Phase 2 Stream Geomorphic Assessment

Tyler Branch Watershed
Towns of Sheldon, Enosburg, and Bakersfield
Franklin County, Vermont

March 2006

Prepared for:
Missisquoi River Basin Association
2839 VT Route 105
East Berkshire, VT 05447

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March 15, 2006

Ms. Cynthia Scott
Missisquoi River Basin Association
2839 VT Route 105
East Berkshire, VT 05447

Re: Phase 2 Stream Geomorphic Assessment
Tyler Branch Watershed
Franklin County, Vermont
JCO Project No. 3-1313-1

Dear Ms. Scott:

The Johnson Company is pleased to present the following Phase 2 Stream Geomorphic Assessment report to the Missisquoi River Basin Association (MRBA). This report includes the results of Phase 2 Geomorphic Assessments performed in accordance with the Vermont Agency of Natural Resources (VTANR) Stream Geomorphic Assessment Protocols on 10 reaches of the Tyler Branch mainstem and 10 reaches of The Branch, a major tributary to the Tyler Branch.

Should you have any questions or require additional assistance, please do not hesitate to contact me at (802) 229-4600. Thank you for the opportunity to be of assistance to the MRBA on this project.

Sincerely,

THE JOHNSON COMPANY, INC.

By: _____
Adam Robtoy
Project Scientist

C: Staci Pomeroy, VTANR

Reviewed by: SAS
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EXECUTIVE SUMMARY

The Johnson Company was retained by Missisquoi River Basin Association (MRBA) to perform Phase 2 Geomorphic Assessments on 10 reaches of the Tyler Branch mainstem (M01, through M05, M07, and M09 through M12) and 10 reaches of The Branch (T1-01 through T-1-08, and T1-10 through T1-11), a major tributary of the Tyler Branch during the summer of 2005. In addition, Bridge and Culvert Assessments were conducted on all structures within the 20 reaches. All of the Phase 2 Assessments were conducted in accordance with the 2005 Vermont Agency of Natural Resources (VT ANR) Stream Geomorphic Assessment Protocols (VT ANR 2005) Steps 1-7. All of the collected data were recorded on the VT ANR Phase 2 data sheets and entered into the VT ANR Stream Geomorphic Assessment Web Based Data Management System (DMS). A thorough internal QA review was performed by The Johnson Company in December 2005. An independent QA review was performed by VT ANR in January 2006 and the Phase 1 and 2 DMS were updated on February 24 – 28, 2006. Goals and Objectives for the project included the following:

- Determine the existing stream type for each targeted reach and field verify the previously collected Phase 1 assessments;
- Conduct geomorphic condition evaluations for each reach which detail the current condition and sensitivity to existing and future natural and anthropogenic stressors;
- Collect and interpret the Phase 2 data to assess which reaches are responding to anthropogenic and natural modifications, and help prioritize which reaches warrant further study and/or restoration activities and;
- Educate the public about the results of the study and the need for future work.

Individual narratives for each assessed reach are included as Appendix A. Based on the field measurements taken during the Phase 2 Assessments, it appears most of the assessed reaches in the watershed are in evolution stage II (degradation) or III (widening). A description of the different channel evolution stages can be found in the VT ANR Stream Geomorphic Assessment Protocols, which may be found online at: http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_geoassess.htm.

Stream type departures were observed in only three of the 20 reaches; T1-01, T1-03, and T1-05A which all have departed from their reference type (C) to a B type channel due to historic degradation. The other reaches have all experienced some degree of historic degradation, though not enough to totally eliminate floodplain access. The dominant sediment regime for the watershed is aggradation. A tremendous amount of excess sediment was observed throughout as seen by enlarged point, side, mid-channel, and diagonal bars. Multiple steep riffles were also observed. Some rather significant erosion was noted at various points, but not enough to account for all of the observed stored sediment. Two factors could explain this discrepancy: 1) The tributaries which were not assessed as part of this project are contributing a great deal of sediment to the system, and 2) The watershed is a naturally high bedload system, and historic

dredging and gravel mining have been used to reduce the build up of sediment. Most likely it is a combination of both of factors which explains the current sediment regime of the system.

Nearly all of the reaches have a sensitivity of high to very high with the potential for further widening and bank erosion, though many areas of both The Branch and Tyler Branch are already rip-rapped (figures 4-7) which limits the potential areas of bank erosion. Those areas with limited riparian buffer (M04, M07, M09, M11, T1-01, T1-02, T1-03, T1-05, and T1-07) are most sensitive to further widening. Of those, M11, T1-02, T1-03, and T1-07 all have residential properties within the natural meander belt width of the stream (approximately six times the bankfull width). These reaches should be targeted for buffer reestablishment and/or active bank stabilization to limit potential property loss from erosion. At the same time, those reaches without significant anthropogenic receptors (T1-08 through T1-11, and M12) may be good candidates for corridor protection so that they may be allowed to naturally move through the evolutionary process. None of the assessed bridges were found to be threatened by nearby bank erosion or undermining abutments. Several bridges are slightly undersized and act as local channel and floodplain constrictions, though none of the identified problem areas are directly associated with a particular bridge. During future bridge replacement projects the collected data should be used to ensure that the new bridges are correctly sized.

Based on the results of the Phase 2 Assessments and visual observations, potential restoration/corridor protection projects identified within the watershed are described below. Figures 8 through 11 depict the project locations. Photos of some of the project areas are shown in Appendix C.

- **The Branch T1-01** (Photo Point 1) – Priorities for T1-01 include the reestablishment of a woody vegetative buffer to prevent further stream bank erosion and reduce nutrient inputs. Currently, most of the reach has no buffer and is bordered by pasture, hay, and cornfields. Nearly the entire reach is accessible to cows, so part of the buffer reestablishment should include fencing to minimize the cows' access to the stream channel.
- **The Branch T1-02** – The eroding bank (approximately 4 feet high and 150 feet long) just upstream of the cemetery and lack of riparian buffer are the major problem areas in the reach. To protect the cemetery, and the hayfield which is currently being eroded, some sort of bank stabilization is needed. Various techniques are available including tree revetments, vegetated geogrid and gabion baskets, coconut fiber logs, rip-rap, and others. Any bank stabilization project should also include reestablishment of a vegetated buffer along the adjacent hayfield.
- **The Branch T1-02/T1-03** – A corridor protection project should be implemented for the tributary that enters The Branch between T1-02 and T1-03. The tributary currently flows through a barnyard and cattle feeding area on the western side of Route 108. In order to limit nutrient inputs into the watershed, it may be possible to work with the farmer to move the feeding area away from the stream and establish riparian buffers to capture some of the runoff.

- **The Branch T1-05** – T1-05 suffers from a lack of vegetative buffer between the stream channel and the adjacent barnyard, hayfields, and pasture. Reestablishment of a wooded buffer along both banks would go a long way towards limiting nutrient inputs and reducing potential future bank erosion.
- **The Branch T1-07** – Like T1-05, T1-07 has almost no woody buffer along the right bank. Establishment of a wooded buffer would not only provide shade and other aquatic habitat improvements, but also prevent potential future erosion and reduce nutrient inputs.
- **The Branch T1-08 to T1-11** – These four reaches, and likely those further upstream as well, are good candidates for the implementation of a corridor protection plan. Currently no major residential development exists within the riparian corridor, which is dominated by a wooded buffer of at least 50 feet on both sides. This plan would document the value that these reaches provide to the watershed (aquatic habitat, sediment and nutrient attenuation, floodwater attenuation, and fluvial adjustment capacity) and ensure that they continue.
- **Tyler Branch M01** (Photo Point 2 and 3) – Two problem areas were noted in M01, a very large mass failure near the confluence with the Missisquoi, and an eroding bank near the upstream end of the reach. Given the rather remote access and size of the mass failure, it would be a very expensive and labor intensive process to stabilize the entire bank. The lower portion of the bank is primarily clay, which is somewhat resistant to erosion, and some lower portions of the bank are beginning to re-vegetate. To maximize the use of limited resources, it may be best to focus restoration efforts on smaller scale projects which could achieve better results with less effort. The eroding bank near the upstream end of M01 is a good example. Currently, the land owner is attempting to stabilize the bank by placing fill along the stream bank. While this may provide some protection in the short term, the fill will also wash away over time and provide unnecessary sediment and nutrients to the system. It may be possible to work with the landowner to provide a more permanent bank stabilization solution, such as those described for T1-02.
- **Tyler Branch M04** (Photo Point 4) – An eroding bank along the unbuffered hayfield near the downstream end of M04 would be a good candidate for stream bank stabilization. Along with bank stabilization, reestablishment of a woody buffer should also be considered for the site.
- **Tyler Brach M07** (Photo Point 5 and 6) – A large portion of M07 is already secured with rip-rap, but the bank just downstream of some of the rip-rap is actively eroding. There is a newly constructed house a few hundred feet from the bank, which may become endangered if the erosion continues. Therefore, some sort of stream bank stabilization is necessary along this bank. In addition, further upstream it appears there has been some berm construction along the right bank to prevent flooding in the adjacent hayfield. If an agreement can be worked out with the landowner it would be beneficial to remove this berm and reestablish floodplain access for the river.

- **Tyler Branch M09** (Photo Point 7) – Two major problems were noted in M09, virtually no riparian buffer, and cattle access to the streambed throughout the reach. The entire right riparian corridor, including the stream channel is utilized for pasture, and a travel corridor for cattle to access upstream grazing areas. It may be possible to work with the landowner to reestablish an adequate buffer, and limit the cows' access to the stream channel to reduce nutrient inputs.
- **Tyler Branch M11** – Like M09, M11 suffers from a lack of riparian buffer along the downstream end of the reach. While there is no major active erosion currently taking place, establishment of woody vegetation would stabilize the stream bank and help prevent erosion in the future.

There are several State and Federal Programs which could potentially provide funding in support of these projects such as the Conservation Reserve Enhancement Program (CREP), which compensates landowners for the loss of cropland to enhance riparian buffers.

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1.0 PROJECT OVERVIEW

The Johnson Company was retained by Missisquoi River Basin Association (MRBA) to perform Phase 2 Geomorphic Assessments on 10 reaches of the Tyler Branch mainstem (M01, through M05, M07, and M09 through M12) and 10 reaches of The Branch (T1-01 through T-1-08, and T1-10 through T1-11), a major tributary of the Tyler Branch during the summer of 2005 (Figure 1). Funding for the project was provided by the Vermont Agency of Natural Resources (VT ANR) Rivers Management Division. Quality Assurance responsibilities were coordinated between The Johnson Company and the Vermont Agency of Natural Resources (VT ANR). Phase 1 Geomorphic Assessments of the watershed were completed by The Lake Champlain Committee in 2003.

The Tyler Branch watershed encompasses approximately 58 square miles within the towns of Sheldon, Enosburg, Bakersfield, and small portions of Fairfield, Montgomery, and Belvidere and is a major tributary of the Missisquoi River. The study area included the entire mainstem of the Tyler Branch from its confluence with the Missisquoi River to its head waters at the confluence of Beaver Meadow Brook and Cold Hollow Brook with the exception of two short reaches (M06, and M08) dominated by bedrock gorges. The study area for The Branch included the ten most downstream reaches, except T1-09 which is influenced by Brown's Pond Dam.

Goals and Objectives for the project included the following:

- Determine the existing stream type for each targeted reach and field verify the previously collected Phase 1 assessments;
- Conduct geomorphic condition evaluations for each reach which detail the current condition and sensitivity to existing and future natural and anthropogenic stressors;
- Collect and interpret the Phase 2 data to assess which reaches are responding to anthropogenic and natural modifications, and help prioritize which reaches warrant further study and/or restoration activities;
- Educate the public about the results of the study and the need for future work.

2.0 BACKGROUND INFORMATION

2.1 GEOGRAPHIC SETTING

The Tyler Branch watershed encompasses approximately 58 square miles within the towns of Sheldon, Enosburg, Bakersfield, and small portions of Fairfield, Montgomery, and Belvidere and is a major tributary of the Missisquoi River which flows into Lake Champlain. The watershed elevation ranges from approximately 360 feet above mean sea level at the confluence with the Missisquoi to more than 1,500 feet at the upstream end of its tributaries. Figure 1 shows the geographic setting for the watershed.

The watershed historically has been dominated by agricultural activities which still make up a large portion of the land use is some areas. Residential development has grown substantially in the past few decades, though a majority of the land area is still sparsely populated by comparison to more urban areas.

2.2 GEOLOGIC SETTING

The Tyler Branch watershed is located in the foothills of the Cold Hollow Mountains. Like other areas within Vermont, the area has been periodically covered by glaciers, the most recent of which occurred from approximately 10,000 to 30,000 years ago. Bedrock in the study area is dominated by a combination of the Underhill and Pinnacle Formations which are comprised of various types of quartzite (Doll 1961). The surficial geology is comprised of glacial till and fluvial gravels and sands (Stewart and MacClintock 1970). Soils in the study area are dominated by loam, silt loam, and loamy sands predominantly associated with the following series; Ondawa silt loam, Rumney silt loam, Winooski silt loam, and Colton loamy sand (USDA SCS 1979).

2.3 GEOMORPHIC SETTING

The locations of the assessed reaches are shown on Figures 1, 2, and 3. The study area included the entire mainstem of the Tyler Branch (M01 to M12) from its confluence with the Missisquoi River to its head waters at the confluence of Beaver Meadow Brook and Cold Hollow

Brook with the exception of two short reaches (M06, and M08) dominated by bedrock gorges. The study area for The Branch included the ten most downstream reaches, except T1-09 which is influenced by Brown's Pond Dam, from T1-01 through T1-11.

The channel slopes for the study area ranged from 0.1% to 1.4% within the Tyler Branch and 0.4% to 1.5% in The Branch (Lake Champlain Committee 2003).
Based on the field observations and review of topographic maps, none of the reaches assessed are located in an alluvial fan. Bedrock grade controls were noted in several reaches throughout the study area including; M04B, M05, M07, M10, M11, M12, T1-01, T1-04, T1-05, T1-06, T1-08, and T1-11.

Based on the Phase 1 data, all 20 reaches within the study have a C reference stream type characterized by slopes of less than 2% with substrate ranging from gravel to cobble. The valley types for all assessed reaches range from broad to very broad with the exception of reaches M10A and M09 which are located within narrow valleys. The calculated valley widths ranged from 150 feet in M10A to nearly 1,000 feet in M01 and M02 (Lake Champlain Committee 2003).

2.4 HYDROLOGY

The nearest USGS gages for the study area are on the Missisquoi River at its outlet in Swanton upstream of the study area, and in East Berkshire. Based on the USGS data several flood events greater than 25 year discharge have occurred over the last 20 years including the years 1992, 1997, and 1998. Based on interviews with landowners within the study area, there was also a relatively large flood event which occurred in the spring of 2002.

2.5 ECOLOGICAL SETTING

The study area includes a variety of aquatic and upland habitat types which range from agricultural crop and pasture land to beaver ponds. The majority of the aquatic habitat consists of a riffle-pool community which has been affected by a large amount of aggradation causing

filling of pools and embedding of riffle substrates. The majority of the riparian zone in the Tyler Branch and lower Branch consists of agricultural pasture and cropland intermixed with hardwood and softwood forests. The upper Branch is less developed with more riparian forests and several beaver ponds and alder wetlands located in the upper reaches (T1-08 through T1-11).

3.0 METHODOLOGY

3.1 FLUVIAL GEOMORPHIC ASSESSMENT PROTOCOLS

All of the Phase 2 Assessments were conducted in accordance with the 2005 Vermont Agency of Natural Resources (VT ANR) Stream Geomorphic Assessment Protocols (VT ANR 2005) Steps 1-7. All of the collected data were recorded on the VT ANR Phase 2 data sheets and entered into the VT ANR Stream Geomorphic Assessment Web Based Data Management System (DMS). Copies of the DMS Reports are provided in Appendix B. Following a thorough quality assurance (QA) review, the previously collected Phase 1 data were updated based on the findings of the Phase 2 Assessments. Bridge and Culvert Assessments were also conducted throughout the study area and the collected data was recorded on the appropriate VT ANR Bridge and Culvert Data Sheets and later entered into the VT ANR Bridge and Culvert Database.

In accordance with the protocols each reach was walked in its entirety prior to collecting any measurements to allow for reach segmentation where appropriate and identification of potential bankfull identifiers and cross section locations. A detailed Site Sketch Map was created for each reach documenting the locations of cross sections, photo points, pebble counts, bank erosion and revetments, grade controls, debris jams, depositional features, channel cut-offs and avulsions, and other important features. Cross sections were measured at representative locations within each reach using a staff gauge and measuring tape.

3.2 QUALITY ASSURANCE AND QUALITY CONTROL

A thorough internal QA review was performed by The Johnson Company in December 2005. An independent QA review was performed by VT ANR in January 2006 and the Phase 1 and 2 DMS were updated on February 24 – 28, 2006. All of the collected data is stored in the

DMS and original copies of the data sheets may be found at The Johnson Company's office in Montpelier, VT.

4.0 RESULTS

4.1 WATERSHED SCALE STRESSORS

Figures 4 and 5 depict the geomorphic features identified on the Tyler Branch during the Phase 2 Assessments. Figures 6 and 7 depict the geomorphic features for The Branch.

4.1.1 Hydrologic Alterations

The Tyler Branch watershed is dominated by agricultural land and rural residential development. As shown in Figures 4 through 7, most of the riparian corridor is crop and pasture lands with some residential development near the floodplain boundaries. Based on field observations and historic maps, it does not appear that a significant amount of wetland loss has occurred in the watershed in the recent past, though given the large amount of straightening which has occurred on The Branch it is likely that some riparian wetlands were filled during the earth work. Some ditching and tile drainage was observed in the lower reaches of both the Branch and Tyler Branch (M01 to M04 and T1-01 to T1-06) which would contribute to diminished infiltration capacity and increased flows during heavy precipitation events. The effects of these increased flows appear to be relatively minor given the percentage of the watershed affected as a whole.

4.1.2 Dams

There are two dams located in the study area, one in T1-04, and one at the upstream end of T1-08 (Figures 5 and 6). Both dams were previously used for mill operations and/or power generation; however neither has been in use for at least the past 20 years. Both of the dams are constructed within naturally occurring bedrock gorges in areas which would have naturally acted as constrictions. A large amount of sediment, seen as enlarged bars, was observed immediately upstream of the dam located in T1-04, but these effects were limited to T1-04 and did not extend upstream to other reaches. The impounded reach upstream of the dam at the end of T1-08 was

not assessed as part of this project. No effects of the dam (i.e. large bars and excess sediment) were observed in T1-10 the nearest assessed reach upstream of the dam.

4.1.3 Sediment Load Indicators

As previously stated, a majority of the study area is dominated by agricultural land, mostly hay fields and pasture. Many of the agricultural lands are unbuffered and extend directly up to the stream bank. As can be expected, many areas of bank erosion are located along these unbuffered fields and are large contributors to the overall sediment regime of the study area. Discussion of individual reaches and areas of erosion are discussed in Appendix A.

Several large mass failures were observed in reaches M01, M04, M12, T1-02, and T1-08 and are shown on Figures 4 through 7. These mass failures, combined with the many other smaller bank erosion sites are major contributing factors to the overall sediment regime of the watershed.

Several of the reaches assessed within the study area contained multiple steep riffles, and enlarged bars, signs of the aggradational process which dominates the watershed. Other depositional features which were common include large point bars, diagonal bars, and side bars. Flood chutes were noted in the following reaches; M04, M05, M07, M09, M12, T1-03, T1-05, T1-06, T1-08, and T1-10. One large channel avulsion was noted near the downstream end of M04. The avulsion eliminated erosion on a mass failure which used to abut the stream channel, but now the stream is cutting into an adjacent unbuffered hay field. A few braided channels were observed in the upper reaches of The Branch, though all of them were associated with beaver activity where dams have blown out and the large slug of water and sediment formed a short braided section immediately downstream of the former dam.

4.2 REACH SCALE STRESSORS – BOUNDARY CONDITIONS

Individual narratives for each assessed reach are included as Appendix A. Below is a summary of the dominant reach scale stressors observed throughout the watershed. Figures 4

and 5 depict the geomorphic features identified on the Tyler Branch during the Phase 2 Assessments. Figures 6 and 7 depict the geomorphic features for The Branch.

4.2.1 Channel Bed Modifiers

Nearly every assessed reach within the study area was found to have some degree of historic degradation, suggesting that at some time in the past dredging and gravel mining were prevalent within the watershed. Dredging not only lowers the stream bed elevation at the excavation site, but the lower elevation migrates upstream via head cuts until a grade control is reached to halt the migration. Despite the numerous grade controls observed throughout the watershed, the degradation process was widespread, indicating that dredging occurred at multiple locations in both the Tyler Branch and The Branch. All of the measured incision ratios in the study area were less than 2.2, so while some incision has taken place, the streams still have limited access to their floodplains during high flow events. Active gravel mining and bar scalping were observed in the following reaches; M01, M02, M03, M07, M09, T1-03, T1-04, and T1-06. Based on information obtained from landowners, permits have been issued by VT ANR for gravel removal in M01, M07, and M09. No signs of any active mining from within the stream bed were observed in any of the reaches.

4.2.2 Bank and Riparian Vegetation Modifiers

Figures 4 through 7 show the locations of bank armoring and active erosion. Significant portions of some of the assessed reaches have been armored, with rip-rap being the most common method. The most significant armoring was noted in reaches M01 through M10. While the rip-rap has helped to limit the amount of bank erosion, it has also prevented the stream from completing its natural evolution process where a degraded stream, such as the Tyler Branch and The Branch, widens to create new floodplain. Areas of extensive rip-rap also tend to transfer energy downstream and erode the nearest unprotected bank as is evident in reach M07 where a long section of the left bank was recently rip-rapped to protect an adjacent hayfield. The rip-rap area ended at the property line and now the unarmored bank just downstream of the rip-rap has begun to erode.

Lack of riparian buffer and woody vegetation is perhaps the largest stressor to the Tyler Branch watershed, as is common in many areas dominated by agricultural. Riparian buffers serve many functions. They help to stabilize stream banks and prevent erosion, provide shade and cover for aquatic species, and serve as natural filters to help remove excess nutrients and organic matter from the system. The following reaches were identified as having inadequate buffer widths; M04, M07, M09, M11, T1-01, T1-02, T1-03, T1-05, and T1-07. In addition to the lack of adequate buffer, portions of many of these reaches are utilized for pasture with cows having access to long segments of the stream channel. This not only contributes additional nutrients directly to the water column, but often leads to additional areas of erosion.

4.3 REACH SCALE STRESSORS – ENERGY GRADE

4.3.1 Slope Modifiers

Channelization has had a major geomorphic impact on the watershed, particularly The Branch. Straightening increases the channel slope and power and velocity of the water within the stream. This can lead to degradation and increased stream bank erosion. Based on review of aerial photos, field observations, and the calculated meander ratios (the meander width measured from the outside of one meander bend to another divided by the bankfull channel width – in an undisturbed system this number is typically near 6) the following reaches appear to have been straightened in the past: M04B (meander ratio of 2.5), M05 (3.0), M09 (3.0), M12 (3.3), T1-01 (2.5), T1-03 (2.8), T1-05 (2), and T1-07 (2.5). T1-02 also appears to have been straightened, but with a meander ratio of 7, has regained some of its meander pattern through degradation, aggradation and widening. Many of these reaches have begun to reestablish new meander patterns, and through bank erosion and aggradation, establish new floodplains. While this is a natural evolutionary process that, over time, will result in a more stable system, there are many human interests which have been placed in the river corridor that can be affected such as homes and agricultural fields. A further discussion of the impacts of channelization within the watershed is presented in Section 5 below.

