Geomorphic Assessment Report and Watershed Plan

Black Brook

Laconia and Gilford, New Hampshire

Prepared for:
City of Laconia




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1.0 INTRODUCTION

A stream geomorphic assessment was performed for Black Brook to evaluate the historic and existing stream channel conditions in order to understand the ongoing stream channel adjustment processes that are impacting water quality, aquatic and riparian habitats, and channel stability. This project grew out of general concerns about the health of Lake Winnipesaukee and recognition that the Lake is a product of its watershed and stream. The watershed and primary stream channels are shown in Figure 1.

Attention was drawn to Black Brook because of excessive sedimentation in Paugus Bay that has and continues to cause reduced depth and excessive milfoil growth, as well as observations of erosion on the Brook itself. The Laconia Conservation District secured funding from the NH Department of Environmental Services for this study.

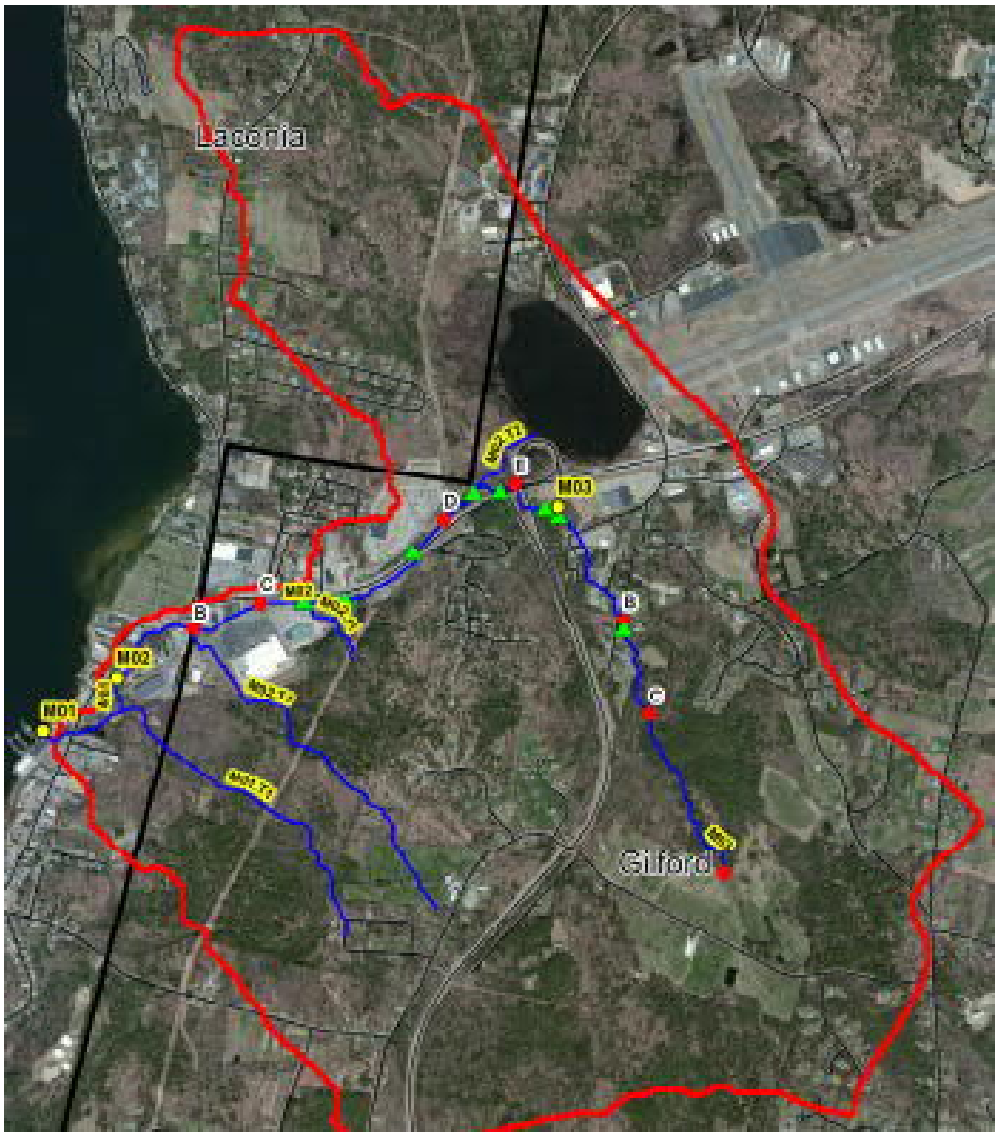

Figure 1. Black Brook Watershed and Primary Stream Channels

2.0 OVERVIEW OF STREAM MORPHOLOGY AS A MANAGEMENT TOOL

Stream geomorphology is the study of the form (or shape) and function of a stream channel as a result of the landscape through which it flows. Stream channels naturally adjust over time; they are not static. But the rate of change is typically slow, and new vegetation generally keeps up with slow pace of erosion on a natural channel. In modern history the changes to stream channels are often a result of indirect human activities such as watershed development or deforestation that change the rate and amount of water reaching stream channels, or the result of direct activities like the physical modifications to stream channels and floodplains. And the rate of stream channel change due to these human influences is increased.

While rivers change, there is a central tendency based on the characteristics of the landscape through which the river flows. That is, a channel in a given landscape (i.e., valley slope and width, drainage area, material size, etc) will tend toward a known shape, often called the reference condition. The reference condition is the shape or form a channel is expected to have considering the landscape through which it flows. Channels that meet the reference condition are stable and provide high quality aquatic habitat. Channels that have departed from reference conditions are unstable (i.e., erosion and deposition issues), provide poor aquatic habitat, and contribute to downstream water quality problems.

Symptoms of a channel that has departed from reference conditions include the following:

- Degradation – "downcutting" or "incision" that results in an overly deep channel.
- Aggradation – deposition of sediment that leads to a shallowing of the channel
- Widening – almost always following an episode of degradation, the erosion of the channel banks resulting in an overly wide channel.
- Planform Adjustment – changes to the pattern of a river channel when viewed from above.

Factors that can cause a channel to depart from reference conditions can be either natural or human-induced, and sometimes a combination of both. Common natural causes include major flooding or clusters of atypically wet years). Common human-induced causes include forest clearing, channel straightening, bank armoring, removal of woody vegetation, filling floodplains, and loss of wetlands.

River channels tend to change in predictable ways known as the Channel Evolution Model (CEM). Figure 2 shows this predictable pattern. In short, changes such as straightening a channel or filling in the floodplain results in the stream having more erosive power, and it digs itself a deeper channel (Stage II). Over time, the stream banks collapse and the channel gets wider (Stage III). Flows in that wider channel are shallow, and they can't transport sediment effectively, so the sediment starts to deposit as bars and benches (Stage IV). Eventually, those bars and benches become a new floodplain down at a lower elevation and the channel is again stable (Stage V).

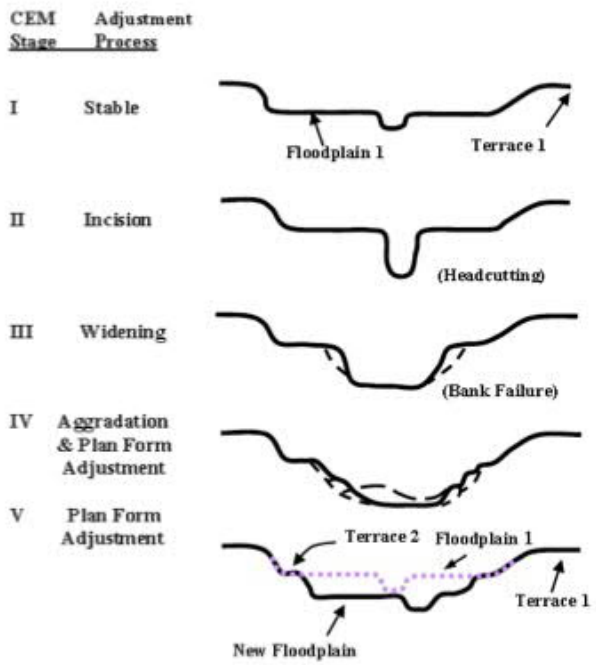

Figure 2. Stages of the Channel Evolution Model (CEM)

3.0 STREAM GEOMORPHIC ASSESSMENT METHODS

The assessment covered Black Brook from the mouth at Spinnaker Cove on Lake Winnipesaukee to the forested headwaters near Morrill Street in Gilford. See Figure 1 as well as Orthophoto Reference Maps in Attachment A. The assessment followed the "NH Implementation" of the Phase 1 and 2 Vermont Stream Geomorphic Assessment (SGA) Protocols. These protocols use mapping and field data to assess watershed, stream corridor, and channel conditions for use in developing management strategies intended to preserve and restore high-functioning stream channels and floodplains, protect and improve surface water quality (sediment and nutrients), and prevent property and infrastructure damage from erosion.

The Phase 1 assessment relied primarily on maps, orthophotos, and other remotely-sensed data. The primary intent of Phase 1 is break the channel into discrete reaches that share similar landscape settings (e.g., floodplain width and valley slope) and determine identify the general type of stream channel (using the Rosgen stream classification scheme) that would be expected in that setting in the absence of human or other disturbance.

The Phase 2 assessment relied on field data. Data were collected primarily in November 2014 and July 2015, with some minor additional data collection in April 2016. The reach breaks identified during Phase 1 were confirmed and some reaches were further subdivided into segments having similar characteristics (e.g., channel dimensions or sedimentation). Cross-sections were surveyed with a level and tape. Other features relevant to the assessment were located using GPS, and ArcGIS and the Stream Geomorphic Assessment Tool (SGAT) extension were used to compile and analyze some of the data.

The Phase 2 field data collected within each segment is relatively extensive. It includes obvious information beginning with the rational for making segment breaks, as well as more obscure

information such as the presence of large woody material in the channel and the number of observed sediment deposits, which collectively provide insight into the condition of the channel. The information collected, much of which is recorded on Phase 2 Field Forms included in Attachment B, includes the following:

- Locations of stream corridor encroachments (e.g. berms, roads, development, etc.)
- Slope and texture of terraces/hillsides adjacent to the channel and/or valley bottom
- Presence, location, and height of any grade controls (e.g. bedrock, dam, etc.)
- Channel and floodplain dimensions measured at one representative, valley-wide cross-section
- Channel materials determined from a pebble count performed within a representative portion of the segment
- Representative riffle/step spacing
- Number of pieces of large woody material within the channel
- Average size of the largest particle on the streambed and depositional bar, if any
- Streambank characteristics (slope, texture, erosion, and vegetation)
- Location and length of any streambank revetments (e.g. riprap, retaining walls, etc.)
- Location, length, and height of any mass slope failures or gullies
- Buffer and riparian corridor characteristics (cover type, vegetation type, and buffer width)
- Presence and location of springs, seeps, tributaries, and adjacent wetlands
- Flow status at the time of the field work (low, moderate, or high)
- Number of debris jams
- Type and number of flow regulations and water withdrawals
- Type, number, and location of any stormwater outfalls
- Type, number, and location of any channel or valley constrictions (e.g. culverts, bridges, bedrock outcrops, etc.)
- Number and location of any beaver dams and the length of channel affected
- Type, number, and location of any depositional features (e.g. mid-channel bars, delta bars, etc.)
- Type and location of any significant planform changes (e.g. avulsions, flood chutes, braiding, etc.)
- Type, number, and location of any significant bedform changes indicative of aggradation or degradation (e.g. steep riffles, head cuts, or tributary rejuvenation)
- Number and location of any stream fords or animal crossings and
- Type and location of any channel alterations (e.g. dredging, straightening, windrowing, etc.) and the length of channel affected.

The cross-section and pebble count data collected in the field was used to compute several parameters including bankfull channel dimensions, width-to-depth ratio, entrenchment ratio, existing stream type, incision ratio, and particle size distributions. These parameters and the other data were used to complete Rapid Habitat and Rapid Geomorphic Assessments (RGA and RHA) for each segment that allowed grading of each segment as reference, good, fair, or poor. Also, the channel evolution stage, dominant geomorphic processes, and stream sensitivity were identified for each segment. The sensitivity ratings were used in conjunction with the measured bankfull channel widths and existing stream types to assign a recommended Fluvial Erosion Hazard (FEH) corridor width to each segment.

The field data and associated information was submitted to the New Hampshire Geological Survey for review and approval. Following several rounds of comments and responses, the assessment was deemed complete and in accordance with New Hampshire standards.

The approved assessment results were used to analyze departure from reference conditions, assign sensitivity ratings to each segment, and identify projects that would improve the local condition of Black Brook and reduce sediment and nutrient loading to Lake Winnipesaukee.

4.0 STREAM ASSESSMENT RESULTS

4.1 Overview

The assessed portion of Black Brook was broken into three reaches. The upstream limit of backwater from Paugus Bay marked the break between the first and second reach. A change in confinement indicated by reduced valley width was used to break the second and third reach. The reaches are labeled M01, M02, and M03 (M for mainstem as opposed to T for tributary) beginning at the mouth and moving upstream[1]. During Phase II, the reach break locations were confirmed in the field and were further subdivided into shorter segments that share similar characteristics. A total of 8 segments were identified – one in reach M01 (i.e., no further subdivision), five in reach M02, and two in reach M03. Figure 3 identifies the reaches and segments.

Figure 3. Black Brook Reaches and Segments

[1] The labeling in this study of Black Brook Mainstem Reach 3 (M03) and Tributary M02T2 is reversed from the labeling included in statewide stream channel mapping (NH Hydrography Dataset), which shows the mainstem extending into Lily Pond rather than turning to the south. The labeling used in this study is consistent with local convention and understanding of the watershed.

Table 1 summarizes the reference stream type, existing stream type, geomorphic and habitat condition, and dominant channel adjustment process for each segment.

Table 1. Phase 2 Assessment Results

Segment	Rosgen Stream Type		Geomorphic Condition	Channel Adjustment Process (Channel Evolution Stage)	Habitat Condition
	Reference	Existing			
M01A	Not fully assessed due to backwater from Lake and beaver dams				
M02A	"				
M02B	Not fully assessed because stream is in pipes				
M02C	E4	E4	Fair	Incising and widening (Stage II/III)	Fair
M02D	E4	E4	Good	Stable (Stage I)	Good
M02E	E4	B4 (departure)	Fair	Widening and aggrading (Stage III/IV)	Fair
M03A	B4	G4 (departure)	Fair	Widening and aggrading (Stage III/IV)	Fair
M03B	B4	B3	Good	Stable (Stage I)	Good

4.2 Segment-Specific Summaries

Brief descriptions of each assessed segment are provided below and photos of each segment are included in Attachment C.

Segment M01A

Segment M01A begins at the mouth of Black Brook at Lake Winnipesaukee and extends 1,500 feet to a point just upstream of the pedestrian bridge behind the McDonalds restaurant on Union Avenue. This is the only segment in Reach M01. The segment is backwatered in its entirety from the Lake and from beaver dams. Extensive wetlands are present along the margins of the channel for much of the segment. There is development in the river corridor for approximately half the segment length. There are four crossings of the brook in this segment including bridges at the Yacht Club (pedestrian), Railroad, Union Avenue, and behind McDonalds (pedestrian). All constrict the floodplain, but are wide enough to not constrict the channel. Because of the backwater, the channel itself was not fully assessed.

Segment M02A

Segment M02A begins just above the pedestrian bridge behind the McDonalds restaurant on Union Avenue and extends upstream approximately 1250 feet to just below Blaisdell Avenue (corresponding, coincidentally, to the Laconia-Gilford boundary). Much of this segment is impounded by a beaver dam. Unlike the downstream segment, however, the channel through this segment is a single continuous thread without significant adjacent wetlands. This is in part a product of more extensive filling of the floodplain for development on both sides of the channel. The one stream crossing in the segment is a relatively narrow private bridge (Laconia Ice Company) just downstream of Blaisdell Avenue. As with the previous segment, backwater conditions prevented a complete assessment of the channel itself.

Segment M02B

Segment M02B begins on the downstream side of Blaisdell Avenue and extends approximately 930 feet to just upstream of the Meredith Village Savings Bank. Almost 80% of this segment is in

a series of three pipes including a 5' culvert under Blaisdell Avenue, a 6' culvert behind and under the Rite Aid property, and a 5' culvert under Meredith Village Savings Bank. Where not in pipes, development is extensive on both sides of the channel. Because of the extensive piping, detailed assessment of the channel characteristics in the segment was not possible.

Segment M02C

Segment M02C begins just upstream of the pipe at Meredith Village Savings Bank and extends approximately 2,100 feet to just upstream of entrance to Walmart. The channel closely parallels Lakeshore Road and crosses from one side to the other in the middle third of the segment. Throughout most of this segment, the floodplain on one side of the channel has been filled by the Lakeshore Road embankment and the floodplain on the other side filled for development, significantly reducing the natural floodplain width. There are a notable nine stream crossings in this segment: seven driveway culverts, a snow machine bridge, and one municipal culvert (Lakeshore Road). While the form of the channel is relatively uniform throughout the reach, vegetation patterns are not. Some areas, like that in front of Bank of New Hampshire have mowed grass down to water's edge while others have extensive shrub and small tree growth.

The channel in segment M02C is incised (Stage II of the Channel Evolution Model, CEM) and in some locations is widening (Stage III)[2]. Significant fresh sediment deposits were noted in some channel locations as well as on the adjacent floodplain. The channel earns ratings of Fair (on the Poor-Fair-Good-Reference continuum) for both geomorphic and habitat condition. The changes in channel form (primarily incision) do not yet represent a change is stream type. As the channel responds to incision with eventual bank erosion and channel widening (as is predicted by the CEM), the changes will very likely be significant enough to represent a change in stream type throughout this reach.

Segment M02D

Segment M02D begins just upstream of the easterly entrance to Walmart and extends approximately 1,200 feet upstream to a culvert under Lakeshore Road near the Bypass (Rte 3). Outflow from Lily Pond joins Black Brook midway through the segment. Notable in this segment is the broad forested floodplain generally present on one or both sides of the channel. There are no culverts or bridges in the segment.

The channel in Segment M02D is generally stable and representative of Stage 1 of the CEM. Fresh sand and gravel deposits were observed in the channel and on the floodplain. The channel earns ratings of Good (on the Poor-Fair-Good-Reference continuum) for both geomorphic and habitat condition.

Segment M02E

Segment M02E begins at the outlet of a culvert under Lakeshore Road near the bypass (Rte 3) and extends upstream approximately 730 feet to a location roughly opposite the cloverleaf off-ramp of the Bypass. The downstream half of this segment is comprised of culverts under

[2] Field assessment data for this segment reports an incision ratio of 1.0, which would indicate no incision. However, we contend that it is indeed incised, and the field measurements are the result of the observed recent and highly mobile sediment deposits in the channel that mask the true channel depth as well as the lack of any natural vegetation that would normally be used to confirm the bankfull elevation in an incised channel (and would in this case have placed that elevation further down the bank below the elevation of incipient flooding).

Lakeshore Road and under the Bypass and a length of open channel between the two. The upstream half is open channel with forested floodplain on the left (south) bank and mowed meadow on the right (north) bank.

The mowed meadow on the right overbank slopes away from the channel. While that is not unheard of in a natural setting, it is certainly uncommon, and it may indicate that the channel was relocated when the Bypass was constructed. Specifically, the channel may have historically flowed in the more northwesterly direction across what's now the mowed meadow but was pushed into the existing east-west alignment when the Bypass was constructed. A review of historical aerial photographs suggests this is indeed the case. That manual relocation of the channel would explain the instability of the existing channel.

The channel (as assessed in the upstream half of the segment above the culverts) previously incised and is now undergoing major widening, aggradation, and planform adjustment (CEM Stage III/IV). While some sediment generated from within this segment is depositing as part of the planform adjustment, much is being transported to downstream reaches. The channel earns ratings of Fair (on the Poor-Fair-Good-Reference continuum) for both geomorphic and habitat condition. The existing channel is more entrenched and has a larger width-to-depth ratio than the reference channel for this location, and the existing B4 stream type is a departure from the reference E4 stream type.

Segment M03A

Segment M03A begins at the upstream end of a mowed meadow roughly opposite the Bypass cloverleaf off-ramp and extends upstream approximately 1,800 feet to just above Breton Road. There are four stream crossings in this segment including three municipal culverts and one long private culvert under the parking lot between the two branches of Annis Drive.

The channel (as assessed in the downstream portion of the segment below the culverts) previously incised and is now undergoing major widening, aggradation, and planform adjustment (CEM Stage III/IV). The segment has been and continues to be a significant source of sediment that is transported to downstream reaches. The channel earns ratings of Fair (on the Poor-Fair-Good-Reference continuum) for both geomorphic and habitat condition. The existing channel is more entrenched than the reference channel for this location, and the existing G4 stream type is a departure from the reference B4 stream type.

Segment M03B

Segment M03B begins just upstream of Breton Road and extends approximately 1,350 feet upstream. There is one private bridge on the segment.

The channel in Segment M03B is generally stable and representative of Stage 1 of the CEM. Fresh sand and gravel deposits were observed in the channel and on the floodplain. The channel earns ratings of Good (on the Poor-Fair-Good-Reference continuum) for both geomorphic and habitat condition.

5.0 BRIDGE AND CULVERT ASSESSMENT

Each stream crossings within the study area was inspected and the size, material, and surrounding stream channel condition documented. A simple inventory is presented in Table 2. Field data sheets and photos are included in Attachments D and E.

There are 23 crossings in the study area. Black Brook is confined to culverts for nearly four tenths of a mile, which is approximately 20% of the channel length. All the crossings eliminate the natural floodplain. That's typical for stream crossings anywhere, but given the sheer number and length of crossings, the cumulative impact becomes particularly significant on Black Brook. Put another way, floodplain functions including attenuation of peak flows and trapping of sediment – two functions that would reduce nutrient and sediment loading to Paugus Bay – have been eliminated on 20% of Black Brook due to culverts.

In general, the most downstream five culverts (up to and including the Laconia Ice bridge) are wide enough to span the channel bankfull width and thus have limited impact on the channel itself. From Blaisdell Avenue to the upstream end of the brook, however, the culverts are consistently too narrow to span the natural channel and are thus likely to contribute to local erosion and channel instability, contribute to flood risks by catching debris and backing up water during major storm events, and reduce the effective movement of fish and other aquatic organisms.

Table 2. Inventory of Stream Crossings

#	Reach	Road/Drive	Type	Span (ft)	Length (ft)	Notes
1	M01A	Private Pedestrian Walkway	Bridge	55	9	Timber with center pier on concrete
2	M01A	Railroad (abandoned)	Bridge	30	15	Old wood pilings piles
3	M01A	Union Avenue	Bridge	20	44	Modern concrete
4	M01A	Ped/Bike Path	Bridge	32	15	Old timber
5	M02A	Laconia Ice	Bridge	9	20	Old concrete slab
6	M02B	Blaisdell Avenue	Culvert	5	100	Concrete box
7	M02B	CVS Parking Lot	Culvert	6	200	Concrete box
8	M02B	Meredith Savings Bank Lot	Culvert Culvert	4 (x2) 5	385	Double corrugated steel outlet Concrete box culvert inlet
9	M02C	Hannaford Entrance Drive	Culvert	7	81	Elliptical corrugated steel
10	M02C	Wild Bird Depot Entrance	Culvert	4.2	64	Old smooth steel
11	M02C	Bank of NH Entrance Drive	Culvert	4.4	62	Old smooth steel
12	M02C	Electrical Substation	Culvert	5.3 (x2)	41	Double elliptical corrugated steel
13	M02C	Country Cooking Entrance	Culvert	5.6	52	Corrugated steel
14	M02C	Kelso Motors	Culvert	6.1 5.75	188	Corrugated steel vert ellipse outlet Corrugated steel arch at inlet
15	M02C	Lakeshore Road	Culvert	7	59	Corrugated steel ellipse

16	M02C	Walmart Entrance Drive	Culvert	6.9	95	Corrugated steel ellipse
17	M02E	Lakeshore Road	Culvert	3.3 (x2)	102	Double barrel concrete pipes
18	M02E	Rte 3	Culvert	6	190	Corrugated steel
19	M03A	Annis Drive	Culvert	4	33	Concrete box
20	M03A	Parking Lot and Upper Annis Drive	Culvert	4 4.9	200	Concrete box outlet Corrugated steel inlet
21	M03A	Mulberry Road	Culvert	4.9	81	Corrugated plastic
22	M03A	Bretton Road	Culvert	3.9	49	Corrugated plastic
23	M03B	Priv drive off Bretton	Bridge	8	12	Concrete slab on blocks

6.0 PROJECT IDENTIFICATION

In recognition that instability of the Black Brook channel is a primary cause of excess sediment and nutrient loading to Paugus Bay, potential projects have been identified that have clear benefits for geomorphic channel stability. Projects may also have secondary water quality benefits and habitat benefits, but it is those that most directly meet the objective of restoring geomorphic channel stability that are presented here. Six potential projects and five additional general management measures have been identified.

6.1 Potential Projects

Six potential projects, some with sub projects, have been identified. Each is described briefly below. Project Concept Sheets are included in Attachment F.

- Project #1. Replace Culverts with Larger Structures that Span the Channel. (Reaches M02, and M03) There are twenty-three stream crossings within the three reaches of the study area. Eighteen of those, from Blaisdell Avenue upstream, are undersized relative to the stream channel and thus contribute to channel instability.

  Replacement culvert sizes should reflect what is known about the stage of channel evolution evident in the surrounding channel. For instance, the channel width in Reach M02C is approximately 7 feet, but we know the channel is incised, and thus some future widening can be expected. An appropriately sized culvert would be designed to span the future anticipated channel width.

  An aluminum pipe arch culvert (i.e., squashed pipe shape) would provide the most cost-effective means of spanning the channel. A structure on the order of 12 – 14 feet wide would be suitable for use anywhere in Reaches M02 and M03, taking into account likely future channel adjustments. The culvert would be recessed and the stream channel constructed through it, with dimensions approximating the natural surrounding channel, so that the finished product resembles the natural stream with a cover over it.

- Project #2. Eliminate Culverts by Sharing Drives. (Reach M02C) Sharing a drive to eliminate a typical culvert would restore on the order of 40 feet of stream channel and floodplain thereby providing additional area for floodwater and sediment to spill out and

deposit rather than being transported downstream. Reducing the length of excessively long culverts would provide the same general benefits.

Many adjacent properties could share driveways, though the amount of site work (i.e., grading, curbing, pavement, etc) needed to provide lateral connections between properties varies widely. In Reach M02, an electrical substation and neighboring restaurant (Country Cookin' at the Lakeside) is a particularly feasible location for a shared driveway. The substation crossing consists of two parallel 5' corrugated steel pipes. The restaurant's crossing consists of a single pipe of similar size. Both are relatively old and rusted. It appears the substation could be readily accessed via the restaurant property and the exiting culverts to the substation removed thereby restoring 40 feet of channel and floodplain. Alternately, a new single shared crossing could be installed and both existing ones eliminated.

