Mostly Incompatable	LLL	9 %

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AOP Coarse Screen		AOP Geomorphic Compatibility		AOP Retrofit Potential	
Green	Full AOP for all aquatic organisms	**Green**	Structure is fully compatable geomorphically 20 < GC < 25	**H**	High probablity the existing culvert can be retrofited
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		Red	Structure is fully incompatable geomorphically 0 < GC < 5	**Pos2 (Center)**	For moderate swimmers
				Pos 3 (right)	For weak swimmers

Town	Road	Stream Name	SgaID / struct_num	AOP Coarse Screen	AOP Geomorphic Compatibility	AOP Retrofit Potential	Percent Bankfull Width
Chelsea	Driveway	Unnamed tributary that runs along Edwards Rd.	700000001209043	No AOP Including Adult Salmonids	Partially Compatable	MML	50 %
Chelsea	VAST trail	Unnamed tributary that runs along Edwards Rd.	700000001309043	Reduced AOP	Mostly Incompatable	LLL	23 %
Chelsea	EDWARDS RD	Unnamed tributary that runs along Edwards Rd.	100008000009041 990008001609041	Reduced AOP	Fully Incompatable	MLL	40 %
Chelsea	WILLIAMSTOWN RD	Unnamed tributary that runs along Edwards Rd.	100004000109041 600004009409041	Reduced AOP	Mostly Incompatable	LLL	35 %

Wildlife Passage

White River

Structures Potentially Suitable for Terrestrial Wildlife Movement

Large Wildlife = deer, moose, bear

Medium Wildlife = fisher, otter, coyote, fox

Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	Footpath	First Branch Mainstem	700000000109043	Bridge	-	-	MD	---	---	---
Chelsea	VAST Trail	First Branch Mainstem	700000000209043	Bridge	-	-	MD	---	---	---
Chelsea	Footpath	First Branch Mainstem	700000000309043	Bridge	-	-	MD	---	---	---
Chelsea	Footpath	First Branch Mainstem	700000000409043	Bridge	-	-	MD	---	Deer - Tracks	---
Chelsea	VAST Trail	First Branch Mainstem	700000000509043	Bridge	-	-	MD	---	---	---
Chelsea	Farm road	First Branch Mainstem	700000000609043	Bridge	-	-	MD	---	---	---
Chelsea	Farm road	First Branch Mainstem	700000000709043	Bridge	-	-	MD	---	---	---
Chelsea	Farm road	First Branch Mainstem	700000000809043	Bridge	-	-	MD	---	---	---
Chelsea	Farm road	First Branch Mainstem	700000000909043	Bridge	-	-	MD	---	---	---
Chelsea	Farm road	First Branch Mainstem	700000001009043	Bridge	-	-	MD	---	---	---
Chelsea	Driveway	First Branch Mainstem	700000001109043	Bridge	-	-	MD	---	---	---
Chelsea	BOBBINSHOP RD	First Branch Mainstem	100004000009041 100904004409041	Bridge	-	-	MD	---	Fisher - Tracks	Fisher - Tracks
Chelsea	JENKINS BROOK RD	First Branch Mainstem	100003000009041 100904001109041	Bridge	-	-	MD	---	---	---
Chelsea	MAPLE AV	First Branch Mainstem	100044000009041 100904004509041	Bridge	-	-	MD	---	---	---
Chelsea	MEADOWBROOK LN	First Branch Mainstem	700000000009043	Bridge	-	-	MD	---	---	---
Chelsea	MOXLEY RD	First Branch Mainstem	100068000009041 100904004609041	Bridge	-	-	MD	---	---	---
Chelsea	ROUTE 110	First Branch Mainstem	200110000009042 200169000909042	Bridge	-	-	MD	---	---	---

Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	ROUTE 110	First Branch Mainstem	200110000109042 200169001209042	Bridge	-	-	MD	---	---	---
Chelsea	ROUTE 110	First Branch Mainstem	200110000209042 200169001309042	Bridge	-	-	MD	---	Unsure - Tracks	Unsure - Tracks
Royalton	MILL RD	First Branch Mainstem	100012000014161 101416002714161	Bridge	-	-	MD	---	Mink - Sighting	---
Royalton	ROUTE 14	First Branch Mainstem	200014000014162 200147002114162	Bridge	-	-	MD	---	---	---
Royalton	TH 92	First Branch Mainstem	100092000014161 101416002914161	Bridge	-	-	MD	---	---	---
Royalton	TH 93	First Branch Mainstem	100093000014161 101416002814161	Bridge	-	-	MD	---	---	---
Tunbridge	BELKNAP BROOK RD	First Branch Mainstem	100060000009131 100913003209131	Bridge	-	-	MD	---	---	---
Tunbridge	BICKNELL HILL RD	First Branch Mainstem	100006000009131 100913003509131	Bridge	-	-	MD	---	---	---
Tunbridge	FOUNDRY RD	First Branch Mainstem	100025000009131 100913003109131	Bridge	-	-	MD	---	---	---
Tunbridge	HOWE LN	First Branch Mainstem	100045000009131 100913003309131	Bridge	-	-	MD	---	---	---
Tunbridge	LARKIN RD	First Branch Mainstem	100013000009131 100913003409131	Bridge	-	-	MD	---	---	---
Tunbridge	ROUTE 110	First Branch Mainstem	200110000009132 200169001A09132	Bridge	-	-	MD	---	Mink - Tracks	Mink - Tracks
Tunbridge	ROUTE 110	First Branch Mainstem	200110000109132 200169000209132	Bridge	-	-	MD	---	---	Mink - Tracks
Tunbridge	ROUTE 110	First Branch Mainstem	200110000209132 200169000409132	Bridge	-	-	MD	---	Beaver - Feeding Signs	Mink - Tracks
Tunbridge	SPRING RD	First Branch Mainstem	100002000009131 100913000509131	Bridge	-	-	MD	---	---	---
Washington	POOR FARM RD	First Branch Mainstem	400028000009151 400028001909151	Bridge	-	-	MD	---	---	---
Washington	ROUTE 110	First Branch Mainstem	300110000009152 300169001509151	Bridge	-	-	MD	---	---	---

Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Washington	ROUTE 110	First Branch Mainstem	300110000109152 300169001609151	Bridge	-	-	MD	---	---	---
Washington	ROUTE 110	First Branch Mainstem	300110000209152 300169001709151	Bridge	-	-	MD	---	Mink - Tracks	Mink - Tracks
Washington	SKY ACRES RD	First Branch Mainstem	100029000009151 400029002109151	Culvert	-	-	-	---	---	---
Washington	TILTON RD	First Branch Mainstem	600043000609151	Culvert	-	-	-	---	Beaver - Feeding Signs	---
Washington	WILLIAMSTOWN RD	First Branch Mainstem	400003000009151	Bridge	-	-	MD	---	---	---

Wildlife Passage

White River

Structures Potentially Suitable for Terrestrial Wildlife Movement

Large Wildlife = deer, moose, bear

Medium Wildlife = fisher, otter, coyote, fox

Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Tunbridge	VAST trail	Strafford Rd. trib	700000000009133	Bridge	-	-	MD	---	Deer - Carcass	---
Tunbridge	Driveway	Strafford Rd. trib	700000000109133	Bridge	-	-	MD	---	---	---
Tunbridge	RECREATION RD	Strafford Rd. trib	100065000009131 990065002209131	Culvert	-	-	-	---	---	---
Tunbridge	STRAFFORD RD	Strafford Rd. trib	100001000009131	Culvert	-	-	-	---	---	---

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			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000009131 990007000809131	Culvert	-	-	-	---	---	---
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000109131 990007002009131	Culvert	-	-	-	---	---	---
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	100007000209131 990007000909131	Bridge	-	-	MD	---	---	---
Tunbridge	DICKERMAN HILL RD	Dickerman Brook	400913002909131 990007002009131	Culvert	-	-	-	---	---	---
Tunbridge	ROUTE 110	Dickerman Brook	200110000309132 300169000709131	Bridge	-	-	MD	---	---	---