Numerous channel constrictions were observed throughout the watershed. These include both natural constrictions, such as bedrock gorges, and human made ones, such as bridges and dams. Naturally occurring bedrock channel constrictions were found in the following reaches; M04B, M12, T1-02, T1-08, and T1-11. Human made constrictions (bridges) were observed in M04B, M09, and M12. The effect of these constrictions was limited to the immediate area upstream and downstream of the constriction and was principally the accumulation of excess sediment above the constriction.

There are two dams located in the study area, one in T1-04, and one at the upstream end of T1-08 (Figures 5 and 6). Both of these dams were constructed in naturally occurring bedrock gorges. A large amount of sediment, seen as enlarged bars, was observed immediately upstream of the dam located in T1-04, but these effects were limited to T1-04 and did not extend upstream to other reaches. The impounded reach upstream of the dam at the end of T1-08 was not assessed as part of this project.

4.3.2 Floodplain Modifiers

No active head cuts were observed throughout the watershed. Nearly all of the reaches had calculated incision ratios of 1.4 to 1.8, indicating that some level of degradation has occurred. It is likely that this degradation is a result of a combination of historic straightening and dredging, which has lowered the streambed elevation. Nearly all of the reaches still have access to at least portions of their historic floodplain, which may be why more severe erosion and other adjustment factors were not seen.

While there were some documented river corridor encroachments within the watershed, they were not as substantial as what would be expected in a more urban setting. Roads have encroached upon portions of T1-06, T1-08, M07, M10, M11, and M12. Limited berm construction was also observed in M07.

4.4 BRIDGE AND CULVERT ASSESSMENTS

A total of 17 Bridge Assessments were completed within the study area. Summary reports from the VT ANR DMS are included in Appendix B. None of the assessed bridges were found to be threatened by nearby bank erosion or undermining abutments. Several bridges are slightly undersized and act as local channel and floodplain constrictions, though none of the identified problem areas are directly associated with a particular bridge. During future bridge replacement projects the collected data should be used to ensure that the new bridges are correctly sized.

5.0 PRELIMINARY PROJECT IDENTIFICATION

5.1 DEPARTURE ANALYSIS – CHANNEL EVOLUTION STAGE

Based on the field measurements taken during the Phase 2 Assessments, it appears most of the assessed reaches in the watershed are in evolution stage II (degradation) or III (widening). The basic evolution model has five stages. In Stage I the stream is in equilibrium condition. In Stage II stream degradation is triggered by some stressor whereby the stream bed elevation is lowered and the stream no longer has adequate access to its floodplain. Without floodplain access, which dissipates the energy during high flow events, the stream banks erode and the channel widens (Stage III). The widened channel does not have the force to move all of the sediment through the system so sediment buildup and aggradation occur and a new floodplain begins to form at a lower elevation (Stage IV). Once the new floodplain is fully developed the stream is back in equilibrium (Stage V). Further information regarding stream evolution models can be found at http://www.anr.state.vt.us/dec/waterq/rivers/htm/rv_geoassess.htm. Stream type departures were observed in only three of the 20 reaches; T1-01, T1-03, and T1-05A which all have departed from their reference type (C) to a B type channel due to historic degradation. The other reaches have all experienced some degree of historic degradation, though not enough to eliminate total floodplain access. Dredging and straightening (discussed in Sections 4.3.1 and 4.2.1) have both occurred in the reaches and likely account for the bulk of the observed degradation. Many naturally occurring bedrock grade controls were observed throughout the reach and may partially explain why more severe degradation has not occurred within the

watershed. The grade controls are fairly evenly spaced throughout the reach and naturally stop head cuts from moving upstream. Those reaches which are in evolution stage III are in the process of widening, but have not yet widened enough to depart from their reference conditions. The lack of extensive over widening may be explained by both natural geologic and anthropogenic factors. The watershed is located within a relatively narrow valley with steep, primarily bedrock and glacial till valley walls which are resistant to erosion when the stream channel bumps against them. In addition, a number of stream banks in the watershed are rip-rapped, which would impede lateral movement. A few reaches, M01, M10, T1-02, and T1-08, appear to be in evolution stage IV, and have developed a partial floodplain at a lower elevation. All of these reaches still have some limited access to their historic floodplain as well with incision ratios of 1.5 to 1.8.

The sediment regime for the watershed is dominated by aggradation. A tremendous amount of excess sediment was observed throughout as seen by enlarged point, side, mid-channel, and diagonal bars. Multiple steep riffles were also observed. Some rather significant erosion was noted at various points, but not enough to account for all of the observed stored sediment. Two factors could explain this discrepancy: 1) The tributaries which were not assessed as part of this project are contributing a great deal of sediment to the system, and 2) The watershed is a naturally high bedload system, and historic dredging and gravel mining have been used to reduce the build up of sediment. Most likely it is a combination of both of these factors which explains the current sediment regime of the system.

5.2 SENSITIVITY ANALYSIS – DOMINANT ADJUSTMENT PROCESS

The dominant adjustment process for the overall watershed appears to be primarily aggradation, and to a lesser extent widening. As stated above, most of the assessed reaches are in evolution stage II and III, though those in Stage II are no longer actively degrading. Based on the evolution stage and stream type, nearly all of the reaches have a sensitivity of high to very high with the potential for further widening and bank erosion. Many areas of both The Branch and Tyler Branch are already rip-rapped (figures 4-7) which limits the potential areas of bank

erosion. Those areas with limited riparian buffer (M04, M07, M09, M11, T1-01, T1-02, T1-03, T1-05, and T1-07) are most sensitive to further widening. Of those, M11, T1-02, T1-03, and T1-07 all have residential properties within the natural meander belt width of the stream (approximately six times the bankfull width). These reaches should be targeted for buffer reestablishment and/or active bank stabilization to limit potential property loss from erosion. At the same time, those reaches without significant anthropogenic receptors (T1-08 through T1-11, and M12) may be good candidates for corridor protection so that they may be allowed to naturally move through the evolutionary process.

5.3 POTENTIAL PROJECT AREAS

Based on the results of the Phase 2 Assessments and visual observations, potential restoration/corridor protection projects identified within the watershed are described below. Figures 8 through 11 depict the project locations. Photos of some of the project areas are shown in Appendix C. There are several State and Federal Programs which could potentially provide funding in support of these projects such as the Conservation Reserve Enhancement Program (CREP), which compensates landowners for the loss of cropland to enhance riparian buffers.

- **The Branch T1-01** (Photo Point 1) – Priorities for T1-01 include the reestablishment of a woody vegetative buffer to prevent further stream bank erosion and reduce nutrient inputs. Currently, most of the reach has no buffer and is bordered by pasture, hay, and cornfields. Nearly the entire reach is accessible to cows, so part of the buffer reestablishment should include fencing to minimize the cows' access to the stream channel.
- **The Branch T1-02** – The eroding bank (approximately 4 feet high and 150 feet long) just upstream of the cemetery and lack of riparian buffer are the major problem areas in the reach. To protect the cemetery and the hayfield which is currently being eroded, some sort of bank stabilization is needed. Various techniques are available including tree revetments, vegetated geogrid and gabion baskets, coconut fiber logs, rip-rap, and others. Any bank stabilization project should also include reestablishment of a vegetated buffer along the adjacent hayfield.
- **The Branch T1-02/T1-03** – A corridor protection project should be implemented for the tributary that enters The Branch between T1-02 and T1-03. The tributary currently flows through a barnyard and cattle feeding area on the western side of Route 108. In order to limit nutrient inputs into the watershed, it may be possible to work with the farmer to

move the feeding area away from the stream and establish some riparian buffer to capture some of the runoff.

- **The Branch T1-05** – T1-05 suffers from a lack of vegetative buffer between the stream channel and the adjacent barnyard, hayfields, and pasture. Reestablishment of a wooded buffer along both banks would go a long way towards limiting nutrient inputs and reducing potential future bank erosion.
- **The Branch T1-07** – Like T1-05, T1-07 has almost no woody buffer along the right bank. Establishment of a wooded buffer would not only provide shade and other aquatic habitat improvements, but also prevent potential future erosion and reduce nutrient inputs.
- **The Branch T1-08 to T1-11** – These four reaches, and likely those further upstream as well, are good candidates for the implementation of a corridor protection plan. Currently no major residential development exists within the riparian corridor, which is dominated by a wooded buffer of at least 50 feet on both sides. This plan would document the value that these reaches provide to the watershed (aquatic habitat, sediment and nutrient attenuation, floodwater attenuation, and fluvial adjustment capacity) and ensure that they continue.
- **Tyler Branch M01** (Photo Point 2 and 3) – Two problem areas were noted in M01, a very large mass failure near the confluence with the Missisquoi, and an eroding bank near the upstream end of the reach. Given the rather remote access and size of the mass failure, it would be a very expensive and labor intensive process to stabilize the entire bank. The lower portion of the bank is primarily clay, which is somewhat resistant to erosion, and some lower portions of the bank are beginning to re-vegetate. To maximize the use of limited resources, it may be best to focus restoration efforts on smaller scale projects which could achieve better results with less effort. The eroding bank near the upstream end of M01 is a good example. Currently, the land owner is attempting to stabilize the bank by placing fill along the stream bank. While this may provide some protection in the short term, the fill will also wash away over time and provide unnecessary sediment and nutrients to the system. It may be possible to work with the landowner to provide a more permanent bank stabilization solution, such as those described for T1-02.
- **Tyler Branch M04** (Photo Point 4) – An eroding bank along the unbuffered hayfield near the downstream end of M04 would be a good candidate for stream bank stabilization. Along with bank stabilization, reestablishment of a woody buffer should also be considered for the site.
- **Tyler Brach M07** (Photo Point 5 and 6) – A large portion of M07 is already secured with rip-rap, but the bank just downstream of some of the rip-rap is actively eroding. There is a newly constructed house a few hundred feet from the bank, which may become endangered if the erosion continues. Therefore, some sort of stream bank stabilization is necessary along this bank. In addition, further upstream it appears there has been some berming along the right bank to prevent flooding in the adjacent hayfield. If an

agreement can be worked out with the landowner it would be beneficial to remove this berm and reestablish floodplain access for the river.

- **Tyler Branch M09** (Photo Point 7) – Two major problems were noted in M09, virtually no riparian buffer, and cattle access to the streambed throughout the reach. The entire right riparian corridor, including the stream channel is utilized for pasture, and a travel corridor for cattle to access upstream grazing areas. It may be possible to work with the landowner to reestablish an adequate buffer, and limit the cows' access to the stream channel to reduce nutrient inputs.
- **Tyler Branch M11** – Like M09, M11 suffers from a lack of riparian buffer along the downstream end of the reach. While there is no major active erosion currently taking place, establishment of woody vegetation would stabilize the stream bank and help prevent erosion in the future.

6.0 REFERENCES

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United States Department of Agriculture Soil Conservation Service, Soil Survey of Franklin County, Vermont, 1979.

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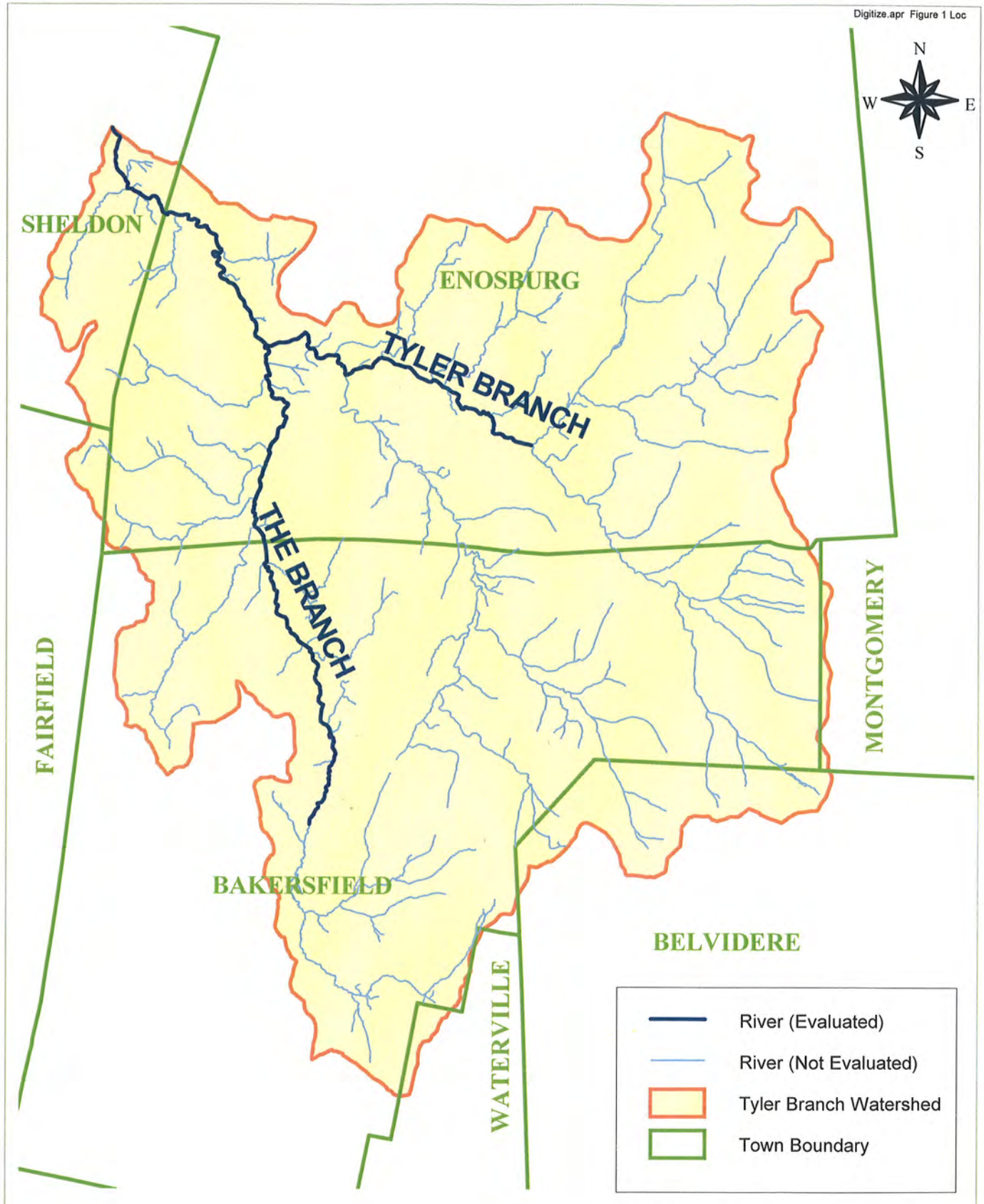
FIGURES



Sources: VCGI Town Boundaries, Subwatersheds and Rivers Layers

Figure 1. Watershed Geographic Setting
Tyler Branch and The Branch Rivers
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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DATE: 3/1/06 PROJECT: 3-1313-1
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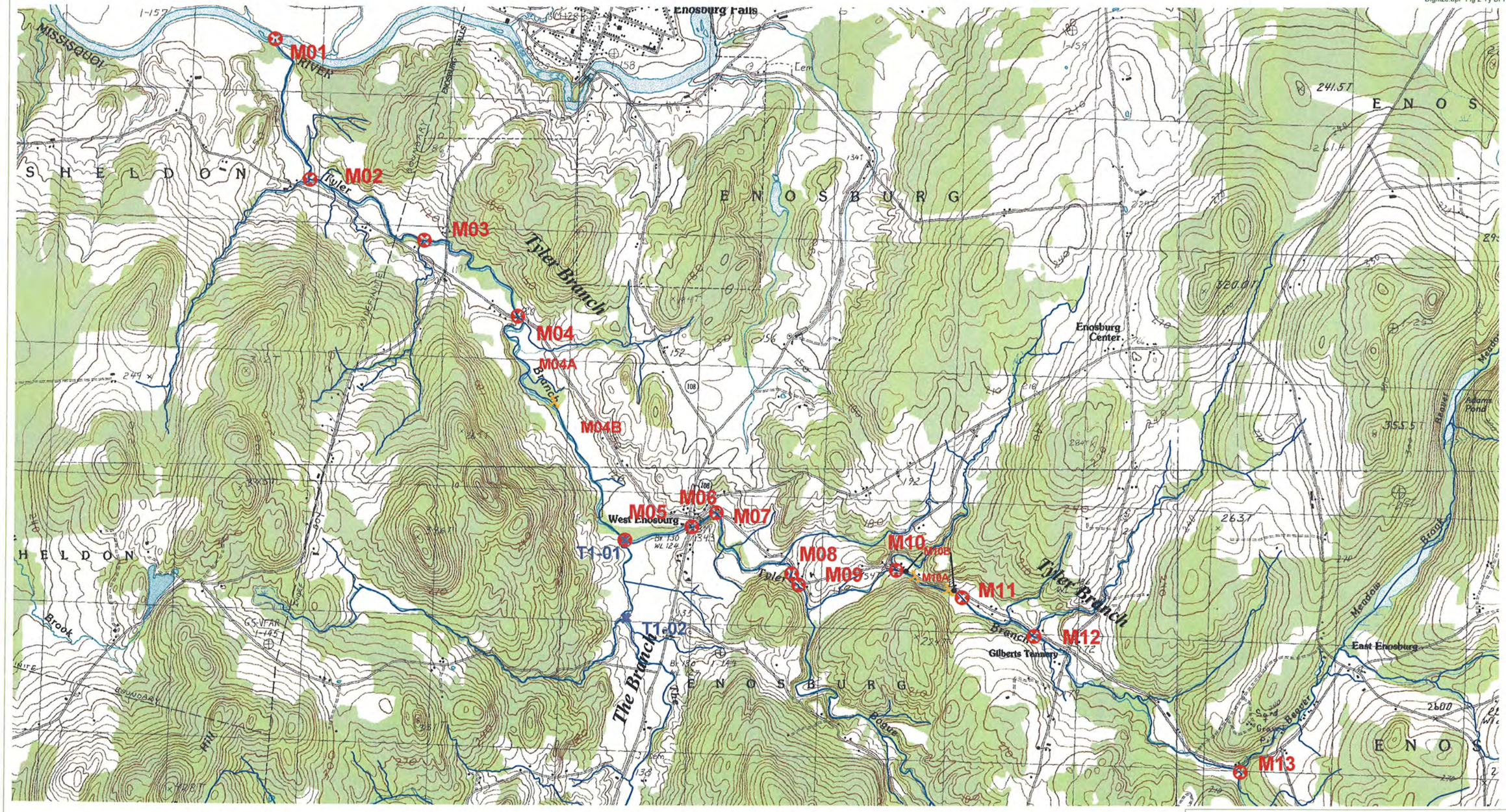

Sources: USGS 7.5' Topographic Map Quadrangles Bakersfield, VT 1986, Cold Hollow Mountain, VT 1986, VCGI Rivers Layer, Reach Breaks from SGAT Tyler Branch 9/1/04.

Figure 2. Tyler Branch Reach Breaks
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Enosburg-Bakersfield, Vermont

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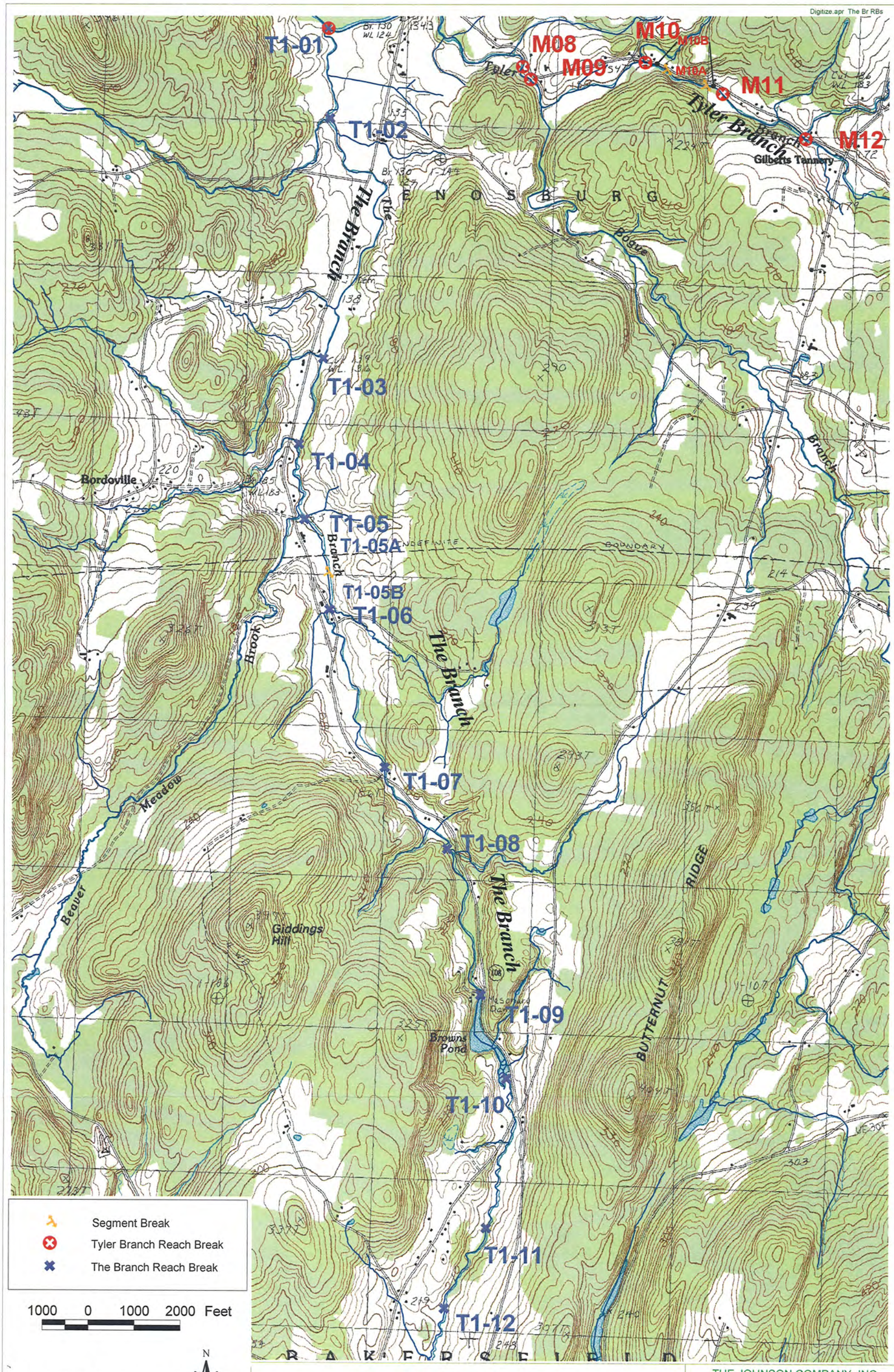

Sources: USGS 7.5' Topographic Quadrangle Bakersfield, VT 1986, VCGI Rivers Layer, Reach Breaks from SGAT Tyler Branch 9/1/04.