- Project #3. "Daylight" the Brook. (Reaches M02 and M03) Daylighting refers to the practice of eliminated piped lengths of stream and restoring a natural channel and floodplain. This allows for some reduction in peak streamflows and provides floodplain on which sediment can be deposited rather than transported downstream. There are five candidate locations:

    - Under Annis Drive Loop (Project #3A). 130' length of pipe under parking lot at U-Haul Dealer. Expanded floodplain on left bank could be restored. Owner would lose 0.5 acres of paved parking.
    - Under Kelso Motors Frontage (Project #3B). 180' length could be reduced to 40'. Owner would lose 0.2 acres of land on which cars are currently displayed. The existing culvert is actively failing, with subsistence of the land above it requiring maintenance by the owner.
    - Under Meredith Village Savings Bank. 160' length of pipe under parking lot. Access to the bank and parking would need to be significantly reconfigured and expanded on the neighboring Lowes lot, making this location extremely logistically difficult and expensive to implement. Thus, it is not explored further in this report.
    - Under Lowes Overflow Parking (Project #3C). 120' pipe length under the overflow parking area just downstream of the Lowes entrance drive. Extensive floodplain or 0.25 acre restored wetland could be created on the right overbank if the entire parking area (26 spots) were eliminated.
    - Behind CVS Pharmacy. 230' pipe length under the parking lot. The channel with a narrow floodplain could be restored. Space is limited, and daylighting would require eliminating the ability to drive behind the CVS building (likely unacceptable) or shrinking and redesigning the adjacent Lowes parking lot. Because of these logistical and cost obstacles, this location is not further explored in this report.

- Project #4. Revegetate to Improve Floodplain Function. (Reach M02) Candidate locations have floodplain but due to lack of robust vegetation the floodplain does not function well to reduce flood flows, trap sediment, and resist erosion. Candidate locations for restoration of floodplain vegetation:
    - Bank of New Hampshire (Project #4A). Currently neatly mowed.
    - Upstream of Bypass (Project #4B). Currently mowed seasonally to top of right bank. Gravel bar deposits on channel margins could also be planted.

- Project #5. Remove Pockets of Fill to Restore Floodplain. (Reaches M01 and M02) Fill in the floodplain is very common throughout Reaches M01 and M02. Much of the fill now has development on it, but there are locations of excess fill pockets that it appears could be removed without impacting use of the land. Removal would restore a small piece of floodplain. A sample candidate location is the right bank of the Brook just downstream of the Lakeshore Road Crossing.

- Project #6. Actively Stabilize Channel. (Reach M03A) The channel below Annis Drive in Reach M03A is incised and unstable and will be a persistent source of sediment until it has widened enough (sending more sediment downstream) that it has adequate floodplain width at the new lower elevation. Rather than wait for that to happen, material can be manually excavated to create the desired floodplain.

6.2 Additional General Management Measures

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A. Fluvial Erosion Hazard Zones

The development of Fluvial Erosion Hazard (FEH) Zones is recommended to prevent increases in man-made conflicts that can result from development in identified fluvial erosion hazard areas; minimize property loss and damage due to fluvial erosion; and prohibit land uses and development in fluvial erosion hazard areas that pose a danger to health and safety. The basis of a Fluvial Erosion Hazard Zone is a defined river corridor, including the course of a river and its adjacent lands. The width of the corridor is defined by the lateral extent of the river meanders, called the meander belt width, which is governed by valley landforms, surficial geology, and the length and slope requirements of the river channel. The width of the corridor is also governed by the stream type and sensitivity of the stream. Information collected during the Phase 2 Assessment including reach sensitivity, reach condition, and stream type can be used to develop these zones.

FEH Zones are intended to delineate for landowners, land use planners, and river managers the area needed to accommodate the natural movement of a balanced or equilibrium stream channel and, if protected from unlimited development, would serve to maximize channel stability and minimize fluvial erosion hazards.

The formal use of FEH Zone maps varies. They can be developed to serve solely as a source of information for landowners and local regulators about possible risks associated with proposed development. They can also be used in a more formal capacity if a community chooses to do so, by incorporating them into local zoning regulations much as is done with FEMA floodplain maps.

Towns have the opportunity to work with the New Hampshire Department of Environmental Services (NHDES) to develop fluvial erosion hazard zones to reduce conflicts within the river corridor. Additional information regarding Fluvial Erosion Hazard Zones is available on the NHDES website http://des.nh.gov/organization/commissioner/pip/factsheets/geo/ documents/geo-10.pdf, in the Environmental Fact Sheet (New Hampshire Department of Environmental Services, 2010a); and in Chapter 2.9 of the Innovative Land Use Planning and Techniques Handbook: New Hampshire Department of Environmental Services, 2010b.

B. Changes in Parking Lot Size Requirements

Based even on a cursory review of orthophotos of the Black Brook watershed, it is clear that the channel and floodplain are pinched in many locations to make room for expansive parking lots. It's also readily apparent that the parking lots are sized for uncommonly busy times and are otherwise typically less than half full.

Laconia regulations prescribe the number of parking spaces for various land uses. Gilford does not. In practice, even with prescriptive parking requirements, review boards often use the numbers as guidelines and make a final determination about the number of spaces.

Given that more parking has contributed to filling of the floodplain that has resulted in an unstable channel and excessive sediment and nutrient loading to the Lake, both municipalities should make efforts to require less parking or to require alternate parking arrangements (e.g., formal sharing arrangement with adjacent businesses) when more parking would contribute to additional fill in the Black Brook floodplain.

C. Community volunteer efforts

Community volunteer efforts are recommended as means to accomplish Land Use guidelines emphasizing clean-up efforts. Trash is common in the stream channel in Reach 2. The City of Laconia, the Town of Gilford, and community groups have the opportunity to sponsor stream cleanup days to remove trash from Black Brook and tributaries. This cleanup effort would improve water quality and would offer a connection between local citizens and the stream that runs through their communities.

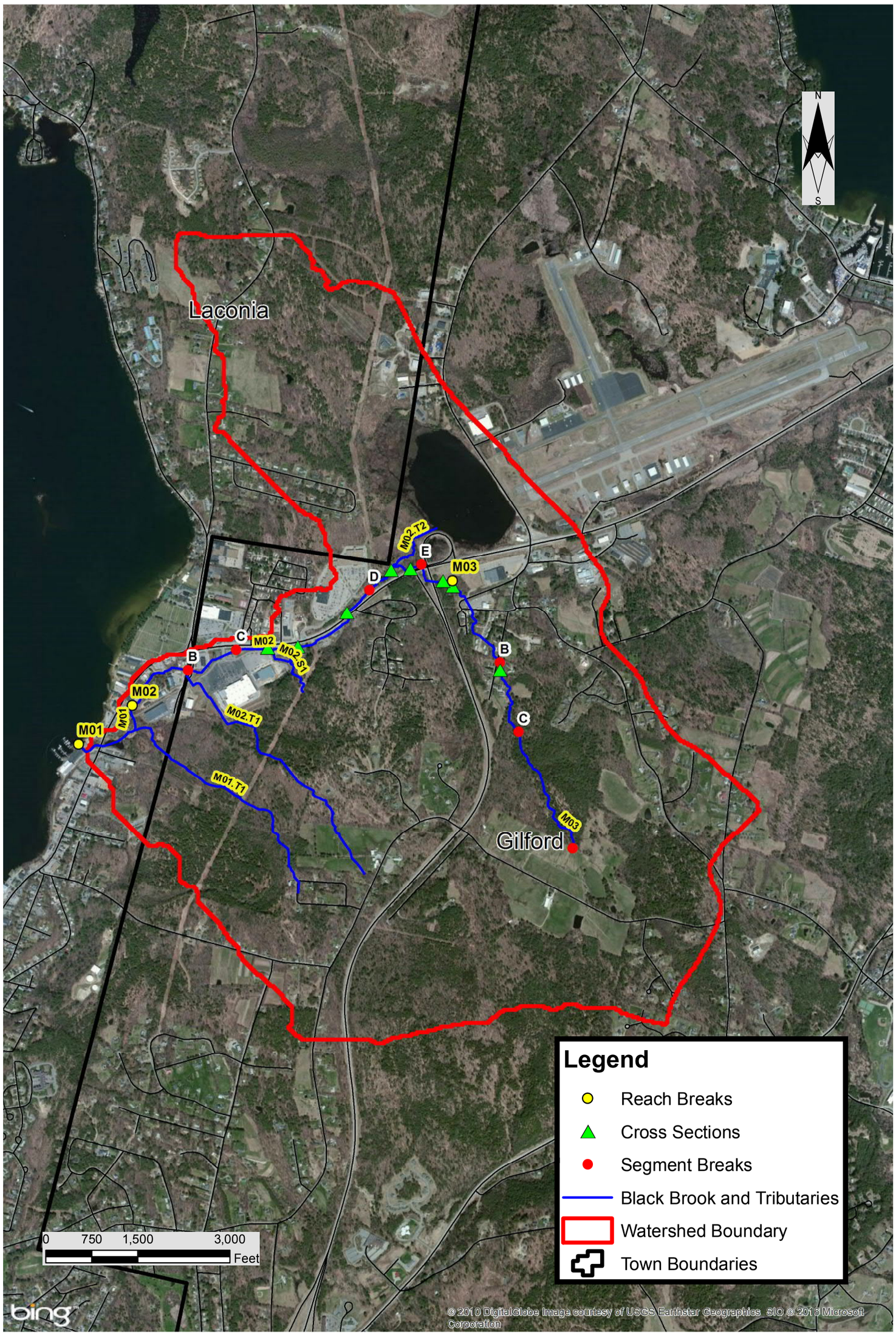
D. Landowner education and outreach

Landowner education and outreach is recommended to improve the public's understanding of fluvial processes, stressors to stream health, and opportunities for restoration through voluntary streamside plantings and protection of stream channels.

E. Conservation easements

Conservation easements are recommended in areas currently free of existing development and stream stressors, in order to protect the integrity of the stream corridors from future encroachments. In the Black Brook Watershed, the land surrounding Reach M02D (largely between Lily Pond and Walmart) is an example of an area that would benefit from conservation easements to the extent it is not already conserved. This area currently provides significant flood and sediment load attenuation that has direct positive benefits to the more developed portions of the watershed downstream where sedimentation and flooding is a problem. The presence of conservation easements would ensure that this land continues to provide these benefits into the future.

A second location for which there is no current conservation easement or similar protection is the left (looking downstream) overbank of the channel between Union Avenue and Blaisdell Avenue. While there is development in this area, there is significantly more undeveloped floodplain than the opposite side of the brook. Indeed, much of the left overbank is currently flooded by backwater from the lake and from beaver dams. The area is acting as a natural sediment detention area. Were it to be filled and developed as has occurred on the opposite bank, the benefits of the intact and functioning floodplain would be lost and the sediment and nutrient issues in Paugus Bay exacerbated.



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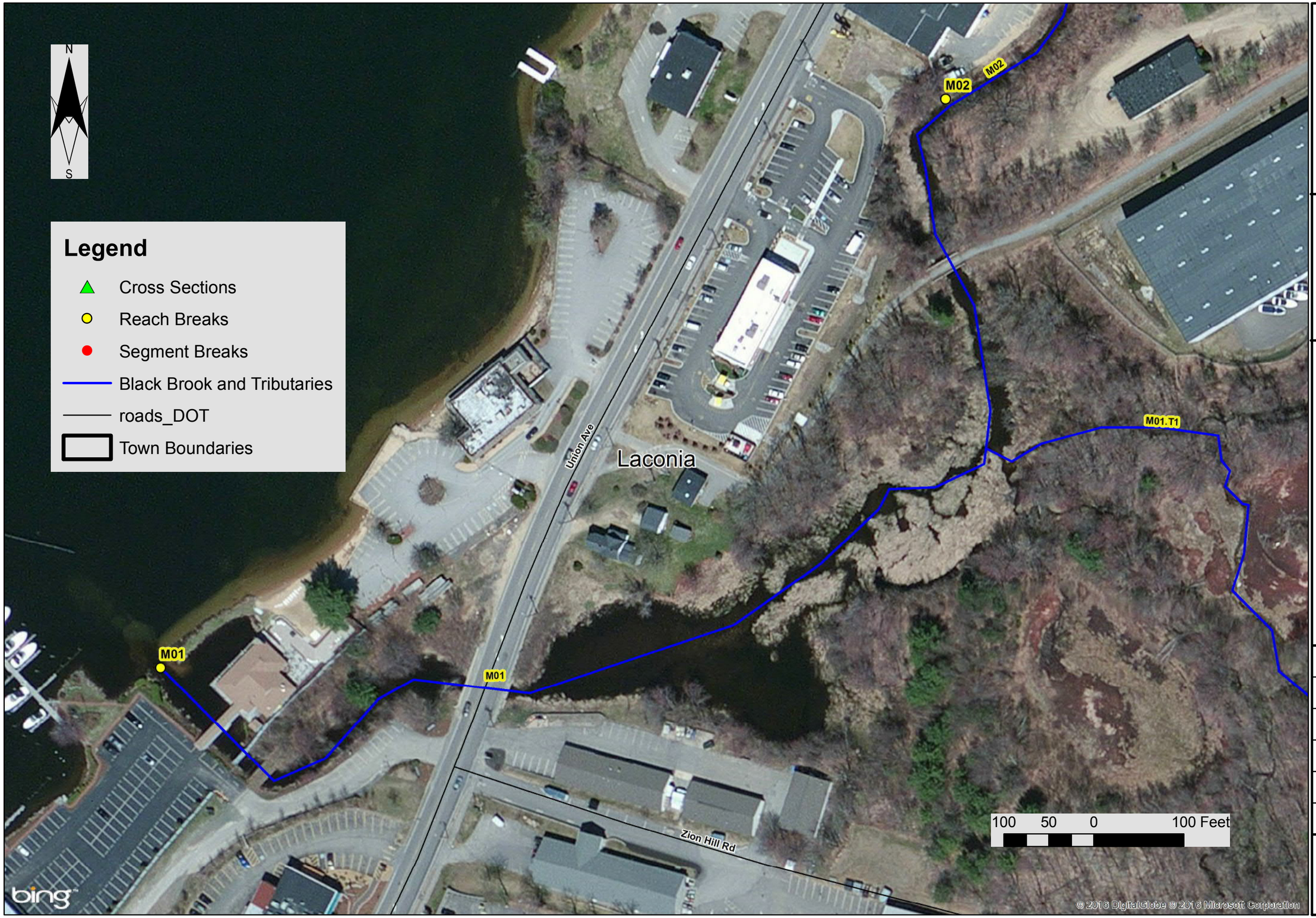
BLACK BROOK WATERSHED

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

APRIL 2016

DRAWN BY: CJK	DATE: 04/12/16
CHECKED BY:	PROJECT NO: 122262
PROJ. ENG: CSE	FIGURE NO:
SCALE:	



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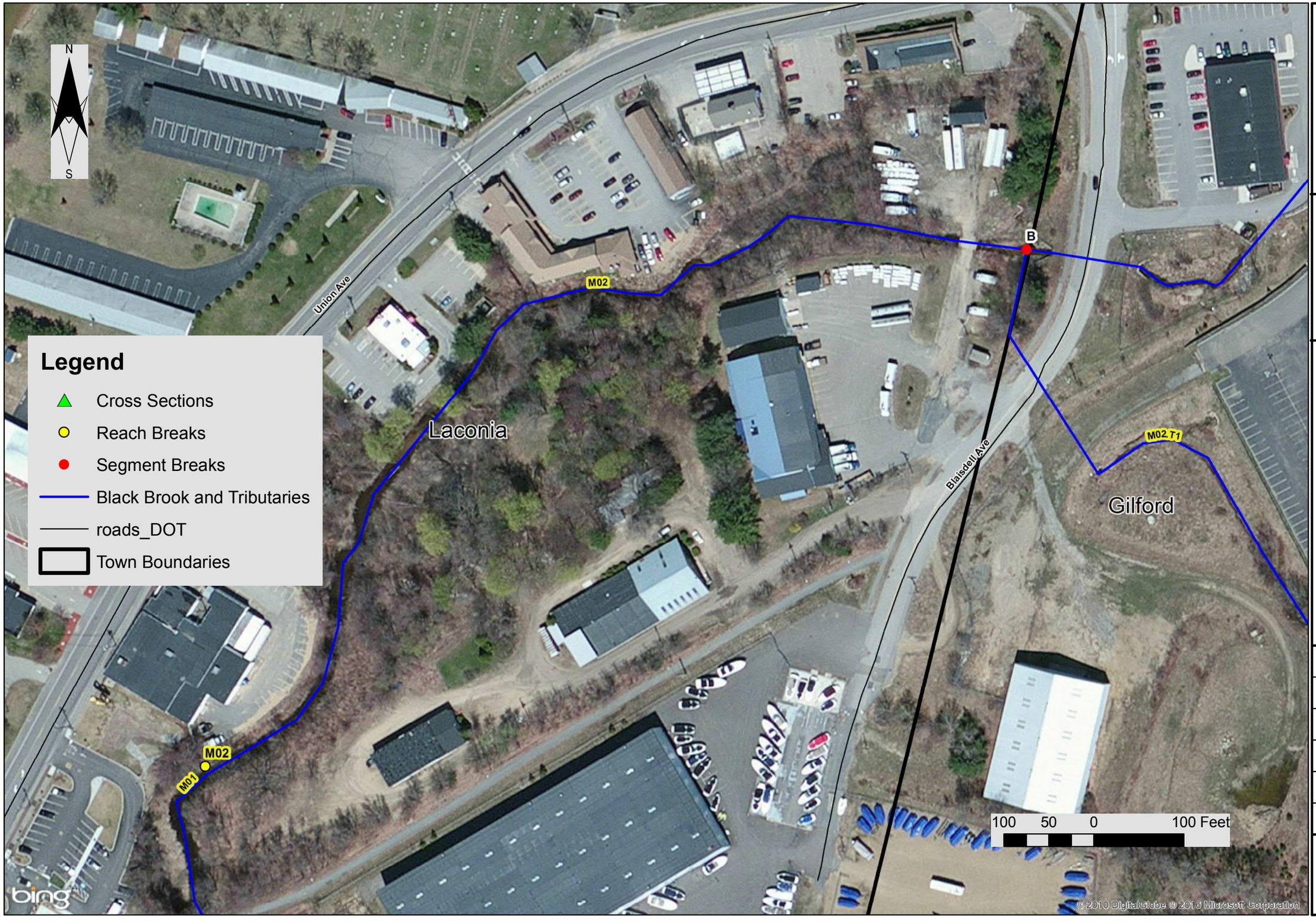
BLACK BROOK
REACH MO1-A

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO1-A**



Legend

- Cross Sections
- Reach Breaks
- Segment Breaks
- Black Brook and Tributaries
- roads_DOT
- Town Boundaries

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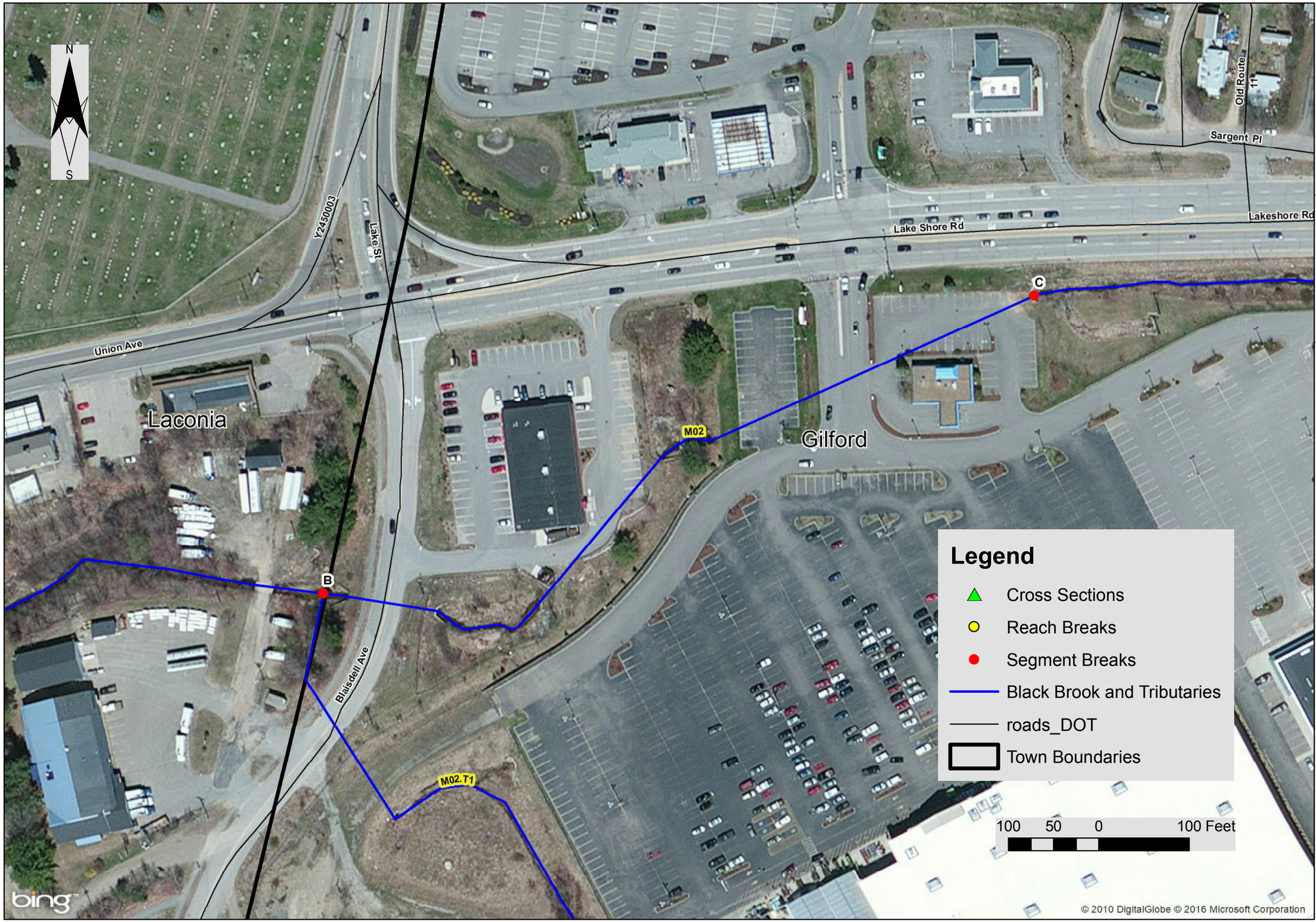
BLACK BROOK
REACH MO2-A

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO2-A**



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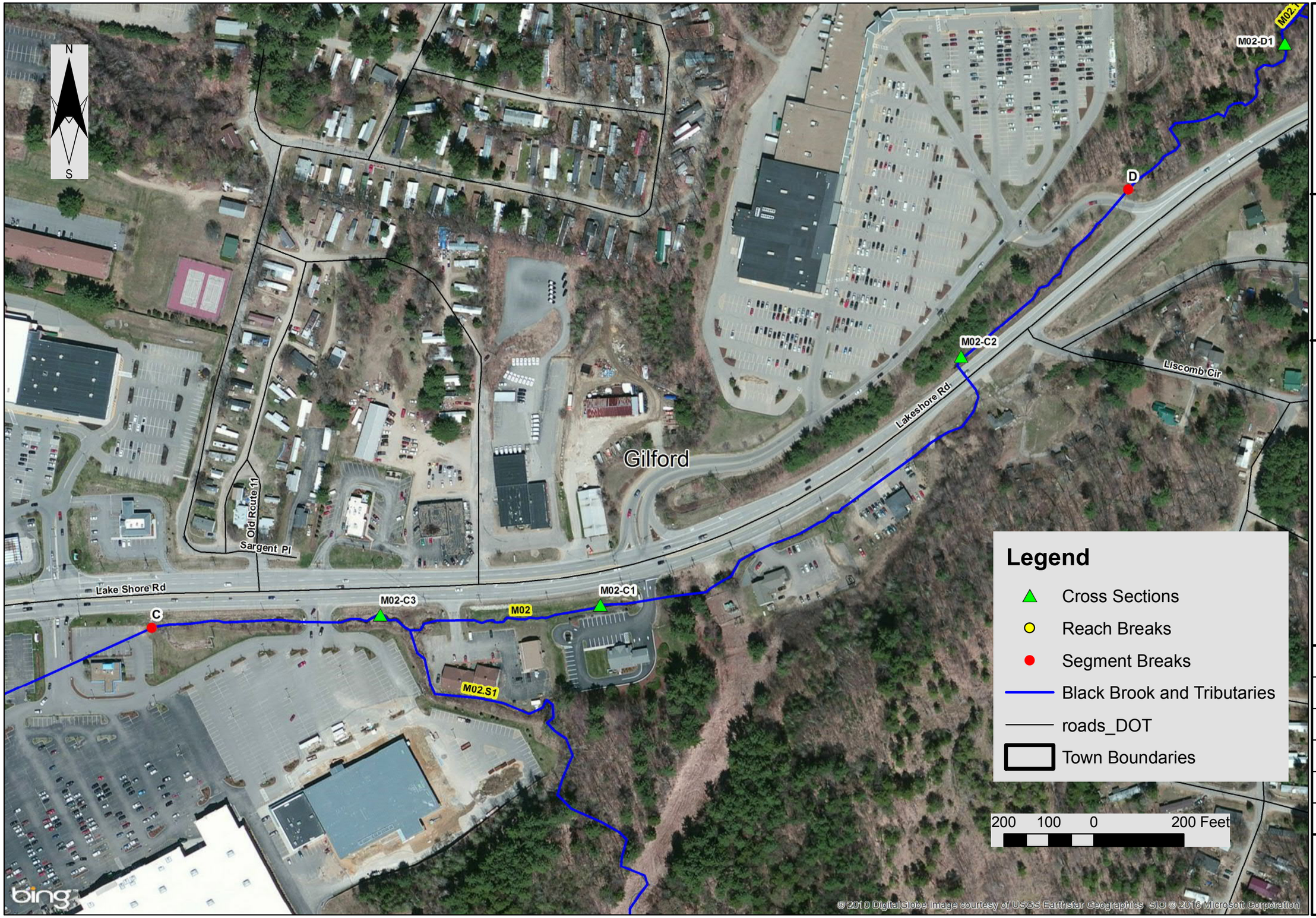
BLACK BROOK
REACH MO2-B