Wildlife Passage

White River

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Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	Private	Cram Brook	700000001509043	Bridge	-	-	MD	---	---	---
Chelsea	Private	Cram Brook	700000001609043	Bridge	X	-	MD	---	---	---
Chelsea	Private	Cram Brook	700000001709043	Bridge	-	-	MD	---	---	---
Chelsea	BEACON HILL	Cram Brook	400904004009041	Culvert	-	-	-	---	---	---
Chelsea	BOBBINSHOP RD	Cram Brook	400904002809041 990004001109041	Culvert	-	-	-	---	---	---
Chelsea	BOBBINSHOP RD	Cram Brook	400904005009041 990004002209041	Culvert	MD	-	MD	---	---	---
Chelsea	BROOK RD	Cram Brook	400904001509041 400003028409041	Culvert	-	-	-	---	---	---
Chelsea	BROOK RD	Cram Brook	400904002009041 990003000809041	Arch	-	-	MD	---	---	---
Chelsea	E RANDOLPH RD	Cram Brook	200000000109042	Culvert	-	-	-	---	---	---
Chelsea	E RANDOLPH RD	Cram Brook	400904000909041 990001000409041	Culvert	-	-	-	---	---	---

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White River

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			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	Private	Jenkins Brook	700000001809043	Bridge	-	-	MD	---	---	---
Chelsea	HALL RD	Jenkins Brook	100000000209041	Culvert	-	-	-	---	---	---
Chelsea	HALL RD	Jenkins Brook	400904003809041 990058001809041	Culvert	-	-	-	---	---	---
Chelsea	JENKINS BROOK RD	Jenkins Brook	100000000009041	Bridge	-	-	MD	---	---	---
Chelsea	JENKINS BROOK RD	Jenkins Brook	700000001909043	Bridge	-	-	MD	---	---	---
Chelsea	REDROCK LN	Jenkins Brook	400000000109041	Bridge	-	-	MD	---	---	---
Chelsea	TOWN FARM RD	Jenkins Brook	400000000009041	Bridge	-	-	MD	---	---	---
Chelsea	VERSHIRE CTR RD	Jenkins Brook	100000000109041	Culvert	-	-	-	---	---	---

Wildlife Passage

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Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	BURGER RD	Jail Brook	600049001509041	Culvert	-	-	-	---	---	---
Chelsea	COURT ST	Jail Brook	100000000309041	Bridge	-	-	MD	---	---	---
Chelsea	ROUTE 110	Jail Brook	200000000209042	Bridge	-	-	MD	---	---	---

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Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	Private	Hart Hollow Brook	700000002009043	Bridge	X	-	MD	---	---	---
Chelsea	Private	Hart Hollow Brook	700000002109043	Bridge	-	-	MD	---	---	---
Chelsea	Private	Hart Hollow Brook	700000002309043	Bridge	-	-	MD	---	---	---
Chelsea	Private	Hart Hollow Brook	700000002409043	Bridge	-	-	MD	---	---	---
Chelsea	Private	Hart Hollow Brook	700000002509043	Bridge	-	-	MD	---	---	---
Chelsea	Private	Hart Hollow Brook	700000002609043	Culvert	-	-	-	---	---	---
Chelsea	ROUTE 110	Hart Hollow Brook	200000000309042	Bridge	-	-	MD	---	---	---
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	100000000409041	Bridge	-	-	MD	---	---	---
Chelsea	UPPER VILLAGE RD	Hart Hollow Brook	700000002209043	Bridge	-	-	MD	---	---	---

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Small Wildlife = herps, small mammals

			X = meets criteria MD = missing data					Wildlife Species Observed		
Town	Road	Stream Name	SgaID / struct_num	Type	Small Wildlife	Medium Wildlife	Large Wildlife	Roadkill	Outside Structure	Inside Structure
Chelsea	Driveway	Unnamed tributary that runs along Edwards Rd.	700000001209043	Culvert	-	-	-	---	---	---
Chelsea	VAST trail	Unnamed tributary that runs along Edwards Rd.	700000001309043	Culvert	-	-	-	---	Deer - Tracks	---
Chelsea	Footpath	Unnamed tributary that runs along Edwards Rd.	700000001409043	Bridge	X	-	MD	---	---	---
Chelsea	EDWARDS RD	Unnamed tributary that runs along Edwards Rd.	100008000009041 990008001609041	Culvert	-	-	-	---	---	---
Chelsea	WILLIAMSTOWN RD	Unnamed tributary that runs along Edwards Rd.	100004000109041 600004009409041	Culvert	-	-	-	---	---	---