Figure 3. The Branch Reach Breaks
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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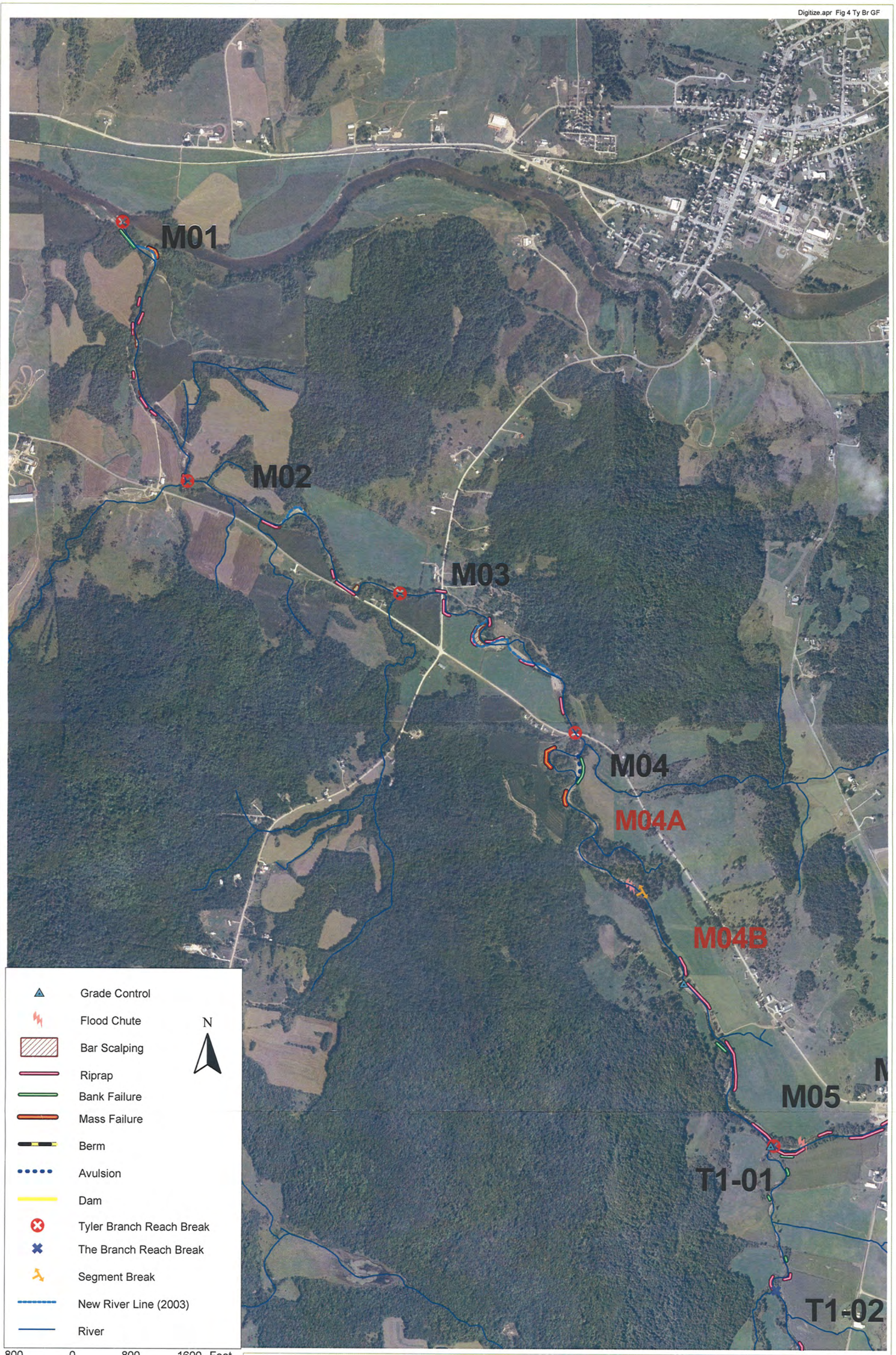

Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 4. Geomorphic Features- Tyler Branch Reach M01-M04 Phase 2 Geomorphic Assessment Enosburg-Bakersfield, Vermont

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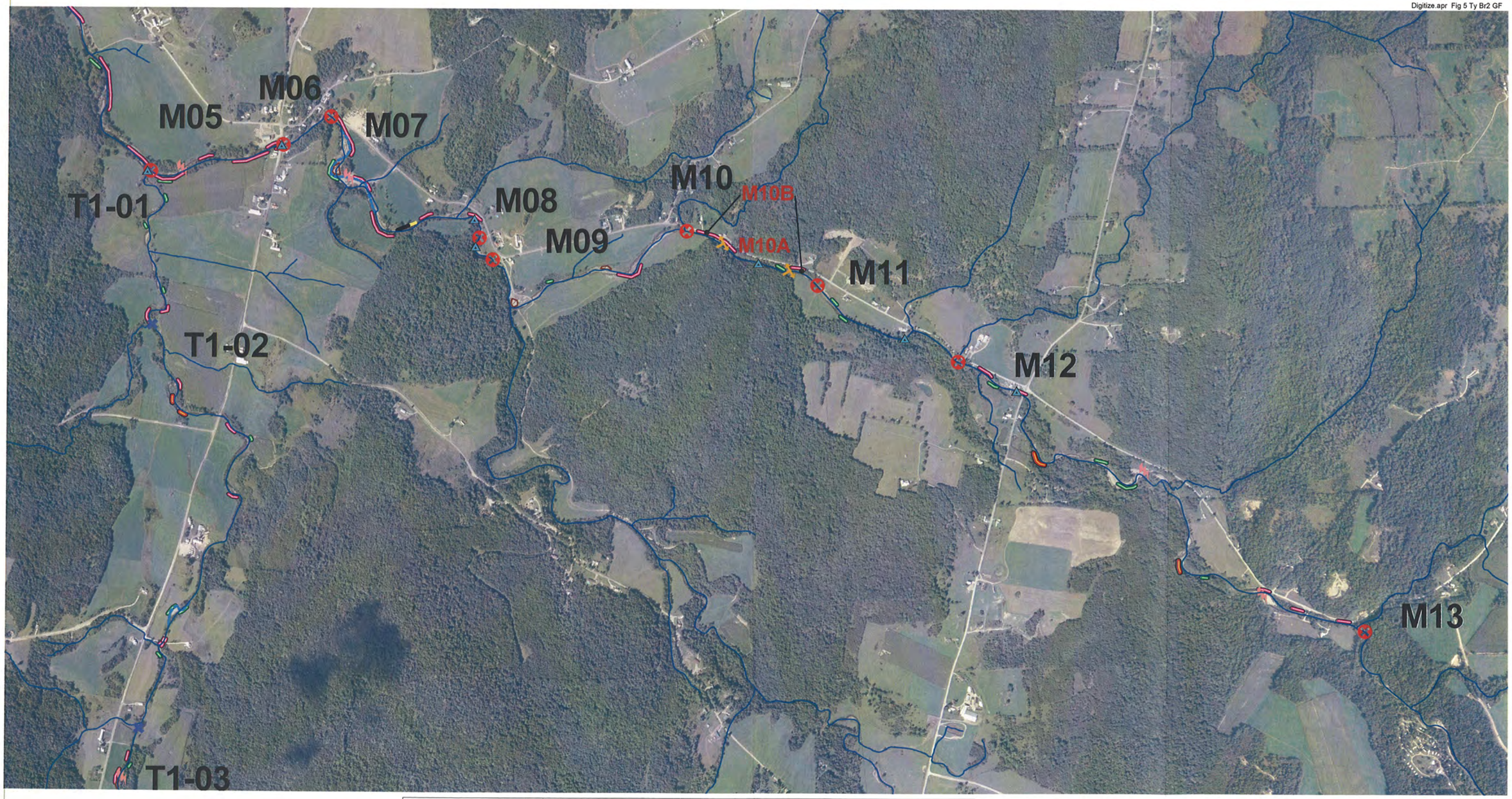

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Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

- Grade Control
- Flood Chute
- Bar Scalping
- Riprap
- Bank Failure
- Mass Failure
- Berm
- Avulsion
- Dam
- Tyler Branch Reach Break
- The Branch Reach Break
- Segment Break
- New River Line (2003)
- River

N

Figure 5. Geomorphic Features- Tyler Branch Reach M05-M12
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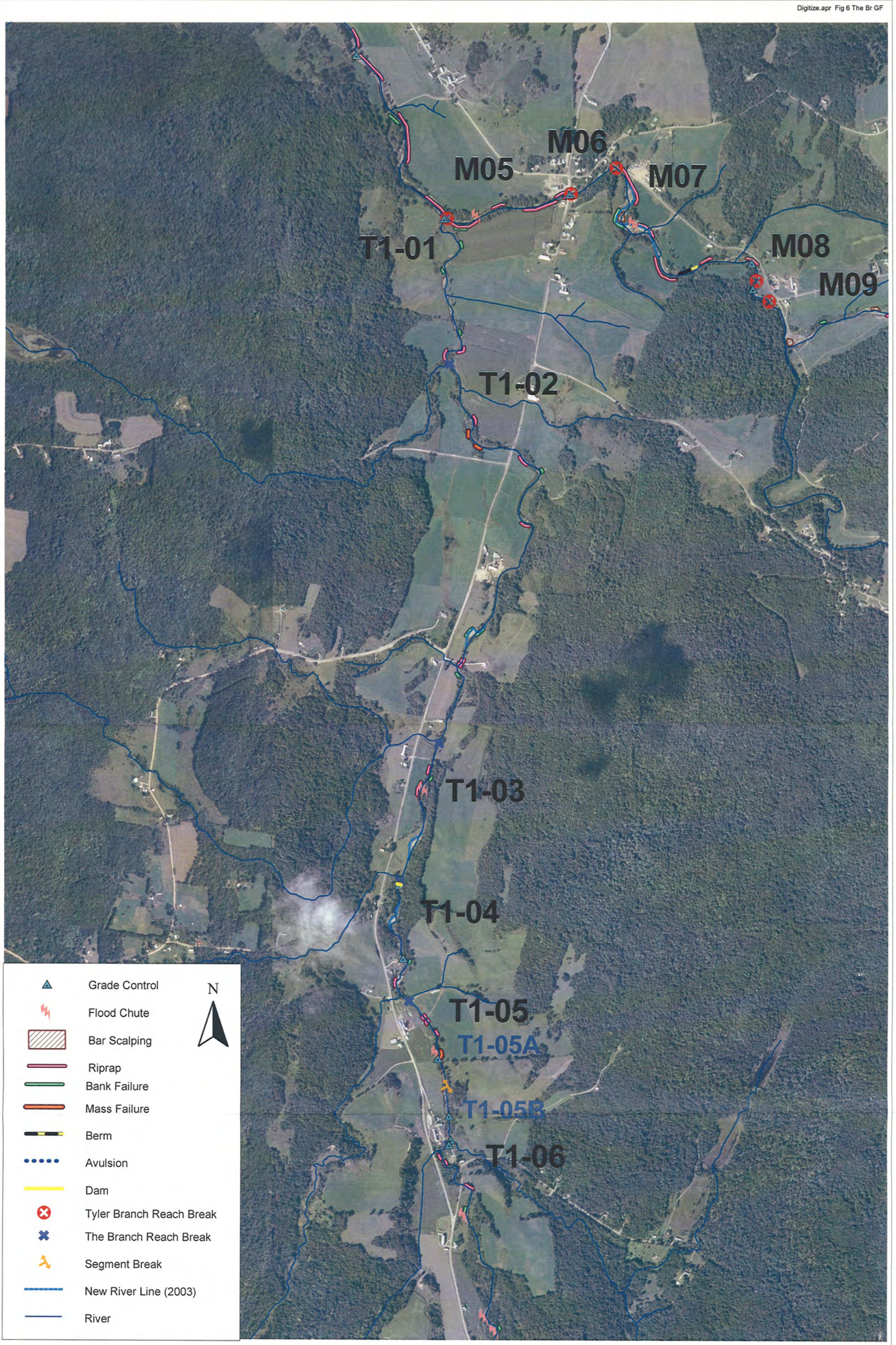

Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 6. Geomorphic Features- The Branch
Reach T1-01-T1-05
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Enosburg-Bakersfield, Vermont

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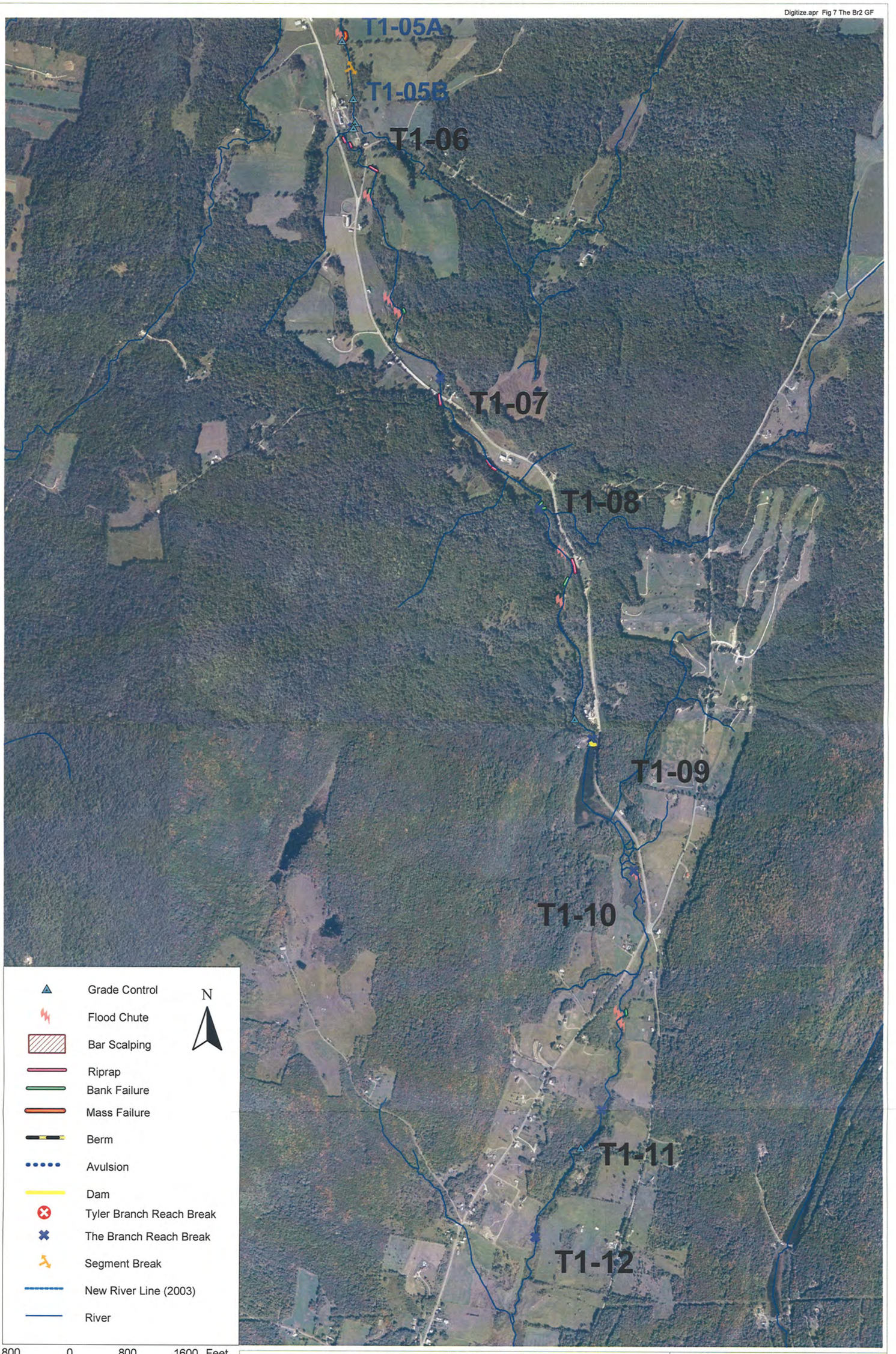

Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 7. Geomorphic Features- The Branch
Reach T1-06 - T1-11
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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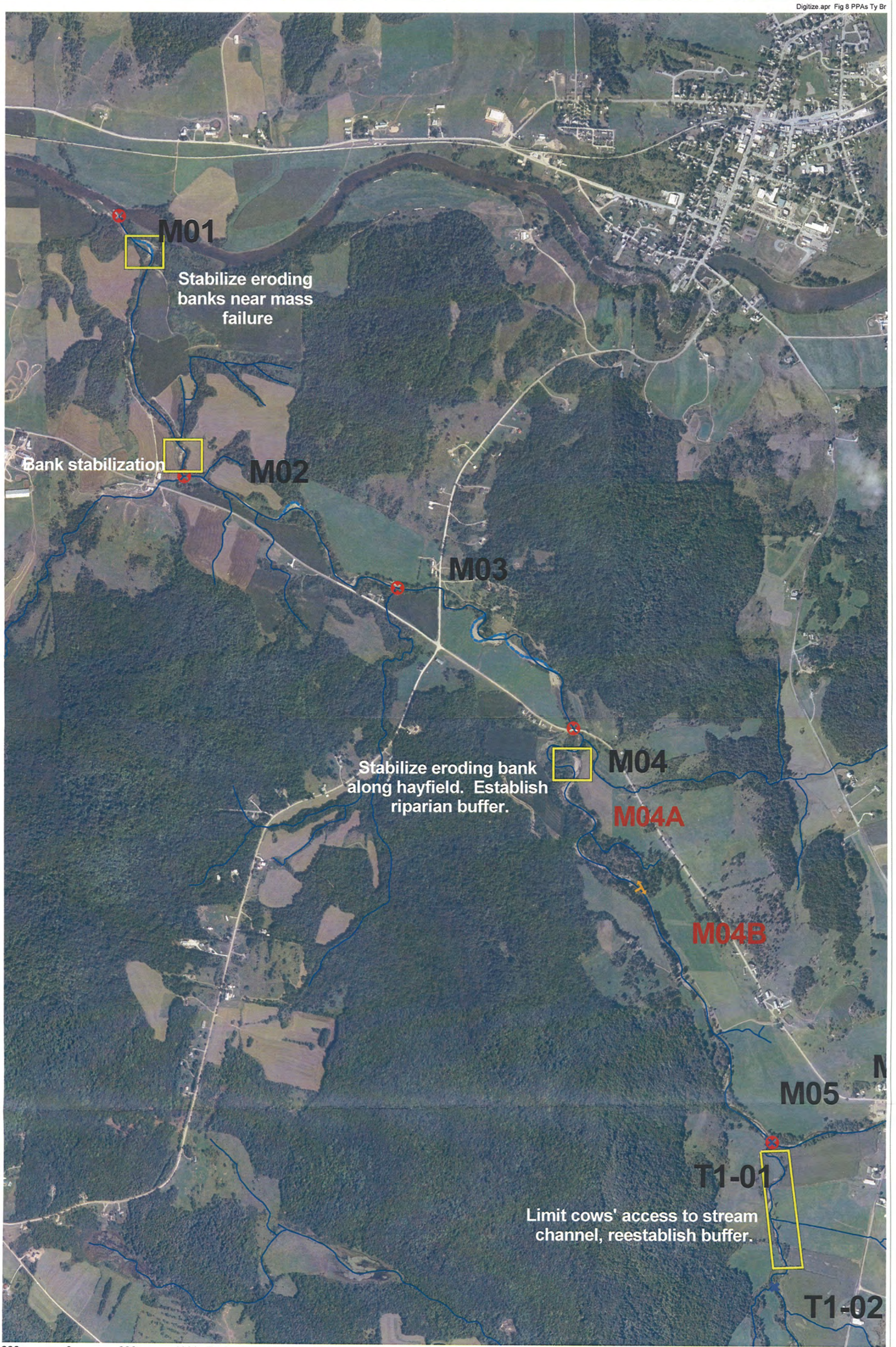

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Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 8. Potential Project Areas- Tyler Branch
Reach M01-M04
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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M05

M06

M07

Stabilize eroding bank. Reestablish woody vegetation buffer.

M08

M09

M10

M10B

M10A

M11

M12

M13

T1-01

ccess to stream
stablish buffer.

Remove berming along streambank. Reestablish woody buffer.

T1-02

Reestablish woody vegetation buffer. Limit cows' access to channel.

Reestablish buffer.

Stabilize eroding bank near cemetery.

T1-03

800 0 800 1600 2400 Feet

N

Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 9. Potential Project Areas- Tyler Branch Reach M05-M12 Phase 2 Geomorphic Assessment Enosburg-Bakersfield, Vermont

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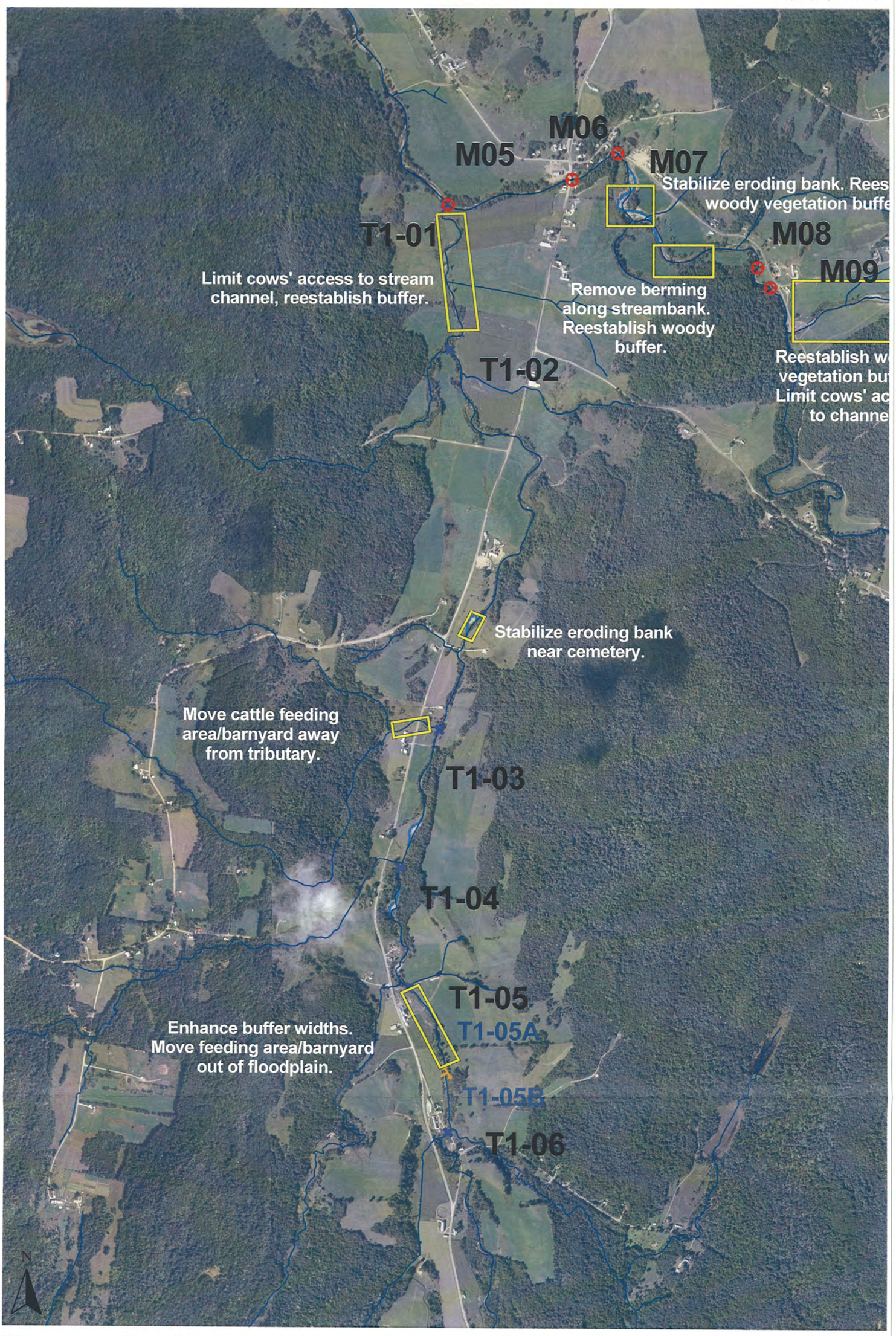