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO2-B**



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BLACK BROOK
REACH M02-C

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

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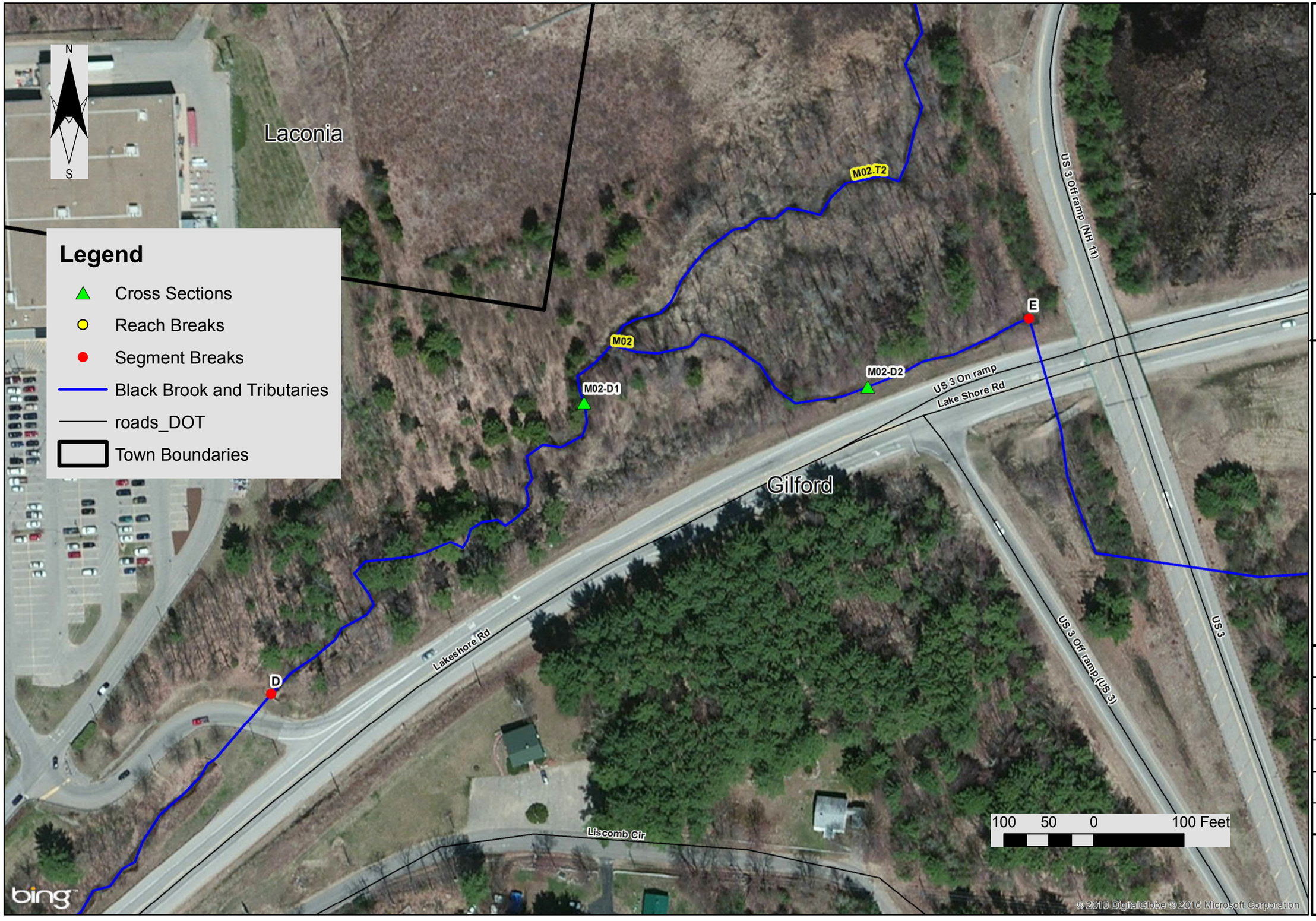
APPROVED BY:
DRAWN BY: CJK
CHECKED BY:
PROJECT NO: 122262
DATE: 04/12/2016
FIGURE NO: **REACH MO2-C**



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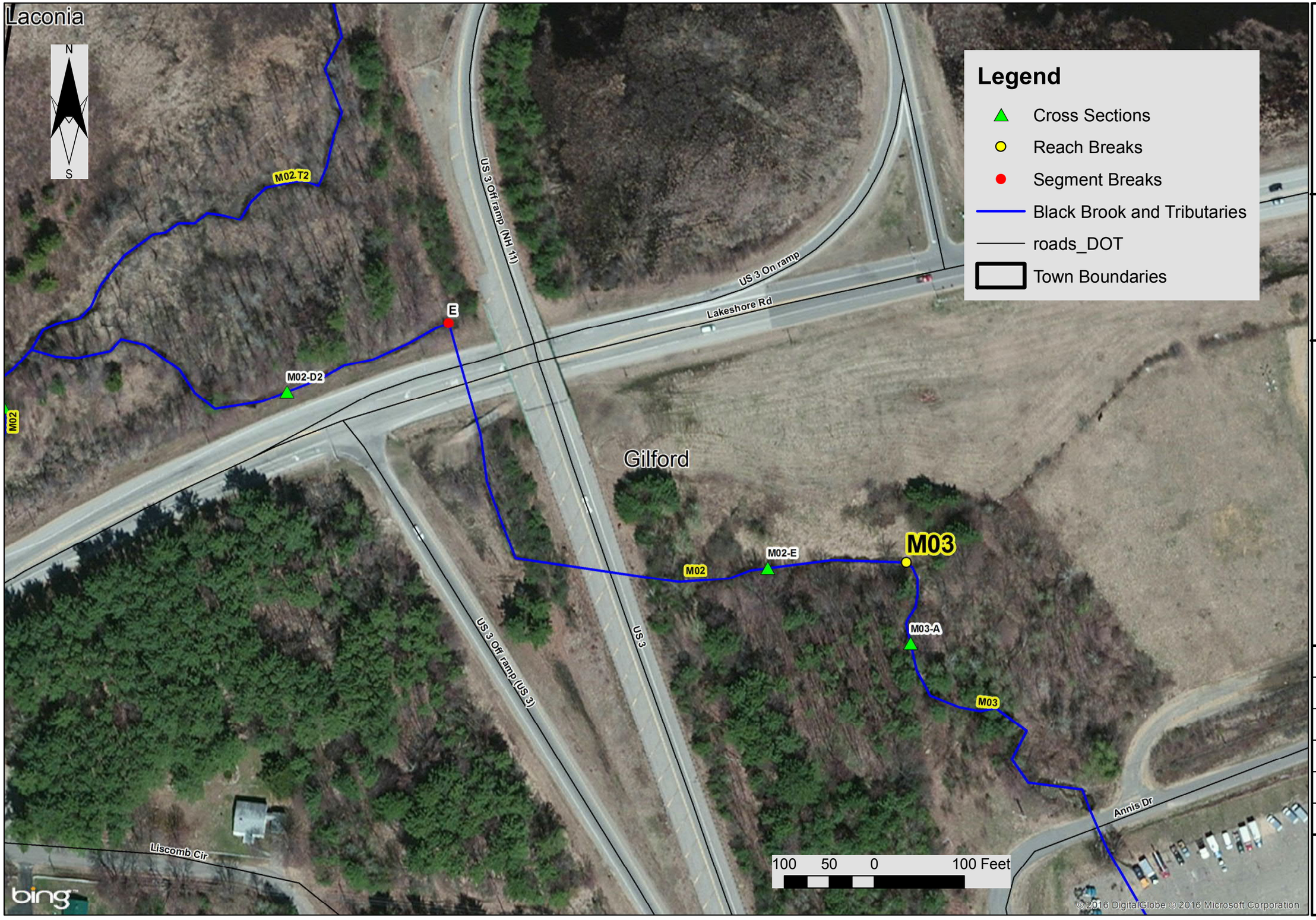
BLACK BROOK
REACH MO2-D

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO2-D**



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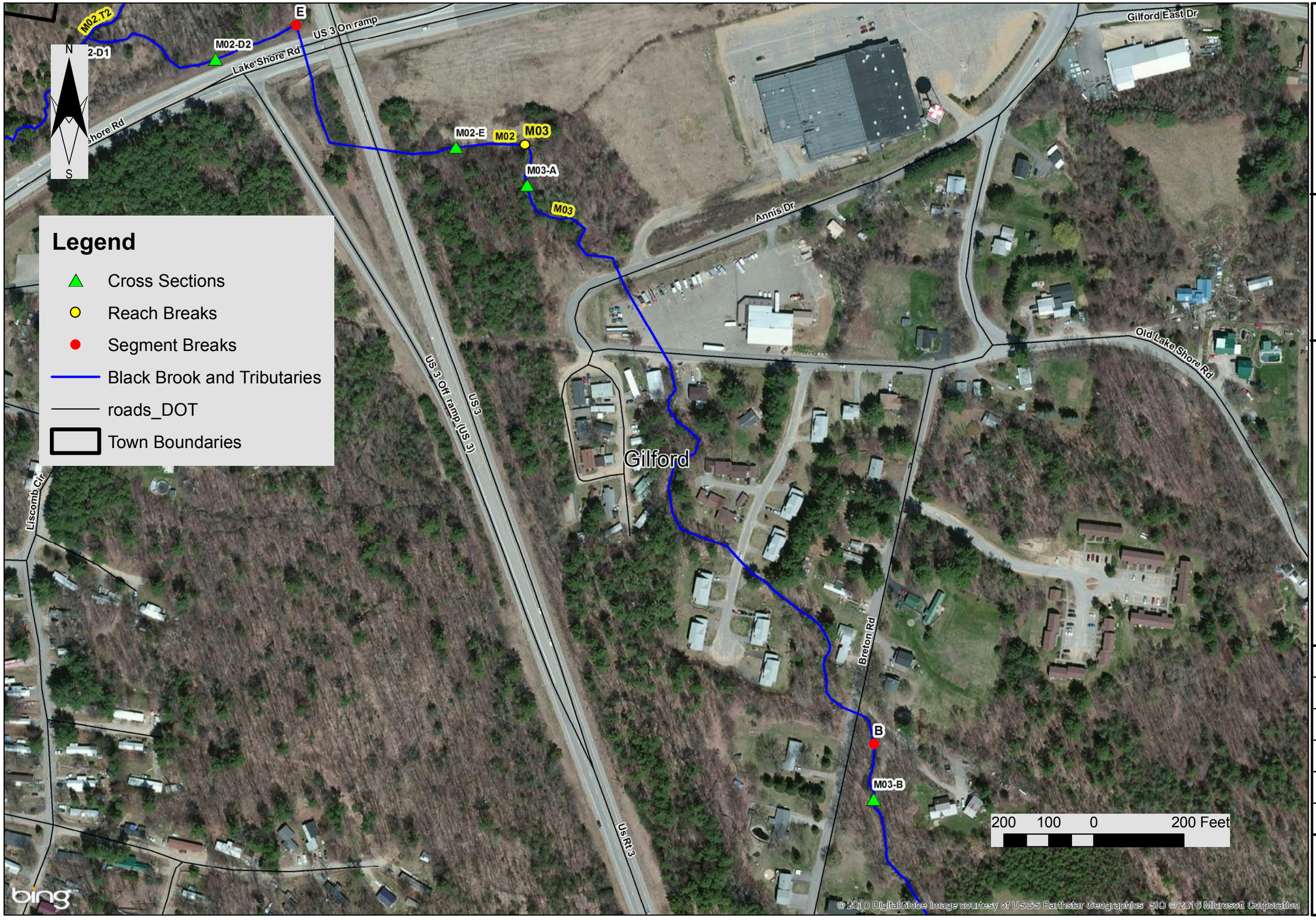
BLACK BROOK
REACH MO2-E

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO2-E**



Legend

- Cross Sections
- Reach Breaks
- Segment Breaks
- Black Brook and Tributaries
- roads_DOT
- Town Boundaries

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BLACK BROOK
REACH M03-A

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

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APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO3-A**

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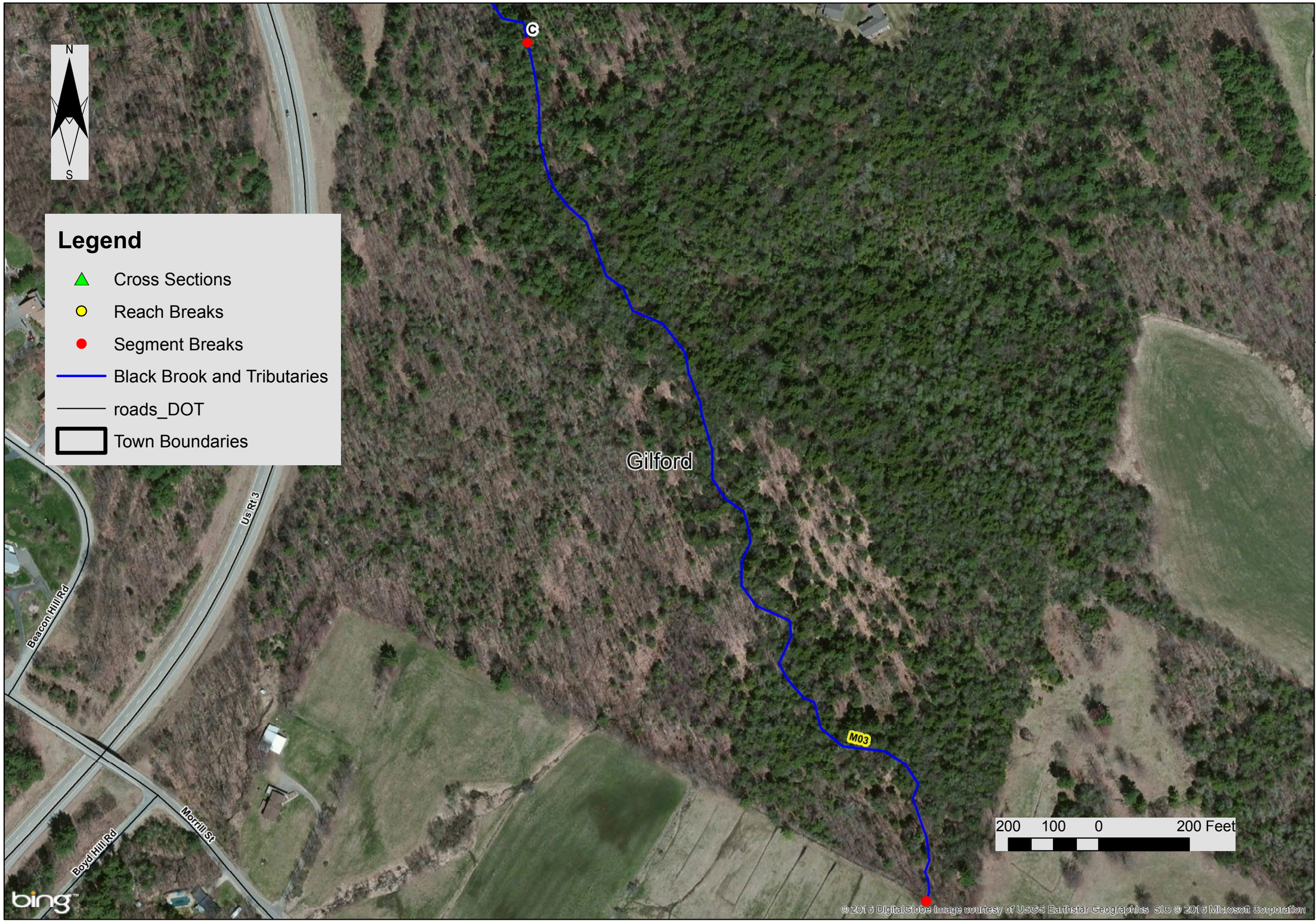
BLACK BROOK
REACH MO3-B

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO3-B**



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BLACK BROOK
REACH MO3-C

CITY OF LACONIA, NEW HAMPSHIRE
BELKNAP COUNTY

DESIGNED BY:	CJK
APPROVED BY:	
DRAWN BY:	CJK
CHECKED BY:	
PROJECT NO:	122262
DATE:	04/12/2016
FIGURE NO:	**REACH MO3-C**

ATTACHMENT B
PHASE 2 ASSESSMENT DATA SHEETS

Note: Raw field data sheets included in this printing pending data entry and database printouts from NH Geological Survey.

Rapid Stream Assessment Field Notes

Stream Name: Black Brook — Segment I.D: M01 — ☐ Sub-Reach
Location: from mouth @ Lake Winnipesaukee — Date: 7/10/15
Town: Laconia
Elevation: ____ ft.
Observers: CSE, AM
Organization /Agency: D+K, BCE
Latitude (N/S): ____
Longitude (E/W): ____
USGS Map Name(s): ____
Drainage Area: ____ sq. mi.
Weather: sunny — Segment Length: 1522 ft.
Rain Storm within past 7 days: Y / (N) — Flood history known: Y / N — Segment Not Assessed: (W)/I/N/G/B/O

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads			
Railroads			
Improved Paths			
Development	917	775	NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor	Right Corridor
(flat (0-3%)) hilly (4-8%) steep (9-15%)	(flat (0-3%)) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)	very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / (N)	**Continuous w/bank** A / S / (N)
Within 1x Wbkf A / S / (N)	**Within 1x Wbkf** A / S / (N)
Texture of Exposed Slope	Texture of Exposed Slope
till boulder/cobble gravel sand (silt) clay bedrock other Not Evaluated	till boulder/cobble gravel sand (silt) clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 3800 ☐ Gorge
(Estimated) / Measured
☐ Human caused change in valley width

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

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

Location in Reach (record locations on field map)
Waterfall // Ledge // (Dam) // Weir

	Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo (Yes) / No
BEAVER DAM	2.6'	1.0	

2. Stream Channel

2.1 Bankfull Width: ____ ft. **2.1a Wetted Width:** ____ ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** ____
2.2 Max. Bankfull Depth: ____ ft. **2.3 Mean Bankfull Depth:** ____ ft.
2.4 Floodprone Width: ____ ft. **2.5 Recently Abandoned FP :** ____ ft. **2.6 Ratio W/d_{mean}:** ____
2.7 Entrenchment: ____ **2.8 Incision Ratio:** ____ IR_{hef}: ____ **2.9 Sinuosity:** ____
2.10 Riffles/Steps: complete / eroded / sedimented / NA / NE (partial or none) (diagonal or continuous) **2.11 Riffle/Step Spacing:** ____ ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness: Mean Channel	Embeddedness: Mean Margin
						Y / N		

2.13 Avg. Size of Largest Particles on:
Bed: ____ Bar: ____
circle: inches or millimeters
2.13a % Exp. Substrate: ____

2.14 Stream Type: A G F B E C D 1 2 3 4 5 6 a b c
Cascade Step-Pool Plane Bed Riffle-Pool Ripple-Dune Braided
Stream Type ☐ Reference Type

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	steep	undercut	**(evaluate on the higher of the two banks)**		
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive
	Bank Erosion (FIT)	**Left**	**Length:** ft. **Height:** ft.				**Bank Revetment Type:** RR		**Length:** 113 ft.
		Right	**Length:** ft. **Height:** ft.				**Bank Revetment Type:**		**Length:** ft.
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)						
		Right	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)						
	Bank Canopy	**Left**	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	**Channel Canopy**	
		Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open	Closed
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	≥ 100 ft	none (SD).		
		Right	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft	none (SD).		
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none
		Right	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none
3.3	**Riparian Corridor (dom/sub)**	**Left**	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)
		Right	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)

4.1 Springs/Seeps/Tribs: abund / min / none **4.2 Adjacent Wetlands:** abund / min / none **4.3 Flow status:** low / mod / high

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

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

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

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

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

LACONIA BRIDGE 9 Y

	Constriction Type (from menu)	Width (ft)	Photo Yes / No		channel constriction	floodprone constriction	Problems (check all that apply) deposition above	deposition below	scour above	scour below	alignment	none
ICE BRIDGE / bike path	bridge	32	Y		☐	☑						
Union Ave	bridge	20	Y		☐	☑						
RR	bridge	30	Y		☐	☑						
Yacht club wall	abutment	21,9	Y		☐	☑					✓	
Yacht club foot	bridge	55	Y									

4.9 Beaver Dams (FIT): # Y 1 421 ft. of the segment affected. ☑ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 774 (With Windrowing : Yes / No)

Comments: backwatered from lake & beaver dam, no riffles

Tally Sheet

Stream Name: BLACK BROOK Segment I.D: M01

Location: MOUTH WINNE → McDONALDS BRIDGE Date: 7/10/15

* NOT FULLY ASSESED - INNUNDATED ☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)

Step 5. Channel Bed and Planform Changes

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

Step 3.1 Bank Erosion **FIT**

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

Step 3.3 Mass Failures and Gullies **FIT**

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

Step 3.1 Bank Revetment **FIT**

Length	
Left Bank	Right Bank
41	
72	
Total: 113	Total:

Step 4.8 Channel Constrictions

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

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

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

Step 1.3 River Corridor Encroachments **FIT**

Type	Length		Height of Fill
	One Side (R)	Both Sides (C)	
REVETMT	917	775	

Step 4.6 Stormwater **FIT**

	Tally
Field Ditch	
Overland Flow	
Road Ditch	
Tile Drain	
Urban Stormwater	1
Other	

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: McDONALD'S BRIDGE → LACONIA ICE
Observers: CSE / AM
Organization /Agency: DHK, BCE
USGS Map Name(s):
Weather: SUNNY
Rain Storm within past 7 days: Y (N) Flood history known: Y / N

Segment I.D: M02A
Date: 7/10/15 ☐ Sub-Reach
Town: LACONIA
Elevation: ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: sq. mi.
Segment Length: 1246 ft.
Segment Not Assessed: W/I/N/G/B/O

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads			
Railroads			
Improved Paths			
Development	1246	1246	NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor	Right Corridor
(flat (0-3%)) hilly (4-8%) steep (9-15%)	(flat (0-3%)) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)	very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / (N)	**Continuous w/bank** A / S / (N)
Within 1x Wbkf A / S / (N)	**Within 1x Wbkf** A / S / (N)
Texture of Exposed Slope	Texture of Exposed Slope
till boulder/cobble gravel sand (silt) clay bedrock other Not Evaluated	till boulder/cobble gravel sand (silt) clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 3700 ☐ Gorge
(Estimated) / Measured
☐ Human caused change in valley width

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

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

Location in Reach (record locations on field map)
Waterfall // Ledge // Dam // Weir

Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No

2. Stream Channel

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

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

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

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

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

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
						Y / N		

2.13 Avg. Size of Largest Particles on:
Bed: Bar:
circle: inches or millimeters
2.13a % Exp. Substrate:

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

Stream Type

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

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	(moderate)	steep	undercut	**(evaluate on the higher of the two banks)**				
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive /	(non-cohesive)	
		Upper	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive /	(non-cohesive)	
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive /	(non-cohesive)	
		Upper	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive /	(non-cohesive)	
	Bank Erosion (FIT)	**Left**	**Length:** ft.	**Height:** ft.		**Bank Revetment Type:** RR HB		**Length:** 162 106	ft.		
		Right	**Length:** ft.	**Height:** ft.		**Bank Revetment Type:** RR HB		**Length:** 162 106	ft.		
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)								
		Right	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / (none (SD))								
	Bank Canopy	**Left**	76 - 100%	(51 - 75%)	26 - 50%	1 - 25%	0%	**Channel Canopy**			
		Right	76 - 100%	(51 - 75%)	26 - 50%	1 - 25%	0%	Open	Closed		
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	(26 – 50 ft.)	51 – 100 ft.	(> 100 ft)	none (SD).				
		Right	(0– 25 ft.)	(26 – 50 ft.)	51 – 100 ft.	> 100 ft	none (SD).				
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	(mixed trees)	(shrubs-sapling)	herbaceous	invasives	none		
		Right	coniferous	deciduous	mixed trees	(shrubs-sapling)	(herbaceous)	invasives	none		
3.3	**Riparian Corridor (dom/sub)**	**Left**	(forest)	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		
		Right	forest	(shrub-sapling)	crop/pasture/hay	(commercial/industrial)	residential	bare	none (SD)		

4.1 Springs/Seeps/Tribs: (abund) / min / none **4.2 Adjacent Wetlands:** (abund) / min / none **4.3 Flow status:** (low) / mod / high

4.4 Current Debris Jams (FIT): # 0 **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / (none) / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater 2 / field ditch ___ / overland flow 1

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

						Problems (check all that apply)					
Constriction Type (from menu)	**Width** (ft)	**Photo** Yes / No		channel constriction	floodprone constriction	deposition above	deposition below	scour above	scour below	alignment	none
BRIDGE	9	Y		☐	☒						✓
				☐	☐						
				☐	☐						
				☐	☐						

CAGNIA ICE

4.9 Beaver Dams (FIT): # 0 0 ft. of the segment affected. ☑ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 1296 ft (With Windrowing : Yes / (No))

Comments: REACH 2 BEGINS HERE – REACH BELOW DOMINATED BY WETLAND MARGINS FROM IMPOUNDMENT. THIS REACH IS ALSO IMPOUNDED, BUT LACKS PRESENCE OF SIGNIFICANT WETLANDS ON MARGINS AND MAINTAINS A SINGLE, DISTINCT CHANNEL.

Tally Sheet

Stream Name: BLACK BROOK Segment I.D: MOZA

Location: McDONALDS BRIDGE → LACONIA ICE BRIDGE Date: 7/10/15

* NOT FULLY ASSESSED INUNDATION ☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)

Step 3.1 Bank Erosion **FIT**

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

Step 3.1 Bank Revetment **FIT**

Length	
Left Bank	**Right Bank**
	130.5
	31.3
	106
Total:	**Total:** 137.3

Step 5. Channel Bed and Planform Changes

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

Step 3.3 Mass Failures and Gullies **FIT**

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

Step 4.8 Channel Constrictions

Constriction Type	Width	Photo?	GPS?	Ch. Constr.	FP. Constr.	DA	DB	SA	SB	A	None

RR 1.) RB 3.) 2.) 4.) 5.)