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Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 10. Potential Project Areas- The Branch
Reach T1-01-T1-05
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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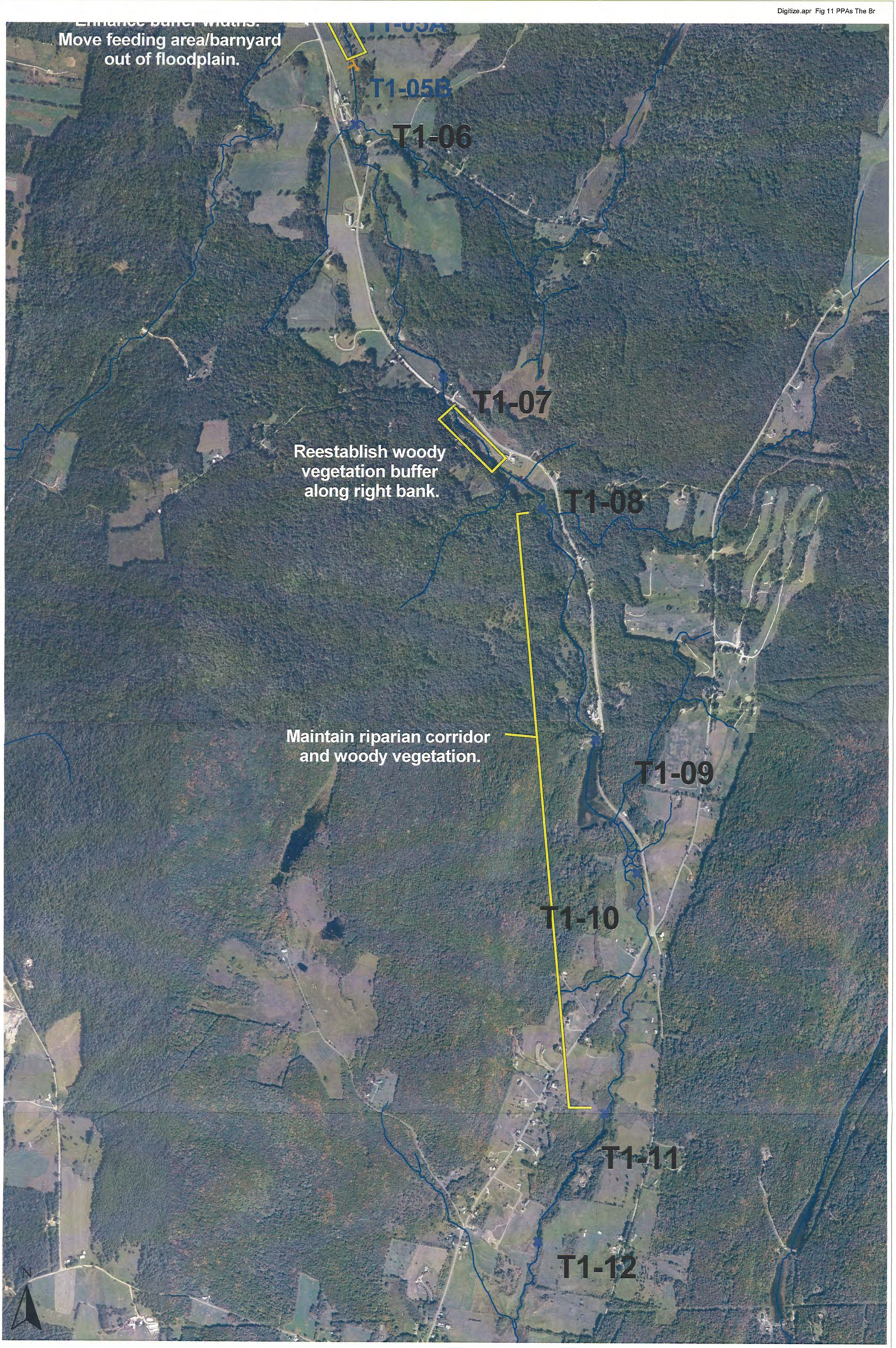

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Sources: NAIP 2003 Orthophotos for Enosburg Falls, VT, Richford, VT, Bakersfield, VT and Cold Hollow Mountains, VT; river lines from VCGI; reach breaks from SGAT Tyler Branch, 9/1/04; all other features from The Johnson Company assessment, 2005.

Figure 11. Potential Project Areas- The Branch
Reach T1-06-T1-11
Phase 2 Geomorphic Assessment
Enosburg-Bakersfield, Vermont

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APPENDIX A

INDIVIDUAL REACH NARRATIVES

The Branch – T1-01

T1-01 is the most downstream reach on The Branch and extends from the confluence with the Tyler Branch to the first major tributary approximately 2,500 feet upstream. The Phase 2 stream type was found to be a B gravel stream, a departure from the Phase 1 reference C stream type. The departure was mainly due to historic degradation which has caused relatively high incision of 1.8, and an entrenchment of 1.8. No active head cuts were observed within the reach so it appears degradation is not currently occurring. Multiple large bars and other aggradational features were observed and based on field observations the reach appeared to be in Stage III of evolution, widening. The reach had an overall geomorphic score of 0.7, right in the middle of "good" and had a habitat assessment score of 0.68. A few areas of erosion were noted on the right and left bank, (220 total feet at an average height of six feet) particularly near the downgradient end of the reach along the right bank were a corn field abuts the stream channel with no buffer. The entire lower half of the reach is utilized for pasture with cows having access to the streambed. Portions of the reach may have been straightened in the past, as demonstrated by the relatively low belt width ratio of approximately 2.5. One grade control was noted at the downstream end of the reach at the confluence with the Tyler Branch. The dominant buffer widths for the reach were <5 feet on the left and 5-25 feet on the right. The riparian corridor for the entire reach is dominated by pasture on the left and hay on the right.

The Branch – T1-02

T1-02 extends from the end of T1-01 to the confluence with the next major tributary, approximately 1 ¼ miles upstream. The lower 500 feet of the reach was occupied by a beaver dam thus was not included in the assessment. The reach was found to be a C gravel type stream, which was consistent with the Phase 1 reference stream type. The major adjustment processes were found to be minor historic degradation (incision of 1.5 with no active head cuts observed) and minor active aggradation and widening as seen with a few enlarged point bars. The reach appeared to have been historically straightened, though the meander ratio of approximately 7 indicates that it has begun to regain some sinuosity. As such, the reach appears to be in Stage IV of adjustment and has begun to redevelop floodplain access. The habitat and geomorphic assessment scores were both calculated in the "good" range with scores of 0.66 and 0.72, respectively. The left riparian corridor of the reach is dominated by hayfields, while the right is a mixture of pasture and forest land. One large mass failure (approximately 30 feet high and 80 feet long) is located just downstream of the bridge which crosses Rt. 108. The failure currently is relatively stable and is beginning to re-vegetate. One other bank failure was noted just upstream of the bridge where a portion of the adjacent cornfield runs into the streambank. A large area of bank erosion and planform adjustment was noted just upstream of a cemetery located along the left bank. A meander is beginning to form in this area causing a large area of bank erosion on both sides of the channel. If the migration continues, it may threaten to erode portions of the cemetery, though it is still several hundred feet from doing so. This area may be a good candidate

for potential restoration activities such as tree revetments, plantings and maybe some rip rap.

The Branch T1-03

T1-03 is located from T1-02 to the next unnamed tributary that enters the Branch approximately 2,000 feet upstream. Like T1-01, T1-02 was found to be a B gravel stream with a c sub-slope of 1.5%, which was a stream type departure from the reference Phase 1 C stream type. The major adjustment processes was historic degradation (incision of 1.5) as no active head cuts were documented. The reach was found to be in Stage II of evolution and appears to have degraded in the past, but has not yet begun to widen with the exception of the upstream end of the reach which is migrating across the adjacent meadow. The reach historically has been straightened as is evident from the aerial photos and the meander ratio of 2.8. The channel was pushed against the right valley wall in the past, and along the unbuffered upper end it has begun to migrate back towards its original path forming a large point bar to the right of the channel. The original channel meander bend is still visible in the meadow. The habitat and geomorphic scores for the reach were 0.7 and 0.68 respectively, both in the "good" range. Relatively minor bank erosion was noted along both the right and left bank with a total length of 100 feet and an average height of 4 feet. The riparian corridor was dominated by pasture on the left side and a mix of forest and pasture on the right. Buffers ranged from <5 to 25 feet along the left and 5 to 50 feet along the right. A small area of minor bar scalping was observed in the middle of the reach and cows have access to the streambed for the upper ½ of the reach. A large dam and bedrock gorge are located just upstream of the reach in the lower portion of reach T1-04.

The Branch T1-04

T1-04 is located from T1-03 to the confluence with the next small tributary located near the intersection of Bordoville Road and Vermont Rt. 108. The lower portion of the reach contains a relatively large dam situated in a naturally occurring bedrock gorge. Both act as channel and floodplain constrictions. Another bedrock gorge (100 feet long and 34 feet wide) is located in the middle of the reach. The stream type was found to be a C gravel riffle pool stream, consistent with the Phase 1 reference type. The major adjustment process was aggradation with multiple large bars and steep riffles present throughout the reach. It appears the reach is in the widening stage of channel evolution (stage III) as the bankfull width was found to be slightly wider than the reference width. Some minor bar scalping was observed on the large bars just upstream of the dam. The habitat and geomorphic scores were 0.71 and 0.70 respectively, both in the "good" range. One small area of bank erosion was noted along the right bank (20 feet long and 5 feet high). The dominant land use within the riparian corridor was residential and forest on the left, and a mix of forest and hay fields on the right with relatively wide buffers ranging from 50 to >100 feet on the majority of both sides. A large, formerly eroding bank in the upper portion of the reach was rip-raped a few years ago. The rip-rap appeared to be in good condition, though the vegetation planted above the rip-rap has died.

The Branch T1-05

T1-05 is located from the confluence with Beaver Meadow Brook to the bridge on Ovitt Road near the intersection with Hennessey Road. The reach was segmented into T1-05A and T1-05B. T1-05A consists of the lower 2/3 of the reach and was found to be a B gravel stream with a sub-slope of <2%. T1-05B was segmented from T1-05 due to its narrower valley, larger substrate, and increased channel slope. Segment B was found to be a B cobble stream. T1-05A had undergone a stream type departure from a reference C type stream to the current B type channel due to historic degradation, which has lowered the entrenchment to 1.7 and increased the incision ratio to 2.2. The segment no longer has access to its original floodplain and was found to be in stage II of evolution. The channel historically has been straightened as is evident by the relatively low meander ratio of 2. The habitat and geomorphic assessment scores were 0.64 and 0.56 respectively. Despite the large incision, there was relatively little erosion noted in the segment with the exception of on large bank failure located in the middle of the segment, which was caused by a debris jam that pushed the stream into the adjacent bank. The riparian corridor was dominated by hay and pasture on both sides with a relatively narrow buffer ranging from <5 feet to 25 feet. A large portion of the reach was accessible by cows and a nearby barnyard and cattle feeding area border the lower portion of the segment. A lack of riparian buffer between the barnyard and the stream is acting as a large source of nutrient input into the watershed.

T1-05B may have also been straightened in the past, though more likely is a naturally straight segment in a narrow portion of the valley with a greater slope and larger substrate. The geomorphic and habitat assessment scores were 0.83 and 0.76 respectively, very near reference condition. The dominant adjustment process was very minor historic degradation, though with an incision ratio of 1.2, the segment was still found to be in stage I of evolution and still has access to its floodplain. The right riparian corridor was dominated by mixed trees and had an adequate buffer of 50 to >100 feet. The left riparian corridor consisted of pasture with a narrow buffer of <5 to 25 feet. The pasture was a narrow band of flat land within the narrow valley that is used as a corridor for cows to move from a barn located upstream to a larger pasture located downstream alongside T1-05A. This lack of a buffer on the left was the only major problem noted within the reach, and no erosion was observed.

The Branch T1-06

T1-06 is located from the end of T1-05 to the bridge on Vt. Route 108 near the intersection with Pudvah Hill Road. The stream was found to be in regime with its Phase 1 reference stream type, C gravel, riffle-pool. The dominant active adjustment process was aggradation, as several large point, side and diagonal bars were observed in the channel, along with multiple steep riffles. The channel was braided in several sections downstream of old beaver dams which have blown out in the recent past. No recent beaver activity was observed, but remnants of the old dams were present. The habitat assessment resulted in a score of 0.66 or "good" while the geomorphic assessment resulted in a "fair" score of 0.54 mainly due to the current aggradation, widening and

planform adjustments noted during the assessment. A channel evolution stage of III was chosen as the measured bankfull width of 40 feet was significantly wider than the Phase 1 width of 31 feet. Two small areas of bank erosion were noted in the middle of the reach, though overall the streambanks appeared to be relatively stable. Rip-rap was present along both banks near the two bridges located at the downstream end of the reach. Both bridges act as floodplain constrictions and a great deal of sediment was observed above and below them. A bedrock grade control was found at the downstream boundary of the reach which prevents any bed elevation changes from moving upstream. The riparian corridor was dominated by hay fields and pasture on both sides, though a buffer ranging from 5 to >100 feet was present throughout. Cows were observed in the stream bed throughout the lower third of the reach.

The Branch T1-07

T1-07 is located from T1-06 to approximately 0.5 miles north of the intersection of Pudvah Hill Road and Vt. Route 108. The stream was found to be in regime with its Phase 1 reference stream type, C gravel, riffle-pool. The dominant adjustment process was minor historic degradation, as evident by the incision ratio of 1.5. Also, it appears historically that the reach was straightened based on field observations and the low meander ratio of 2.5. This historic increase in channel slope and/or alteration of the channel bed during straightening is likely the cause of the historic degradation. A good deal of channel aggradation was also noted through large point bars and multiple steep riffles. The channel was found to be in Stage III of evolution as it begins to form new meanders and a lower elevation floodplain. The habitat and geomorphic assessment evaluations scored 0.71 and 0.69 respectively, both in the "good" range. A 140 foot long by 4 foot high area of bank erosion was noted on the right bank along an unbuffered portion of an adjoining hay field. One house was noted along the right bank which is close to being in the floodplain. The riparian corridor was dominated by a mix of forest and residential on the right and hay and forest on the left. Both banks had a buffer width ranging from 5 to 100 feet.

The Branch T1-08

T1-08 is located from the end of T1-07 to Brown's Pond Dam. The stream was found to be in regime with its Phase 1 reference stream type, C gravel, riffle-pool. The dominant active adjustment process was aggradation as multiple steep riffles and enlarged bars were observed throughout the reach. Minor historic degradation was also evident. The stream was found to be in Stage IV of evolution as the aggradation and planform adjustments have formed a new lower elevation flooplain, though the stream still has limited access to its historic floodplain as well. The middle of the reach was dominated by beaver activity with two large dams impounding approximately 600 feet of the channel. One large mass failure (150 feet long by 20 feet high) was noted along the left bank near the lower end of the reach. Another smaller bank failure (100 feet long by 3 feet high) was noted further upstream. The riparian corridor was dominated by forest on both sides with no apparent human caused impacts to the corridor with the exception of a telephone line which runs along the stream bed in several locations. The upstream

end of the reach consists of a large bedrock gorge and Brown's Pond Dam which was built within the gorge.

The Branch T1-10

T1-10 extends from just downstream of the intersection of Route 108, and King Road to approximately 4,000 feet upstream. The stream was found to be in regime with its Phase 1 reference stream type, C gravel, riffle-pool. The dominant adjustment process was historic minor degradation and the stream was found to be in Stage II of evolution. The habitat and geomorphic assessment scores were 0.74 and 0.76 respectively. Despite the historic degradation, the stream still has access to its floodplain (incision of 1.4) during larger flood events. The upper ½ of the reach was dominated by several abandoned beaver dams. One small area of bank erosion was noted mid-reach (30 feet long by 6 feet high), though overall the stream banks appeared relatively stable. The riparian corridor was dominated by a mixture of alders and hay fields, though the entire reach was buffered by shrubs and saplings ranging from 26 to >100 feet wide. Overall, the reach appeared to be relatively stable and no major problem areas were noted.

The Branch T1-11

T1-11 is located from T1-10 to approximately 1,000 feet east of the intersection of Hydes Hill Road and Route 108. The stream was found to be in regime with its Phase 1 reference stream type, C cobble, riffle-pool. No major adjustment processes were identified, and the reach was found to be in Stage I of evolution. The habitat and geomorphic scores were 0.89 and 0.88 respectively, both in "reference" condition. The reach was dominated by several beaver dams with the abandoned ones located on the downstream end of the reach and the active ones located upstream. The riparian corridor was a mix of forest and pasture land, though a buffer of at least 100 feet was present along both stream banks. No major problem areas were noted within the reach.

Tyler Branch M01

M01 extends from the confluence with the Missisquoi River to the first tributary near Tyler Branch Road. The Reach was found to be in regime with the Phase 1 reference stream type (C, gravel, riffle-pool stream). The dominant adjustment process was aggradation, as evident by the multiple steep riffles and large pint and side bars. The stream was found to be in Stage IV of evolution as the stream has aggraded and begun to develop a new floodplain at a lower elevation, though it still has access to its historic floodplain as well. The habitat and geomorphic assessment scores were 0.63 and 0.68 respectively, both in the "good" range. Bar scalping and gravel mining were evident throughout the reach. According to the landowner, a permit has been granted by the Rivers Management Program allowing the gravel removal. Hay and cornfields on the right and a mix of hay fields and forestland on the left dominated the riparian corridor. Most of the reach did contain a narrow buffer of mixed trees ranging in width from 5 to 50 feet. One large mass failure was noted near the confluence with the Missisquoi. The

failure was approximately 200 feet long by 30 feet high. Another smaller bank failure (300 feet long by 6 feet high) was noted on the left bank just downstream of the mass failure. One other problem area noted in the reach was an eroding bank located near the upstream end of the reach. An attempt was being made by the landowner to stabilize the bank by dumping gravel and fill along the erosion; however it is unclear if this will stop the erosion or simply wash more sediment into the system and delay the erosion of the bank.

Tyler Branch M02

M02 extends from M01 to the tributary that enters the main stem 500 feet west of the intersection of Duffy Hill Road and Tyler Branch Road. The Reach was in regime with the Phase 1 reference stream type (C, gravel, riffle-pool stream). The dominant adjustment process was minor aggradation and widening. Multiple large point bars and a single steep riffle were noted. There was also minor historic degradation, though the streambed has since aggraded and still has access to its floodplain. The reach was found to be in Stage III of evolution, though the measured channel width was not significantly wider than the calculated Phase 1 width and the reach may be on the verge of entering Stage IV of evolution. The habitat and geomorphic assessment scores were 0.64 (fair) and 0.68 (good) respectively. Minor bar scalping was observed near the upstream end of the reach. Hay and cornfields dominated the riparian corridor, though a majority of the reach contained a 5-foot to 50-foot buffer. Despite the rather intense anthropogenic activity, no significant bank failures were noted though approximately 800 feet of the left bank had been rip-rapped. A beaver dam was noted at the upstream end of the reach and extended into the lower portion of M03. No major problem areas were observed during the assessment.

Tyler Branch M03

M03 extends from M02 to the bridge that crosses Tyler Branch Road just east of the intersection of Tyler Branch Road and Duffy Hill Road. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The dominant adjustment processes were major aggradation and widening as evident by the multiple large unvegetated point, side and diagonal bars and multiple steep riffles. The measured representative cross section was not significantly wider than the Phase 1 calculated one; however, field observations and the other measured cross sections were indicative of the extensive widening which is taking place as the stream goes through Stage III of evolution. The habitat and geomorphic assessment scores were both 0.58, in the "fair", highly sensitive category. Hayfields dominated the left bank while a mixture of forest and hayfields were found on the right. No major areas of erosion were noted; however, a significant portion of the reach (1,000 feet on the left and 500 feet on the right) has been rip-rapped. A 5 to 25 foot wide buffer was noted on the left, while a slightly wider 26 to 100 foot wide buffer dominated the right bank. Some minor bar scalping was noted in the middle of the reach. A beaver dam present at the start of the reach impounded water up to the bridge on Duffy Hill Road, approximately 500 feet.

Tyler Branch M04

M04 extends from M03 to the confluence with The Branch. The reach was segmented into M04A and M04B. M04A extends from M03 to just downstream of the farm bridge, which crosses the stream mid-reach, and M04B makes up the remainder of the reach. Both segments were C, gravel streams, however M04B was a plane bed system consisting of a single run with no riffles or pools. Aggradation and widening were the dominant adjustment processes in M04A with very large point and side bars, particularly near the downstream end of the reach placing the segment in evolution Stage III. An incision ratio of 1.8 also indicates that the channel has degraded, though no active head cuts were observed. The habitat and geomorphic assessment scores were 0.68 and 0.60 respectively, both in the "good" range. The riparian corridor was dominated by hayfields on the right and forest on the left, and buffers ranged from 26 to 100 feet on both sides except at the downstream end of the reach on the right where there was no buffer between the stream and hayfield. A large channel avulsion has occurred at this location and approximately 400 feet of channel has been cutoff. A large bank failure was present opposite the avulsion as the stream is migrating into the adjacent hayfield. A very large mass failure was noted inside the abandoned meander bend (300 feet long by 50 feet high) and another mass failure was observed along the left bank (200 feet long by 30 feet high) a few hundred feet upstream of the avulsion.

M04B has been historically straightened (meander width ratio of approximately 2.5) and is currently in Stage III of evolution. The dominant adjustment processes observed were historic degradation, and active aggradation and widening. Nearly the entire right bank has been secured with rip-rap. A small area of erosion was noted along the left bank (approximately 100 feet long and 2 feet high). The habitat and geomorphic assessment scores were 0.53 ("fair" due to the lack of discernable bed features) and 0.65 ("good"). A bedrock grade control was noted at the upstream end of the segment. Both riparian corridors were dominated by hayfields, though a 5 to 50 buffer was present throughout. No major problem areas were observed in M04B.

Tyler Branch M05

M05 is a relatively short reach which extends from the confluence with The Branch upstream to the bridge on Route 108. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The major adjustment processes were major historic degradation, and active widening and planform adjustments. The reach has been straightened historically, and is currently in transition between evolution Stage II and III as it has degraded and begun to widen but rip-rap present on both banks has impeded the widening process. The habitat and geomorphic scores were 0.61, both in the "fair" category. Hay and cornfields are present along both banks with a 26 to 50 foot wide buffer strip. Bedrock grade controls are present at both the upstream and downstream ends of the reach. A small area of erosion was noted on the left bank (150 feet long by six feet high) as the rip-rap has been undermined. No other major problem areas were noted within the reach.

Tyler Branch M07

M07 extends from near the intersection of Grange Hall Road to a large bedrock gorge located approximately ¾ of a mile upstream. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The major adjustment processes were major historic degradation (incision of 1.6), and active aggradation and widening (evolution stage III). Multiple large point and mid channel bars, along with multiple steep riffles, were observed throughout the reach. The habitat and geomorphic assessment scores were 0.61, both in the "fair" range. Hayfields are present along both banks with a buffer ranging from 5 to 50 feet. The Vermont River Management Division has issued a permit allowing for gravel mining and bar scalping, which was evident near the downstream end of the reach. Significant portions of the right bank (1,800 feet) and left bank (400 feet) have been rip-rapped limiting erosion to one area on the left approximately 6 feet high and 300 feet long. A new house has been constructed a few hundred feet from this eroding bank, and may become threatened if the stream continues to migrate and no erosion abatement measures are taken. The Missisquoi River Basin Association recently completed a tree-planting project along a portion of the left bank. Use of berming was observed along a portion of the right bank.

Tyler Branch M09

M09 is located from the end of M08 to the next upstream tributary that enters near the intersection of Tyler Branch Road and Ovitt Road. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The major adjustment processes were historic degradation, and minor aggradation and widening placing the channel in Stage III of evolution. Based on field observations and the current meander width ratio (~3) it appears the channel may have been historically straightened. The habitat and geomorphic scores were 0.53 (fair) and 0.74 (good) respectively. The landowner has a permit from VT ANR allowing for gravel mining from the reach, which was observed on a large point bar at the downstream end of the reach. A single steep riffle and multiple large point and side bars were observed throughout the reach. The riparian corridor was dominated by pasture and a single cornfield with no buffer for most of the reach. Cows were observed in the stream channel throughout the entire reach, which is utilized as a corridor for the cows to access pastures further upstream. Also, the large point bar which has been scalped serves as a feeding area for the cows. Despite the lack of riparian buffer, there was only one small area of erosion noted within the reach (50 feet long by 5 feet high mid-reach). No other problem areas were noted.

Tyler Branch M10

M10 extends from M09 to approximately ½ mile west of the intersection of Tyler Branch Road and Boston Post Road. The reach was segmented into M10A and M10B.

M10A is located in a relatively short, narrow portion of the valley in the middle of the reach and was found to be a B, cobble, step-pool type stream. The major adjustment processes observed were historic degradation and widening, though a new floodplain has developed putting the channel in Stage IV of evolution. Tyler Branch Road runs along the right bank and has narrowed the valley, though not enough to change the valley type. The habitat and geomorphic scores were 0.81 and 0.71 respectively, both in the "good" range. The riparian corridor was dominated by undeveloped forest land on both sides, though a few homes were present on the other side of Tyler Branch Road on the right. Channel spanning bedrock was observed mid-reach. One area of bank erosion (50 feet long by 5 feet high) was noted on the right bank in one of the areas not protected by rip-rap. Most of the remainder of the right bank was rip-rapped, and no erosion was noted on the left bank.

M10B makes up the remainder of M10 and is comprised of the lower and upper quarters of the reach where the valley widens and the channel slope decreases. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The channel is currently in Stage II of evolution with the major adjustment processes observed to be historic degradation, and aggradation. Both the habitat and geomorphic assessment scores were 0.72 ("good"). Pasture was observed on the left bank with a narrow buffer ranging from 0 to 25 feet, while the right bank was dominated by forest and residential properties located on the other side of Tyler Branch Road. No major problem areas were noted within the segment except for the lack of riparian buffer along the left bank.

Tyler Branch M11

M11 is located from the end of M10 to just west of the intersection of Tyler Branch Road and Boston Post Road. The stream was found to be in regime with its Phase 1 reference stream type (C, gravel, riffle-pool). The major observed adjustment processes were historic degradation and widening placing the channel in transition from Stage II to Stage III of evolution. Both the habitat and geomorphic assessment scores were within the "good" range with respective scores of 0.8 and 0.83. A mix of hay fields and forest land were observed along the left bank with a buffer ranging from 5 to 100 feet, while the right riparian corridor was dominated by pasture and residential property with a narrow buffer of 0 to 25 feet. A large channel spanning bedrock grade control was observed near the upper end of the reach. Two areas of erosion were observed; one being 100 feet long by 7 feet high on the right bank and the other being 100 feet long by 5 feet high along the left bank. Tyler Branch Road has encroached upon the channel in the upper portion of the reach, though the left side of the channel still has adequate floodplain access. Many of the homes constructed in the lower portion of the reach are close to being within the floodplain of the stream.

Tyler Branch M12

M12 extends from M11 to the confluence of Beaver Meadow Brook and Cold Hollow Brook. The stream was found to be in regime with its Phase 1 reference stream

type (C, cobble, riffle-pool). The major observed adjustment processes were historic straightening (meander width ratio of approximately 3.3), and active aggradation, widening and planform adjustments (Evolution Stage III). The habitat and geomorphic assessments scored "good" (0.72) and "fair" (0.60) with very high stream sensitivity. The riparian corridor was dominated by forest and shrubs and saplings on both sides with a few hayfields scattered along the right bank. Approximately 500 feet of the channel was impounded by a beaver dam at the time of the assessment. Two large mass failures were observed along the left bank mid-reach; one measured 150 feet long and 20 feet high while the other measured 200 feet long and 20 feet high. Several other smaller areas of erosion were noted along both banks and combined with multiple flood chutes demonstrate the degree of planform adjustment and widening occurring within the reach as it creates new floodplain.

APPENDIX B

PHASE 2 DATA MANAGEMENT SYSTEM REPORTS

Project: **Tyler Branch**

Phase 2 Reach Summary

February 24, 2006

Stream: **The Branch** Reach # **T1-01** Segment: **0** Completion Date: **July 21, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **Yes**

Segment Length (ft): **2,479** Segment Location: **from confluence with Tyler Branch to first tributary, approximately 2500 feet upstream**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Response**

1.2 Alluvial Fan: **No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Flat
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Never
Texture	Gravel	Gravel

1.5 Valley Features

Valley Width (ft)	500
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	45.0
2.2 Max Depth (ft)	2.8
2.3 Mean Depth (ft)	2.1
2.4 Floodprone Width	80.0
2.5 Low Bank Height	5.0
2.6 Width/Depth	21.4
2.7 Entrenchment	1.8
2.8 Incision Ratio	1.8
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	250

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	8.0 %
Coarse Gravel	50.0 %
Fine Gravel	33.0 %
Sand	9.0 %
Silt/Clay Present?	No
Detritus	10.0 %
# Large Woody	3

2.13 Average Largest Particle

Bed	4 inches
Bar	3 inches

2.14 Stream Type

B 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type

(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	50	130
Erosion Height	8.0	4.0
Revetmt. Type	None	None
Revetmt. Length	0	0
Near Bank Veg.	Left	Right
Dominant	Pasture	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin
Bank Canopy	Left	Right
Canopy	0	1-25
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	<5	5-25
Sub-dominant	5-25	26-50
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Shrubs/Saplin
Sub-dominant	Shrubs/Saplin	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Hay
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin
Mass Failures	None	
Mean Failure	0.0	

possible histroic straightening, cows have access to stream for ~1/2 of total reach length

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None	
4.2 Adjacent Wetlands	Some	
4.3 Flow Status	Moderate	
4.4 # of Debris Jams	1	
4.5 Impoundments	None	
Impoundmt. Location		
4.6 # of Stormwater	0	
4.7 Upstream Flow	None	
4.9 # of Beaver Dams	0	0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	Multiple
Diagonal	Delta	Island
None	Single	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Single	None	Yes

5.4 Stream Ford or Animal	Yes
5.5 Channel Alterations	Straightenin

Project: **Tyler Branch**

Phase 2 Reach Summary

February 24, 2006

Stream: **The Branch** Reach # **T1-01** Segment: **0** Completion Date: **July 21, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **Yes**

Segment Length (ft): **2,479** Segment Location: **from confluence with Tyler Branch to first tributary, approximately 2500 feet upstream**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**10**
6.2 Embeddedness	**13**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**15**
6.5 Channel Flow Status	**14**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 7 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 4 Right: 2**
Total Score	**135**
Habitat Rating	**0.675**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**C to B**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**16**		**No**

Total Score	**56**
Geomorphic Rating	**0.7**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:

Minor historic degredation, minor widening, possible historic straightening, some meanders starting to reform along unbuffered sections of reach

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **6,678**

Phase 2 Reach Summary

Reach # **T1-02** Segment: **0**
Observers: **Adam Robtoy, Paul Stanley**
Segment Location: **From T1-01 to just south of intersection of Chester Arthur Road and VT. 108**

February 24, 2006
Completion Date: **July 22, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Transfer**
1.2 Alluvial Fan: **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	100	100
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Gravel	Gravel

1.5 Valley Features

Valley Width (ft)	655
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	31.0
2.2 Max Depth (ft)	2.8
2.3 Mean Depth (ft)	2.1
2.4 Floodprone Width	350.0
2.5 Low Bank Height	4.3
2.6 Width/Depth	14.8
2.7 Entrenchment	11.3
2.8 Incision Ratio	1.5
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	13.0 %
Coarse Gravel	37.0 %
Fine Gravel	30.0 %
Sand	20.0 %
Silt/Clay Present?	Yes
Detritus	0.0 %
# Large Woody	5

2.13 Average Largest Particle

Bed	2 inches
Bar	3 inches

2.14 Stream Type: **C 4 Non Riffle-Pool**

Is a sub-reach? **No**

2.15 Reference Stream Type (if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Sand	Sand
Consistency	Cohesive	Cohesive
Bank Erosion	Left	Right
Erosion Length	370	150
Erosion Height	4.0	8.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	100	50
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy	26-50	26-50
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	26-50
Sub-dominant	5-25	5-25
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Pasture
Sub-dominant	Residential	Forest
Mass Failures	One	
Mean Failure	30.0	

historic channel straightening, beaver dam near end of reach, large mass failure (currently relatively stable) just downstream of RT. 108 bridge

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Moderate
4.4 # of Debris Jams	3
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	1 500 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	Multiple
Diagonal	Delta	Island
Single	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal	Yes
5.5 Channel Alterations	Straightenin

Project: **Tyler Branch**

Phase 2 Reach Summary

February 24, 2006

Stream: **The Branch** Reach # **T1-02** Segment: **0** Completion Date: **July 22, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Paul Stanley** Rain: **No**

Segment Length (ft): **6,678** Segment Location: **From T1-01 to just south of intersection of Chester Arthur Road and VT. 108**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**14**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**19**
6.4 Sediment Deposition	**9**
6.5 Channel Flow Status	**11**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 5 Right: 7**
6.9 Bank Vegetation Protection	**Left: 7 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 6**
Total Score	**132**
Habitat Rating	**0.66**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**57**		
Geomorphic Rating	**0.7125**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Narrative:

minor historic degredation, minor aggradation, widening, planform adjustments.

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **2,031**

Phase 2 Reach Summary

Reach # **T1-03** Segment: **0**
Observers: **Adam Robtoy, Pete Rath**
Segment Location: **from T1-02 to tributary that enters just below concrete dam located on Mike Larose property**

February 24, 2006
Completion Date: **July 28, 2005**
Rain: **Yes**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Transfer**
1.2 Alluvial Fan: **No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Never	Always
Texture	Gravel	Bedrock

1.5 Valley Features

Valley Width (ft)	566
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	34.0
2.2 Max Depth (ft)	1.9
2.3 Mean Depth (ft)	1.6
2.4 Floodprone Width	57.0
2.5 Low Bank Height	2.8
2.6 Width/Depth	21.2
2.7 Entrenchment	1.7
2.8 Incision Ratio	1.5
2.9 Sinuosity	Low
2.10 Riffles Type	Eroded
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	3.0 %
Boulder	4.0 %
Cobble	19.0 %
Coarse Gravel	37.0 %
Fine Gravel	28.0 %
Sand	9.0 %
Silt/Clay Present?	No
Detritus	3.0 %
# Large Woody	6

2.13 Average Largest Particle

Bed	3 inches
Bar	2 inches

2.14 Stream Type: **B 4 c Riffle-Pool**

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	50	50
Erosion Height	4.0	4.0
Revetmt. Type	Rip-rap	None
Revetmt. Length	200	0
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Coniferous
Sub-dominant	Pasture	Pasture
Bank Canopy	Left	Right
Canopy	26-50	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	26-50
Sub-dominant	<5	5-25
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Forest
Sub-dominant		Pasture
Mass Failures	None	
Mean Failure	0.0	

historic straightening, and possible historic gravel mining, stream is starting to regain sinuosity in southern portion of reach by moving back from valley wall into adjacent pasture.

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None	
4.2 Adjacent Wetlands	None	
4.3 Flow Status	Moderate	
4.4 # of Debris Jams	0	
4.5 Impoundments	Large	
Impoundmt. Location	Upstream	
4.6 # of Stormwater	0	
4.7 Upstream Flow	Run-of-river	
4.9 # of Beaver Dams	0	0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal: **Yes**
5.5 Channel Alterations: **Straightenin**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 24, 2006

Stream: **The Branch** Reach # **T1-03** Segment: **0** Completion Date: **July 28, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Pete Rath** Rain: **Yes**

Segment Length (ft): **2,031** Segment Location: **from T1-02 to tributary that enters just below concrete dam located on Mike Larose property**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**14**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**17**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**13**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 8 Right: 9**
6.9 Bank Vegetation Protection	**Left: 6 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 3 Right: 8**
Total Score	**139**
Habitat Rating	**0.695**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**C to B**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**14**		**Yes**
Total Score	**54**		
Geomorphic Rating	**0.675**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**Moderate**		

Narrative:

historic straightening, minor historic degradation and aggradation

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **1,957**

Phase 2 Reach Summary

Reach # **T1-04** Segment: **0**
Observers: **Adam Robtoy, Staci Pomeroy**
Segment Location: **from T1-03 to intersection of Bordoville Road and VT. RT. 108**

February 24, 2006
Completion Date: **July 29, 2005**
Rain: **Yes**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	200	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Bedrock

1.5 Valley Features
Valley Width (ft) ~~200~~ 250
Confinement Type **Broad**
Rock Gorge? **No**
Human-caused change - valley width? **No**
1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	43.0
2.2 Max Depth (ft)	2.8
2.3 Mean Depth (ft)	1.5
2.4 Floodprone Width	125.0
2.5 Low Bank Height	4.3
2.6 Width/Depth	28.7
2.7 Entrenchment	2.9
2.8 Incision Ratio	1.5
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	4.0 %
Boulder	1.0 %
Cobble	25.0 %
Coarse Gravel	15.0 %
Fine Gravel	36.0 %
Sand	20.0 %
Silt/Clay Present?	No
Detritus	5.0 %
# Large Woody	2

2.13 Average Largest Particle
Bed 65 mm
Bar 80 mm
2.14 Stream Type
C 4 Riffle-Pool
Is a sub-reach? **No**
2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

	Lower	Upper
Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	20
Erosion Height	0.0	5.0
Revetmt. Type	Rip-rap	None
Revetmt. Length	150	0
Near Bank Veg.	Left	Right
Dominant	Herbaceous	Shrubs/Saplin
Sub-dominant	Shrubs/Saplin	Deciduous
Bank Canopy	Left	Right
Canopy	26-50	26-50
Mid-Channel	Open	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	51-100	>100
Sub-dominant	5-25	5-25
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Mixed Trees
Sub-dominant	Herbaceous	

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Residential	Forest
Sub-dominant		Hay
Mass Failures	None	
Mean Failure	0.0	

bedrock gorge located mid-reach (100' long and 34' wide), several enlarged bars and steep riffles particulary above bedrock gorage and dam. Large dam located at downstream end of reach.

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Moderate
4.4 # of Debris Jams	0
4.5 Impoundments	Small
Impoundmt. Location	In Reach
4.6 # of Stormwater	0
4.7 Upstream Flow	Run-of-river
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	Multiple	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	No

5.4 Stream Ford or Animal **No**
5.5 Channel Alterations **Bar Scalping**

February 24, 2006

Phase 2 Reach Summary

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **1,957**

Reach # **T1-04** Segment: **0** Completion Date: **July 29, 2005**
Observers: **Adam Robtoy, Staci Pomeroy** Rain: **Yes**
Segment Location: **from T1-03 to intersection of Bordoville Road and VT. RT. 108**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**10**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**16**
6.4 Sediment Deposition	**9**
6.5 Channel Flow Status	**14**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 9 Right: 9**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 7 Right: 10**
Total Score	**141**
Habitat Rating	**0.705**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**15**		**No**

Total Score	**56**
Geomorphic Rating	**0.7**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:
some aggradation (large bars, steep riffles), some historic degradation, and widening

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **1,200**

Phase 2 Reach Summary

Reach # **T1-05** Segment: **A**
Observers: **Adam Robtoy**
Segment Location: **from intersection of Beaver Meadow Brook to subreach 5B (~1000 feet upstream)**

February 25, 2006
Completion Date: **August 9, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	50	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features
Valley Width (ft): **393**
Confinement Type: **Very Broad**
Rock Gorge?: **No**
Human-caused change - valley width?: **No**
1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft): **31.0**
2.2 Max Depth (ft): **2.7**
2.3 Mean Depth (ft): **1.9**
2.4 Floodprone Width: **52.0**
2.5 Low Bank Height: **6.0**
2.6 Width/Depth: **16.3**
2.7 Entrenchment: **1.7**
2.8 Incision Ratio: **2.2**
2.9 Sinuosity: **Low**
2.10 Riffles Type: **Complete**
2.11 Riffle/Step Spacing: **300**

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	4.0 %
Cobble	26.0 %
Coarse Gravel	21.0 %
Fine Gravel	40.0 %
Sand	9.0 %
Silt/Clay Present?	Yes
Detritus	3.0 %
# Large Woody	0

2.13 Average Largest Particle
Bed **3 inches**
Bar **3 inches**
2.14 Stream Type
B 4 c Riffle-Pool
Is a sub-reach? **No**
2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank: **Steep**

Bank Texture	Lower	Upper
Material Type	Boulder/Cob	Gravel
Consistency	Non-cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length	0	100
Erosion Height	0.0	12.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	50	150

Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Pasture	Pasture

Bank Canopy	Left	Right
Canopy	26-50	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	5-25
Sub-dominant	<5	<5

Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Hay
Sub-dominant	Pasture	Pasture
Mass Failures	One	
Mean Failure	12.0	

historic straightening, farm bridge crossing reach, cows have access to large portion of reach, tributary at downstream end of reach runs through adjacent barnyard/feedlot, large mass failure caused by debris jam which pushed stream from old channel into right bank. Segment 5B upper

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps: **Some**
4.2 Adjacent Wetlands: **None**
4.3 Flow Status: **Moderate**
4.4 # of Debris Jams: **0**
4.5 Impoundments: **None**
Impoundmt. Location
4.6 # of Stormwater: **0**
4.7 Upstream Flow: **None**
4.9 # of Beaver Dams: **0** **0** ft
4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	None
Diagonal	**Delta**	**Island**
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Single	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal: **Yes**
5.5 Channel Alterations: **Straightenin**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 25, 2006

Stream: **The Branch** Reach # **T1-05** Segment: **A** Completion Date: **August 9, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **1,200** Segment Location: **from intersection of Beaver Meadow Brook to subreach 5B (~1000 feet upstream)**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**13**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**15**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**10**
6.7 Frequency of Riffles/Steps	**14**
6.8 Bank Stability	**Left: 9 Right: 7**
6.9 Bank Vegetation Protection	**Left: 7 Right: 6**
6.10 Riparian Vegetation Zone Width	**Left: 3 Right: 3**
Total Score	**127**
Habitat Rating	**0.635**
Habitat Stream Condition	**Good**

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	**16**	**None**	**No**
7.3 Widening Channel	**13**		**No**
7.4 Change in Planform	**11**		**Yes**
Total Score	**45**		
Geomorphic Rating	**0.5625**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**High**		

Narrative:

historic degradation and straightening, stream type change from C to B.

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **976**

Phase 2 Reach Summary

February 25, 2006

Reach # **T1-05** Segment: **B** Completion Date: **August 9, 2005**
Observers: **Adam Robtoy** Rain: **No**
Segment Location: **from T1-05A to bridge on Ovitt Road near intersection with Hennessey Road**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	100	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Sometimes	Always
Texture	Not Evalua	Bedrock

1.5 Valley Features

Valley Width (ft)	150
Confinement Type	Narrow
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	23.0
2.2 Max Depth (ft)	2.5
2.3 Mean Depth (ft)	1.7
2.4 Floodprone Width	47.0
2.5 Low Bank Height	2.9
2.6 Width/Depth	13.5
2.7 Entrenchment	2.0
2.8 Incision Ratio	1.2
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	100

2.12 Substrate Composition

Bedrock	6.0 %
Boulder	18.0 %
Cobble	34.0 %
Coarse Gravel	14.0 %
Fine Gravel	22.0 %
Sand	6.0 %
Silt/Clay Present?	No
Detritus	5.0 %
# Large Woody	1

2.13 Average Largest Particle

Bed	8 inches
Bar	8 inches

2.14 Stream Type

B 3 Non Riffle-Pool

Is a sub-reach? **Yes**

2.15 Reference Stream Type
(if different from Phase 1)

B 3 Non Riffle-Pool

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Bedrock
Consistency	Cohesive	Cohesive
Bank Erosion	Left	Right
Erosion Length	0	0
Erosion Height	0.0	0.0
Revetmt. Type	None	None
Revetmt. Length	0	0
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Coniferous
Sub-dominant	Pasture	Deciduous
Bank Canopy	Left	Right
Canopy	26-50	76-100
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	<5	>100
Sub-dominant	5-25	51-100
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Mixed Trees
Sub-dominant	Herbaceous	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Forest
Sub-dominant		
Mass Failures	None	
Mean Failure	0.0	

Bedrock along right bank for entire sub-reach. channel spanning bedrock grade control near upper end of reach. cows have access to stream bed for entire sub-reach. sub-reach to 5A due to narrower valley, larger substrate, and increased slope.

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Moderate
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	None	None
Diagonal	**Delta**	**Island**
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal **Yes**
5.5 Channel Alterations **None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 25, 2006

Stream: **The Branch** Reach # **T1-05** Segment: **B** Completion Date: **August 9, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **976** Segment Location: **from T1-05A to bridge on Ovitt Road near intersection with Hennessey Road**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**12**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**18**
6.5 Channel Flow Status	**19**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 8 Right: 10**
6.9 Bank Vegetation Protection	**Left: 4 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 2 Right: 10**
Total Score	**151**
Habitat Rating	**0.755**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**15**	**None**	**Yes**
7.2 Channel Aggradation	**18**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**17**		**No**

Total Score	**66**
Geomorphic Rating	**0.825**
Channel Evolution Model	**F**
Channel Evolution Stage	**I**
Geomorphic Condition	**Good**
Stream Sensitivity	**Moderate**

Narrative:
minor historic degradation otherwise fairly stable

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **4,507**

Phase 2 Reach Summary

Reach # **T1-06** Segment: **0**
Observers: **adam robtoy**
Segment Location: **from T1-05 to intersection of Pudvah Hill Road and VT. RT. 108**

February 27, 2006
Completion Date: **August 10, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Response**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	300	200
Railroads	0	0
Improved Paths	0	0
Development	0	50

1.4 Adjacent Side

	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	412
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	40.0
2.2 Max Depth (ft)	2.6
2.3 Mean Depth (ft)	1.5
2.4 Floodprone Width	260.0
2.5 Low Bank Height	3.4
2.6 Width/Depth	26.7
2.7 Entrenchment	6.5
2.8 Incision Ratio	1.3
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	250

2.12 Substrate Composition

Bedrock	1.0 %
Boulder	3.0 %
Cobble	38.0 %
Coarse Gravel	34.0 %
Fine Gravel	16.0 %
Sand	8.0 %
Silt/Clay Present?	No
Detritus	5.0 %
# Large Woody	5

2.13 Average Largest Particle

Bed	6 inches
Bar	4 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Sand
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	50	40
Erosion Height	3.0	6.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	100	400
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy	76-100	76-100
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	5-25
Sub-dominant	>100	>100
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Pasture
Sub-dominant	Forest	Forest
Mass Failures	None	
Mean Failure	0.0	

several braided channel sections in reach where old beaver dams have blown out. No recent beaver activitiy present. Lots of large gravel bars and steep riffles.