		Tally
Step 2.12 / Step 4.4	**Large Woody Debris** / **Debris Jams**	—
Step 2.11	**Riffle/Step Spacing:**	—
Step 2.13	**Avg. Largest Particle**	**On Bed:** — **On Bar:** —

Step 1.3 River Corridor Encroachments **FIT**

Type	Length		Height of Fill
	One Side	Both Sides	
DEVELOPMENT		917(R) 775(L)	—

Step 4.6 Stormwater **FIT**

	Tally
Field Ditch	
Overland Flow	1
Road Ditch	
Tile Drain	
Urban Stormwater	11
Other	

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: FROM ENTRANCE TO STORM DRAIN @ LOWES — TO BACKWATER @ LACONIA ICE
Observers: CE/AS
Organization /Agency: DHK
USGS Map Name(s):
Weather: CLOUDY 36°F
Rain Storm within past 7 days: Y / N Flood history known: Y / N

Segment I.D: M02 B
Date: 11/14/15 & 7/10/15 ☐ Sub-Reach
Town: GUILFORD
Elevation: ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: sq. mi.
Segment Length: ft.
Segment Not Assessed: W/I/N/G/B/O MOSTLY CULVERTS / STORM WATER POND

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads	265.5		UK
Railroads			
Improved Paths			
Development		921.5	NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N
Within 1x Wbkf A / S / N
Texture of Exposed Slope
till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated

Right Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N
Within 1x Wbkf A / S / N
Texture of Exposed Slope
till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 3200' ☐ Gorge
Estimated / Measured
☐ Human caused change in valley width

1.6 Grade Controls (FIT) ☐ none
Fill out height fields for grade controls if applicable →
Location in Reach
(record locations on field map)
Waterfall // Ledge // Dam // Weir

	Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No
Narrowly Confined (>=1 & < 2)			
Semi-confined (>2 & < 4)			
Narrow (>= 4 & < 6)			
Broad (>= 6 & <10)			
Very Broad (>= 10)			

2. Stream Channel

2.1 Bankfull Width: ft. **2.1a Wetted Width:** ft. **2.1b Ratio (W_{wetted} / W_{bkf}):**
2.2 Max. Bankfull Depth: ft. **2.3 Mean Bankfull Depth:** ft.
2.4 Floodprone Width: ft. **2.5 Recently Abandoned FP :** ft. **2.6 Ratio W/d_{mean}:**
2.7 Entrenchment: **2.8 Incision Ratio:** IR_{hef} : **2.9 Sinuosity:**
2.10 Riffles/Steps: complete / eroded / sedimented / NA / NE (partial or none) (diagonal or continuous) **2.11 Riffle/Step Spacing:** ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
						Y / N		

2.13 Avg. Size of Largest Particles on:
Bed: Bar:
circle: inches or millimeters
2.13a % Exp. Substrate:

2.14 Stream Type: A G F B E C D 1 2 3 4 5 6 a b c
Cascade Step-Pool Plane Bed Riffle-Pool Ripple-Dune Braided
Stream Type
☐Reference Type

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	steep	undercut	(evaluate on the higher of the two banks)				
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive		
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive		
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive		
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive		
	Bank Erosion (FIT)	**Left**	**Length:** 11 ft.	**Height:** 0 ft.	**Bank Revetment Type:** HB RR	**Length:** 110 10 ft.					
		Right	**Length:** — ft.	**Height:** — ft.	**Bank Revetment Type:** HB RR	**Length:** 76 19 ft.					
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)								
		Right	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)								
	Bank Canopy	**Left**	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	**Channel Canopy**			
		Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open	Closed		
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft	none (SD)				
		Right	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft	none (SD)				
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none		
		Right	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none		
3.3	**Riparian Corridor (dom/sub)**	**Left**	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		
		Right	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		

4.1 Springs/Seeps/Tribs: abund / min / none **4.2 Adjacent Wetlands**: abund / min / none **4.3 Flow status:** low / mod / high

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

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater 2 / field ditch ___ / overland flow 2

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

Constriction Type (from menu)	**Width** (ft)	**Photo** Yes / No		channel constriction	floodprone constriction	**Problems** (check all that apply) deposition above	deposition below	scour above	scour below	alignment	none
CULVERT	5	Y		☑	☑						✓
CULVERT	6	Y		☑	☑						✓
CULVERT	5	Y		☑	☐		✓			✓	
				☐	☐						

4.9 Beaver Dams (FIT): # 0 0 ft. of the segment affected. ☑ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 921 (With Windrowing : Yes / No)

Comments: STREAM MOSTLY IN A CULVERTS IN THIS SEGMENT

LONG - A29-

Tally Sheet

Stream Name: Beech Brook
Location: From entrance to storm drain @ Loves to Backwater @ Laconia Ice
Segment I.D: M02 B3
Date: 7/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)

Step 3.1 Bank Erosion FIT

Major Erosion along retaining wall

Left Bank Length	Height	Right Bank Length	Height
11	0		
Total:	Avg.	Total:	Avg.

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	2
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	
	Degrade	Head Cuts	
	Tributary Rejuvenation?	Yes / No	

Step 3.3 Mass Failures and Gullies FIT

Mass Fail - Length		Height	Gully - Length		Length
Left	Right		Left	Right	
			1		20

Step 3.1 Bank Revetment FIT

Length	
Left Bank	Right Bank
56	35
15	15
12	13
22	13
3	2
10	19
Total: 120	Total: 97

Step 4.8 Channel Constrictions

HB
RB

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

		Tally
Step 2.12	Large Woody Debris	
Step 4.4	Debris Jams	

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

Step 1.3 River Corridor Encroachments FIT

Type	Length		Height of Fill
	One Side	Both Sides	
Road Embankment	265	921.5	UNK - in stormsys

Step 4.6 Stormwater FIT

	Tally
Field Ditch	
Overland Flow	11
Road Ditch	
Tile Drain	
Urban Stormwater	11
Other	

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: FROM WALMART CULVERT TO STORM DRAIN ENTRANCE @ LOWES
Observers: CSE / AS
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: CLOUDY, 36°F
Rain Storm within past 7 days: Y / N Flood history known: Y / N

Segment I.D.: MO2C
Date: 11/14/14 ☐ Sub-Reach
Town: GUILFORD
Elevation: 520' ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: 1.96 sq. mi.
Segment Length: 2100 ft.
Segment Not Assessed: W/I/N/G/B/O

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms		0	
Roads	R 2029 / L 562		
Railroads			
Improved Paths			
Development	R 2675 / L 2030		NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor	Right Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)	flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)	very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N	Continuous w/bank A / S / N
Within 1x Wbkf A / S / N	Within 1x Wbkf A / S / N
Texture of Exposed Slope	Texture of Exposed Slope
till boulder/cobble gravel sand silt	till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated	clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 24 ☐ Gorge
Estimated / Measured
☐ Human caused change in valley width

1.6 Grade Controls (FIT) ☐ none — Fill out height fields for grade controls if applicable →
Location in Reach (record locations on field map)
Waterfall // Ledge // Dam // Weir

	Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No
Narrowly Confined (>=1 & < 2)			
Semi-confined (>2 & < 4)			
Narrow (>= 4 & < 6)			
Broad (>= 6 & <10)			
Very Broad (>= 10)			

2. Stream Channel

(BANK OF NH SECTION SELECTED AS BEST REPRESENTATIVE)

2.1 Bankfull Width: 6.90 ft. **2.1a Wetted Width:** 3 ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** 0.43
2.2 Max. Bankfull Depth: 2.90 ft. **2.3 Mean Bankfull Depth:** 1.46 ft.
2.4 Floodprone Width: 32 ft. **2.5 Recently Abandoned FP :** 0 ft. **2.6 Ratio W/d_{mean}:** 4.74
2.7 Entrenchment: 4.64 **2.8 Incision Ratio:** 1 IR_{hef} : 1 **2.9 Sinuosity:** LOW
2.10 Riffles/Steps: complete / eroded (partial or none) / sedimented (diagonal or continuous) / NA / NE **2.11 Riffle/Step Spacing:** 50 ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
	12.9	15.9	4.0	22.6	44.5	Y / N	Q3	Q75

2.13 Avg. Size of Largest Particles on:
Bed: 01 Bar: 0.1
circle inches or millimeters
2.13a % Exp. Substrate: 80%

2.14 Stream Type: A G F B E C D 1 2 3 4 5 6 a b c
Cascade Step-Pool Plane Bed Riffle-Pool Ripple-Dune Braided
Stream Type E4
☐ Reference Type

* FIT DATA COLLECTED W/ GPS — SEE GIS

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	(steep)	(undercut)	**(evaluate on the higher of the two banks)**			
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / non-cohesive	
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / non-cohesive	
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / non-cohesive	
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / non-cohesive	
GRE FIT	**Bank Erosion (FIT)**	**Left**	**Length:** 1180.1 ft. **Height:** 1 ft.				**Bank Revetment Type:** HB RR		**Length:** 40.7 298.2 ft.	
		Right	**Length:** 902.5 ft. **Height:** 1 ft.				**Bank Revetment Type:** HB RR		**Length:** 13.6 6.9 ft.	
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)							
		Right	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)							
	Bank Canopy	**Left**	76 - 100%	51 - 75%	(26 - 50%)	1 - 25%	0%	**Channel Canopy**		
		Right	76 - 100%	51 - 75%	(26 - 50%)	1 - 25%	0%	(Open)	Closed	
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	(0 – 25 ft.)	26 – 50 ft.	51 – 100 ft.	> 100 ft	(none (SD).)			
		Right	(0– 25 ft)	26 – 50 ft.	51 – 100 ft.	> 100 ft	(none (SD).)			
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	mixed trees	(shrubs-sapling)	herbaceous	invasives	none	
		Right	coniferous	deciduous	mixed trees	(shrubs-sapling)	herbaceous	invasives	none	
3.3	**Riparian Corridor (dom/sub)**	**Left**	forest (shrub-sapling)	crop/pasture/hay	(commercial/industrial)	residential	bare	none (SD)		
		Right	forest (shrub-sapling)	crop/pasture/hay	(commercial/industrial)	residential	bare	none (SD)		

4.1 Springs/Seeps/Tribs: abund / (min) / none **4.2 Adjacent Wetlands**: abund / min / (none) **4.3 Flow status:** low / (mod) / high

4.4 Current Debris Jams (FIT): # 2 **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / (none) / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater 5 / field ditch ___ / overland flow 3

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

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

4.9 Beaver Dams (FIT): # 0 ~ ___ ft. of the segment affected. ☑ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 2100 2674.7 (With Windrowing : Yes / (No))

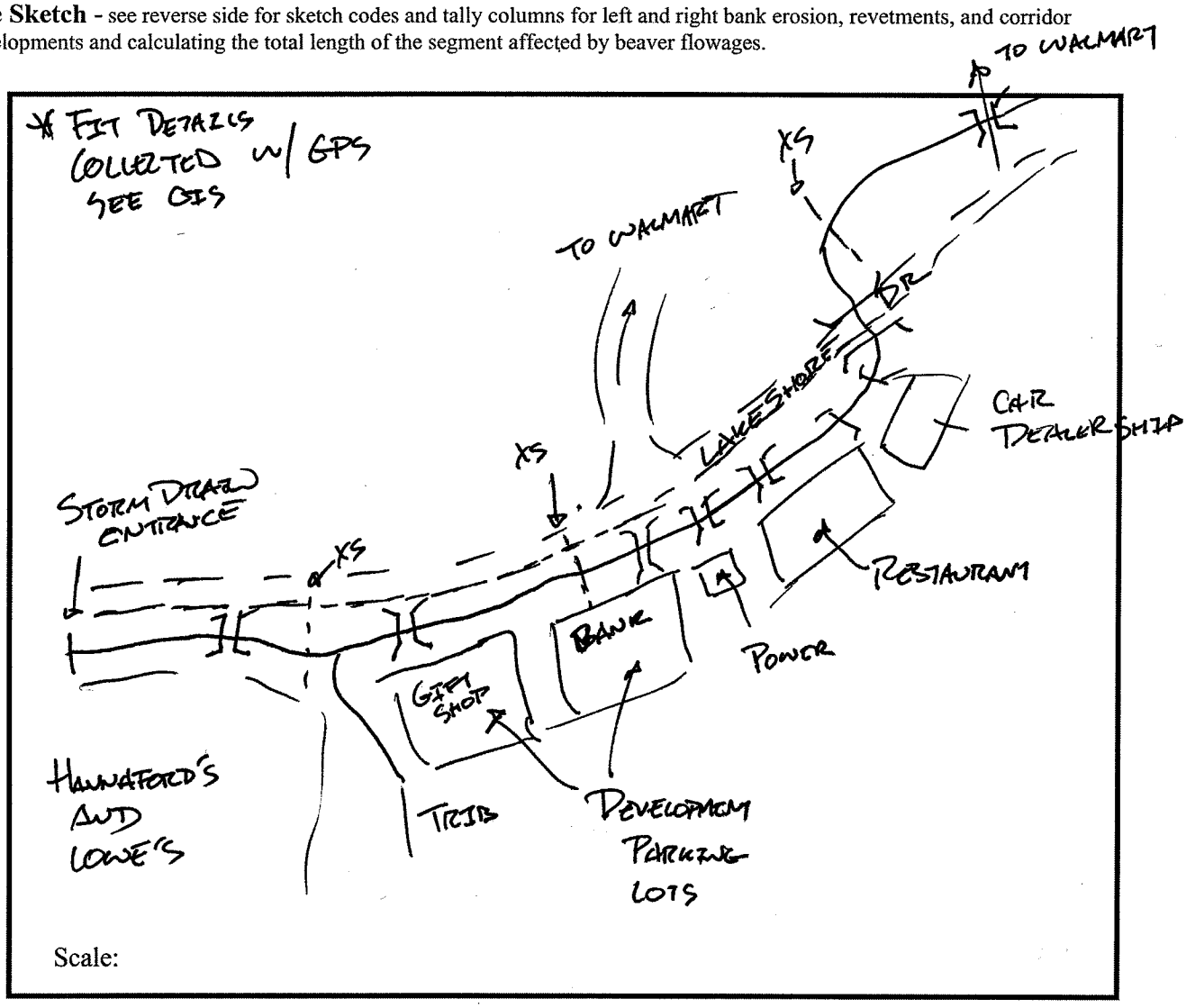
Comments: BANK IS STEEP IN MOST LOCATIONS AND FREQUENTLY UNDERCUT.

Sketch Form for Sites – Segments – Reaches

Stream Name: BLACK BROOK
Date: 11/14/14
Observers: CSE/AS/AM
Organization /Agency: DHK/BCG

Segment or Site ID: M02C
Town: GILFORD
Elevation: 520 Ft.

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



Height of bankfull features above water surface (Ft.)

_____ _____ _____ _____ _____ Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

Tally Sheet

Stream Name: BLACK BROOK
Location: GILFORD, NH

Segment I.D: M02C
Date: 11/14/14 – 7/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)
2.5	7	VEGETATION / GEOMETRIC GRADE BREAKS

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	1
		Point	3
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		1
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	11
	Degrade	Head Cuts	
	Tributary Rejuvenation?		Yes / No

Step 3.1 Bank Erosion **FIT**

Left Bank Length	Height	Right Bank Length	Height
1180.1	~1'	902.5	~1'
	IMPACT		
SEE	SPREADSHEET		
	FOR BREAKDOWN		
Total:	Avg.	Total:	Avg.

Step 3.3 Mass Failures and Gullies **FIT**

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

Step 3.1 Bank Revetment **FIT**

Length	
Left Bank	Right Bank
40.7	13.6
298.2	6.9
SEE	IMPACT
SPREADSHEET	
FOR	BREAKDOWN
Total:	Total:

H/B
RIPRAP

Step 4.8 Channel Constrictions – SEE CULVERT/BRIDGE FORMS

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

		Tally
Step 2.12 / Step 4.4	Large Woody Debris	
	Debris Jams	11

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

Step 1.3 River Corridor Encroachments **FIT**

Type	Length		Height of Fill
	~~One Side~~	~~Both Sides~~	
ROAD	561.9 (L)	2528.9 (R)	
		2100	
DEVELOPMENT	2030.4 (L)	2674.8 (R)	

Step 4.6 Stormwater **FIT**

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

Cross-Section Worksheet

Stream Name: BLACK BROOK Reach-Segment: M02C

Location: WALMART -> STORM DRAIN @ LOWES Date: 11/14/14 – RESURVEYED 8/2015

Observers:

Comments:

BKF Height

Revised 4.2016

Cross-Section Notes Codes

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

Cross-sections - Number and Location Description:

1

1) BANK NH

Note	Distance
PARKING LOT	0
LTER	14
	15
LTBANK	18
LEW	20
TW	22
RW	23
RTOB	25
RTER	40
RTBANK	54

Depth	
0	6.76
14	0.73
15	0.49
18	0
18.5	-0.1
19	-0.2
19.5	-0.8
20	-2.9
20.5	-2.9
21	-2.9
21.5	-2.9
22	-2.8
22.5	-1.8
23	-1.2
23.5	-0.9
24	-0.5
24.5	-0.2
24.9	0
25	0.23
40	1.66
54	6.9

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
0	0	32		

Dimensions			
10.04	x-section area	1.46	d mean
6.90	width	10.12	wet P
2.90	d max	0.99	hyd radi
1.00	incision ratio	4.74	w/d ratio
32.00	W flood prone area	4.64	ent ratio

2

2) BELOW WALMART

Note	Distance
LTOB	0
	2
	4
	9
LRF	12
TW	13
	14
	17
	19
RTOB/RBF	21
	24
RTER	27
	30

Depth	
0	5.6
2	4.5
4	3.1
9	0.9
12	0
12.1	-1.2
12.6	-1.5
13.1	-1.9
13.6	-2
14.1	-1.9
14.6	-1.8
15.1	-1.7
15.6	-1.7
16.1	-1.7
16.6	-1.6
17.1	-1.5
17.6	-1.4
18.1	-1.4
18.6	-0.2
19.1	0
24	0.1
27	0
30	5.6

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	0	25		

Dimensions			
10.51	x-section area	1.48	d mean
7.10	width	9.34	wet P
2.00	d max	1.13	hyd radi
1.00	incision ratio	4.80	w/d ratio
25.00	W flood prone area	3.52	ent ratio

3

3) IN FRONT OF HANNAFORD

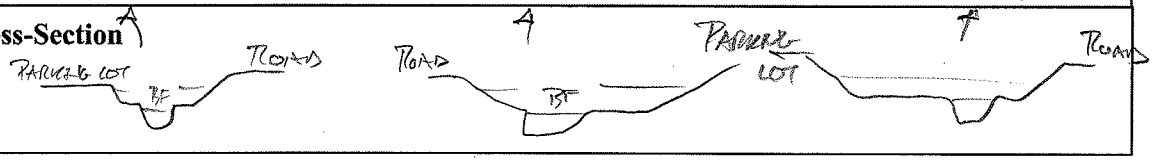
Note	Distance
PARKING LOT	0
	5
	10
	15
	22
LTER	25
	30
	35
LTBANK	40
LEW	42
TW	42.5
RW	43
	44
	44.5
	45
	45.5
	46
ROAD	63

Depth	
0	8.62
5	6.79
10	4.35
15	3.22
22	0.19
25	0.15
30	0.09
35	0.01
40	0
40.5	-1.4
41	-2
41.5	-2.1
42	-2.2
42.5	-2.4
43	-2.4
43.5	-2.6
44	-2.5
44.5	-3
45	-2.9
45.5	-2.2
46	-2.1
46.5	-1.9
47	-0.2
47.5	0.1
50	0.99
54	1.07
63	4.96

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	0.5	40		

Dimensions			
14.93	x-section area	2.04	d mean
7.33	width	10.66	wet P
3.00	d max	1.40	hyd radi
1.17	incision ratio	3.60	w/d ratio
40.00	W flood prone area	5.45	ent ratio

Drawing of Typical Cross-Section



Bed Substrate Composition

Size Class	Millimeters	Inches	Relative Size	Distribution of 100 Particles				Percent
1-Bedrock	> 4096	> 160	Bigger than a VW Bug					BANK NH ONLY
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug	13	5	17	12	12.9
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball	16	15	34	22	15.9
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball	4	7	10	7	4.0
4-Fine Gravel	2-16	0.08 – 0.63	Pepper corn to marble	23	37	16	25	22.8
5-Sand or Smaller	0.062-2.00	0.002-0.1	Smaller than a pepper corn	45	46	22	38	44.5
6-Silt	<0.062	<0.002						

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: GILFORD UPSTREAM OF WALMART CULVERT
Observers: CSE / MTM
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: CLEAR
Rain Storm within past 7 days: Y / (N) Flood history known: Y / N

Segment I.D: M02D
Date: 9/17/14 ☐ Sub-Reach
Town: LACONIA
Elevation: 530 ft.
Latitude (N/S): 43.5658
Longitude (E/W): 71.4367
Drainage Area: 1.78 sq. mi.
Segment Length: 670 ft.
Segment Not Assessed: ~~W/I/N/G/B/O~~

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads	793(L)		
Railroads			
Improved Paths			
Development	16.3(R)		NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor
(flat (0-3%)) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / (N)
Within 1x Wbkf A / S / (N)
Texture of Exposed Slope
till boulder/cobble gravel (sand) silt
clay bedrock other Not Evaluated

Right Corridor
flat (0-3%) hilly (4-8%) (steep (9-15%))
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / (N)
Within 1x Wbkf A / S / (N)
Texture of Exposed Slope
till boulder/cobble gravel (sand) silt
clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 250+ ☐ Gorge
Estimated / Measured
☒ Human caused change in valley width

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

1.6 Grade Controls (FIT) ☒ none
Fill out height fields for grade controls if applicable →
Location in Reach
(record locations on field map)
Waterfall // Ledge // Dam // Weir

Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No

2. Stream Channel

VALUES CALCULATED FROM MIDS SPREADSHEET BASED ON XS 2

2.1 Bankfull Width: 8.3 ft. **2.1a Wetted Width:** 4 ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** 0.48
2.2 Max. Bankfull Depth: 2.60 ft. **2.3 Mean Bankfull Depth:** 1.45 ft.
2.4 Floodprone Width: 100 ft. **2.5 Recently Abandoned FP :** 0 ft. **2.6 Ratio W/d_{mean}:** 5.71
2.7 Entrenchment: 12.05 **2.8 Incision Ratio:** 1 IR_{hef} : — **2.9 Sinuosity:** LOW
2.10 Riffles/Steps: complete / eroded (partial or none) / (sedimented (diagonal or ~~continuous~~)) / NA / NE **2.11 Riffle/Step Spacing:** 50 ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
0	4	9	9	34	44	Y / (N)	Q100	Q100

2.13 Avg. Size of Largest Particles on:
Bed: 5 Bar: 1
circle: inches or millimeters
2.13a % Exp. Substrate: 80%

2.14 Stream Type: A G F B (E) C D 1 2 3 (4) 5 6 a (b) c
Cascade Step-Pool Plane Bed (Riffle-Pool) Ripple-Dune Braided
Stream Type E4
☐ Reference Type

X FIT DATA COLLECTED w/ GPS

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	(steep)	undercut	**(evaluate on the higher of the two banks)**			
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	(gravel)	sand	silt/clay	mix	cohesive	(non-cohesive)
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive	(non-cohesive)
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	(gravel)	sand	silt/clay	mix	cohesive	(non-cohesive)
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive	(non-cohesive)
*	**Bank Erosion (FIT)**	**Left**	**Length:** 184.7 ft. **Height:** 1 ft.				**Bank Revetment Type:**		**Length:**	ft.
		Right	**Length:** 94.1 ft. **Height:** 1 ft.				**Bank Revetment Type:** HB RR		**Length:** 2.1 3.9	ft.
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / (deciduous) / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)							
		Right	coniferous / (deciduous) / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)							
	Bank Canopy	**Left**	(76 - 100%)	51 - 75%	26 - 50%	1 - 25%	0%	**Channel Canopy**		
		Right	(76 - 100%)	51 - 75%	26 - 50%	1 - 25%	0%	Open	(Closed)	
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	(26 – 50 ft.)	(51 – 100 ft.)	> 100 ft	none (SD).			
		Right	0– 25 ft.	26 – 50 ft.	(51 – 100 ft.)	(> 100 ft)	none (SD).			
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	(deciduous)	mixed trees	(shrubs-sapling)	herbaceous	invasives	none	
		Right	coniferous	(deciduous)	mixed trees	(shrubs-sapling)	herbaceous	invasives	none	
3.3	**Riparian Corridor (dom/sub)**	**Left**	(forest)	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)	
		Right	(forest)	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)	

4.1 Springs/Seeps/Tribs: abund / min / (none) **4.2 Adjacent Wetlands**: abund / (min) / none **4.3 Flow status:** low / (mod) / high

4.4 Current Debris Jams (FIT): # 2 **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / (none) / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater 1 / field ditch ___ / overland flow ___

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

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

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

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 366.1 (With Windrowing : Yes / (No))

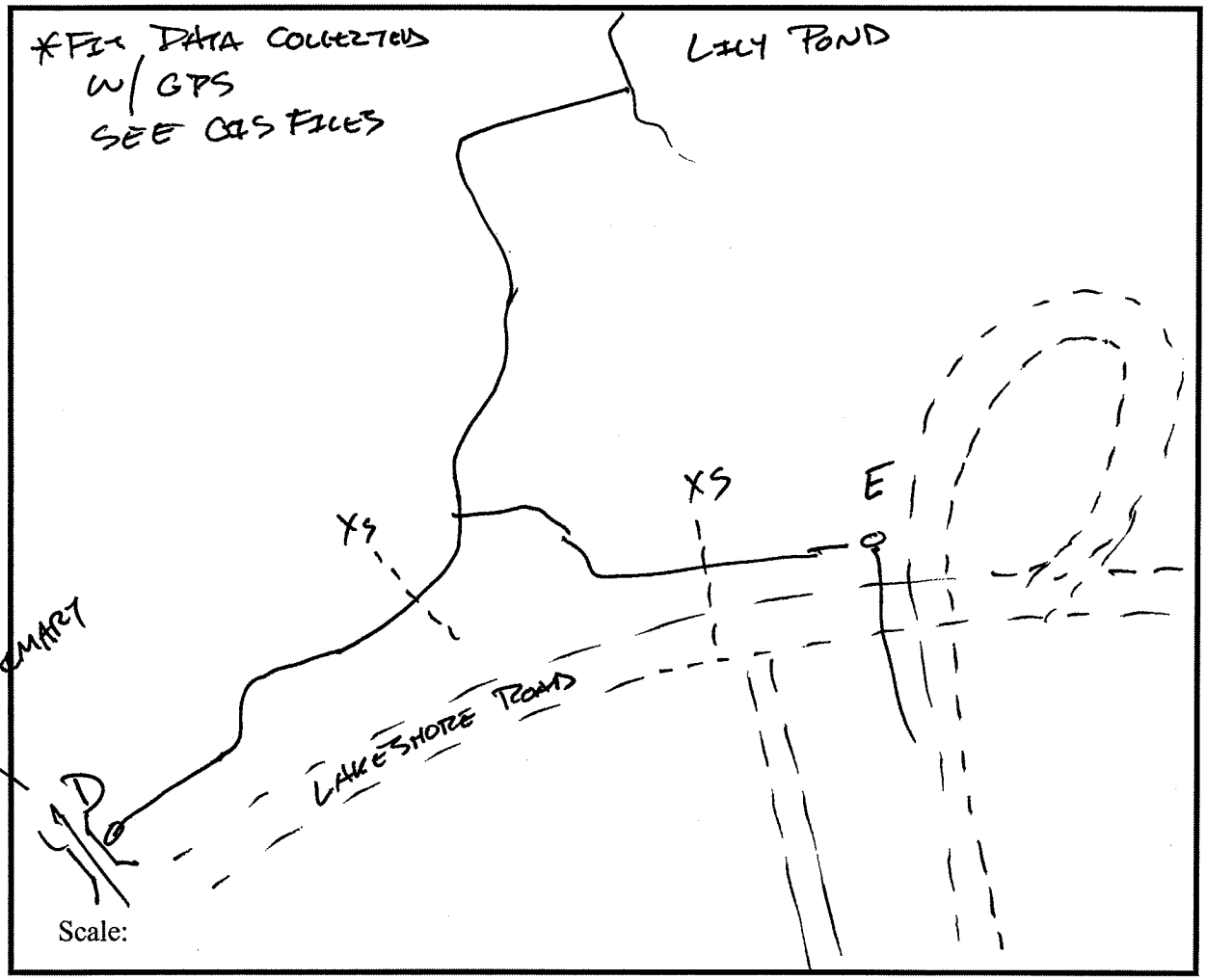
Comments:

Sketch Form for Sites – Segments – Reaches

Stream Name: BLACK BROOK
Date: 9/17/14 - 7/10/15
Observers: CSE/AS/AM/MTM
Organization /Agency: D+R/BCE

Segment or Site ID: M02D
Town: GILFORD, NH
Elevation: 530 Ft.