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	3
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Multiple	Multiple	Multiple
Diagonal	**Delta**	**Island**
Multiple	Single	Multiple

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	None	None	Multiple

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	Yes

5.4 Stream Ford or Animal **Yes**
5.5 Channel Alterations **Bar Scalping**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 27, 2006

Stream: **The Branch** Reach # **T1-06** Segment: **0** Completion Date: **August 10, 2005**

Organization: **Johnson Company** Observers: **adam robtoy** Rain: **No**

Segment Length (ft): **4,507** Segment Location: **from T1-05 to intersection of Pudvah Hill Road and VT. RT. 108**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**14**
6.2 Embeddedness	**15**
6.3 Velocity/Depth Patterns	**18**
6.4 Sediment Deposition	**7**
6.5 Channel Flow Status	**10**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 6 Right: 6**
6.10 Riparian Vegetation Zone Width	**Left: 6 Right: 6**
Total Score	**132**
Habitat Rating	**0.66**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**9**	**None**	**No**
7.3 Widening Channel	**10**		**No**
7.4 Change in Planform	**11**		**No**

Total Score	**43**
Geomorphic Rating	**0.5375**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Fair**
Stream Sensitivity	**Very High**

Narrative:

major planform change due to braiding downstream of former beaver dams, major aggradation, lots of sediment and large bars

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **2,500**

Phase 2 Reach Summary

Reach # **T1-07** Segment: **0**
Observers: **Adam Robtoy, C. Bronze**
Segment Location: **From T1-06 to 0.5 miles north intersection of Pudvah Hill road and Route 108**

February 27, 2006
Completion Date: **August 11, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	100	100
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Very Steep
Continuous w/	Sometimes	Never
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	376
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	27.0
2.2 Max Depth (ft)	2.9
2.3 Mean Depth (ft)	1.9
2.4 Floodprone Width	280.0
2.5 Low Bank Height	4.3
2.6 Width/Depth	14.2
2.7 Entrenchment	10.4
2.8 Incision Ratio	1.5
2.9 Sinuosity	Moderate
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	3.0 %
Cobble	47.0 %
Coarse Gravel	7.0 %
Fine Gravel	29.0 %
Sand	14.0 %
Silt/Clay Present?	No
Detritus	2.0 %
# Large Woody	4

2.13 Average Largest Particle

Bed	6 inches
Bar	5 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	140
Erosion Height	0.0	4.0
Revetmt. Type	Rip-rap	None
Revetmt. Length	150	0
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Herbaceous
Sub-dominant	Deciduous	Deciduous
Bank Canopy	Left	Right
Canopy	51-75	1-25
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	5-25
Sub-dominant	51-100	51-100
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Herbaceous
Sub-dominant	Herbaceous	Mixed Trees

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Residential
Sub-dominant	Forest	Forest
Mass Failures	None	
Mean Failure	0.0	

possible historic straightening, large point bars, lots of stored sediment, two snowmobile trails located mid-reach (only downstream bridge assessed as both had similar characteristics).

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	Multiple	Multiple
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	Yes

5.4 Stream Ford or Animal **Yes**
5.5 Channel Alterations **Straightenin**

February 27, 2006

Project: **Tyler Branch**

Phase 2 Reach Summary

Stream: **The Branch** Reach # **T1-07** Segment: **0** Completion Date: **August 11, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, C. Bronze** Rain: **No**

Segment Length (ft): **2,500** Segment Location: **From T1-06 to 0.5 miles north intersection of Pudvah Hill road and Route 108**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**17**
6.2 Embeddedness	**14**
6.3 Velocity/Depth Patterns	**16**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**14**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 9 Right: 7**
6.9 Bank Vegetation Protection	**Left: 7 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 5**
Total Score	**142**
Habitat Rating	**0.71**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**10**	**None**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**16**		**No**

Total Score	**55**
Geomorphic Rating	**0.6875**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:

historic degradation, minor aggradation leading to large bars and reestablishment of new floodplain and meander patterns

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,678**

Phase 2 Reach Summary

Reach # **T1-08** Segment: **0**
Observers: **Adam Robtoy, Brian Jerose**
Segment Location: **from T1-07 to Brown's Pond dam**

February 27, 2006
Completion Date: **August 12, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	400
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Very Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Bedrock	Not Evalua

1.5 Valley Features

Valley Width (ft)	240
Confinement Type	Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	26.0
2.2 Max Depth (ft)	2.3
2.3 Mean Depth (ft)	1.8
2.4 Floodprone Width	105.0
2.5 Low Bank Height	2.5
2.6 Width/Depth	14.4
2.7 Entrenchment	4.0
2.8 Incision Ratio	1.1
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	150

2.12 Substrate Composition

Bedrock	1.0 %
Boulder	6.0 %
Cobble	36.0 %
Coarse Gravel	40.0 %
Fine Gravel	10.0 %
Sand	7.0 %
Silt/Clay Present?	No
Detritus	5.0 %
# Large Woody	31

2.13 Average Largest Particle

Bed	10 inches
Bar	8 inches

2.14 Stream Type

C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	100	0
Erosion Height	3.0	0.0
Revetmt. Type	None	Rip-rap
Revetmt. Length	0	100
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Deciduous	Deciduous
Bank Canopy	Left	Right
Canopy	51-75	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	51-100	51-100
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant		
Mass Failures	One	
Mean Failure	18.0	

lots of large bars/stored sediment, large mass failure and debris jam near bottom of reach, 2 beaver dams in middle of reach - 600' long and ~2 feet high,

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some	
4.2 Adjacent Wetlands	None	
4.3 Flow Status	Low	
4.4 # of Debris Jams	3	
4.5 Impoundments	Large	
Impoundmt. Location	Upstream	
4.6 # of Stormwater	0	
4.7 Upstream Flow	Run-of-river	
4.9 # of Beaver Dams	2	600 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Multiple	Multiple	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	None	None	Multiple

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	No

5.4 Stream Ford or Animal **No**
5.5 Channel Alterations **None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 27, 2006

Stream: **The Branch** Reach # **T1-08** Segment: **0** Completion Date: **August 12, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Brian Jerose** Rain: **No**

Segment Length (ft): **3,678** Segment Location: **from T1-07 to Brown's Pond dam**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**15**
6.2 Embeddedness	**15**
6.3 Velocity/Depth Patterns	**18**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**13**
6.6 Channel Alteration	**16**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 6 Right: 9**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 5**
Total Score	**151**
Habitat Rating	**0.755**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**14**	**None**	**Yes**
7.2 Channel Aggradation	**12**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**15**		**No**

Total Score	**56**
Geomorphic Rating	**0.7**
Channel Evolution Model	**F**
Channel Evolution Stage	**IV**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:

minor historic degradation, active minor aggradation, other 2 cross sections showed incision of 1.5 and 1.6.

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,893**

Phase 2 Reach Summary

Reach # **T1-10** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from intersection of Route 108, King Road and Boston Post Road to approximatley 3000 feet**

February 27, 2006
Completion Date: **August 18, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	100	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	292
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	20.2
2.2 Max Depth (ft)	2.0
2.3 Mean Depth (ft)	1.7
2.4 Floodprone Width	145.0
2.5 Low Bank Height	2.7
2.6 Width/Depth	11.9
2.7 Entrenchment	7.2
2.8 Incision Ratio	1.4
2.9 Sinuosity	Moderate
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	150

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	13.0 %
Coarse Gravel	43.0 %
Fine Gravel	21.0 %
Sand	23.0 %
Silt/Clay Present?	No
Detritus	10.0 %
# Large Woody	6

2.13 Average Largest Particle

Bed	4 inches
Bar	3 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Sand
Consistency	Non-cohesive	Cohesive
Bank Erosion	Left	Right
Erosion Length	0	30
Erosion Height	0.0	6.0
Revetmt. Type	None	None
Revetmt. Length	0	0
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy	76-100	76-100
Mid-Channel	Open	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	26-50	26-50
Sub-dominant	>100	>100
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Shrubs/Saplin	Hay
Sub-dominant	Hay	Shrubs/Saplin
Mass Failures	None	
Mean Failure	0.0	

several old beaver dams (no longer active) affecting upper 1/2 of reach lots of old channels and flood chutes associated with abandoned beaver dams

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some		
4.2 Adjacent Wetlands	None		
4.3 Flow Status	Low		
4.4 # of Debris Jams	0		
4.5 Impoundments	None		
Impoundmt. Location			
4.6 # of Stormwater	0		
4.7 Upstream Flow	None		
4.9 # of Beaver Dams	6	1200	ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Single	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal **No**
5.5 Channel Alterations **None**

February 27, 2006

Project: **Tyler Branch**

Phase 2 Reach Summary

Stream: **The Branch** Reach # **T1-10** Segment: **0** Completion Date: **August 18, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **3,893** Segment Location: **from intersection of Route 108, King Road and Boston Post Road to approximatley 3000 feet**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**13**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**12**
6.5 Channel Flow Status	**17**
6.6 Channel Alteration	**18**
6.7 Frequency of Riffles/Steps	**13**
6.8 Bank Stability	**Left: 9 Right: 8**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 8 Right: 8**
Total Score	**148**
Habitat Rating	**0.74**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**14**	**None**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**16**		**No**

Total Score	**61**
Geomorphic Rating	**0.7625**
Channel Evolution Model	**F**
Channel Evolution Stage	**II**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:
minor degradation and aggradation, reach relatively stable

Project: **Tyler Branch**
Stream: **The Branch**
Organization: **Johnson Company**
Segment Length (ft): **2,189**

Phase 2 Reach Summary

Reach # **T1-11** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from T1-10 to 1,000 feet east of intersection of Hydes Hill Road and Route 108.**

February 27, 2006
Completion Date: **August 19, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Transfer**
1.2 Alluvial Fan: **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Very Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Bedrock	Bedrock

1.5 Valley Features

Valley Width (ft)	182
Confinement Type	Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	25.0
2.2 Max Depth (ft)	2.1
2.3 Mean Depth (ft)	1.6
2.4 Floodprone Width	300.0
2.5 Low Bank Height	2.7
2.6 Width/Depth	15.6
2.7 Entrenchment	12.0
2.8 Incision Ratio	1.3
2.9 Sinuosity	Moderate
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	125

2.12 Substrate Composition

Bedrock	10.0 %
Boulder	11.0 %
Cobble	38.0 %
Coarse Gravel	21.0 %
Fine Gravel	9.0 %
Sand	11.0 %
Silt/Clay Present?	No
Detritus	5.0 %
# Large Woody	6

2.13 Average Largest Particle

Bed	8 inches
Bar	6 inches

2.14 Stream Type: **C 3 Non Riffle-Pool**

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

	Lower	Upper
Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Sand
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	0
Erosion Height	0.0	0.0
Revetmt. Type	None	None
Revetmt. Length	0	0
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy	76-100	76-100
Mid-Channel	Open	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	>100	>100
Sub-dominant		
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Mixed Trees	Mixed Trees

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant	Pasture	Pasture
Mass Failures	None	
Mean Failure	0.0	

several abandoned and active beaver dams within reach (abandoned dams are in downstream section, active ones are upstream), reach appears to be stable and in reference condition

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	In Reach
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	5 800 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal: **No**
5.5 Channel Alterations: **None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 27, 2006

Stream: **The Branch** Reach # **T1-11** Segment: **0** Completion Date: **August 19, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **2,189** Segment Location: **from T1-10 to 1,000 feet east of intersection of Hydes Hill Road and Route 108.**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**18**
6.2 Embeddedness	**15**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**19**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**19**
6.7 Frequency of Riffles/Steps	**19**
6.8 Bank Stability	**Left: 10 Right: 10**
6.9 Bank Vegetation Protection	**Left: 9 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 10**
Total Score	**178**
Habitat Rating	**0.89**
Habitat Stream Condition	**Referen**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**18**	**None**	**No**
7.2 Channel Aggradation	**18**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**18**		**No**
Total Score	**70**		
Geomorphic Rating	**0.875**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**I**		
Geomorphic Condition	**Referen**		
Stream Sensitivity	**Moderate**		

Narrative:

No adjustments, reach in reference condition

Phase 2 Reach Summary

February 27, 2006

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **4,082**
Reach # **M01**
Segment: **0**
Observers: **Adam Robtoy, Paul Stanley**
Completion Date: **August 24, 2005**
Rain: **No**
Segment Location: **from confluence with Missisquoi to intersection with 1st tributary near Tyler Branch Road**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Response**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	937
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	72.0
2.2 Max Depth (ft)	4.1
2.3 Mean Depth (ft)	3.3
2.4 Floodprone Width	700.0
2.5 Low Bank Height	4.6
2.6 Width/Depth	21.8
2.7 Entrenchment	9.7
2.8 Incision Ratio	1.1
2.9 Sinuosity	Low
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	300

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	8.0 %
Coarse Gravel	38.0 %
Fine Gravel	38.0 %
Sand	16.0 %
Silt/Clay Present?	Yes
Detritus	2.0 %
# Large Woody	6

2.13 Average Largest Particle

Bed	3 inches
Bar	3 inches

2.14 Stream Type

C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

	Lower	Upper
Typical Bank	Steep	
Bank Texture		
Material Type	Silt/Clay	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	300	200
Erosion Height	6.0	30.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	400	100
Near Bank Veg.	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous
Bank Canopy	Left	Right
Canopy	26-50	26-50
Mid-Channel	Open	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	26-50	26-50
Sub-dominant	5-25	5-25
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Hay
Sub-dominant	Forest	Crop
Mass Failures	One	
Mean Failure	30.0	

large mass failure near confluence with Missisquoi (~30 feet high), bar scalping and gravel mining throughout reach with permit from ANR, gravel and construction debris being trucked in and placed on upstream banks to attempt to stop bank erosion, farm road runs along entire left bank but

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	Multiple	Multiple
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	No

5.4 Stream Ford or Animal **Yes**
5.5 Channel Alterations **Bar**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 27, 2006

Stream: **Tyler Branch** Reach # **M01** Segment: **0** Completion Date: **August 24, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Paul Stanley** Rain: **No**

Segment Length (ft): **4,082** Segment Location: **from confluence with Missisquoi to intersection with 1st tributary near Tyler Branch Road**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**15**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**12**
6.5 Channel Flow Status	**10**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**16**
6.8 Bank Stability	**Left: 5 Right: 5**
6.9 Bank Vegetation Protection	**Left: 8 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 5**
Total Score	**125**
Habitat Rating	**0.625**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**15**	**None**	**Yes**
7.2 Channel Aggradation	**11**	**None**	**No**
7.3 Widening Channel	**13**		**No**
7.4 Change in Planform	**15**		**No**
Total Score	**54**		
Geomorphic Rating	**0.675**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Narrative:

minor/major aggradation, minor historic degradation and widening, other cross sections show slightly more degradation, aggradation causing new floodplain development

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,881**

Phase 2 Reach Summary

Reach # **M02** Segment: **0**
Observers: **Adam Robtoy, Paul Stanley**
Segment Location: **from M01 to tributary that enters 500' west of intersection of Duffy Hill Road and Tyler**

February 27, 2006
Completion Date: **August 25, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Response**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	300	0
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	963
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	78.0
2.2 Max Depth (ft)	4.4
2.3 Mean Depth (ft)	3.7
2.4 Floodprone Width	800.0
2.5 Low Bank Height	5.5
2.6 Width/Depth	21.1
2.7 Entrenchment	10.3
2.8 Incision Ratio	1.2
2.9 Sinuosity	Low
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	300

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	8.0 %
Coarse Gravel	51.0 %
Fine Gravel	25.0 %
Sand	16.0 %
Silt/Clay Present?	Yes
Detritus	5.0 %
# Large Woody	8

2.13 Average Largest Particle

Bed	3 inches
Bar	3 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Silt/Clay	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	0
Erosion Height	0.0	0.0
Revetmt. Type	Rip-rap	None
Revetmt. Length	800	0
Near Bank Veg.	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin
Bank Canopy	Left	Right
Canopy	26-50	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	26-50
Sub-dominant	26-50	5-25
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Deciduous
Sub-dominant	Deciduous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Crop	Crop
Sub-dominant	Hay	Hay
Mass Failures	None	
Mean Failure	0.0	

minor bar scalping near upstream end of reach, very large point bar along large bend mid-reach. nearly plane bed system along lower end of reach

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	Single
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Single	None	No

5.4 Stream Ford or Animal **No**
5.5 Channel Alterations **Bar Scalping**

February 27, 2006

Project: **Tyler Branch**

Phase 2 Reach Summary

Stream: **Tyler Branch** Reach # **M02** Segment: **0** Completion Date: **August 25, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Paul Stanley** Rain: **No**

Segment Length (ft): **3,881** Segment Location: **from M01 to tributary that enters 500' west of intersection of Duffy Hill Road and Tyler**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**13**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**13**
6.4 Sediment Deposition	**11**
6.5 Channel Flow Status	**10**
6.6 Channel Alteration	**12**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 8 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 6**
Total Score	**127**
Habitat Rating	**0.635**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**13**		**No**

Total Score	**54**
Geomorphic Rating	**0.675**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:
minor historic degradation, minor aggradation and widening

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,996**

Phase 2 Reach Summary

Reach # **M03** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from M02 to bridge that crosses Tyler Branch Road**

February 28, 2006
Completion Date: **August 25, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Response**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	100	100
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	754
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	74.0
2.2 Max Depth (ft)	4.0
2.3 Mean Depth (ft)	3.1
2.4 Floodprone Width	600.0
2.5 Low Bank Height	6.1
2.6 Width/Depth	23.9
2.7 Entrenchment	8.1
2.8 Incision Ratio	1.5
2.9 Sinuosity	Moderate
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	350

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	0.0 %
Cobble	8.0 %
Coarse Gravel	37.0 %
Fine Gravel	36.0 %
Sand	19.0 %
Silt/Clay Present?	Yes
Detritus	5.0 %
# Large Woody	4

2.13 Average Largest Particle

Bed	4 inches
Bar	3 inches

2.14 Stream Type

C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Undercut	
Bank Texture	Lower	Upper
Material Type	Silt/Clay	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	0
Erosion Height	0.0	0.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	1000	500
Near Bank Veg.	Left	Right
Dominant	Herbaceous	Herbaceous
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin
Bank Canopy	Left	Right
Canopy	1-25	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	5-25	51-100
Sub-dominant	26-50	26-50
Buffer Veg. Type	Left	Right
Dominant	Shrubs/Saplin	Shrubs/Saplin
Sub-dominant	Herbaceous	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Hay	Forest
Sub-dominant	Shrubs/Saplin	Hay
Mass Failures	None	
Mean Failure	0.0	

lots of large bars, wide channel with multiple exposed unvegetated point bars, rip rap dominates left bank (appears to be recently installed within last few years to protect adjacent fields)

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	1 500 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	Multiple
Diagonal	Delta	Island
Multiple	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	None	No

5.4 Stream Ford or Animal	No
5.5 Channel Alterations	Bar Scalping

February 28, 2006

Project: **Tyler Branch**

Phase 2 Reach Summary

Stream: **Tyler Branch** Reach # **M03** Segment: **0** Completion Date: **August 25, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **3,996** Segment Location: **from M02 to bridge that crosses Tyler Branch Road**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**10**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**13**
6.4 Sediment Deposition	**7**
6.5 Channel Flow Status	**9**
6.6 Channel Alteration	**10**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 8 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 4 Right: 7**
Total Score	**116**
Habitat Rating	**0.58**
Habitat Stream Condition	**Fair**

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	**10**		**No**
7.4 Change in Planform	**13**		**No**

Total Score	**46**
Geomorphic Rating	**0.575**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Fair**
Stream Sensitivity	**Very High**

Narrative:

major aggradation and widening possibly due to historic straightening, stream is begining to regain sinuosity, Stage III chosen due to field observations and widths at other cross sections,

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,600**

Phase 2 Reach Summary

Reach # **M04** Segment: **A**
Observers: **Adam Robtoy, Staci Pomeroy**
Segment Location: **from M03 to just downstream of farm bridge that crosses mid-reach**

February 28, 2006
Completion Date: **August 26, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone	**Response**
1.2 Alluvial Fan	**No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	**0**	**0**
Roads	**0**	**200**
Railroads	**0**	**0**
Improved Paths	**0**	**0**
Development	**0**	**0**

1.4 Adjacent Side	Left	Right
Hillside Slope	**Steep**	**Steep**
Continuous w/	**Sometimes**	**Never**
W/in 1 Bankfill	**Sometimes**	**Never**
Texture	**Silt/Clay**	**Not Evalua**

1.5 Valley Features	
Valley Width (ft)	**788**
Confinement Type	**Very Broad**
Rock Gorge?	**No**
Human-caused change - valley width?	**No**

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	**63.0**
2.2 Max Depth (ft)	**3.3**
2.3 Mean Depth (ft)	**2.8**
2.4 Floodprone Width	**750.0**
2.5 Low Bank Height	**5.9**
2.6 Width/Depth	**22.5**
2.7 Entrenchment	**11.9**
2.8 Incision Ratio	**1.8**
2.9 Sinuosity	**Moderate**
2.10 Riffles Type	**Sedimented**
2.11 Riffle/Step Spacing	**300**

2.12 Substrate Composition

Bedrock	**0.0** %
Boulder	**2.0** %
Cobble	**20.0** %
Coarse Gravel	**29.0** %
Fine Gravel	**32.0** %
Sand	**17.0** %
Silt/Clay Present?	**Yes**
Detritus	**5.0** %
# Large Woody	**24**

2.13 Average Largest Particle

Bed	**75 mm**
Bar	**75 mm**

2.14 Stream Type

C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	**Steep**	
Bank Texture	Lower	Upper
Material Type	**Gravel**	**Sand**
Consistency	**Non-cohesive**	**Non-cohesive**
Bank Erosion	Left	Right
Erosion Length	**200**	**400**
Erosion Height	**30.0**	**6.0**
Revetmt. Type	**None**	**None**
Revetmt. Length	**0**	**0**
Near Bank Veg.	Left	Right
Dominant	**Herbaceous**	**Herbaceous**
Sub-dominant		
Bank Canopy	Left	Right
Canopy	**26-50**	**26-50**
Mid-Channel	**Open**	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	**51-100**	**26-50**
Sub-dominant	**26-50**	**51-100**
Buffer Veg. Type	Left	Right
Dominant	**Deciduous**	**Deciduous**
Sub-dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Hay**
Sub-dominant	**Hay**	
Mass Failures	**One**	
Mean Failure	**30.0**	

large mass failure near downstream end of reach, old channel cut off near downstream end of reach, stream is now eroding into adjacent unbuffered hayfield. Very large point bars near cutoff

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	**Some**
4.2 Adjacent Wetlands	**Some**
4.3 Flow Status	**Low**
4.4 # of Debris Jams	**0**
4.5 Impoundments	**None**
Impoundmt. Location	
4.6 # of Stormwater	**0**
4.7 Upstream Flow	**None**
4.9 # of Beaver Dams	**0** **0** ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Multiple	**Multiple**	**Multiple**
Diagonal	Delta	Island
Single	**None**	**None**

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Single	**Single**	**None**	**None**

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Single	**None**	**Yes**

5.4 Stream Ford or Animal	**Yes**
5.5 Channel Alterations	**None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M04** Segment: **A** Completion Date: **August 26, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Staci Pomeroy** Rain: **No**

Segment Length (ft): **3,600** Segment Location: **from M03 to just downstream of farm bridge that crosses mid-reach**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**17**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**7**
6.5 Channel Flow Status	**9**
6.6 Channel Alteration	**18**
6.7 Frequency of Riffles/Steps	**18**
6.8 Bank Stability	**Left: 7 Right: 7**
6.9 Bank Vegetation Protection	**Left: 8 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 8 Right: 5**
Total Score	**137**
Habitat Rating	**0.685**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**Yes**
7.2 Channel Aggradation	**12**	**None**	**No**
7.3 Widening Channel	**12**		**No**
7.4 Change in Planform	**13**		**No**
Total Score	**48**		
Geomorphic Rating	**0.6**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**III**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Narrative:
historic degradation and active widening and aggrading channel, recent neck cut-off and moderate/severe erosion along adjacent hayfield

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **4,000**

Phase 2 Reach Summary

Reach # **M04** Segment: **B**
Observers: **Adam Robtoy, Staci Pomeroy**
Segment Location: **from just downstream of farm bridge at mid-reach to confluence with The Branch**

February 28, 2006
Completion Date: **August 26, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone	**Response**
1.2 Alluvial Fan	**No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	**0**	**0**
Roads	**0**	**0**
Railroads	**0**	**0**
Improved Paths	**0**	**0**
Development	**0**	**0**

1.4 Adjacent Side	Left	Right
Hillside Slope	**Steep**	**Steep**
Continuous w/	**Sometimes**	**Never**
W/in 1 Bankfill	**Sometimes**	**Never**
Texture	**Silt/Clay**	**Not Evalua**

1.5 Valley Features	
Valley Width (ft)	**788**
Confinement Type	**Very Broad**
Rock Gorge?	**No**
Human-caused change - valley width?	**No**

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	**81.0**
2.2 Max Depth (ft)	**4.9**
2.3 Mean Depth (ft)	**3.4**
2.4 Floodprone Width	**750.0**
2.5 Low Bank Height	**6.9**
2.6 Width/Depth	**23.8**
2.7 Entrenchment	**9.3**
2.8 Incision Ratio	**1.4**
2.9 Sinuosity	**Low**
2.10 Riffles Type	**Sedimented**
2.11 Riffle/Step Spacing	**500**

2.12 Substrate Composition

Bedrock	**0.0** %
Boulder	**0.0** %
Cobble	**6.0** %
Coarse Gravel	**50.0** %
Fine Gravel	**28.0** %
Sand	**16.0** %
Silt/Clay Present?	**No**
Detritus	**5.0** %
# Large Woody	**2**

2.13 Average Largest Particle

Bed	**75 mm**
Bar	**75 mm**

2.14 Stream Type

C 4 Non Plane Bed

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	**Steep**	
Bank Texture	Lower	Upper
Material Type	**Gravel**	**Sand**
Consistency	**Non-cohesive**	**Non-cohesive**
Bank Erosion	Left	Right
Erosion Length	**100**	**0**
Erosion Height	**2.0**	**0.0**
Revetmt. Type	**None**	**Rip-rap**
Revetmt. Length	**0**	**2500**
Near Bank Veg.	Left	Right
Dominant	**Herbaceous**	**Herbaceous**
Sub-dominant	**Shrubs/Saplin**	**Shrubs/Saplin**
Bank Canopy	Left	Right
Canopy	**26-50**	**26-50**
Mid-Channel	**Open**	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**5-25**
Sub-dominant	**5-25**	**26-50**
Buffer Veg. Type	Left	Right
Dominant	**Deciduous**	**Deciduous**
Sub-dominant	**Herbaceous**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Hay**
Sub-dominant	**Forest**	**Pasture**
Mass Failures	**None**	
Mean Failure	**0.0**	

possible historic straightening, nearly all of right bank covered in rip-rap, bedrock and bridge constrictions are located at same point (bridge built around bedrock outcrop)

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	**None**
4.2 Adjacent Wetlands	**None**
4.3 Flow Status	**Low**
4.4 # of Debris Jams	**0**
4.5 Impoundments	**None**
Impoundmt. Location	
4.6 # of Stormwater	**0**
4.7 Upstream Flow	**None**
4.9 # of Beaver Dams	**0** **0** ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	**Multiple**	**Multiple**
Diagonal	Delta	Island
None	**None**	**None**

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	**None**	**None**	**None**

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	**None**	**No**

5.4 Stream Ford or Animal	**Yes**
5.5 Channel Alterations	**Straightenin**

February 28, 2006

Project: **Tyler Branch**

Phase 2 Reach Summary

Stream: **Tyler Branch** Reach # **M04** Segment: **B** Completion Date: **August 26, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy, Staci Pomeroy** Rain: **No**

Segment Length (ft): **4,000** Segment Location: **from just downstream of farm bridge at mid-reach to confluence with The Branch**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**11**
6.2 Embeddedness	**7**
6.3 Velocity/Depth Patterns	**11**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**10**
6.6 Channel Alteration	**9**
6.7 Frequency of Riffles/Steps	**11**
6.8 Bank Stability	**Left: 9 Right: 6**
6.9 Bank Vegetation Protection	**Left: 8 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 2**
Total Score	**106**
Habitat Rating	**0.53**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Plane Bed**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**14**		**No**
7.4 Change in Planform	**13**		**No**

Total Score	**52**
Geomorphic Rating	**0.65**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Fair**
Stream Sensitivity	**Very High**

Narrative:

major historic degradation, major active aggradation, historic straightening, rip rap runs along most of right bank

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **1,791**

Phase 2 Reach Summary

Reach # **M05** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from confluence with The Branch to VT. Route 108 Bridge**

February 28, 2006
Completion Date: **September 8, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	50	50
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Never
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	615
Confinement Type	Very Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	70.0
2.2 Max Depth (ft)	3.6
2.3 Mean Depth (ft)	2.3
2.4 Floodprone Width	600.0
2.5 Low Bank Height	6.5
2.6 Width/Depth	30.4
2.7 Entrenchment	8.6
2.8 Incision Ratio	1.8
2.9 Sinuosity	Low
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	350

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	2.0 %
Cobble	33.0 %
Coarse Gravel	43.0 %
Fine Gravel	8.0 %
Sand	14.0 %
Silt/Clay Present?	No
Detritus	3.0 %
# Large Woody	3

2.13 Average Largest Particle

Bed	6 inches
Bar	6 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	150	0
Erosion Height	6.0	0.0
Revetmt. Type	Rip-rap	Rip-rap
Revetmt. Length	1200	800
Near Bank Veg.	Left	Right
Dominant	Herbaceous	Deciduous
Sub-dominant	Deciduous	Herbaceous
Bank Canopy	Left	Right
Canopy	1-25	26-50
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	26-50	26-50
Sub-dominant	5-25	5-25
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Shrubs/Saplin	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Crop	Hay
Sub-dominant	Forest	Forest
Mass Failures	None	
Mean Failure	0.0	

Historic straightening, rip-rap present on significant portions of both banks, bedrock grade controls present at upstream and downstream ends of reach

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	None
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	Multiple
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Single	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Single	None	No

5.4 Stream Ford or Animal	No
5.5 Channel Alterations	Straightenin

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M05** Segment: **0** Completion Date: **September 8, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **1,791** Segment Location: **from confluence with The Branch to VT. Route 108 Bridge**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**13**
6.2 Embeddedness	**10**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**13**
6.5 Channel Flow Status	**10**
6.6 Channel Alteration	**6**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 7 Right: 9**
6.9 Bank Vegetation Protection	**Left: 7 Right: 8**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 6**
Total Score	**123**
Habitat Rating	**0.615**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**12**		**No**
7.4 Change in Planform	**11**		**No**
Total Score	**49**		
Geomorphic Rating	**0.6125**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Narrative:

historic straightening, major historic degradation, rip rap on banks preventing further widening and planform adjustments, channel evolution stage borderline between II and III

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,435**

Phase 2 Reach Summary

Reach # **M07** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from intersection of Grange Hall Road and Tyler Branch Road to bedrock gorge located**

February 28, 2006
Completion Date: **September 8, 2005**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone	**Response**
1.2 Alluvial Fan	**No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	**0**	**300**
Roads	**0**	**300**
Railroads	**0**	**0**
Improved Paths	**0**	**0**
Development	**0**	**0**
1.4 Adjacent Side	Left	Right
Hillside Slope	**Steep**	**Steep**
Continuous w/	**Never**	**Never**
W/in 1 Bankfill	**Sometimes**	**Never**
Texture	**Not Evalua**	

1.5 Valley Features

Valley Width (ft)	**531**
Confinement Type	**Broad**
Rock Gorge?	**No**
Human-caused change - valley width?	**No**

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	**63.0**
2.2 Max Depth (ft)	**3.6**
2.3 Mean Depth (ft)	**2.9**
2.4 Floodprone Width	**375.0**
2.5 Low Bank Height	**5.9**
2.6 Width/Depth	**21.7**
2.7 Entrenchment	**6.0**
2.8 Incision Ratio	**1.6**
2.9 Sinuosity	**Moderate**
2.10 Riffles Type	**Sedimented**
2.11 Riffle/Step Spacing	**250**

2.12 Substrate Composition

Bedrock	**0.0** %
Boulder	**0.0** %
Cobble	**38.0** %
Coarse Gravel	**36.0** %
Fine Gravel	**18.0** %
Sand	**8.0** %
Silt/Clay Present?	**No**
Detritus	**3.0** %
# Large Woody	**4**

2.13 Average Largest Particle

Bed	**6 inches**
Bar	**6 inches**

2.14 Stream Type

C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	**Steep**	
Bank Texture	Lower	Upper
Material Type	**Gravel**	**Gravel**
Consistency	**Non-cohesive**	**Non-cohesive**
Bank Erosion	Left	Right
Erosion Length	**300**	**0**
Erosion Height	**6.0**	**0.0**
Revetmt. Type	**Rip-rap**	**Rip-rap**
Revetmt. Length	**400**	**1800**
Near Bank Veg.	Left	Right
Dominant	**Herbaceous**	**Herbaceous**
Sub-dominant	**Deciduous**	**Deciduous**
Bank Canopy	Left	Right
Canopy	**1-25**	**1-25**
Mid-Channel	**Open**	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	**26-50**	**5-25**
Sub-dominant	**5-25**	**26-50**
Buffer Veg. Type	Left	Right
Dominant	**Deciduous**	**Shrubs/Saplin**
Sub-dominant	**Shrubs/Saplin**	**Deciduous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Hay**	**Hay**
Sub-dominant	**Forest**	**Forest**
Mass Failures	**None**	
Mean Failure	**0.0**	

bar scalping and gravel mining with permit from ANR, lots of large bars in lower end of reach, riprap dominates right bank, rip rap and tree planting performed along left bank with help from MRBA, trees cut along right bank (mid-reach) and used along with fill to create berms and prevent

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	**Some**
4.2 Adjacent Wetlands	**None**
4.3 Flow Status	**Low**
4.4 # of Debris Jams	**0**
4.5 Impoundments	**None**
Impoundmt. Location	
4.6 # of Stormwater	**0**
4.7 Upstream Flow	**None**
4.9 # of Beaver Dams	**0** **0** ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Multiple	**Multiple**	**Multiple**
Diagonal	Delta	Island
None	**None**	**None**

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Single	**None**	**None**	**None**

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	**None**	**No**

5.4 Stream Ford or Animal **No**

5.5 Channel Alterations **Bar**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M07** Segment: **0** Completion Date: **September 8, 2005**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **3,435** Segment Location: **from intersection of Grange Hall Road and Tyler Branch Road to bedrock gorge located**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**11**
6.2 Embeddedness	**12**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**11**
6.6 Channel Alteration	**10**
6.7 Frequency of Riffles/Steps	**15**
6.8 Bank Stability	**Left: 8 Right: 10**
6.9 Bank Vegetation Protection	**Left: 5 Right: 6**
6.10 Riparian Vegetation Zone Width	**Left: 5 Right: 5**
Total Score	**123**
Habitat Rating	**0.615**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**12**	**None**	**Yes**
7.2 Channel Aggradation	**12**	**None**	**No**
7.3 Widening Channel	**11**		**No**
7.4 Change in Planform	**14**		**No**

Total Score	**49**
Geomorphic Rating	**0.6125**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Fair**
Stream Sensitivity	**High**

Narrative:

historic degradation, currently aggrading and widening, begining to reform sinuosity and create new floodplain, Stage III evolution chosen based on field observations and width of other cross section (74')

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **3,405**

Phase 2 Reach Summary

Reach # **M09** Segment: **0**
Observers: **Adam Robtoy, Paul Stanley**
Segment Location: **from M08 to tributary that enters near intersection of Tyler Branch Road and Ovitt Road**

February 28, 2006
Completion Date: **September 16,**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Transfer**
1.2 Alluvial Fan: **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	200
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Very Steep
Continuous w/	Never	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	400
Confinement Type	Narrow
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	72.0
2.2 Max Depth (ft)	3.0
2.3 Mean Depth (ft)	2.3
2.4 Floodprone Width	295.0
2.5 Low Bank Height	3.4
2.6 Width/Depth	31.3
2.7 Entrenchment	4.1
2.8 Incision Ratio	1.1
2.9 Sinuosity	Low
2.10 Riffles Type	Sedimented
2.11 Riffle/Step Spacing	400

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	3.0 %
Cobble	44.0 %
Coarse Gravel	35.0 %
Fine Gravel	9.0 %
Sand	10.0 %
Silt/Clay Present?	No
Detritus	0.0 %
# Large Woody	1

2.13 Average Largest Particle

Bed	8 inches
Bar	7 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Boulder/Cob	Gravel
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	50
Erosion Height	0.0	5.0
Revetmt. Type	Rip-rap	None
Revetmt. Length	300	0
Near Bank Veg.	Left	Right
Dominant	Pasture	Shrubs/Saplin
Sub-dominant	Herbaceous	Pasture
Bank Canopy	Left	Right
Canopy	0	1-25
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	<5	5-25
Sub-dominant	None	<5
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Shrubs/Saplin
Sub-dominant		Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Crop	Pasture
Sub-dominant	Pasture	Forest
Mass Failures	None	
Mean Failure	0.0	

historic straightening, gravel mining with permit from VT DEC, cows have access to stream bed for entire reach, lots of filamentous algae on stream bed

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	Multiple	Multiple
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Single	None	None	Single

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Single	None	No

5.4 Stream Ford or Animal: **Yes**
5.5 Channel Alterations: **Straightenin**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M09** Segment: **0** Completion Date: **September 16,**

Organization: **Johnson Company** Observers: **Adam Robtoy, Paul Stanley** Rain: **No**

Segment Length (ft): **3,405** Segment Location: **from M08 to tributary that enters near intersection of Tyler Branch Road and Ovitt Road**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**8**
6.2 Embeddedness	**11**
6.3 Velocity/Depth Patterns	**10**
6.4 Sediment Deposition	**13**
6.5 Channel Flow Status	**11**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**14**
6.8 Bank Stability	**Left: 9 Right: 7**
6.9 Bank Vegetation Protection	**Left: 5 Right: 2**
6.10 Riparian Vegetation Zone Width	**Left: 0 Right: 2**
Total Score	**106**
Habitat Rating	**0.53**
Habitat Stream Condition	**Fair**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**15**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**15**		**No**

Total Score	**59**
Geomorphic Rating	**0.7375**
Channel Evolution Model	**F**
Channel Evolution Stage	**III**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:

minor historic degradation, major active aggradation and minor widening, Stage III chosen based on field observations and other cross section shows more incision (1.8),

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **1,000**

Phase 2 Reach Summary

Reach # **M10** Segment: **A**
Observers: **Adam Robtoy**
Segment Location: **Middle half of M10, from M09 to 1/2 mile west intersection of Tyler Branch Road and Boston**

February 28, 2006
Completion Date: **September 15,**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	1000
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Always	Always
Texture	Bedrock	Not Evalua

1.5 Valley Features
Valley Width (ft) **150**
Confinement Type **Narrow**
Rock Gorge? **No**
Human-caused change - valley width? **Yes**
1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	52.0
2.2 Max Depth (ft)	2.9
2.3 Mean Depth (ft)	2.2
2.4 Floodprone Width	85.0
2.5 Low Bank Height	5.1
2.6 Width/Depth	23.6
2.7 Entrenchment	1.6
2.8 Incision Ratio	1.8
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	8.0 %
Boulder	12.0 %
Cobble	38.0 %
Coarse Gravel	22.0 %
Fine Gravel	16.0 %
Sand	4.0 %
Silt/Clay Present?	No
Detritus	10.0 %
# Large Woody	3

2.13 Average Largest Particle
Bed **8 inches**
Bar **7 inches**
2.14 Stream Type
B 3 c Step-Pool
Is a sub-reach? **Yes**
2.15 Reference Stream Type
(if different from Phase 1)
B 3 Non Step-Pool

Step 3. Riparian Features

3.1 Stream Banks
Typical Bank **Steep**

Bank Texture	Lower	Upper
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive

Bank Erosion	Left	Right
Erosion Length	0	50
Erosion Height	0.0	10.0
Revetmt. Type	None	Rip-rap
Revetmt. Length	0	200

Near Bank Veg.	Left	Right
Dominant	Deciduous	Deciduous
Sub-dominant	Coniferous	Coniferous

Bank Canopy	Left	Right
Canopy	76-100	51-75
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	26-50
Sub-dominant	None	5-25

Buffer Veg. Type	Left	Right
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Shrubs/Saplin	Shrubs/Saplin

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Forest
Sub-dominant		Residential
Mass Failures	None	
Mean Failure	0.0	

naturally straight channel in narrow valley, valley has been narrowed slightly by addition of roadway along right bank

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some
4.2 Adjacent Wetlands	None
4.3 Flow Status	Low
4.4 # of Debris Jams	0
4.5 Impoundments	None
Impoundmt. Location	
4.6 # of Stormwater	0
4.7 Upstream Flow	None
4.9 # of Beaver Dams	0 0 ft

4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Single	None	Multiple
Diagonal	Delta	Island
None	None	Single

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal **No**
5.5 Channel Alterations **None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M10** Segment: **A** Completion Date: **September 15,**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **1,000** Segment Location: **Middle half of M10, from M09 to 1/2 mile west intersection of Tyler Branch Road and Boston**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**17**
6.2 Embeddedness	**13**
6.3 Velocity/Depth Patterns	**16**
6.4 Sediment Deposition	**16**
6.5 Channel Flow Status	**18**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**18**
6.8 Bank Stability	**Left: 10 Right: 8**
6.9 Bank Vegetation Protection	**Left: 10 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 5**
Total Score	**162**
Habitat Rating	**0.81**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**11**	**None**	**Yes**
7.2 Channel Aggradation	**16**	**None**	**No**
7.3 Widening Channel	**14**		**Yes**
7.4 Change in Planform	**16**		**No**
Total Score	**57**		
Geomorphic Rating	**0.7125**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**IV**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Narrative:

major historic degradation, minor aggradation and widening, but overall relatively stable reach in narrow valley

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **878**

Phase 2 Reach Summary

Reach # **M10** Segment: **B**
Observers: **Adam Robtoy**
Segment Location: **from M09 to 1/2 mile west of the intersection of Tyler Branch Road and Boston Post Road**

February 28, 2006
Completion Date: **September 15,**
Rain: **No**

Step 1. Valley and Floodplain

1.1 Watershed Zone: **Transfer**
1.2 Alluvial Fan: **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	800
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Steep	Steep
Continuous w/	Never	Never
W/in 1 Bankfill	Never	Sometimes
Texture	Not Evalua	Not Evalua

1.5 Valley Features

Valley Width (ft)	400
Confinement Type	Broad
Rock Gorge?	No
Human-caused change - valley width?	Yes

1.6 Grade Controls
Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	46.0
2.2 Max Depth (ft)	2.8
2.3 Mean Depth (ft)	2.4
2.4 Floodprone Width	300.0
2.5 Low Bank Height	4.2
2.6 Width/Depth	19.2
2.7 Entrenchment	6.5
2.8 Incision Ratio	1.5
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	200

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	6.0 %
Cobble	32.0 %
Coarse Gravel	28.0 %
Fine Gravel	24.0 %
Sand	10.0 %
Silt/Clay Present?	Yes
Detritus	5.0 %
# Large Woody	0

2.13 Average Largest Particle

Bed	6	inches
Bar	6	inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	0	0
Erosion Height	0.0	0.0
Revetmt. Type	None	Rip-rap
Revetmt. Length	0	500
Near Bank Veg.	Left	Right
Dominant	Herbaceous	Shrubs/Saplin
Sub-dominant	Pasture	Herbaceous
Bank Canopy	Left	Right
Canopy	1-25	0
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	<5	5-25
Sub-dominant	5-25	26-50
Buffer Veg. Type	Left	Right
Dominant	Herbaceous	Shrubs/Saplin
Sub-dominant	Shrubs/Saplin	Mixed Trees

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Pasture	Residential
Sub-dominant		Forest
Mass Failures	None	
Mean Failure	0.0	

wider valley type and smaller substrate than M10A, segment is comprised of lower 1/4 and upper 1/4 of M10, cows have access to lower portions of segment

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some	
4.2 Adjacent Wetlands	None	
4.3 Flow Status	Low	
4.4 # of Debris Jams	0	
4.5 Impoundments	None	
Impoundmt. Location		
4.6 # of Stormwater	0	
4.7 Upstream Flow	None	
4.9 # of Beaver Dams	0	0 ft

4.8 Channel Constrictions
Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Multiple	None
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal: **No**
5.5 Channel Alterations: **None**

Project: **Tyler Branch**

Phase 2 Reach Summary

February 28, 2006

Stream: **Tyler Branch** Reach # **M10** Segment: **B** Completion Date: **September 15,**

Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **No**

Segment Length (ft): **878** Segment Location: **from M09 to 1/2 mile west of the intersection of Tyler Branch Road and Boston Post Road**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**15**
6.2 Embeddedness	**13**
6.3 Velocity/Depth Patterns	**14**
6.4 Sediment Deposition	**15**
6.5 Channel Flow Status	**15**
6.6 Channel Alteration	**14**
6.7 Frequency of Riffles/Steps	**18**
6.8 Bank Stability	**Left: 9 Right: 8**
6.9 Bank Vegetation Protection	**Left: 7 Right: 9**
6.10 Riparian Vegetation Zone Width	**Left: 3 Right: 4**
Total Score	**144**
Habitat Rating	**0.72**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**14**	**None**	**Yes**
7.2 Channel Aggradation	**15**	**None**	**No**
7.3 Widening Channel	**15**		**No**
7.4 Change in Planform	**14**		**No**
Total Score	**58**		
Geomorphic Rating	**0.725**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**II**		
Geomorphic Condition	**Good**		
Stream Sensitivity	**High**		

Narrative:

minor historic degradation, minor aggradation, widening, and planform

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **2,234**

Phase 2 Reach Summary

Reach # **M11** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from M10 to tributary that enters just west of intersection of Tyler Branch Road and Boston**

February 28, 2006
Completion Date: **September 28,**
Rain: **Yes**

Step 1. Valley and Floodplain

1.1 Watershed Zone **Transfer**
1.2 Alluvial Fan **No**
1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	0	0
Roads	0	700
Railroads	0	0
Improved Paths	0	0
Development	0	0

1.4 Adjacent Side	Left	Right
Hillside Slope	Very Steep	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
Texture	Bedrock	Bedrock

1.5 Valley Features

Valley Width (ft)	300
Confinement Type	Broad
Rock Gorge?	No
Human-caused change - valley width?	No

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	50.0
2.2 Max Depth (ft)	3.4
2.3 Mean Depth (ft)	2.7
2.4 Floodprone Width	180.0
2.5 Low Bank Height	5.3
2.6 Width/Depth	18.5
2.7 Entrenchment	3.6
2.8 Incision Ratio	1.6
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing	300

2.12 Substrate Composition

Bedrock	0.0 %
Boulder	6.0 %
Cobble	43.0 %
Coarse Gravel	34.0 %
Fine Gravel	10.0 %
Sand	8.0 %
Silt/Clay Present?	No
Detritus	10.0 %
# Large Woody	3

2.13 Average Largest Particle

Bed	6 inches
Bar	5 inches

2.14 Stream Type
C 4 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

Typical Bank	Steep	
Bank Texture	Lower	Upper
Material Type	Bedrock	Gravel
Consistency	Cohesive	Non-cohesive
Bank Erosion	Left	Right
Erosion Length	100	100
Erosion Height	5.0	7.0
Revetmt. Type	None	None
Revetmt. Length	0	0
Near Bank Veg.	Left	Right
Dominant	Deciduous Shrubs/Saplin	
Sub-dominant	Shrubs/Saplin	Herbaceous
Bank Canopy	Left	Right
Canopy	51-75	1-25
Mid-Channel	Open	

3.2 Riparian Buffer

Buffer Width	Left	Right
Dominant	>100	5-25
Sub-dominant	5-25	<5
Buffer Veg. Type	Left	Right
Dominant	Mixed Trees Shrubs/Saplin	
Sub-dominant	Shrubs/Saplin	Herbaceous

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	Forest	Residential
Sub-dominant	Hay	Pasture
Mass Failures	None	
Mean Failure	0.0	

bedrock grade control mid-reach, houses along downstream half of reach close to being within floodplain.