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



Height of bankfull features above water surface (Ft.)

_____ _____ _____ _____ _____ Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

Tally Sheet

Stream Name: BLACK BROOK
Location: GILFORD, NH

Segment I.D: M02D
Date: 9/17/14 - 7/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)
1.3	11.5	

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	3
		Side	
		Diagonal	1
		Delta	
		Island	
5.2 FIT	Flood Chutes		1
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	1
	Degrade	Head Cuts	
	Tributary Rejuvenation?		Yes / No

Step 3.1 Bank Erosion FIT

Left Bank Length	Height	Right Bank Length	Height
184.7	~1'	94.1	~1'
SEE IMPACT			
SPREADSHEET			
FOR BREAKDOWN			
Total:	Avg.	Total:	Avg.

Step 3.3 Mass Failures and Gullies FIT

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

Step 3.1 Bank Revetment FIT

Length	
Left Bank	Right Bank
0	7.1
0	3.9
Total:	Total:

RB

RR

Step 4.8 Channel Constrictions — SEE ~~ATTACHED~~ N/A

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

		Tally
Step 2.12	Large Woody Debris	
Step 4.4	Debris Jams	11
Step 2.11	Riffle/Step Spacing:	
Step 2.13	Avg. Largest Particle	On Bed: / On Bar:

Step 1.3 River Corridor Encroachments FIT

Type	Length		Height of Fill
	~~One Side~~	~~Both Sides~~	
DEVELOPMENT	0 (L)	16.3 (R)	
ROAD	793.3 (L)	0 (R)	

Step 4.6 Stormwater FIT

	Tally
Field Ditch	
Overland Flow	
Road Ditch	
Tile Drain	
Urban Stormwater	1
Other	

Cross-Section Worksheet

Stream Name: BLACK BROOK
Location:
Observers: CGE / MTM

Reach-Segment: MOZD #1
Date: 9/17/14

Comments:

BKF Height

Cross-Section Notes Codes

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

Revised 4.2016

Cross-sections - Number and Location Description:

BELOW LILLY POND TRIB

Note	Distance	Depth
TERRACE TOP	3	0.45
	10	2.85
	35	3.90
	57	4.34
BFR	70.5	5.60
TOE	72	7.45
REW	76.5	7.90
TW	76.5	7.95
TOE	81.0	7.72
BFL	82.5	6.35
	90.0	5.95
	100	5.76
	126	5.40
	136	5.55
	250	ROADWAY

Note	Distance	Depth
	0	0.8
	12	0.95
	38	0.57
	48	0.4
	55.5	0
	56	-1.5
	57	-1.9
	58	-1.8
	59	-1.9
	60	-1.9
	61	-2.1
	62	-2.3
	63	-2.1
	64	-2.3
	65	-1.4
	66	-0.4
	66.5	0
	67.5	0.55
	81	2.01
	103	2.45
	128	3.5
	135	5.9

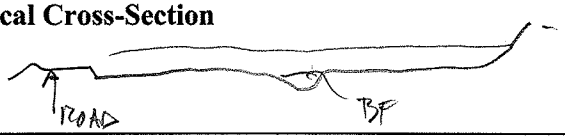
Note	Distance	Depth

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	0	100		

Dimensions			
19.13	x-section area	1.74	d mean
11.00	width	13.15	wet P
2.30	d max	1.45	hyd radi
1.00	incision ratio	6.33	w/d ratio
100.00	W flood prone area	9.09	ent ratio

Bankfull Width	11.5	Bankfull Width	
Max. Depth	1.06	Max. Depth	
Mean Depth	1.27	Mean Depth	
Floodprone Width	0	Floodprone Width	
Low Bank Height	1.18	Low Bank Height	
Width/depth Ratio	9.03	Width/depth Ratio	
Entrenchment	10 +	Entrenchment	
Incision Ratio	1	Incision Ratio	

Drawing of Typical Cross-Section



Bed Substrate Composition

Size Class	Millimeters	Inches	Relative Size	Distribution of 100 Particles	Percent
1-Bedrock	> 4096	> 160	Bigger than a VW Bug		
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug	4	4 %
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball	9	9 %
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball	10	9 %
4-Fine Gravel	2-16	0.08 – 0.63	Pepper corn to marble	35	34 %
5-Sand or Smaller	0.062-2.00	0.002-0.1	Smaller than a pepper corn	46	44 %
6-Silt	<0.062	<0.002			

Cross-Section Worksheet

Stream Name: BLACK BK
Location:
Observers: CSE, AM

Reach-Segment: M02-D #2
Date: 7/10/15

Comments:

across very Rd. but ~12.5 ft² ≤

BKF Height

Revised 4.2016

Cross-Section Notes Codes

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

Cross-sections - Number and Location Description:

floodprone goes way out

get RVW from contours / map

Note	Distance	Depth
LVW get off map		
edge of rd	-79.2	~~-6.2~~
edge of road	-19.8	-4.4
	-8.7	-2.7
embankment	-4	-1.6
	-0.9	-0.3
LBF, LRPN	0	0
	0.3	1.2
LEW	1.5	1.8
	2.2	1.9
	3	1.9
		8.3
Bankfull Width		
Max. Depth		2
* Mean Depth		1.53
Floodprone Width		
Low Bank Height		2.3
* Width/depth Ratio		5.424
Entrenchment		
Incision Ratio		1.15
IRhef		
Wetted Width		4
Ratio (W_{wetted}/W_{bkf}:		0.48

Note	Distance	Depth
	3.5	1.9
TW	4	2
	4.5	2
	5	1.9
REW	5.5	1.8
	6	1.7
	6.5	1.1
	7	0.7
	8	0.1
RBF, RPIN	8.3	0
	9.8	-0.1
	14.8	-0.5
RTOB	47	-0.3
	71	-0.2
	wetland	
Bankfull Width		
Ma		
Me		
Flo		
Lo		
W		
En		
Inc		
IR		
W		
Ra		

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	0	100		

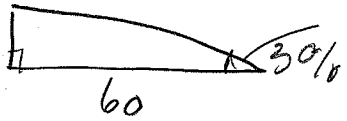
Dimensions			
12.06	x-section area	1.45	d mean
8.30	width	10.03	wet P
2.00	d max	1.20	hyd radi
1.00	incision ratio	5.71	w/d ratio
100.00	W flood prone area	12.05	ent ratio

Note	Distance	Depth

Bankfull Width
Max. Depth
Mean Depth
Floodprone Width
Low Bank Height
Width/depth Ratio
Entrenchment
Incision Ratio
IRhef
Wetted Width
Ratio (W_{wetted}/W_{bkf}:

Drawing of Typical Cross-Section

Embeddedness	Ch1	Ch2	Ch3	Ch4	Ch5	**Avg Ch:**	Ma1	Ma2	Ma3	Ma4	Ma5	**Avg Ma:**
Largest Mobile Particles	Bd1	Bd2	Bd3	Bd4	Bd5	**Avg Bd:**	Br1	Br2	Br3	Br4	Br5	**Avg Br:**



Material	Size Range (mm)		Size Range(in)		Count
silt/clay	0	0.062	0.000	0.002	
very fine sand	0.062	0.125	0.002	0.005	
fine sand	0.125	0.25	0.005	0.010	
medium sand	0.25	0.5	0.010	0.020	
coarse sand	0.5	1	0.020	0.039	
very coarse sand	1	2	0.039	0.079	
very fine gravel	2	4	0.079	0.157	
fine gravel	4	6	0.157	0.236	
fine gravel	6	8	0.236	0.315	
medium gravel	8	11	0.315	0.433	
medium gravel	11	16	0.433	0.630	
coarse gravel	16	22	0.630	0.866	
coarse gravel	22	32	0.866	1.260	
very coarse gravel	32	45	1.260	1.772	
very coarse gravel	45	64	1.772	2.520	
small cobble	64	90	2.520	3.543	
medium cobble	90	128	3.543	5.039	
large cobble	128	180	5.039	7.087	
very large cobble	180	256	7.087	10.079	
small boulder	256	362	10.079	14.252	
small boulder	362	512	14.252	20.157	
medium boulder	512	1024	20.157	40.315	
large boulder	1024	2048	40.315	80.630	
very large boulder	2048	4096	80.630	161.260	
bedrock					
		Total Particles:			

Rapid Stream Assessment Field Notes

Stream Name: BEAVER BROOK
Location: U/S ROUTE 3 CULVERT

Observers: CSE / AS
Organization /Agency: DAKE
USGS Map Name(s):
Weather: CLOUDY, 50°F
Rain Storm within past 7 days: Y / N Flood history known: Y / N

Segment I.D: MOR E
Date: 11/10/14 ☐ Sub-Reach
Town: GUILFORD
Elevation: 540 ft.
Latitude (N/S): 43.5656
Longitude (E/W): 71.4332
Drainage Area: 0.77 sq. mi.
Segment Length: 700 ft.
~~Segment Not Assessed: W/I/N/G/B/O~~

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads		312	>10'
Railroads			
Improved Paths			
Development			NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N
Within 1x Wbkf A / S / N
Texture of Exposed Slope
till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated

Right Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N
Within 1x Wbkf A / S / N
Texture of Exposed Slope
till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated

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

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

1.6 Grade Controls (FIT) ☑ none
Fill out height fields for grade controls if applicable →
Location in Reach
(record locations on field map)
Waterfall // Ledge // Dam // Weir

Total Height (0.0 ft)	Height Above Water Surface (0.0 ft)	Photo Yes / No

2. Stream Channel

2.1 Bankfull Width: 11.50 ft. **2.1a Wetted Width:** 6 ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** 0.52
2.2 Max. Bankfull Depth: 1.40 ft. **2.3 Mean Bankfull Depth:** 0.97 ft.
2.4 Floodprone Width: 22 ft. **2.5 Recently Abandoned FP :** 1.9 ft. **2.6 Ratio W/d_{mean}:** 11.81
2.7 Entrenchment: 1.91 **2.8 Incision Ratio:** 2.36 IR_{hef} : **2.9 Sinuosity:** LOW
2.10 Riffles/Steps: complete / eroded / sedimented / NA / NE
(partial or none) (diagonal or ~~continuous~~)
2.11 Riffle/Step Spacing: 28' ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
		6	40	16	38	(Y) / N	Q100	Q100

2.13 Avg. Size of Largest Particles on:
Bed: 2 Bar: 2
circle: inches or millimeters
2.13a % Exp. Substrate: 80'r.

2.14 Stream Type: A G F (B) E C D 1 2 3 (4) 5 6 a b c
Cascade Step-Pool Plane Bed (Riffle-Pool) Ripple-Dune Braided
Stream Type B4
☐ Reference Type

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	(steep)	undercut	**(evaluate on the higher of the two banks)**				
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive / (non-cohesive)		
		Upper	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive / (non-cohesive)		
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive / (non-cohesive)		
		Upper	bedrock	boulder/cobble	gravel	sand	(silt/clay)	mix	cohesive / (non-cohesive)		
	Bank Erosion (FIT)	**Left**	**Length:** 130.1 ft.	**Height:** 1.5 ft.	**Bank Revetment Type:** HB RR		**Length:** 0 147.5 ft.				
		Right	**Length:** 60.0 ft.	**Height:** 1.5 ft.	**Bank Revetment Type:** HB RR		**Length:** 3.1 0 ft.				
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)								
		Right	coniferous / deciduous / (shrubs-sapling) / (herbaceous) / lawn / pasture / bare / invasives / none (SD)								
	Bank Canopy	**Left**	76 - 100%	(51 - 75%)	26 - 50%	1 - 25%	0%	**Channel Canopy**			
		Right	76 - 100%	51 - 75%	(26 - 50%)	1 - 25%	0%	(Open)	Closed		
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	(0 – 25 ft.)	26 – 50 ft.	51 – 100 ft.	(> 100 ft)	none (SD).				
		Right	(0 – 25 ft.)	26 – 50 ft.	51 – 100 ft.	(> 100 ft)	none (SD).				
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	(deciduous)	mixed trees	shrubs-sapling	herbaceous	invasives	none		
		Right	coniferous	deciduous	mixed trees	shrubs-sapling	(herbaceous)	invasives	none		
3.3	**Riparian Corridor (dom/sub)**	**Left**	(forest)	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		
		Right	forest	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	(none) (SD)		

4.1 Springs/Seeps/Tribs: abund / min / (none) **4.2 Adjacent Wetlands**: abund / (min) / none **4.3 Flow status**: (low) / mod / high

4.4 Current Debris Jams (FIT): # (0) **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / (none) / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch___ / urban stormwater 1 / field ditch ___/ overland flow ___

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

Constriction Type (from menu)	**Width** (ft)	**Photo** Yes / No		channel constriction	floodprone constriction	**Problems** (check all that apply) deposition above	deposition below	scour above	scour below	alignment	none
Culvert	3.3 3.7 2	Y		☑	☑	✓				✓	
Culvert	6	Y		☑	☑						
				☐	☐						
				☐	☐						

4.9 Beaver Dams (FIT): # 0 ____ ft. of the segment affected. ☑ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 705.0 (With Windrowing : Yes / No)

Comments: ADJACENT SLOPE DOMINANTLY FLAT, HOWEVER IS STEEP IN THE PORTION ENCROACHING ON BY THE US 3 RAMP AND US 3

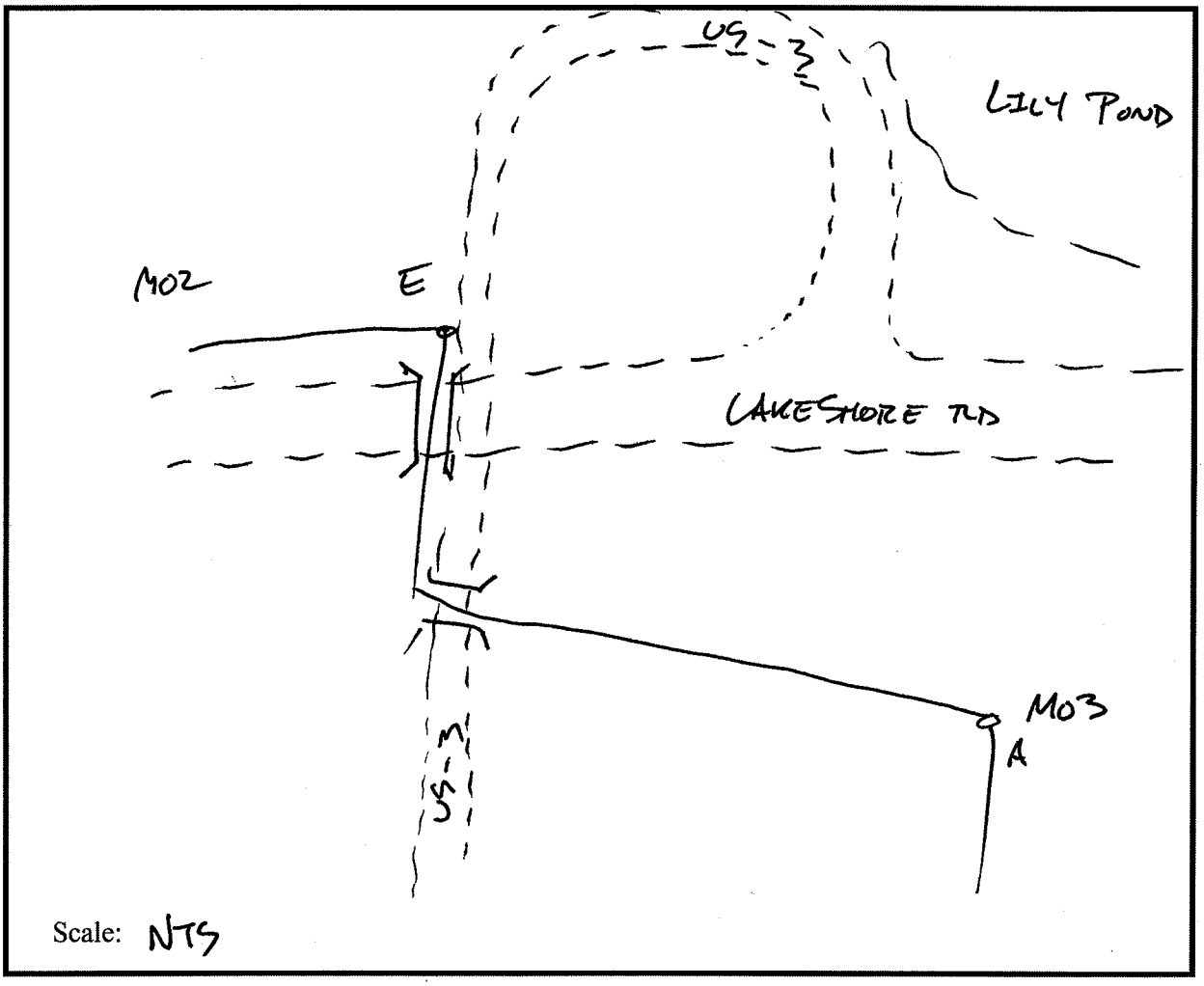
SOME UNDERCUTTING – BANKS PREDOMINANTLY SILT & SAND

Sketch Form for Sites – Segments – Reaches

Stream Name: BLACK BROOK
Date: 11/10/14 - 7/10/15
Observers: CSE/AS/AM
Organization /Agency: D+K / BCE

Segment or Site ID: MOZE
Town: GILFORD, NH
Elevation: 540 Ft.

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



Height of bankfull features above water surface (Ft.)

_____ _____ _____ _____ _____ Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

Tally Sheet

Stream Name: BLACK BROOK
Location: GILFORD, NH

Segment I.D: MOZE
Date: 11/10/14 – 9/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)
1.26	12.4	

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	3
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	
	Degrade	Head Cuts	
	Tributary Rejuvenation?	Yes / No	

Step 3.1 Bank Erosion FIT

Left Bank Length	Height	Right Bank Length	Height
130.1	~1.9'	60.0	~1.5
SEE FOR	IMPACT BREAKDOWN	SPREAD SHEET	
Total:	Avg.	Total:	Avg.

Step 3.3 Mass Failures and Gullies FIT

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

Step 3.1 Bank Revetment FIT

Length	
Left Bank	Right Bank
0	3.1
147.5	0
Total:	Total:

HB
RR

Step 4.8 Channel Constrictions SEE CULVERT SHEETS

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

		Tally
Step 2.12	Large Woody Debris	
Step 4.4	Debris Jams	

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

Step 1.3 River Corridor Encroachments FIT

Type	Length		Height of Fill
	One Side	Both Sides	

Step 4.6 Stormwater FIT

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

Cross-Section Worksheet

Stream Name: Black Brook
Location: US RT 3 Culvert
Observers: OSE/AS

Reach-Segment: MOE
Date: 11/10/14

Comments:

BKF Height

Revised 4.2016

Cross-Section Notes Codes

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

Cross-sections - Number and Location Description:

Note	Distance	Depth
	19	-4.74
	23	-6.82
LBF	25	-7.22
	26	-7.92
	28	-8.11
	30	-8.25
	32	-8.21
TW	34	-8.64
RBF	35	-8.61
	40	-5.81
	45	-4.83
	122	-2.65
	215	-0.00

Note	Distance	Depth
	0	3.96
	77	1.78
	78	1.7
	79	1.4
	80	1.3
	81	1.3
	82	1
	83	0.6
	84	0.6
	85	0.5
	86	0.3
	87	0
	87.5	-1.3
	88	-1.3
	89	-1.1
	90	-1.2
	91	-1
	92	-1.3
	93	-1.3
	94	-1.4
	95	-1.1
	96	-1
	97	-0.1
	97	-0.1
	98	-0.1
	99	0.1
	100	0.8
	101	1.5
	102	1.9
	103	1.87

Note	Distance	Depth

Bankfull Width	12.4
Max. Depth	2.03
Mean Depth	1.26
Floodprone Width	34
Low Bank Height	1.76
Width/depth Ratio	9.83
Entrenchment	2.50
Incision Ratio	1.68

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	1.9	22		

Dimensions			
11.20	x-section area	0.97	d mean
11.50	width	12.89	wet P
1.40	d max	0.87	hyd radi
2.36	incision ratio	11.81	w/d ratio
22.00	W flood prone area	1.91	ent ratio

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

Drawing of Typical Cross-Section

Bed Substrate Composition

Size Class	Millimeters	Inches	Relative Size	Distribution of 100 Particles	Percent
1-Bedrock	> 4096	> 160	Bigger than a VW Bug		
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug		
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball	6	6
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball	41	40
4-Fine Gravel	2-16	0.08 – 0.63	Pepper corn to marble	17	16
5-Sand or Smaller	0.062-2.00	0.002-0.1	Smaller than a pepper corn	39	38
6-Silt	<0.062	<0.002			

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: GILFORD ABOVE LAKESHORE RD FROM MOVIE THEATER TO BRIDGE ROAD
Observers: CGE/AS
Organization /Agency: DHK
USGS Map Name(s): LACONIA
Weather: CLOUDY 36°F
Rain Storm within past 7 days: Y (N) Flood history known: Y (N)

Segment I.D: M03A
Date: 11/14/14 ☐ Sub-Reach
Town: GILFORD
Elevation: 900+ ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: 0.75 sq. mi.
Segment Length: 1600 ft.
Segment Not Assessed: ~~W/I/N/G/B/O~~

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both ~~Banks~~	Height from tw
Berms			
Roads	486(L)	288.4(R)	10'
Railroads			
Improved Paths			
Development	1182(L)	1356(R)	NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor	Right Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)	flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)	very steep (16-25%) x-steep (>25%)
Continuous w/bank A / (S) / N	**Continuous w/bank** A / (S) / N
Within 1x Wbkf (A) / S / N	**Within 1x Wbkf** (A) / S / N
Texture of Exposed Slope	Texture of Exposed Slope
till boulder/cobble gravel (sand) silt	till boulder/cobble gravel (sand) silt
clay bedrock other Not Evaluated	clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 1300 ☐ Gorge
Estimated / Measured
☐ Human caused change in valley width

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

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

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

2. Stream Channel

2.1 Bankfull Width: 13.46 ft. **2.1a Wetted Width:** 7 ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** 0.52
2.2 Max. Bankfull Depth: 1.5 ft. **2.3 Mean Bankfull Depth:** 1.2 ft.
2.4 Floodprone Width: 15 ft. **2.5 Recently Abandoned FP :** +3.99 ft. **2.6 Ratio W/d_{mean}:** 11.22
2.7 Entrenchment: 1.1 **2.8 Incision Ratio:** 3.66 IR_{hef} : — **2.9 Sinuosity:** LOW
2.10 Riffles/Steps: complete / (eroded) / sedimented / NA / NE (partial or none) (diagonal or continuous) **2.11 Riffle/Step Spacing:** 60 ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
	12	31	26	17	14	Y (N)	Q50	Q50

2.13 Avg. Size of Largest Particles on: Bed: 4 Bar: 3
circle: (inches) or millimeters
2.13a % Exp. Substrate: 50

2.14 Stream Type: A (G) F B E C D 1 2 3 (4) 5 6 a (b) c
Cascade (Step-Pool) Plane Bed Riffle-Pool Ripple-Dune Braided
Stream Type G4b ☐ Reference Type

* FIT COLLECTED W/ GPS SEE GIS
SLIGHTLY OUT OF W/depth RATIO RANGE BUT OTHER FACTORS CONSISTENT

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	(steep)	undercut	**(evaluate on the higher of the two banks)**				
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / (non-cohesive)		
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / (non-cohesive)		
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / (non-cohesive)		
		Upper	bedrock	boulder/cobble	gravel	(sand)	silt/clay	mix	cohesive / (non-cohesive)		
	Bank Erosion (FIT) X	**Left**	**Length:** 354.4 ft.	**Height:** 1 ft.	**Bank Revetment Type:** HB RR	**Length:** 34.3 82.2 ft.					
		Right	**Length:** 286.5 ft.	**Height:** 1 ft.	**Bank Revetment Type:** HB RR	**Length:** 14.9 221.9 ft.					
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)								
		Right	coniferous / deciduous / (shrubs-sapling) / herbaceous / lawn / pasture / bare / invasives / none (SD)								
	Bank Canopy	**Left**	76 - 100%	(51 - 75%)	26 - 50%	1 - 25%	0%	**Channel Canopy**			
		Right	76 - 100%	(51 - 75%)	26 - 50%	1 - 25%	0%	Open	(Closed)		
3.2	**Buffer Width** (dom/sub) (FIT 0-25 ft)	**Left**	(0 – 25 ft.)	(26 – 50 ft.)	51 – 100 ft.	> 100 ft	none (SD).				
		Right	(0 – 25 ft.)	(26 – 50 ft.)	51 – 100 ft.	> 100 ft	none (SD).				
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	mixed trees	(shrubs-sapling)	herbaceous	invasives	none		
		Right	coniferous	deciduous	mixed trees	(shrubs-sapling)	herbaceous	invasives	none		
3.3	**Riparian Corridor** (dom/sub)	**Left**	(forest)	(shrub-sapling)	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		
		Right	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)		

4.1 Springs/Seeps/Tribs: abund / (min) / none **4.2 Adjacent Wetlands**: abund / min / (none) **4.3 Flow status:** low / (mod) / high

4.4 Current Debris Jams (FIT): # 5 **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / (none) / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater 0 / field ditch ___ / overland flow 3

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

Constriction Type (from menu)	Width (ft)	Photo Yes / No		channel constriction	floodprone constriction	**Problems** (check all that apply) deposition above	deposition below	scour above	scour below	alignment	none
CULVERT	4	Y		☐	☑						
CULVERT	4.9	Y		☑	☑						
CULVERT	4.9	Y		☐	☐						
CULVERT	3.9	Y		☐	☑	Yes					

4.9 Beaver Dams (FIT): # 0 ___ ft. of the segment affected. ☒ Bridge & Culvert Assessments

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

Length of Straightening: 714.6 (With Windrowing : Yes / (No))

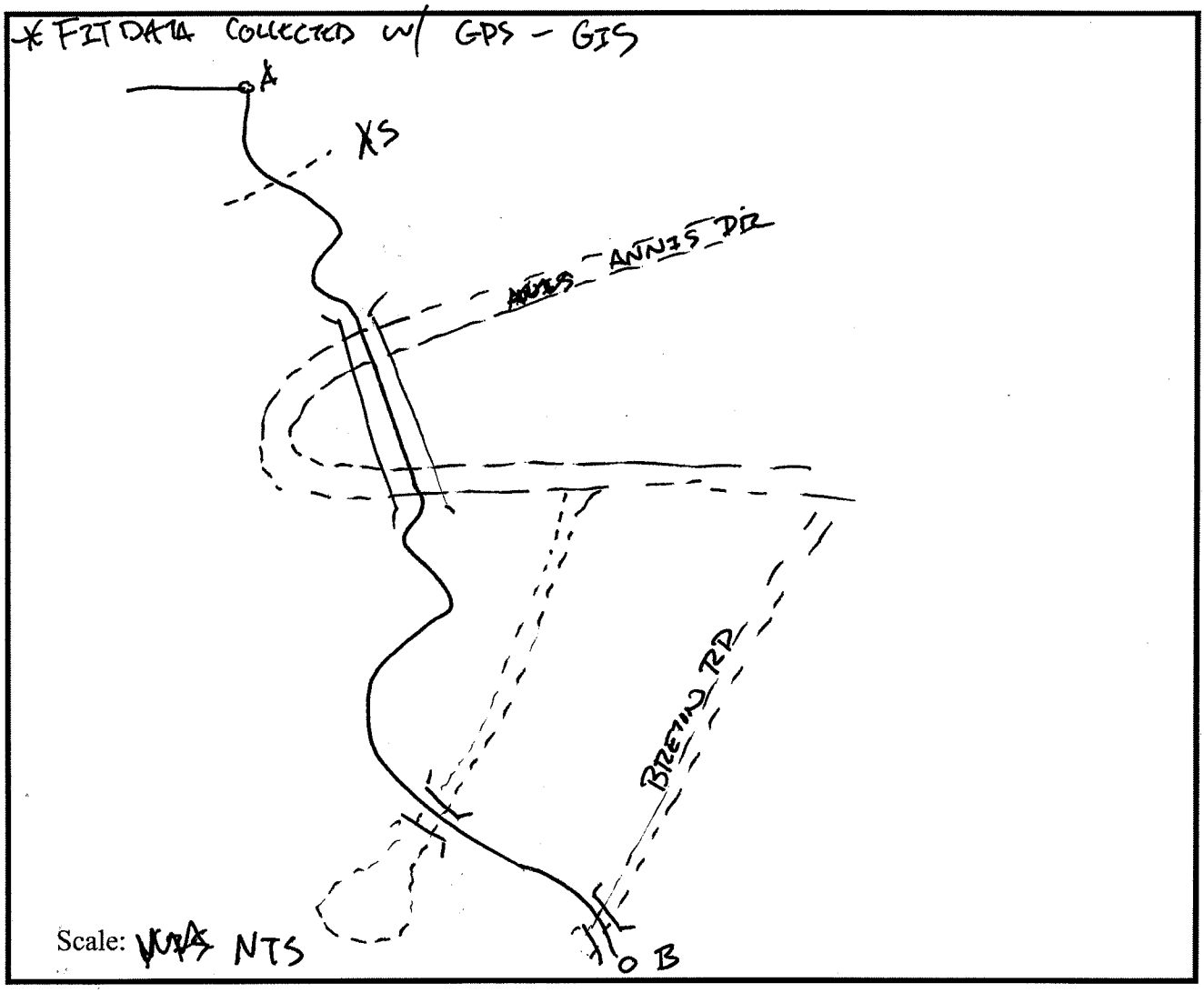
Comments: BANK COMPOSED OF PREDOMINANTLY SAND MIXED W/ GRAVEL

Sketch Form for Sites – Segments – Reaches

Stream Name: BLACK BROOK
Date: 11/14/14 – 7/10/15
Observers: CSE/AS/AM
Organization /Agency: D+K / BCE

Segment or Site ID: M03A
Town: GILFORD NH
Elevation: 560' Ft.