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	Some	
4.2 Adjacent Wetlands	None	
4.3 Flow Status	Moderate	
4.4 # of Debris Jams	0	
4.5 Impoundments	None	
Impoundmt. Location		
4.6 # of Stormwater	0	
4.7 Upstream Flow	None	
4.9 # of Beaver Dams	0	0 ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
None	Single	Single
Diagonal	Delta	Island
None	None	None

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
None	None	None	None

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
None	None	No

5.4 Stream Ford or Animal **Yes**
5.5 Channel Alterations **None**

Phase 2 Reach Summary

February 28, 2006

Project: **Tyler Branch**
Stream: **Tyler Branch** Reach # **M11** Segment: **0** Completion Date: **September 28,**
Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **Yes**
Segment Length (ft): **2,234** Segment Location: **from M10 to tributary that enters just west of intersection of Tyler Branch Road and Boston**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**14**
6.2 Embeddedness	**13**
6.3 Velocity/Depth Patterns	**15**
6.4 Sediment Deposition	**20**
6.5 Channel Flow Status	**19**
6.6 Channel Alteration	**16**
6.7 Frequency of Riffles/Steps	**17**
6.8 Bank Stability	**Left: 8 Right: 8**
6.9 Bank Vegetation Protection	**Left: 9 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 9 Right: 5**
Total Score	**160**
Habitat Rating	**0.8**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**14**	**None**	**Yes**
7.2 Channel Aggradation	**19**	**None**	**No**
7.3 Widening Channel	**16**		**No**
7.4 Change in Planform	**17**		**No**

Total Score	**66**
Geomorphic Rating	**0.825**
Channel Evolution Model	**F**
Channel Evolution Stage	**II**
Geomorphic Condition	**Good**
Stream Sensitivity	**High**

Narrative:
minor historic degradation, minor active widening

Project: **Tyler Branch**
Stream: **Tyler Branch**
Organization: **Johnson Company**
Segment Length (ft): **7,687**

Phase 2 Reach Summary

Reach # **M12** Segment: **0**
Observers: **Adam Robtoy**
Segment Location: **from M11 to confluence of beaver meadow brook and cold hollow brook**

February 28, 2006
Completion Date: **September 29,**
Rain: **Yes**

Step 1. Valley and Floodplain

1.1 Watershed Zone	**Response**
1.2 Alluvial Fan	**No**

1.3 Corridor Encroachments

Length (ft)	Left	Right
Berms	**0**	**0**
Roads	**300**	**1400**
Railroads	**0**	**0**
Improved Paths	**0**	**0**
Development	**0**	**0**

1.4 Adjacent Side	Left	Right
Hillside Slope	**Steep**	**Very Steep**
Continuous w/	**Sometimes**	**Sometimes**
W/in 1 Bankfill	**Sometimes**	**Sometimes**
Texture	**Other**	**Silt/Clay**

1.5 Valley Features	
Valley Width (ft)	**469**
Confinement Type	**Very Broad**
Rock Gorge?	**No**
Human-caused change - valley width?	**No**

1.6 Grade Controls

Data not displayed due to problem with report.

Step 2. Stream Channel

2.1 Bankfill Width (ft)	**44.0**
2.2 Max Depth (ft)	**3.0**
2.3 Mean Depth (ft)	**2.3**
2.4 Floodprone Width	**250.0**
2.5 Low Bank Height	**4.5**
2.6 Width/Depth	**19.1**
2.7 Entrenchment	**5.7**
2.8 Incision Ratio	**1.5**
2.9 Sinuosity	**Moderate**
2.10 Riffles Type	**Sedimented**
2.11 Riffle/Step Spacing	**300**

2.12 Substrate Composition

Bedrock	**0.0** %
Boulder	**4.0** %
Cobble	**53.0** %
Coarse Gravel	**25.0** %
Fine Gravel	**7.0** %
Sand	**11.0** %
Silt/Clay Present?	**Yes**
Detritus	**5.0** %
# Large Woody	**12**

2.13 Average Largest Particle

Bed	**8 inches**
Bar	**6 inches**

2.14 Stream Type

C 3 Non Riffle-Pool

Is a sub-reach? **No**

2.15 Reference Stream Type
(if different from Phase 1)

Step 3. Riparian Features

3.1 Stream Banks

	Lower	Upper
Typical Bank	**Steep**	
Bank Texture	Lower	Upper
Material Type	**Gravel**	**Sand**
Consistency	**Non-cohesive**	**Non-cohesive**
Bank Erosion	Left	Right
Erosion Length	**800**	**150**
Erosion Height	**10.0**	**4.0**
Revetmt. Type	**None**	**Rip-rap**
Revetmt. Length	**0**	**600**
Near Bank Veg.	Left	Right
Dominant	**Shrubs/Saplin**	**Shrubs/Saplin**
Sub-dominant	**Herbaceous**	**Herbaceous**
Bank Canopy	Left	Right
Canopy	**26-50**	**26-50**
Mid-Channel	**Open**	

3.2 Riparian Buffer

	Left	Right
Buffer Width		
Dominant	**>100**	**26-50**
Sub-dominant	**5-25**	**5-25**
Buffer Veg. Type	Left	Right
Dominant	**Mixed Trees**	**Shrubs/Saplin**
Sub-dominant	**Shrubs/Saplin**	**Herbaceous**

3.3 Riparian Corridor

Corridor Land	Left	Right
Dominant	**Forest**	**Shrubs/Saplin**
Sub-dominant	**Hay**	**Hay**
Mass Failures	**Multiple**	
Mean Failure	**15.0**	

historic straightening, lots of large bars/aggradation, several large mass failures and eroding banks (planform adjustment)

Step 4. Flow & Flow Modifiers

4.1 Springs / Seeps	**Some**
4.2 Adjacent Wetlands	**None**
4.3 Flow Status	**Moderate**
4.4 # of Debris Jams	**0**
4.5 Impoundments	**None**
Impoundmt. Location	
4.6 # of Stormwater	**0**
4.7 Upstream Flow	**None**
4.9 # of Beaver Dams	**1 500** ft

4.8 Channel Constrictions

Data not displayed due to problem with report.

Step 5. Channel Bed and Planform Changes

5.1 Bar Types

Mid	Point	Side
Multiple	**Multiple**	**Multiple**
Diagonal	Delta	Island
None	**None**	**Multiple**

5.2 Other Features

Flood Chute	Neck Cutoff	Chan. Avulsion	Braiding
Multiple	**None**	**None**	**Multiple**

5.3 Steep Riffles and Head Cuts

Steep Riffles	Head Cuts	Trib Rejuv.
Multiple	**None**	**Yes**

5.4 Stream Ford or Animal	**Yes**
5.5 Channel Alterations	**Straightenin**

Phase 2 Reach Summary

February 28, 2006

Project: **Tyler Branch**
Stream: **Tyler Branch** Reach # **M12** Segment: **0** Completion Date: **September 29,**
Organization: **Johnson Company** Observers: **Adam Robtoy** Rain: **Yes**
Segment Length (ft): **7,687** Segment Location: **from M11 to confluence of beaver meadow brook and cold hollow brook**

Step 6. Rapid Habitat Assessment Data

Stream Gradient Type **High**

	Score
6.1 Epifaunal Substrate - Available	**16**
6.2 Embeddedness	**15**
6.3 Velocity/Depth Patterns	**16**
6.4 Sediment Deposition	**10**
6.5 Channel Flow Status	**11**
6.6 Channel Alteration	**15**
6.7 Frequency of Riffles/Steps	**14**
6.8 Bank Stability	**Left: 5 Right: 8**
6.9 Bank Vegetation Protection	**Left: 10 Right: 7**
6.10 Riparian Vegetation Zone Width	**Left: 10 Right: 7**
Total Score	**144**
Habitat Rating	**0.72**
Habitat Stream Condition	**Good**

Step 7. Rapid Geomorphic Assessment Data

Confinement Type **Unconfined**

	Score	STD	Historic
7.1 Channel Degradation	**13**	**None**	**Yes**
7.2 Channel Aggradation	**14**	**None**	**No**
7.3 Widening Channel	**11**		**No**
7.4 Change in Planform	**10**		**No**
Total Score	**48**		
Geomorphic Rating	**0.6**		
Channel Evolution Model	**F**		
Channel Evolution Stage	**III**		
Geomorphic Condition	**Fair**		
Stream Sensitivity	**Very High**		

Narrative:
major historic degradation, major active widening, aggradation, and planform adjustments

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	200027003706012	**Local Structure ID**	---
Assessment Date	08/18/2005	**Observers**	AWR
Town	Bakersfield		
Location	Route 108 at intersection of Boston Post Road and King Road		
Latitude	44.81	**Longitude**	-72.79
Road Name	Route 108	**Road Type**	Paved
Stream Name	The Branch		
Channel width	17 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Concrete	**Number of bridge piers/arches**	0
Bridge Width	30 ft.	**Skewed to roadway?**	Yes
Bridge Clearance	8 ft.		
Bridge/Arch Span	17 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Naturally Straight
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	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 greater than 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.)	---	---	

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?

	Upstream	Downstream
Vegetation Band - Left	No	No
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	200027004106012	**Local Structure ID**	---
Assessment Date	08/10/2005	**Observers**	AWR
Town	Bakersfield		
Location	on Rt. 108 just south of intersection of Pudvah Road and 108		
Latitude	44.83	**Longitude**	-72.80
Road Name	VT Route 108	**Road Type**	Paved
Stream Name	The Branch		
Channel width	16 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Concrete	**Number of bridge piers/arches**	0
Bridge Width	26 ft.	**Skewed to roadway?**	No
Bridge Clearance	12 ft.		
Bridge/Arch Span	27 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	No
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits greater than 1/2 bankfull	No	No	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	Road Embankment	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	300271004006011	**Local Structure ID**	---
Assessment Date	08/12/2005	**Observers**	AWR
Town	Bakersfield		
Location	End Reach 8 near Brown's Pond Dam		
Latitude	44.82	**Longitude**	-72.79
Road Name	BROWNS POND RD	**Road Type**	Paved
Stream Name	The Branch		
Channel width	15 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	16 ft.	**Skewed to roadway?**	No
Bridge Clearance	25 ft.		
Bridge/Arch Span	30 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Not Significant
Structure is located at significant break in valley slope	Yes
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Naturally Straight
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	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 greater than 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	Yes	No	
Beaver Dam distance (ft.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Mixed Forest	
Dominant Vegetation Type - Right	Shrub/Sapling	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?

	Upstream	Downstream
Vegetation Band - Left	No	No
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	300271004206011	**Local Structure ID**	---
Assessment Date	08/10/2005	**Observers**	AWR
Town	Bakersfield		
Location	500 feet north of southern intersection of Ovitt Road and Rt. 108		
Latitude	44.83	**Longitude**	-72.80
Road Name	OVITT RD	**Road Type**	Paved
Stream Name	The Branch		
Channel width	18 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Concrete	**Number of bridge piers/arches**	0
Bridge Width	22 ft.	**Skewed to roadway?**	Yes
Bridge Clearance	4 ft.		
Bridge/Arch Span	20 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	Sediment
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Unsure
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	Yes
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Point, Side, Mid-channel	None
Elevation of sediment deposits greater than 1/2 bankfull	No	Yes	No
Bank Erosion	Low	Low	
Hard Bank Armoring	Intact	None	
Stream bed scour causing undermining around or under structure	None	Wing walls	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	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?			
Vegetation Band - Left	No	No	
Vegetation 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	lots of sediment present immediately downstream of bridge		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	300271004306011	**Local Structure ID**	---
Assessment Date	08/10/2005	**Observers**	AWR
Town	Bakersfield		
Location	1,000 feet north of southern intersection of Ovitt Road and Rt. 108		
Latitude	44.84	**Longitude**	-72.80
Road Name	OVITT RD	**Road Type**	Paved
Stream Name	The Branch		
Channel width	21 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Concrete	**Number of bridge piers/arches**	0
Bridge Width	19 ft.	**Skewed to roadway?**	No
Bridge Clearance	8 ft.		
Bridge/Arch Span	21 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Cobble	Gravel
Bedrock Present	No	Yes	Yes
Type of Sediment Deposits	None	Point	None
Elevation of sediment deposits greater than 1/2 bankfull	No	No	No
Bank Erosion	Low	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	Herbaceous/Grass	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100006013	**Local Structure ID**	---
Assessment Date	08/11/2005	**Observers**	AWR
Town	Bakersfield		
Location	ATV/VAST bridge located just downstream of Mountain View Realty		
Latitude	44.82	**Longitude**	-72.80
Road Name	VAST trail	**Road Type**	Trail
Stream Name	The Branch		
Channel width	14 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	8 ft.	**Skewed to roadway?**	No
Bridge Clearance	6 ft.		
Bridge/Arch Span	30 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	---
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	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 greater than 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.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Bare	Bare	
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?			
Vegetation Band - Left	Yes	No	
Vegetation 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	Identical bridge located approximately 500 feet upstream		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	100603001006031	**Local Structure ID**	N/A
Assessment Date	08/25/2005	**Observers**	Adam Robtoy
Town	Enosburg		
Location	where Duffy Hill Road crosses Tyler Branch		
Latitude	44.89	**Longitude**	-72.82
Road Name	DUFFY HILL RD	**Road Type**	Paved
Stream Name	Tyler Branch		
Channel width	50 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	30 ft.	**Skewed to roadway?**	Yes
Bridge Clearance	12 ft.		
Bridge/Arch Span	85 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Follow Road
Estimated distance avulsion would follow road	300 ft.
Angle of stream flow approaching structure	Sharp Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Side	Side
Elevation of sediment deposits greater than 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	None	
Beaver Dam near Structure	No	Yes	
Beaver Dam distance (ft.)	0	500	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	Shrub/Sapling	
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?			
Vegetation Band - Left	Yes	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	100603004806031	**Local Structure ID**	N/A
Assessment Date	09/28/2005	**Observers**	AWR
Town	Enosburg		
Location	Intersection of Boston Post Road and Tyler Branch Road		
Latitude	44.86	**Longitude**	-72.76
Road Name	BOSTON POST RD	**Road Type**	Paved
Stream Name	Tyler Branch		
Channel width	32 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	18 ft.	**Skewed to roadway?**	No
Bridge Clearance	8 ft.		
Bridge/Arch Span	37 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Sharp Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	None	None
Elevation of sediment deposits greater than 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.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Road Embankment	
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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	100603005106031	**Local Structure ID**	N/A
Assessment Date	08/25/2005	**Observers**	Adam Robtoy
Town	Enosburg		
Location	Tyler Branch Road, approx. 1/2 mile east of intersectio of Tyler Branch Road and Duffy Hill Road		
Latitude	44.89	**Longitude**	-72.81
Road Name	TYLER BRANCH RD	**Road Type**	Gravel
Stream Name	Tyler Branch		
Channel width	51 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	28 ft.	**Skewed to roadway?**	No
Bridge Clearance	10 ft.		
Bridge/Arch Span	75 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	1 ft.
Angle of stream flow approaching structure	Sharp Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Sand	Sand
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Side	None
Elevation of sediment deposits greater than 1/2 bankfull	Yes	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	Shrub/Sapling	Shrub/Sapling	
Dominant Vegetation Type - Right	Road Embankment	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?			
Vegetation Band - Left	No	No	
Vegetation Band - Right	No	No	

Wildlife

	Roadkill	Outside Structure	Inside Structure
Species	None	---	---

Other Information

Spatial location data collected with GPS?	Yes	**Photos taken?**	Yes
Comments	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	200027004706032	**Local Structure ID**	N/A
Assessment Date	07/22/2005	**Observers**	AWR
Town	Enosburg		
Location	Route 108, just north of St. Pierre Road		
Latitude	44.86	**Longitude**	-72.80
Road Name	Route 108	**Road Type**	Paved
Stream Name	The Branch		
Channel width	35 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	35 ft.	**Skewed to roadway?**	No
Bridge Clearance	7 ft.		
Bridge/Arch Span	60 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Unsure
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Sharp Bend
Pool present immediately downstream of structure	No
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	None	Side	Side
Elevation of sediment deposits greater than 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	None	
Beaver Dam near Structure	No	No	
Beaver Dam distance (ft.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Shrub/Sapling	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	200027004806032	**Local Structure ID**	N/A
Assessment Date	09/08/2005	**Observers**	AWR
Town	Enosburg		
Location	at intersection of VT-108 and Tyler Branch Road		
Latitude	44.87	**Longitude**	-72.80
Road Name	VT Route 108	**Road Type**	Paved
Stream Name	Tyler Branch		
Channel width	48 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Concrete	**Number of bridge piers/arches**	0
Bridge Width	32 ft.	**Skewed to roadway?**	No
Bridge Clearance	12 ft.		
Bridge/Arch Span	70 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Unsure
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	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 greater than 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	Shrub/Sapling	
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?			
Vegetation Band - Left	Yes	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100006033	**Local Structure ID**	N/A
Assessment Date	07/22/2005	**Observers**	AWR
Town	Enosburg		
Location	private driveway near intersection of Rt. 108 and Chester A. Arthur Road		
Latitude	44.85	**Longitude**	-72.80
Road Name	private driveway	**Road Type**	Gravel
Stream Name	The Branch		
Channel width	28 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	12 ft.	**Skewed to roadway?**	No
Bridge Clearance	8 ft.		
Bridge/Arch Span	45 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Point	Side	None
Elevation of sediment deposits greater than 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	No	
Beaver Dam distance (ft.)	---	---	

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?			
Vegetation Band - Left	No	No	
Vegetation 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 undersized causing aggradation upstream		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100106033	**Local Structure ID**	N/A
Assessment Date	09/16/2005	**Observers**	AWR
Town	Enosburg		
Location	farm bridge in Patrick Vallincourt's pasture		
Latitude	44.87	**Longitude**	-72.78
Road Name	farm road	**Road Type**	Gravel
Stream Name	Tyler Branch		
Channel width	25 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	12 ft.	**Skewed to roadway?**	No
Bridge Clearance	5 ft.		
Bridge/Arch Span	28 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Gravel
Bedrock Present	No	No	No
Type of Sediment Deposits	Side	Side	None
Elevation of sediment deposits greater than 1/2 bankfull	No	No	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	Yes	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100206033	**Local Structure ID**	N/A
Assessment Date	08/26/2005	**Observers**	Adam Robtoy
Town	Enosburg		
Location	Farm road located mid-reach 4		
Latitude	44.88	**Longitude**	-72.81
Road Name	Farm Road	**Road Type**	Gravel
Stream Name	Tyler Branch		
Channel width	45 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	1
Bridge Width	13 ft.	**Skewed to roadway?**	No
Bridge Clearance	7 ft.		
Bridge/Arch Span	62 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Not Significant
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Follow Road
Estimated distance avulsion would follow road	50 ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	Yes
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Gravel	Gravel	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	Side	Side	None
Elevation of sediment deposits greater than 1/2 bankfull	No	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.)	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?			
Vegetation Band - Left	No	Yes	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100306033	**Local Structure ID**	N/A
Assessment Date	09/28/2005	**Observers**	AWR
Town	Enosburg		
Location	farm bridge near start of reach M11		
Latitude	44.87	**Longitude**	-72.77
Road Name	farm road	**Road Type**	Gravel
Stream Name	Tyler Branch		
Channel width	30 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	12 ft.	**Skewed to roadway?**	No
Bridge Clearance	9 ft.		
Bridge/Arch Span	50 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Partially
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Unsure
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Mild Bend
Pool present immediately downstream of structure	No
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Cobble	Cobble
Bedrock Present	No	No	No
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits greater than 1/2 bankfull	No	No	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	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100406033	**Local Structure ID**	N/A
Assessment Date	09/29/2005	**Observers**	AWR
Town	Enosburg		
Location	Just off Tyler Branch Road, Private Driveway near end of reach M12		
Latitude	44.86	**Longitude**	-72.75
Road Name	private driveway	**Road Type**	Gravel
Stream Name	Tyler Branch		
Channel width	10 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	14 ft.	**Skewed to roadway?**	No
Bridge Clearance	5 ft.		
Bridge/Arch Span	75 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	Deformation
Steep riffle present immediately upstream of structure	No
If channel avulses, stream will	Cross Road
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Naturally Straight
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	Upstream	Downstream	In Structure
Dominant Bed Material	Cobble	Gravel	Bedrock
Bedrock Present	Yes	Yes	Yes
Type of Sediment Deposits	None	None	None
Elevation of sediment deposits greater than 1/2 bankfull	No	No	No
Bank Erosion	None	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.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Bare	Road Embankment	
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?			
Vegetation Band - Left	No	No	
Vegetation 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	bedrock covers about 1/2 of available space under bridge		

Stream Geomorphic Assessment

VT DEC

Bridge Summary Report

General Information

VTrans Structure ID	700000100506033	**Local Structure ID**	N/A
Assessment Date	08/09/2005	**Observers**	AWR
Town	Enosburg		
Location	near end of reach 5 - farm bridge at Hull Farm		
Latitude	44.84	**Longitude**	-72.80
Road Name	farm road	**Road Type**	Gravel
Stream Name	The Branch		
Channel width	21 ft. (Measured)	**High flow stage**	No

Bridge/Arch Information

Material	Steel	**Number of bridge piers/arches**	0
Bridge Width	12 ft.	**Skewed to roadway?**	No
Bridge Clearance	7 ft.		
Bridge/Arch Span	30 ft.		

Geomorphic Information

Floodplain filled by roadway approaches	Entirely
Structure is located at significant break in valley slope	No
Obstructions at the opening of the structure	None
Steep riffle present immediately upstream of structure	Yes
If channel avulses, stream will	Unsure
Estimated distance avulsion would follow road	--- ft.
Angle of stream flow approaching structure	Channelized Straight
Pool present immediately downstream of structure	Yes
Downstream bank heights are substantially higher than upstream bank heights	No
Stepped footers	No

More Geomorphic Information

	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 greater than 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.)	---	---	

Vegetation

	Upstream	Downstream	In Structure
Dominant Vegetation Type - Left	Herbaceous/Grass	Herbaceous/Grass	
Dominant Vegetation Type - Right	Shrub/Sapling	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?			
Vegetation Band - Left	No	No	
Vegetation 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	---		

APPENDIX C

PHOTOGRAPHIC PLATES

Photo Point 1: Reach T1-01.

Photo Point 2: Reach M01.

Photo Point 3: Reach M01.

Photo Point 4: M04.

Photo Point 5: M07.

Photo Point 6: M07 – berm.

Photo Point 7: M09.