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



Height of bankfull features above water surface (Ft.)

_____ _____ _____ _____ _____

Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

Tally Sheet

Stream Name: BLACK BROOK
Location: GILFORD, NH

Segment I.D: M03A
Date: 11/14/14 – 7/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)
1.0	15	

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	4
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		
5.3 FIT	Aggrade	Steep Riffles	1
	Degrade	Head Cuts	
	Tributary Rejuvenation?		Yes / (No)

Step 3.1 Bank Erosion **FIT**

Left Bank Length	Height	Right Bank Length	Height
354.4	~1'	286.5	~1'
SEE IMPACT SPREADSHEET FOR BREAKDOWN			
Total:	Avg.	Total:	Avg.

Step 3.3 Mass Failures and Gullies **FIT**

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

Step 3.1 Bank Revetment **FIT**

	Length	
	Left Bank	Right Bank
HB	34.3	14.9
FR	82.2	221.9
Total:	Total:	

Step 4.8 Channel Constrictions – SEE CULVERT SHEETS

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

		Tally
Step 2.12 / Step 4.4	Large Woody Debris / Debris Jams	|||
Step 2.11 / Step 2.13	Riffle/Step Spacing: / Avg. Largest Particle	On Bed:	On Bar:

Step 1.3 River Corridor Encroachments **FIT**

Type	Length		Height of Fill
	One Side	Both Sides	
DEVELOPMENT	1182.4 (L)	1356.4 (R)	
ROAD	485.6 (L)	286.4 (R)	

Step 4.6 Stormwater **FIT**

	Tally
Field Ditch	
Overland Flow	|||
Road Ditch	
Tile Drain	
Urban Stormwater	N/A
Other	

Cross-Section Worksheet

Stream Name: BLACK BROOK
Location: GUILFORD
Observers: CSE, AS

Reach-Segment: M03A
Date: 11/14/14

Comments:

BKF Height

Cross-Section Notes Codes

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

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

Cross-sections - Number and Location Description:

IN ERODED AREA

Note	Distance	Depth
SHOT R	0	4.87
TBANK R	4	4.55
BBANK R	6	7.71
BFR	13	8.54
TOER	14	9.16
WWR	22	9.88
THAL	24	9.94
TOEL	27	9.56
BFL	28	9.05
TBANKL	33	3.73
SHOT	51	3.82
ROAD EMBK	234	3.XX

FLAT NO SHOT

Revised 4.2016

Note	Distance	Depth
	0	5.54
	183	4.72
	201	4.81
	202.5	2.1
	203.5	1.8
	204.5	1.5
	205.5	-1.3
	206.5	-1.3
	207.5	-1.4
	208.5	-1.5
	209.5	-1.3
	210.5	-1.2
	211.5	-1.2
	212.5	-1.2
	213.5	-1.1
	214.5	-1.3
	215.5	-1.2
	216.5	-1.4
	217.5	-1.1
	218.5	0
	219.5	1.4
	220.5	2.1
	230	3.99
	234	3.67

Bankfull Width		Bankfull Width	15
Max. Depth		Max. Depth	~~1.0~~ 1.4
Mean Depth		Mean Depth	1.0
Floodprone Width		Floodprone Width	~~22~~ 23
Low Bank Height		Low Bank Height	3.99
Width/depth Ratio		Width/depth Ratio	15.97
Entrenchment		Entrenchment	1.29
Incision Ratio		Incision Ratio	3.83
IRhef		IRhef	—
Wetted Width		Wetted Width	—

Bankfull Width

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	3.99	15		

Dimensions			
16.15	x-section area	1.20	d mean
13.46	width	15.00	wet P
1.50	d max	1.08	hyd radi
3.66	incision ratio	11.22	w/d ratio
15.00	W flood prone area	1.11	ent ratio

Wetted Width

Drawing of Typical Cross-Section

Size Class	Millimeters	Inches	Relative Size	Distribution of 100 Particles	Percent
1-Bedrock	> 4096	> 160	Bigger than a VW Bug		
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug	12	12
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball	31	31
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball	26	26
4-Fine Gravel	2 – 16	0.08 – 0.63	Pepper corn to marble	17	17
5-Sand or Smaller	< 2.00	< 0.08	Smaller than a pepper corn	14	14

Embeddedness	Ch1	Ch2	Ch3	Ch4	Ch5	Ma1	Ma2	Ma3	Ma4	Ma5
Largest mobile particles	Bd1	Bd2	Bd3	Bd4	Bd5	Br1	Br2	Br3	Br4	Br5

Rapid Stream Assessment Field Notes

Stream Name: BLACK BROOK
Location: ABOVE CULVERT BELOW TOWN ROAD
PARTIAL ASSESSMENT
Observers: CSE/AS
Organization /Agency: D+C
USGS Map Name(s):
Weather: CLOUDY, 36°
Rain Storm within past 7 days: Y / N Flood history known: Y / N

Segment I.D: M053B
Date: 11/14/14 ☐ Sub-Reach
Town: GILFORD
Elevation: 620 ft.
Latitude (N/S): 43.56205
Longitude (E/W): 74.42973
Drainage Area: 0.69 sq. mi.
Segment Length: 1350 ft.
Segment Not Assessed: ~~W/I/N/G/B/O~~

1. Valley and River Corridor

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

1.3 River Corridor Encroachments (FIT)	Reach or Segment Length: One Bank	Both Banks	Height from tw
Berms			
Roads	195(L)		15'
Railroads			
Improved Paths			
Development	369(L)	196(R)	NA

1.4 Slope of the Adjacent Terrace or Hillside

Left Corridor	Right Corridor
flat (0-3%) hilly (4-8%) steep (9-15%)	flat (0-3%) hilly (4-8%) steep (9-15%)
very steep (16-25%) x-steep (>25%)	very steep (16-25%) x-steep (>25%)
Continuous w/bank A / S / N	Continuous w/bank A / S / N
Within 1x Wbkf A / S / N	Within 1x Wbkf A / S / N
Texture of Exposed Slope	Texture of Exposed Slope
till boulder/cobble gravel sand silt	till boulder/cobble gravel sand silt
clay bedrock other Not Evaluated	clay bedrock other Not Evaluated

1.5 Confinement
Valley width / Channel width
Valley Width: 100 ☐ Gorge
Estimated / Measured
☐ Human caused change in valley width

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

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

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

2. Stream Channel

2.1 Bankfull Width: 12.30 ft. **2.1a Wetted Width:** 7.5 ft. **2.1b Ratio (W_{wetted} / W_{bkf}):** 0.61

2.2 Max. Bankfull Depth: 1.50 ft. **2.3 Mean Bankfull Depth:** 0.95 ft.

2.4 Floodprone Width: 70 ft. **2.5 Recently Abandoned FP :** +1.91 FROM BFE ft. **2.6 Ratio W/d_{mean}:** 12.98

2.7 Entrenchment: 1.63 **2.8 Incision Ratio:** 2.27 IR_{hef} : — **2.9 Sinuosity:** LOW

2.10 Riffles/Steps: complete (partial or none) eroded / sedimented (diagonal or continuous) / NA / NE **2.11 Riffle/Step Spacing:** 12 ft.

2.12 Bed Substrate Composition (percent):

1 Bedrock	2 Boulder >10 in >256 mm	3 Cobble 2.5 - 10 in 64-256 mm	4 Gravel Course 0.6-2.5in 16-64mm	4 Gravel Fine 0.08-0.63in 2-16 mm	5 Sand 0.002-0.1in .062-2mm	6 Silt or Clay (present)	Embeddedness Mean Channel	Embeddedness Mean Margin
	12	35	30	10	13	Y (N)	Q50	Q50

2.13 Avg. Size of Largest Particles on: Bed: 70 Bar: 1.5 circle: inches or millimeters

2.13a % Exp. Substrate: 50

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

Cascade (Step-Pool) Plane Bed Riffle-Pool Ripple-Dune Braided

Stream Type B4b ☐ Reference Type

FIT COLLECTED W/GPS SEE GIS

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

3. Riparian banks, Buffers, and Corridors

3.1	**Typical Bank Slope**		shallow	moderate	steep	undercut	**(evaluate on the higher of the two banks)**			
	Bank Texture-RB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive	
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive	
	Bank Texture-LB	**Lower**	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive	
		Upper	bedrock	boulder/cobble	gravel	sand	silt/clay	mix	cohesive / non-cohesive	
	Bank Erosion (FIT)	**Left**	**Length:** 279.4 ft. **Height:** ~1 ft.				**Bank Revetment Type:** RR		**Length:** 319.3 ft.	
		Right	**Length:** 196.4 ft. **Height:** ~1 ft.				**Bank Revetment Type:** RR		**Length:** 182.1 ft.	
	Near Bank Veg. Type (dom/sub)	**Left**	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)							
		Right	coniferous / deciduous / shrubs-sapling / herbaceous / lawn / pasture / bare / invasives / none (SD)							
	Bank Canopy	**Left**	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	**Channel Canopy**		
		Right	76 - 100%	51 - 75%	26 - 50%	1 - 25%	0%	Open / Closed		
3.2	**Buffer Width (dom/sub) (FIT 0-25 ft)**	**Left**	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft.	none (SD).			
		Right	0 – 25 ft.	26 – 50 ft.	51 – 100 ft.	> 100 ft.	none (SD).			
	Buffer Veg. Type (dom/sub)	**Left**	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none	
		Right	coniferous	deciduous	mixed trees	shrubs-sapling	herbaceous	invasives	none	
3.3	**Riparian Corridor (dom/sub)**	**Left**	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)	
		Right	forest	shrub-sapling	crop/pasture/hay	commercial/industrial	residential	bare	none (SD)	

4.1 Springs/Seeps/Tribs: abund / min / none **4.2 Adjacent Wetlands:** abund / min / none **4.3 Flow status:** low / mod / high

4.4 Current Debris Jams (FIT): # 1 **4.5 Flow Regs. & Withdrawals (FIT):** TYPE: withdrawal / bypass / r-o-r / store & release / none / unk

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

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

4.7 Stormwater Inputs (FIT): tile drain ___ / road ditch ___ / urban stormwater ___ / field ditch 1 / overland flow ___

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

Constriction Type (from menu)	Width (ft)	Photo Yes / No		channel constriction	floodprone constriction	**Problems** (check all that apply) deposition above	deposition below	scour above	scour below	alignment	none
BRIDGE	8	Y		☐	☑						✓
				☐	☐						
				☐	☐						
				☐	☐						

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

5. Channel Bed and Planform Changes

(5.0 to 5.3 record on tally sheet)

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

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

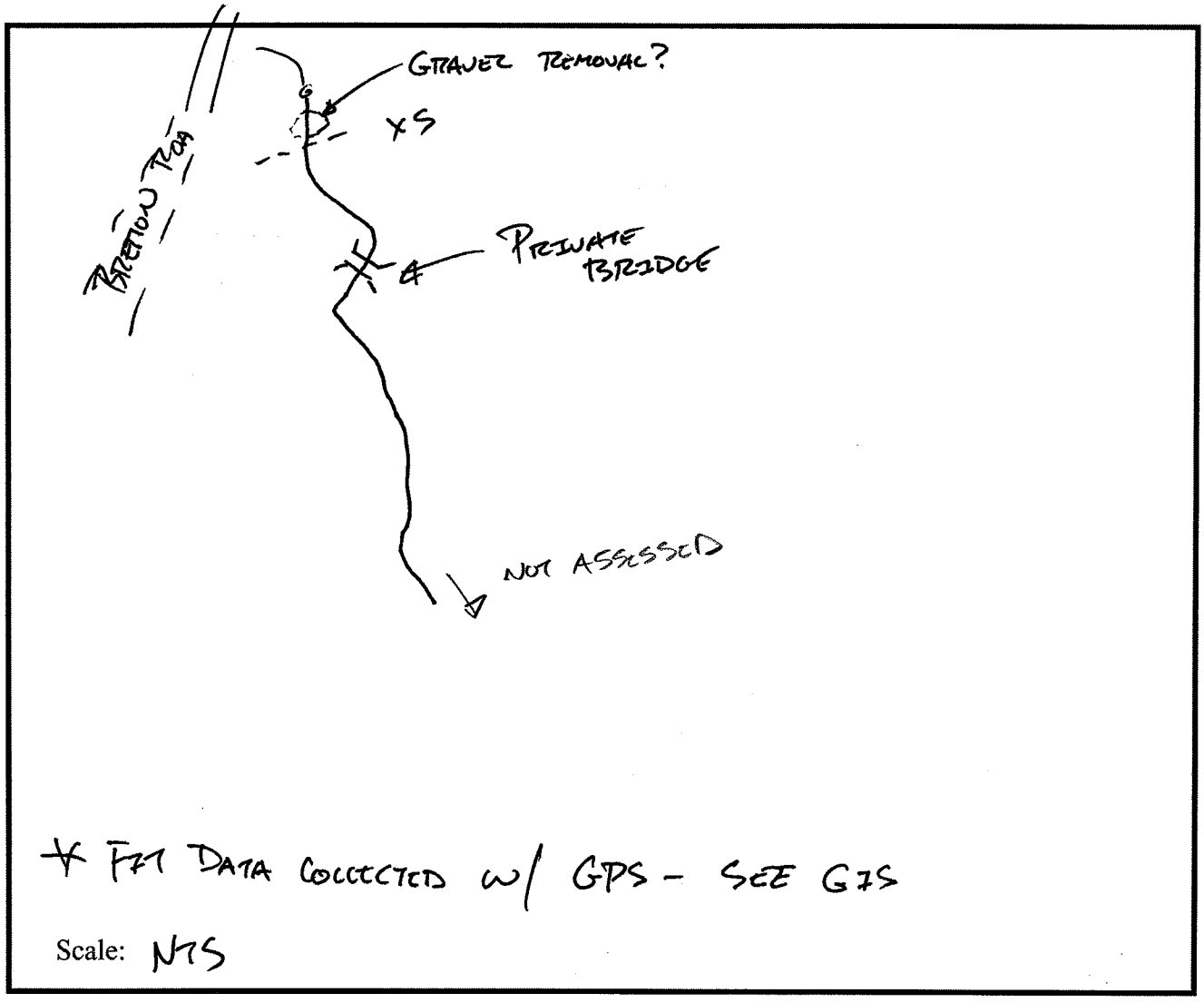
Length of Straightening: 266.8 (With Windrowing : Yes / No)

Comments:

Sketch Form for Sites – Segments – Reaches

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

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



Height of bankfull features above water surface (Ft.)

_____ _____ _____ _____ _____ Selected BKF Height

_____ _____ _____ _____ _____ _____

Constrictions α

LWD tally
Debris Jams
Stormwater

Tally Sheet

Stream Name: BLACK BROOK
Location: GILFORD, NH

Segment I.D: M03B
Date: 11/14/14 – 9/10/15

☐ Sub-Reach

Step 2.1 Height of bankfull above water surface

Bankfull Height	Chan. Wdth	Comments (describe indicators)
1.0	12.2	

Step 3.1 Bank Erosion **FIT**

Left Bank Length	Height	Right Bank Length	Height
279.4	~1'	196.4	~1'
SEE IMPACT FOR		SPREADSHEET BREAKDOWN	
Total:	Avg.	Total:	Avg.

Step 3.1 Bank Revetment **FIT**

Length	
Left Bank	Right Bank
RR 319.3	182.1
Total:	Total:

Step 1.3 River Corridor Encroachments **FIT**

Type	Length ~~One Side~~	~~Both Sides~~	Height of Fill
DEVELOPMENT	389 (L)	196.3 (R)	
ROAD	195.1 (L)	0 (R)	

Step 5. Channel Bed and Planform Changes

Record actual number of features			Tally
5.1	Depositional Features (Bar Type)	Mid	
		Point	1
		Side	
		Diagonal	
		Delta	
		Island	
5.2 FIT	Flood Chutes		III
	Neck Cut-offs		
	Channel Avulsions		
	Braiding		
	Migration		I
5.3 FIT	Aggrade	Steep Riffles	I
	Degrade	Head Cuts	
	Tributary Rejuvenation?	Yes / No	

Step 3.3 Mass Failures and Gullies **FIT**

Mass Fail - Length		Height	Gully - Length		Length
Left	Right		Left	Right	
				X	100'

Step 4.8 Channel Constrictions

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

		Tally
Step 2.12	Large Woody Debris	
Step 4.4	Debris Jams	I

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

Step 4.6 Stormwater **FIT**

	Tally
Field Ditch	
Overland Flow	
Road Ditch	
Tile Drain	
Urban Stormwater	
Other	E → FARM FIELD AGGRADE

Cross-Section Worksheet

Stream Name: BLACK BROOK
Location: ABOVE BRIGHAM ROAD
Observers: CSE + AS

Reach-Segment: M03B3
Date: 11/12/14

Comments:

BKF Height

Cross-Section Notes Codes

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

Cross-sections - Number and Location Description:

ABOVE BRIGHAM ROAD CULV

Note	Distance	Depth
LTOR	0	-0.69
	10	-1.61
	15	-2.28
	20	-3.16
LTOB	21	-3.31
LBF	22	-4.22
LEW	24	-5.53
	26	-5.51
TW	28	-3.58
	30	-5.49
REW	31.5	-5.19
RBF	34	-4.28
	35	-3.99
RTOB	39	-2.31
	45	-2.02
	55	-1.66
	60	-0.87
	70	0.05
	73	+1.00

Note	Distance	Depth
	0	3.53
	10	2.61
	15	1.94
	20	1.04
	21	0.91
	22	0
	23	-0.9
	24	-1.3
	25	-1.2
	26	-1.4
	27	-1.2
	28	-1.5
	29	-1.3
	30	-1.1
	31	-0.8
	34	-0.1
	35	0.23
	39	1.91
	45	2.2
	55	2.54
	60	3.35
	70	4.17
	73	3.22

Note	Distance	Depth

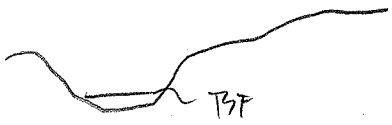
Bankfull Width	12.21
Max. Depth	1.36
Mean Depth	1.00
Floodprone Width	20
Low Bank Height	1.91 +BF
Width/depth Ratio	12.25
Entrenchment	1.64
Incision Ratio	1.40

Elevation Bankfull	Elevation RAF	W fpa (ft)	Channel Slope (%)	Manning's "n"
	1.91	20		

Dimensions			
11.67	x-section area	0.95	d mean
12.30	width	12.99	wet P
1.50	d max	0.90	hyd radi
2.27	incision ratio	12.98	w/d ratio
20.00	W flood prone area	1.63	ent ratio

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

Drawing of Typical Cross-Section



Bed Substrate Composition

Size Class	Millimeters	Inches	Relative Size	Distribution of 100 Particles	Percent
1-Bedrock	> 4096	> 160	Bigger than a VW Bug		
2-Boulder	256 – 4096	10.1 – 160	Basketball to VW Bug	13	12
3-Cobble	64 – 256	2.5 – 10.1	Tennis ball to basketball	37	35
4-Coarse Gravel	16 – 64	0.63 – 2.5	Marble to tennis ball	32	30
4-Fine Gravel	2-16	0.08 – 0.63	Pepper corn to marble	10	10
5-Sand or Smaller	0.062-2.00	0.002-0.1	Smaller than a pepper corn	13	13
6-Silt	<0.062	<0.002			

6b. VERMONT RAPID HABITAT ASSESSMENT FIELD FORM – LOW GRADIENT STREAMS

Stream Name: BLACK BROOK
Location: FROM WALMART ACCESS TO STORM DRAIN ENTERANCE BELOW LOWES
Observers: CSE, AS
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: CLOUDY, 36°F
Rain Storm within past 7 days: Y / (N)

Segment i.d: M02C
Date: 11/14/14
Town: GILFORD
Elevation: 520 ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: 1.96 + sq. mi.
Segment Length: 2100 ft.

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.1 Epifaunal Substrate and Available Cover	Greater than 50% of stream bed and lower banks covered with mix of substrates favorable for epifaunal colonization and fish cover; substrates include snags, submerged logs, undercut banks, and unembedded cobbles and boulders.	30-50% of stream bed and lower banks covered with a mix of substrates favorable for epifaunal colonization and fish cover	10-30% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present	Less than 10% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
6.2b Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.3b Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
6.4 Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
6.5 Channel Flow Status	Water reaches base of both lower banks, and <10% of channel bed substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.6 Channel Alteration	Channelization in the form of dredging, straightening, berms or streambank armoring is absent or minimal; stream with normal pattern.	Some channelization present along 10-20% of segment, usually in areas of bridge abutments; evidence of past channelization, (greater than past 20 yr) may be present, but recent channelization not present.	Channelization along 20-80% of stream segment ; riprap or armoring present on both banks.	Over 80% of the stream segment channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.7b Channel Sinuosity	The bends in the stream increase the stream length 2.5 to 4 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1.5 to 2.5 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1 to 1.5 times longer than the straight down-valley length.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0
6.8 Bank Stability (score each bank) **Note: determine left and right banks facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in segment (or reach) has areas of erosion.	Moderately unstable; 30-60% of bank in segment (or reach) has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _____ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE _____ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
6.9 Bank Vegetative Protection **(refer to field notes 3.1)** (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
6.10 Riparian Vegetative Zone Width (buffer) **(refer to field notes 3.2)** (score each side of channel)	Width of naturally vegetated riparian buffer >100 ft; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian buffer 50 - 100 ft; human activities have impacted zone only minimally.	Width of riparian buffer 25 - 50 ft; human activities have impacted zone a great deal.	Width of riparian buffer < 25 ft: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 (1) 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 (1) 0

6.11 Total Score: 80 / 200 = 40 **Condition:** FAIR

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

VT RAPID GEOMORPHIC ASSESSMENT ---- CONFINED STREAMS

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

Stream Name: BLACK BROOK
Location: WALMART ACCESS TO DOWNSTREAM OF LOWES
Observers: CSE + AS
Organization /Agency: D+K
Reference Stream Type E4 ☒ Modified
(If bedrock controlled gorge, alluvial fan, or naturally braided system see Handbook Protocols)

Segment I.D: M02C
Date: 11/14/14
Town: GUILFORD, NH
Elevation: 520 ft.
Weather: CLOUDY, 36°F
Rain Storm within past 7 days: Y / (N)

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

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

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation			9		✓	✓	0.59	II
Aggradation		12						
Widening		13	1				7.6 Stream Condition: FAIR	
Planform		13				✓		
Sub-totals:		38	9		Total Score:	47		

Channel Adjustment Processes: DEGRADATION CONTINUING AFTER HISTORIC PLANFORM + DEGRADATION

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

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

6b. VERMONT RAPID HABITAT ASSESSMENT FIELD FORM – LOW GRADIENT STREAMS

Stream Name: BLACK BROOK
Location: DOWNSTREAM OF LAKESHORE RD UPSTREAM OF WALMART ACCESS
Observers: CSE + MTM
Organization /Agency: D+K
USGS Map Name(s): LAONIA
Weather: CLEAR
Rain Storm within past 7 days: Y / (N)

Segment i.d: M02D
Date: 9/17/14
Town: GUILFORD
Elevation: 530 ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: 1.78 sq. mi.
Segment Length: 670 ft.

Habitat Parameter	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
6.1 Epifaunal Substrate and Available Cover	Greater than 50% of stream bed and lower banks covered with **mix** of substrates favorable for epifaunal colonization and fish cover; substrates include snags, submerged logs, undercut banks, and unembedded cobbles and boulders.	30-50% of stream bed and lower banks covered with a **mix** of substrates favorable for epifaunal colonization and fish cover	10-30% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present	Less than 10% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.2b Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.3b Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.4 Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
6.5 Channel Flow Status	Water reaches base of both lower banks, and <10% of channel bed substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.6 Channel Alteration	Channelization in the form of dredging, straightening, berms or streambank armoring is absent or minimal; stream with normal pattern.	Some channelization present along 10-20% of segment, usually in areas of bridge abutments; evidence of past channelization, (greater than past 20 yr) may be present, but recent channelization not present.	Channelization along 20-80% of stream segment ; riprap or armoring present on both banks.	Over 80% of the stream segment channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.7b Channel Sinuosity	The bends in the stream increase the stream length 2.5 to 4 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1.5 to 2.5 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1 to 1.5 times longer than the straight down-valley length.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
6.8 Bank Stability (score each bank) **Note: determine left and right banks facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in segment (or reach) has areas of erosion.	Moderately unstable; 30-60% of bank in segment (or reach) has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
6.9 Bank Vegetative Protection **(refer to field notes 3.1)** (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
6.10 Riparian Vegetative Zone Width (buffer) **(refer to field notes 3.2)** (score each side of channel)	Width of naturally vegetated riparian buffer >100 ft; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian buffer 50 - 100 ft; human activities have impacted zone only minimally.	Width of riparian buffer 25 - 50 ft; human activities have impacted zone a great deal.	Width of riparian buffer < 25 ft: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0

6.11 Total Score: 149 / 200 = 0.75 **Condition:** Good

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

VT RAPID GEOMORPHIC ASSESSMENT — UNCONFINED STREAMS

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

Stream Name: BLACK BROOK
Location: BELOW LAKE SHORE RD CULVERT TO WALMART ACCESS
Observers: MTM, CSE
Organization /Agency: D+K
Reference Stream Type E4 ☐ Modified
(If alluvial fan or naturally braided system see Handbook Protocols)

Segment I.D: M02D
Date: 9/17/14
Town: GOFFSTOWN, NH
Elevation: 530 ft.
Weather: CLEAR
Rain Storm within past 7 days: Y / (N)

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

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

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation		15					0.71	
Aggradation		13						
Widening		15					7.6 Stream Condition: GOOD	I
Planform		14						
Sub-totals:		57			**Total Score:** 57			

Channel Adjustment Processes: STABLE, SOME AGGRADATION AND CHANGE IN PLANFORM

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

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

6b. VERMONT RAPID HABITAT ASSESSMENT FIELD FORM – LOW GRADIENT STREAMS

Stream Name: BLACK BROOK
Location: FROM SLOPE BREAK NEAR MOVIE THEATER ACROSS RT 3 + LAKESHORE RD
Observers: CSE, AS
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: CLOUDY, 36°F
Rain Storm within past 7 days: Y / (N)

Segment i.d: MOZE
Date: 11/10/14
Town: GUILFORD
Elevation: 540 ft.
Latitude (N/S): 43.5658
Longitude (E/W): 71.4332
Drainage Area: 0.77 sq. mi.
Segment Length: 700 ft.

Habitat Parameter	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
6.1 Epifaunal Substrate and Available Cover	Greater than 50% of stream bed and lower banks covered with **mix** of substrates favorable for epifaunal colonization and fish cover; substrates include snags, submerged logs, undercut banks, and unembedded cobbles and boulders.	30-50% of stream bed and lower banks covered with a **mix** of substrates favorable for epifaunal colonization and fish cover	10-30% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present	Less than 10% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
6.2b Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
6.3b Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
6.4 Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 (4) 3 2 1 0
6.5 Channel Flow Status	Water reaches base of both lower banks, and <10% of channel bed substrate is exposed	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
6.6 Channel Alteration	Channelization in the form of dredging, straightening, berms or streambank armoring is absent or minimal; stream with normal pattern.	Some channelization present along 10-20% of segment, usually in areas of bridge abutments; evidence of past channelization, (greater than past 20 yr) may be present, but recent channelization not present.	Channelization along 20-80% of stream segment ; riprap or armoring present on both banks.	Over 80% of the stream segment channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 (3) 2 1 0

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.7b Channel Sinuosity	The bends in the stream increase the stream length 2.5 to 4 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1.5 to 2.5 times longer than the straight down-valley length.	The bends in the stream increase the stream length 1 to 1.5 times longer than the straight down-valley length.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 3 2 1 0
6.8 Bank Stability (score each bank) **Note: determine left and right banks facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in segment (or reach) has areas of erosion.	Moderately unstable; 30-60% of bank in segment (or reach) has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE _____ (LB)	Left Bank 10 9	8 7 6	5 (4) 3	2 1 0
SCORE _____ (RB)	Right Bank 10 9	8 7 6	5 (4) 3	2 1 0
6.9 Bank Vegetative Protection **(refer to field notes 3.1)** (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
6.10 Riparian Vegetative Zone Width (buffer) **(refer to field notes 3.2)** (score each side of channel)	Width of naturally vegetated riparian buffer >100 ft; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian buffer 50 - 100 ft; human activities have impacted zone only minimally.	Width of riparian buffer 25 - 50 ft; human activities have impacted zone a great deal.	Width of riparian buffer < 25 ft: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

6.11 Total Score: 82 / 200 = 41 **Condition:** FAIR

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

VT RAPID GEOMORPHIC ASSESSMENT ----- UNCONFINED STREAMS

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

Stream Name: BLACK BROOK
Location: GUILFORD, NH SEGMENT INCLUDING US RT 3 CULVERT
Observers: CSE, AS
Organization /Agency: D+R
Reference Stream Type E ☐ Modified
(If alluvial fan or naturally braided system see Handbook Protocols)

Segment I.D: M02E
Date: 11/10/14
Town: GUILFORD, NH
Elevation: 540 ft.
Weather: CLOUDY
Rain Storm within past 7 days: Y / (N)

Adjustment Process	Condition Category: Reference	Good	Fair	Poor	
7.1 Channel Degradation (Incision) • Exposed till or fresh substrate in the stream bed and exposed infrastructure (bridge footings) • New terraces or recently abandoned floodplains. • Headcuts, or nickpoints that are 2-3 times steeper than typical riffle. • Freshly eroded, vertical banks. • Alluvial (river) sediments that are imbricated (stacked like dominoes) high in bank. • Tributary rejuvenation, observed through the presence of nickpoints at or upstream of the mouth of a tributary. • Bars with steep faces, usually occurring on the downstream end of a bar. **Stream Type Departure** ☐ **Type of STD:** _____	☐ Little evidence of localized slope increase or nickpoints.	☒ Minor localized slope increase or nickpoints.	☐ Sharp change in slope, head cuts present, and/or tributaries rejuvenating.	☐ Sharp change in slope and / or multiple head cuts present. Tributaries rejuvenating.	3
	☐ Incision Ratio ≥ 1.0 < 1.2 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.2 < 1.4 **and** Entrenchment ratio > 2.0	☐ Incision Ratio ≥ 1.4 < 2.0 **and** Entrenchment ratio > 2.0	☒ Incision ratio ≥ 2.0 **OR** Entrenchment ratio ≤ 2.0	0
	☐ Riffle heads complete and comprised of courser sediments (≥D80). Full complement of expected bed features.	☐ Riffle heads mostly complete. Riffle lengths may appear shorter. Full complement of expected bed features.	☒ Riffles or dunes may appear incomplete; bed profile dominated by runs.	☐ Riffle-pool or ripple-dune features replaced by plane bed features.	1
	☐ No significant human-caused change in channel confinement or valley type.	☒ Only minor human-caused change in channel confinement but no change in valley type.	☐ Significant human-caused change in channel confinement enough to change valley type, but still unconfined.	☐ Human-caused change in valley type, unconfined or narrow changed to confined.	3
	☐ No evidence of historic / present channel straightening, gravel mining, dredging and/or channel avulsions.	☐ Evidence of minor bar scalping on a point bar and/or channel avulsion; but minor to no historic channel straightening, gravel mining, or dredging.	☐ Evidence of significant historic channel straightening, dredging, gravel mining and/or channel avulsions.	☒ Extensive historic channel straightening, commercial gravel mining, and/or recent channel avulsion.	0
	☒ No known flow alterations (i.e., increases in flow or decreases in sediment supply).	☐ Minor flow alterations, some flow increase and/or reduction of sediment load.	☐ Major historic flow alterations, greater flows and/or reduction of sediment load.	☐ Major existing flow alterations, greater flows and/or reduction of sediment load.	3.3
Score: 10 **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	
7.2 Channel Aggradation • Shallow pool depths. • Abundant sediment deposition on point bars and mid-channel bars and extensive sediment deposition at obstructions, channel constrictions, and at the upstream end of tight meander bends. Islands may be present. • Most of the channel bed is exposed during typical low flow periods. • High frequency of debris jams. • Coarse gravels, cobbles, and boulders may be embedded with sand/silt and fine gravel. ** This parameter may be a difficult to infeasible to evaluate in ripple-dune stream types **Stream Type Departure** ☐ **Type of STD:** _____	☐ Complete riffle heads and deep pools in riffle-pool systems.** Full complement of expected bed features.	☐ Mostly complete riffles and/or some filling of pools with fine sediment. Pools may only be slightly deeper and wider than runs.**	☒ Incomplete riffles or dunes and dominated by runs. Significant filling of pools with sediment, pools may be absent with runs prevailing.	☐ Riffle-pool or ripple-dune features replaced by plane bed features.	1
	☐ Minor point or delta bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Single to multiple mid-channel or diagonal bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or diagonal bars present. Major sediment buildup at the head of bendways leading to steep riffles and flood chutes.	☒ Multiple unvegetated mid-channel or diagonal bars present splitting or braiding flows even under low flow conditions.	0
	☐ No apparent increase in fine gravel/sand substrates (pebble count).**	☐ Some increase in fine gravel/sand substrates that may comprise over 50% of the sediments.	☒ Large incr. in fine gravel/ sand substrates that may comprise over 70% of the sediments. Sediment feels soft underfoot.	☐ Homogenous fine gravel/ sand substrates may comprise over 90% of the sediments. Sediment feels soft underfoot.	1
	☒ Low width/depth ratio ≤ 20 for C or B type channels ≤ 10 for E type channels	☐ Low to moderate W/d ratio >20 ≤ 30 for C or B channels >10 ≤ 12 for E channels	☐ Moderate to high W/d ratio >30 ≤ 40 for C or B channels >12 ≤ 20 for E channels	☐ High width/depth ratio >40 for C or B type channels >20 for E type channels	3.3
	☐ No known flow alterations (i.e., decrease in flow or increase in sediment supply).	☐ Minor reduction in flow and/or increase in sediment load. Flood-related sediment working through reach, seen as enlarged bars.	☒ Major historic flow alterations, reduction in flows and / or increase in sediment load.	☐ Major existing flow alterations, extreme reduction in flows and / or increase in sediment load.	1.5
	☒ No human-made constrictions causing upstream deposition.	☒ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive upstrm / dwnstrm deposition and flow bifurcation.	3
Score: 10 **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1	

Adjustment Process	Condition Category				
	Reference	**Good**	**Fair**	**Poor**	
7.3 Widening Channel • Active undermining of bank vegetation on both sides of the channel; many unstable bank overhangs that have little vegetation holding soils together. • Erosion on both right and left banks. • Recently exposed tree roots (fresh roots are 'green' and do not break easily, older roots are brittle and will break easily in your hand). • Fracture lines at the top of the bank that appear as cracks parallel to the river. • Evidence of landslides and mass failures. • Mid-channel bars and side bars may be present. • Urbanization and stormwater outfalls leading to higher rate and duration of runoff and channel enlargement.	☒ Low width/depth ratio ≤20 for channel slopes <4% ≤10 for channel slopes ≥4%	☐ Low to moderate W/d ratio >20 ≤30 for slopes <4% >10 ≤12 for slopes ≥4%	☐ Moderate to high W/d ratio >30 ≤40 for slopes <4% >12 ≤20 for slopes ≥4%	☐ High width/depth ratio >40 for channel slopes <4% >20 for channel slopes ≥4%	8&9 4
	☐ Little to no scour and erosion at the base of both banks. Negligible bank overhangs, fracture lines at top of banks, leaning trees or freshly exposed tree roots.	☐ Minimal to moderate scour and erosion at the base of both banks. Some overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☐ Moderate to high scour and erosion at the base of both banks. Many bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	☒ Continuous and laterally extensive scour and erosion at the base of both banks. Continuous bank overhangs, fracture lines at top of banks, leaning trees and freshly exposed tree roots.	0
	☐ Incision Ratio ≥1.0 <1.2 **and** Where channel slope <4% Entrenchment ratio >1.4 Where channel slope ≥4% Entrenchment ratio >1.2	☐ Incision Ratio ≥1.2 <1.4 **and** Where channel slope <4% Entrenchment ratio >1.4 Where channel slope ≥4% Entrenchment ratio >1.2	☐ Incision Ratio ≥1.4 <2.0 **and** Where channel slope <4% Entrenchment ratio >1.4 Where channel slope ≥4% Entrenchment ratio >1.2	☒ Incision ratio ≥2.0 **and** Where channel slope <4% Entrenchment ratio ≤1.4 Where channel slope ≥4% Entrenchment ratio ≤1.2	0
	☐ Minor side or delta bars present. Depositional features typically less than half bankfull stage in height.	☒ Single to multiple mid-channel or side bars present. Minor depositional features typically less than half bankfull stage in height.	☐ Multiple unvegetated mid-channel or side bars present. Major sediment buildup at the head of constrictions leading to steep riffles and/or flood chutes.	☐ Multiple unvegetated mid-channel, side or diagonal bars or islands present, splitting or braiding flows even under low flow conditions.	4
	☐ No known channel and / or flow alterations (i.e., increase in flow and/or change in sediment supply).	☐ Minor increase in watershed input of flows and/or sediment. Episodic (flood) discharges resulting in short-term enlargement.	☒ Major channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	☐ Major and extensive channel and/or flow alterations, increase in flows and/or change in sediment load (increase or decrease).	1.25
Score: 9 **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1	
7.4 Change in Planform • Flood chutes present. • Channel avulsions evident or impending. • Change or loss in bed form structure, sometimes resulting in a mix of plane bed and step-pool forms. • Island formation and/or multiple thread channels.	☐ Low bank erosion on outside bends, little or no change in sinuosity within the reach.	☐ Low to moderate lateral bank erosion on outside bends, may include minor change in sinuosity within the reach.	☐ Moderate to high lateral bank erosion on most outside bends, may include moderate change in reach sinuosity.	☒ Extensive lateral bank erosion on most outside bends, may include major change in sinuosity within the reach.	0.5
	☐ Little or no evidence sediment buildup, only minor delta or side bars typically less than half bankfull stage in height.	☒ Single to multiple unvegetated mid-channel, delta, or side bars. Some potential for channel avulsion.	☐ Multiple unvegetated mid-channel, delta, or side bars, typically greater than bankfull stage in height. Evidence of past channel avulsion and/or islands.	☐ Multiple and major mid-channel, delta, and/or side bars. Evidence of recent channel avulsion, multiple thread channels, and islands.	4
	☐ No human-caused alteration of channel planform and / or the width of the floodprone area.	☐ Minor to moderate alteration of channel planform and/or width of the floodprone area resulting from floodplain encroachment, channel straightening, or dredging.	☐ Major alteration of channel planform and/or width of the floodprone area resulting from historic encroachment, dredging, or channel straightening.	☒ Major alteration of channel planform and the width of the floodprone area resulting from recent and extensive encroachment, dredging, and/or channel straightening.	0.5
	☐ Human-made constrictions causing only negligible upstream deposition.	☒ Human-made constrictions smaller than floodprone width, causing minor to moderate upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than floodprone width, causing major upstrm / dwnstrm deposition.	☐ Human-made constrictions significantly smaller than bankfull width, causing extensive major upstrm / dwnstrm deposition and flow bifurcation.	4
Score: 9 **Historic** ☐	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1	

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference / N/S	Good / Minor	Fair / Major	Poor / Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation			10		✓		0.48	II/III
Aggradation			10					
Widening			9				7.6 Stream Condition:	
Planform			9					
Sub-totals:			38		**Total Score:**	36	FAIR	

Channel Adjustment Processes: DEGRADATION WITH PERIODIC AGGRADATION WITH CONCURRENT WIDENING ADJUSTMENT DUE TO CHANNELIZED PLANFORM

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

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

6a. VT RAPID HABITAT ASSESSMENT FIELD FORM—HIGH GRADIENT STREAMS

Stream Name: BLACK BROOK
Location: FROM GRADE BREAK NEAR MOVIE THEATER TO BRIGGS ROAD CULVERT
Observers: CSE, AS
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: ~~GOOD, 36°F~~ CLEAR
Rain Storm within past 7 days: Y / (N)

Segment I.D: M03A
Date: 11/18/14
Town: GUILFORD
Elevation: 580+ ft.
Latitude (N/S):
Longitude (E/W):
Drainage Area: .075 sq. mi.
Segment Length: 1600 ft.

Habitat Parameter	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
6.1 Epifaunal Substrate and Available Cover	Greater than 70% of stream bed and lower banks covered with mix of substrates favorable for epifaunal colonization and fish cover; substrates include snags, submerged logs, undercut banks, and unembedded cobbles and boulders.	40-70% of stream bed and lower banks covered with a mix of substrates favorable for epifaunal colonization and fish cover	20-40% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present	Less than 20% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
6.2a Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.3a Velocity/Depth Patterns	All four velocity/depth patterns present (slow-deep, slow-shallow, fast-deep, fast-shallow). Slow is < 1ft/s (0.3 m/s), deep is > 1.5 ft (0.5 m).	Only 3 of the 4 patterns present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat patterns present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth pattern (usually slow-deep).
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.4 Sediment Deposition	Little or no enlargement of islands or point bars and < 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; > 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
6.5 Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
6.6 Channel Alteration	Channelization in the form of dredging, straightening, berms or streambank armoring is absent or minimal; stream with normal pattern.	Some channelization present along 10-20% of segment, usually in areas of bridge abutments; evidence of past channelization, (greater than past 20 yr) may be present, but recent channelization not present.	Channelization along 20-80% of stream segment ; riprap or armoring present on both banks.	Over 80% of the stream segment channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.7a Frequency of Riffles/Steps (Morphological Diversity)	Occurrence of riffles/steps relatively frequent; ratio of distance between riffles is 5-7 times (steps 3-5 times) stream width; variety of habitat is key. In streams where riffles/steps are continuous, presence of boulders or other large, natural obstruction is important.	Occurrence of riffles/steps infrequent; distance between riffles is 7-15 times (steps 5-15 times) stream width.	Occasional riffle/step or bend; bottom contours provide some habitat; distance between riffles/steps is 15 to 25 stream widths.	Generally all flat water or shallow riffles/steps; poor habitat; distance between riffles/steps is >25 stream widths. Mostly runs.
SCORE	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.8 Bank Stability (score each bank) **Note: determine left and right banks facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in segment (or reach) has areas of erosion.	Moderately unstable; 30-60% of bank in segment (or reach) has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
6.9 Bank Vegetative Protection (refer to field notes 3.1) (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
6.10 Riparian Vegetative Zone Width (buffer) (refer to field notes 3.2) (score each side of channel)	Width of naturally vegetated riparian buffer >100 ft; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian buffer 50 - 100 ft; human activities have impacted zone only minimally.	Width of riparian buffer 25 - 50 ft; human activities have impacted zone a great deal.	Width of riparian buffer < 25 ft: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0

6.11 Total Score: 112 / 200 = 56 **Condition:** FAIR

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

VT RAPID GEOMORPHIC ASSESSMENT ---- CONFINED STREAMS

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

Stream Name: BLACK BROOK
Location: ABOVE CULVERT ON BRETON RD TO MOVIE THEATER REACH BREAK
Observers: CSE, AS
Organization /Agency: DHK
Reference Stream Type B4 ☐ Modified
(If bedrock controlled gorge, alluvial fan, or naturally braided system see Handbook Protocols)

Segment I.D: M03A
Date: 11/10/14
Town: GUILFORD
Elevation: 580 ft.
Weather: CLEAR
Rain Storm within past 7 days: Y / (N)

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

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

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference N/S	Good Minor	Fair Major	Poor Extreme	STD*	Historic
Degradation			9			
Aggradation		13				
Widening			9			
Planform		~~14~~ 13				
Sub-totals:		~~37~~ 26	18		**Total Score:** ~~44~~ 44	

Condition Rating: (Total Score / 80) ~~0.56~~ 0.55

7.6 Stream Condition: FAIR

Channel Evolution Stage: III / IV

Channel Adjustment Processes: ACTIVE DEGRADATION COMBINED WITH WIDENING + NEW FLOODPLAIN BUILDUP.

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

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

6a. VT RAPID HABITAT ASSESSMENT FIELD FORM—HIGH GRADIENT STREAMS

Stream Name: BLACK BROOK
Location: ABOVE BROWN RD CULVERT TO SHEEP FIELD
Observers: CSE, AS
Organization /Agency: D+K
USGS Map Name(s): LACONIA
Weather: CLOUDY, 36°F
Rain Storm within past 7 days: Y / (N)

Segment I.D: M03B
Date: 11/14/14
Town: GUILFORD
Elevation: 630FT ft.
Latitude (N/S): 43.56205
Longitude (E/W): 71.42973
Drainage Area: 0.69 sq. mi.
Segment Length: ~~3,500~~ 1350 ft.

Habitat Parameter	Condition Category			
	Reference	**Good**	**Fair**	**Poor**
6.1 Epifaunal Substrate and Available Cover	Greater than 70% of stream bed and lower banks covered with mix of substrates favorable for epifaunal colonization and fish cover; substrates include snags, submerged logs, undercut banks, and unembedded cobbles and boulders.	40-70% of stream bed and lower banks covered with a mix of substrates favorable for epifaunal colonization and fish cover	20-40% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present	Less than 20% of stream bed and lower banks covered with substrates favorable for epifaunal colonization and fish cover; few substrate types present
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.2a Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 (18) 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.3a Velocity/Depth Patterns	All four velocity/depth patterns present (slow-deep, slow-shallow, fast-deep, fast-shallow). Slow is < 1ft/s (0.3 m/s), deep is > 1.5 ft (0.5 m).	Only 3 of the 4 patterns present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat patterns present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth pattern (usually slow-deep).
SCORE	20 19 18 (17) 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.4 Sediment Deposition	Little or no enlargement of islands or point bars and < 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; > 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
6.5 Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 (12) 11	10 9 8 7 6	5 4 3 2 1 0
6.6 Channel Alteration	Channelization in the form of dredging, straightening, berms or streambank armoring is absent or minimal; stream with normal pattern.	Some channelization present along 10-20% of segment, usually in areas of bridge abutments; evidence of past channelization, (greater than past 20 yr) may be present, but recent channelization not present.	Channelization along 20-80% of stream segment ; riprap or armoring present on both banks.	Over 80% of the stream segment channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	(20) 19 18 17 16	15 14 13 12 (1)	10 9 8 7 6	5 4 3 2 1 0

Habitat Parameter	Condition Category			
	Reference	Good	Fair	Poor
6.7a Frequency of Riffles/Steps (Morphological Diversity)	Occurrence of riffles/steps relatively frequent; ratio of distance between riffles is 5-7 times (steps 3-5 times) stream width; variety of habitat is key. In streams where riffles/steps are continuous, presence of boulders or other large, natural obstruction is important.	Occurrence of riffles/steps infrequent; distance between riffles is 7-15 times (steps 5-15 times) stream width.	Occasional riffle/step or bend; bottom contours provide some habitat; distance between riffles/steps is 15 to 25 stream widths.	Generally all flat water or shallow riffles/steps; poor habitat; distance between riffles/steps is >25 stream widths. Mostly runs.
SCORE	20 (19) 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6.8 Bank Stability (score each bank) **Note: determine left and right banks facing downstream**	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in segment (or reach) has areas of erosion.	Moderately unstable; 30-60% of bank in segment (or reach) has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ____ (LB)	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
6.9 Bank Vegetative Protection (refer to field notes 3.1) (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0
6.10 Riparian Vegetative Zone Width (buffer) (refer to field notes 3.2) (score each side of channel)	Width of naturally vegetated riparian buffer >100 ft; human activities (i.e. parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian buffer 50 - 100 ft; human activities have impacted zone only minimally.	Width of riparian buffer 25 - 50 ft; human activities have impacted zone a great deal.	Width of riparian buffer < 25 ft: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 (9)	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 (9)	8 7 6	5 4 3	2 1 0

6.11 Total Score: ~~166~~ 157 / 200 = ~~0.83~~ 0.79 **Condition:** (GOOD) ~~REFERENCE~~

SOME SEDIMENTATION DOWNSTREAM OF CHANNELIZED FROM FLOODS

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

VT RAPID GEOMORPHIC ASSESSMENT ---- UNCONFINED STREAMS

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

Stream Name: BLACK BROOK
Location: ABOVE BRETON RD CULVERT

Observers: CSE, AS
Organization /Agency: DHR
Reference Stream Type B4b ☐ Modified
(If alluvial fan or naturally braided system see Handbook Protocols)

Segment I.D: M03B
Date: 11/14/14
Town: GUILFORD
Elevation: 630 ft.
Weather: CLOUDY, 36°
Rain Storm within past 7 days: Y (N)

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

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

7.5 Channel Adjustment Scores – Stream Condition – Channel Evolution Stage

Condition / Departure	Reference N/S	Good Minor	Fair Major	Poor Extreme	STD*	Historic	Condition Rating: (Total Score / 80)	Channel Evolution Stage:
Degradation		12					0.68	I
Aggradation	16							
Widening		13					7.6 Stream Condition: GOOD	
Planform		13						
Sub-totals:		→ 54			**Total Score:**	54		

Channel Adjustment Processes: STABLE, SOME INCISION

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

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

ATTACHMENT C
CHANNEL CORRIDOR PHOTOGRAPHS

Selected Black Brook Photos by Reach

M01

M02A

M02B

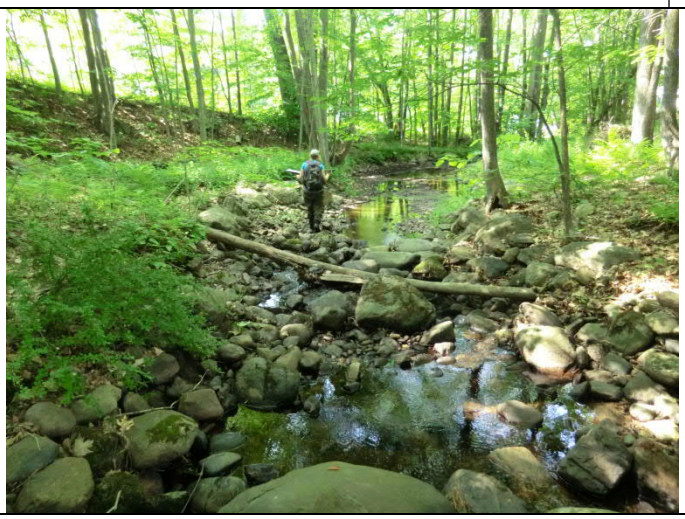
M02C

M02D

M02E

M03A

M03B



ATTACHMENT D
CULVERT AND BRIDGE ASSESSMENT DATA SHEETS

Note: Raw field data sheets included in this printing pending data entry and database printouts from NH Geological Survey.

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge** / **arch**

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE/AM DFK/BCG			Date & Time	7/10/15 12:05P
Town	Laconia	Datum	WGS 84	Latitude (N/S)	
Location	walkway @ Yacht club			Longitude (E/W)	
SGA Reach ID	No 1			Stream Name	Black Brook
Road Name	walkway to Yacht club			Road Type	paved gravel (trail) railroad
# of shoulder lanes	0			Crossing Condition	new (old) eroding collapsing rusted
# of travel lanes	1	Structure Materials	Aluminum (Concrete) Masonry (arches) & Slabs Prestressed Concrete/ Post-tensioned Steel (Timber) Other: BRIDGE IS A TIMBER STRUCTURE ON CONCRETE PIERS	Structure skewed to roadway	yes (no)
# of bridge cells or arches at crossing	2			Flow Conditions	unusually low (typical low) higher than average flood conditions
Overflow pipe(s)	yes (no)				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** **partially (1/4 – 3/4 of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **failure of bridge** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion** **aggradation** **none**
Upstream bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**
N/A Backwater from lake

Reference bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

N/A Backwater from Lake

Downstream

Pool present immediately downstream of structure: **yes** **no**
Pool depth at point of streamflow entry: N/A **(0.0 feet)** LAKE DS
Maximum pool depth: N/A **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no** N/A
Stepped footers: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:** NONE
Distance from downstream end of bridge/arch to hydraulic control: N/A **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.)____ **2.)**____ **3.)**____ **4.)**____ **5.)**____ **(ft.)**
N/A lake immediately DS

	Upstream	Downstream	In Structure
Dominant bed material at structure (use codes below)	1 2 3 4 5 **6** UNK	1 2 3 4 5 **6** UNK	1 2 3 4 5 **6** UNK
Bedrock present	yes **no**	yes **no**	yes **no**
Sediment deposit types (circle all that apply)	**none** delta side point mid-channel	**none** delta side point mid-channel	**none** delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	yes **no**	yes **no**
Beaver dam near structure Distance from structure to dam	yes **no** distance: ____ (ft.)	yes **no** distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing **none** UNK	intact failing **none** UNK	
Bank erosion	high low **none**	high low **none**	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** abutments footers wing walls	**none** abutments footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	B	B	B	B	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes **no**	yes **no**	yes **no**	yes **no**	
Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** NONE			**none**	

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

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

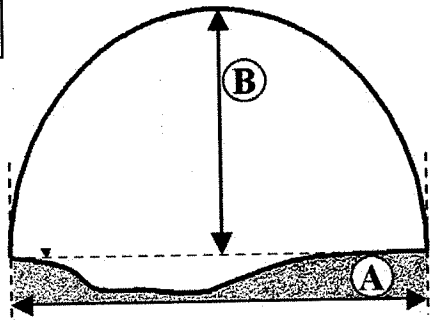
- Concrete pier in middle creates 2 bridge cells
- lake immediately DS

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	3082 ☐	3085 ☐	— ☐
Photo View - Downstream	3083 ☐	3084 ☐	3081 ☐

Record the file name for each photo taken in the appropriate box

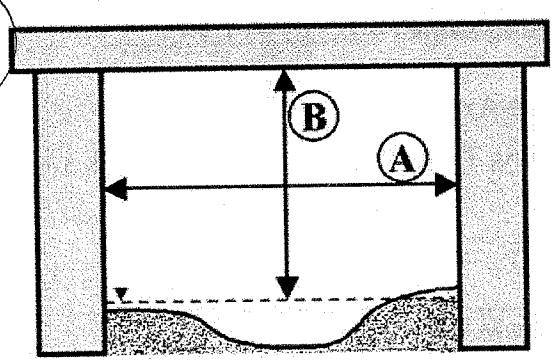
Crossing Dimensions

1.

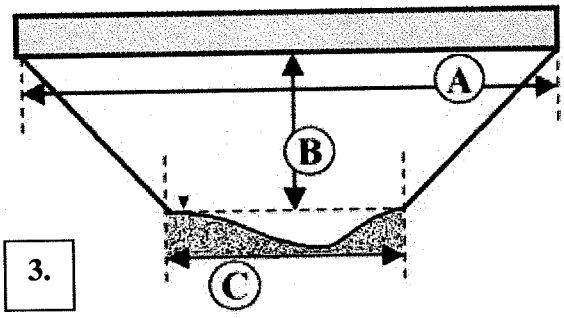


Open Bottom Arch

2.

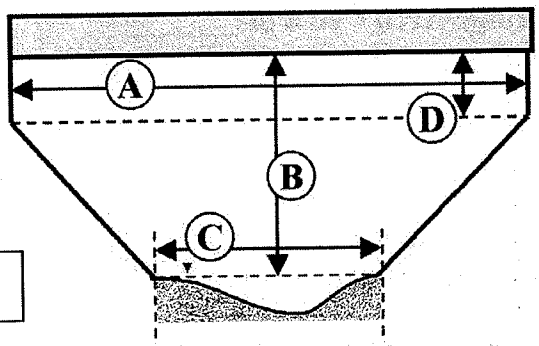


Bridge with Abutments



3.

Bridge with Side Slopes



4.

Bridge w/ Side Slopes & Abutments

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☐ Ford

(L)

	Ⓐ	WS Ⓑ	TW Ⓒ	Ⓓ
Upstream Dimensions (ft.)	28	3.7	7.3	
Downstream Dimensions (ft.)	28	3.4	7.2	

Length of stream through crossing (ft.): 8.4
Crossing Slope (%): <1%

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

Bridge/Arch Cell 2 of 2

66' abut to abut

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4.

(R)

	Ⓐ	WS Ⓑ	TW Ⓒ	Ⓓ
Upstream Dimensions (ft.)	27	3.2	4.4	
Downstream Dimensions (ft.)	27	3.3	4.5	

Length of stream through crossing (ft.): 8.4
Crossing Slope (%): <1%

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge / arch**

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE Am			Date & Time	7/10/15 11:45A
Town	Laconia	Datum		Latitude (N/S)	43.5582208°N
Location	@ yacht club			Longitude (E/W)	-71.4551821°W
SGA Reach ID	M01			Stream Name	Black Brook
Road Name	abandoned railroad bridge			Road Type	paved gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	1	Structure Materials	Aluminum Concrete Masonry (arches) & Slabs Prestressed Concrete/ Post-tensioned Steel ~~Timber~~ Other: _____	Structure skewed to roadway	yes no
# of bridge cells or arches at crossing	1			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> ¾ of floodplain)** **partially (¼ – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **failure of bridge** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion** **aggradation** **none**
Upstream bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**
N/A lake backwater

Reference bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**
N/A lake backwater

Downstream

Pool present immediately downstream of structure: **yes** **no** N/A
Pool depth at point of streamflow entry: N/A **(0.0 feet)** Backwater from lake
Maximum pool depth: N/A **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Stepped footers: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:** NONE
Distance from downstream end of bridge/arch to hydraulic control: N/A **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.)____ **2.)**____ **3.)**____ **4.)**____ **5.)**____ **(ft.)**
N/A backwater from lake

	Upstream	Downstream	In Structure
Dominant bed material at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	yes no
Sediment deposit types (circle all that apply)	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none abutments footers wing walls	none abutments footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	B	S	B	B	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	
Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** NONE			**none**	

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

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

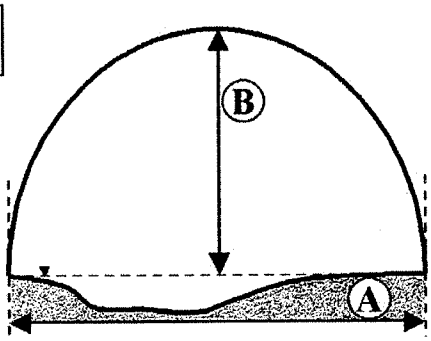
Comments/Drawings:
- abandoned railroad bridge
- backwatered from lake
- very deep, could not get under it

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	3078 ☐	3079 ☐	3078 ☐
Photo View - Downstream	3077 ☐	3080 ☐	3077 ☐

Record the file name for each photo taken in the appropriate box

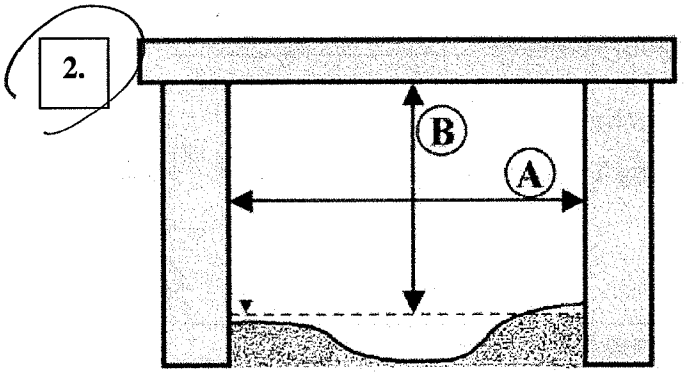
Crossing Dimensions

1.

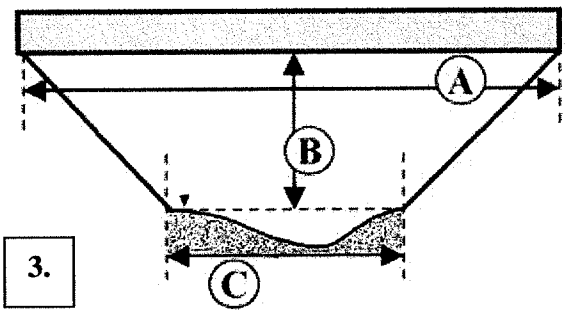


Open Bottom Arch

2.

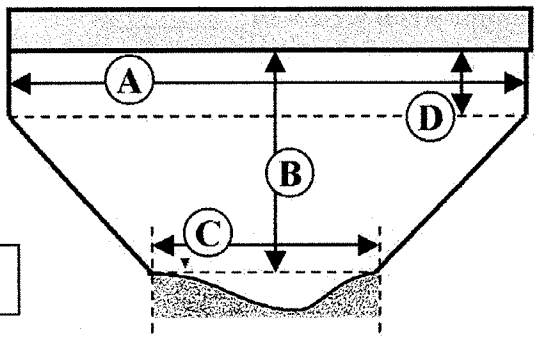


Bridge with Abutments



3.

Bridge with Side Slopes



4.

Bridge w/ Side Slopes & Abutments

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	30	3.7	6.9	
Downstream Dimensions (ft.)	31	3.6	6.8	

Length of stream through crossing (ft.): 14.5
Crossing Slope (%): < 1%

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

Bridge/Arch Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge** / **arch**

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE / Ar			Date & Time	7/10/15 11:15A
Town	Lacania	Datum	WGS 84	Latitude (N/S)	43.55847692°N
Location	Next to Firesideliving			Longitude (E/W)	-71.45416250°W
SGA Reach ID	M02			Stream Name	Black Brook
Road Name	Union Ave			Road Type	**paved** gravel trail railroad
# of shoulder lanes	0			Crossing Condition	**new** old eroding collapsing rusted
# of travel lanes	3	Structure Materials	**Aluminum** **Concrete** **Masonry (arches) & Slabs** **Prestressed Concrete/ Post-tensioned** **Steel** **Timber** **Other:** _____	Structure skewed to roadway	yes **no**
# of bridge cells or arches at crossing	1			Flow Conditions	**unusually low** **typical low** **higher than average** **flood conditions**
Overflow pipe(s)	yes **no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** **partially (1/4 – 3/4 of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: yes **no** unsure
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **failure of bridge** **none** **other:** _____

Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 66 **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** wetland/lake backwater **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion** **aggradation** **none**
Upstream bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**
N/A wetland/lake backwater

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**

N/A wetland/lake backwater

Downstream

Pool present immediately downstream of structure: **yes** **no** → lake backwater
Pool depth at point of streamflow entry: N/A **(0.0 feet)**
Maximum pool depth: N/A **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Stepped footers: **yes** **no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:** None
Distance from downstream end of bridge/arch to hydraulic control: None **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion aggradation none**
Downstream bankfull widths: 1.)____ **2.)**____ **3.)**____ **4.)**____ **5.)**____ **(ft.)**
N/A lake backwater

	Upstream	**Downstream**	**In Structure**
Dominant bed material at structure (use codes below)	**1 2 3 4 5 6 UNK**	**1 2 3 4 5 6 UNK**	**1 2 3 4 5 6 UNK**
Bedrock present	**yes no**	**yes no**	**yes no**
Sediment deposit types (circle all that apply)	**none delta side point mid-channel**	**none delta side point mid-channel**	**none delta side point mid-channel**
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	**yes no**	**yes no**	**yes no**
Beaver dam near structure Distance from structure to dam	**yes no** **distance:** 500 **(ft.)**	**yes no** **distance:** ____ **(ft.)**	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	**intact failing none UNK**	**intact failing none UNK**	
Bank erosion	**high low none**	**high low none**	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none abutments footers wing walls**	**none abutments footers wing walls**	

Wildlife Data (left/right bank determined facing downstream)	**Upstream**		**Downstream**		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	B	S	B	S	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	**yes no**	**yes no**	**yes no**	**yes no**	
Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** None			**none**	

Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	sign	species (none)	sign
	great blue heron	stightning		
	ducks	stightning		

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

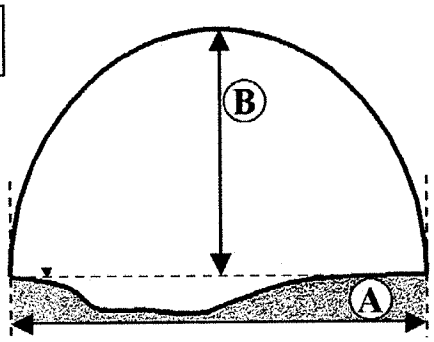
Comments/Drawings:
- wetland / backwatered from lake

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	3071 ☐	3075 ☐	3073 ☐
Photo View - Downstream	3072 ☐	3076 ☐	3074 ☐

Record the file name for each photo taken in the appropriate box

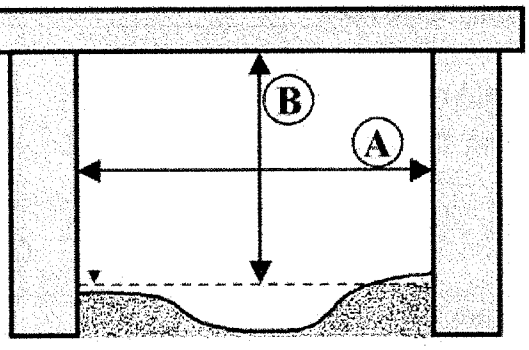
Crossing Dimensions

1.

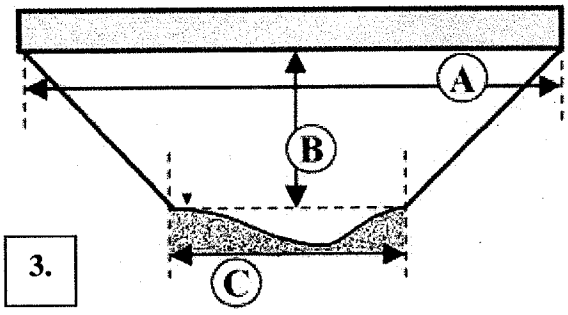


Open Bottom Arch

2.

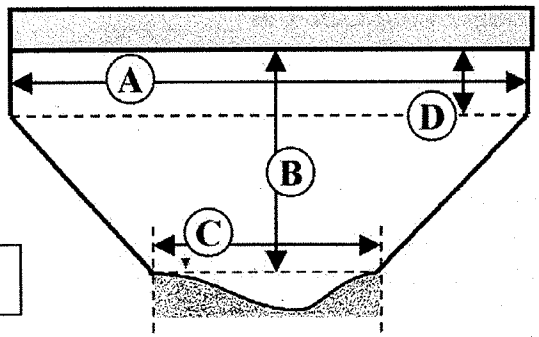


Bridge with Abutments



3.

Bridge with Side Slopes



4.

Bridge w/ Side Slopes & Abutments

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☐ **Ford**

	Ⓐ	WS Ⓑ	bed Ⓒ	Ⓓ
Upstream Dimensions (ft.)	20	2.8	6	
Downstream Dimensions (ft.)	20	2.6	6	

Length of stream through crossing (ft.): 43.5
Crossing Slope (%): <1%

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

Bridge/Arch Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge** / **arch**

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE / AM			Date & Time	7/10/15 10:50A
Town	Laconia	Datum		Latitude (N/S)	43.559755°N
Location	bikepath behind McDonalds			Longitude (E/W)	-71.4523005°W
SGA Reach ID	M01			Stream Name	Black Brook
Road Name	bike/foot path			Road Type	**paved gravel trail railroad**
# of shoulder lanes	0			Crossing Condition	**new old eroding collapsing rusted**
# of travel lanes	1	Structure Materials	**Aluminum Concrete Masonry (arches) & Slabs Prestressed Concrete/ Post-tensioned Steel Timber Other: _____**	Structure skewed to roadway	**yes no**
# of bridge cells or arches at crossing	1			Flow Conditions	**unusually low typical low higher than average flood conditions**
Overflow pipe(s)	**yes no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes no unsure**
Water depth in the crossing matches that of stream: **yes no (significantly deeper) no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes no (significantly faster) no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood sediment wood & sediment failure of bridge none other: _____**

Steep riffle present immediately upstream of structure: **yes no**
If channel avulses, stream will: **cross road follow road cross and follow road unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°) mild bend (5° - 45°) naturally straight channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion aggradation none**
Upstream bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

CAN't get

Reference bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

CAN'T GET
impounded + very deep

Downstream

Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: _____ **(0.0 feet)**
Maximum pool depth: _____ **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes (no)**
Stepped footers: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:** NONE
Distance from downstream end of bridge/arch to hydraulic control: NONE **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion aggradation (none)**
Downstream bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**
CAN'T GET

	Upstream	Downstream	In Structure
Dominant bed material at structure (use codes below)	**1 2 3 4 5 6 UNK**	**1 2 3 4 5 6 UNK**	**1 2 3 4 5 6 UNK**
Bedrock present	**yes no**	**yes no**	**yes no**
Sediment deposit types (circle all that apply)	**none delta side point mid-channel**	**none delta side point mid-channel**	**none delta side point mid-channel**
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	**yes no**	**yes no**	**yes no**
Beaver dam near structure Distance from structure to dam	**yes no** **distance: _____ (ft.)**	**yes no** **distance: _____ (ft.)**	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	**intact failing none UNK**	**intact failing none UNK**	
Bank erosion	**high low none**	**high low none**	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none abutments footers wing walls**	**none abutments footers wing walls**	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	H	H	H	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	**(yes) no**	**yes (no)**	**(yes) no**	**(yes) no**	
Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** NONE →			**(none)**	

Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	sign	species (none)	sign
	ducks	sighting		
	great blue heron	sighting		

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

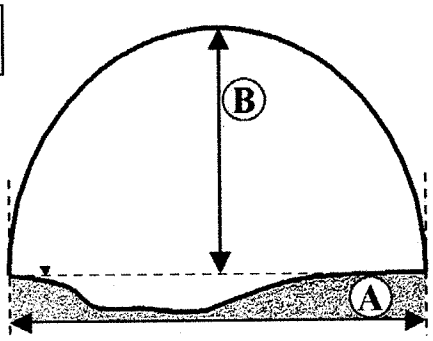
Comments/Drawings:
- impounded/wetland - can't access stream for full BG assessment

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	3063 ☐	3066 ☐	3065 ☐
Photo View - Downstream	3062 ☐	3067 ☐	3064 ☐

Record the file name for each photo taken in the appropriate box

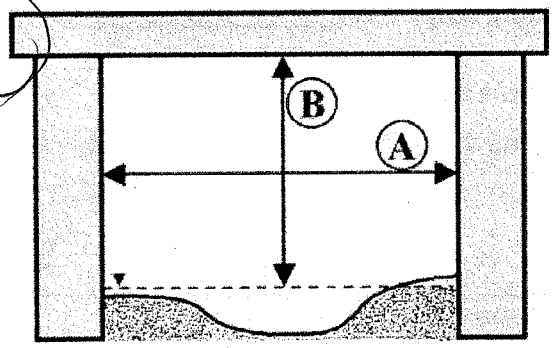
Crossing Dimensions

1.



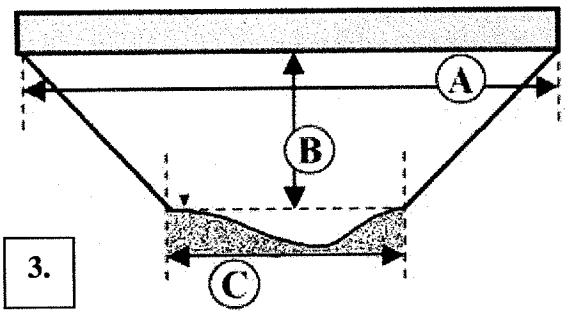
Open Bottom Arch

2.



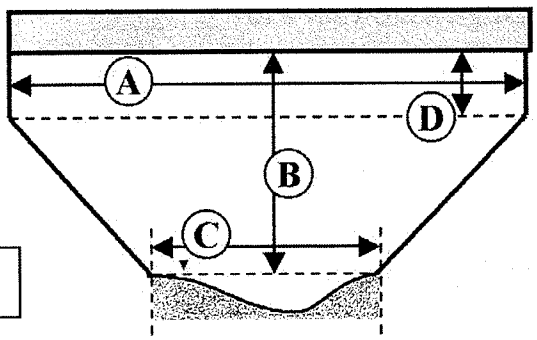
Bridge with Abutments

3.



Bridge with Side Slopes

4.



Bridge w/ Side Slopes & Abutments

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐**Ford**

	Ⓐ	WS Ⓑ	TW Ⓒ	Ⓓ
Upstream Dimensions (ft.)	22	2.8	7.8	
Downstream Dimensions (ft.)	22	2.8	7.8	

Length of stream through crossing (ft.): 15
Crossing Slope (%): < 1%

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

Bridge/Arch Cell 2 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge** / **arch**

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE/AM			Date & Time	7/10/15 9:30A
Town	Laconia	Datum		Latitude (N/S)	43.561855°N
Location	Laconia Ice driveway			Longitude (E/W)	-71:449128 5°W
SGA Reach ID	M02-A			Stream Name	BLACK BK
Road Name	driveway			Road Type	paved gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	1	Structure Materials	Aluminum Concrete Masonry (arches) & Slabs Prestressed Concrete/ Post-tensioned Steel Timber Other: _____	Structure skewed to roadway	yes no
# of bridge cells or arches at crossing	1			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

* BACK WATERED

General

Floodplain filled by roadway approaches: **entirely** (> ¾ of floodplain) **partially** (¼ – ¾ of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **failure of bridge** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: — **(ft.)**
Angle of stream flow approaching structure: **sharp bend** (45° - 90°) **mild bend** (5° - 45°) **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion** **aggradation** **none**
Upstream bankfull widths: 1.) 15 2.) 15 3.) 20 4.) 13 5.) 11 **(ft.)**

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**

Downstream

Pool present immediately downstream of structure: **yes** **no** INUNDATED
Pool depth at point of streamflow entry: 2.5 FT **(0.0 feet)**
Maximum pool depth: — **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** (**no**)
Stepped footers: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:** none
Distance from downstream end of bridge/arch to hydraulic control: none **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion** **aggradation** (**none**)
Downstream bankfull widths: 1.) 13 **2.)** 14 **3.)** 12 **4.)** 15 **5.)** 15 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material at structure (use codes below)	1 2 3 4 (5) 6 UNK	1 2 3 4 (5) 6 UNK	1 2 3 4 (5) 6 UNK
Bedrock present	yes (no)	yes (no)	yes (no)
Sediment deposit types (circle all that apply)	(none) delta side point mid-channel	(none) delta side point mid-channel	(none) delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes (no)	yes (no)	yes (no)
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	(yes) no distance: 1600 (ft.)	INUNDATION CAUSED BY BEAVER DAM THROUGH SOME DISTANCE AWAY
Hard bank armoring	intact failing none (UNK)	intact failing none (UNK)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none abutments footers wing walls	none abutments footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	H	H	H	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes (no)	yes (no)	yes (no)	yes (no)	
Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**			(none)	

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

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

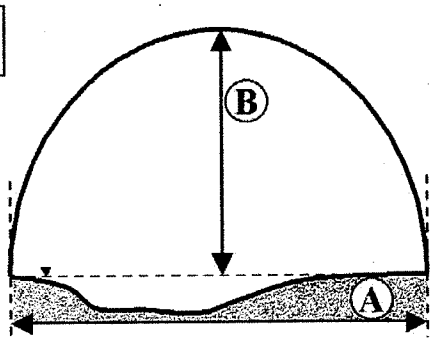
- old concrete slab bridge
- Rabbit leaning in
- Not Frazier Beaver Dam
1600' Downstream in Pendant

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	3052 ☐	3054 ☐	3050 ☐
Photo View - Downstream	3051 ☐	3055 ☐	3049 ☐

Record the file name for each photo taken in the appropriate box

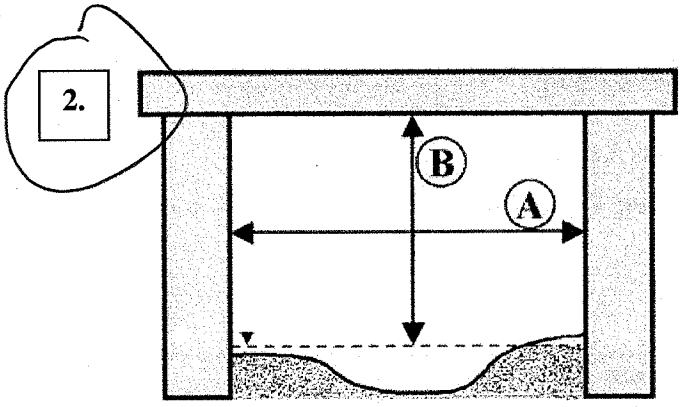
Crossing Dimensions

1.

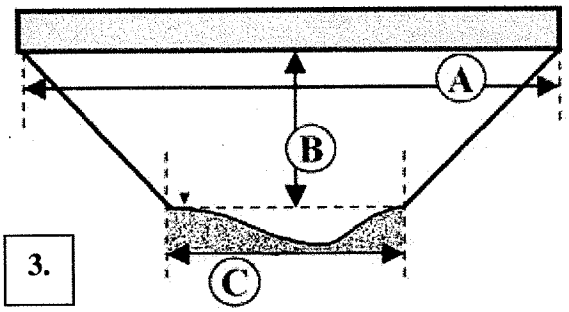


Open Bottom Arch

2.

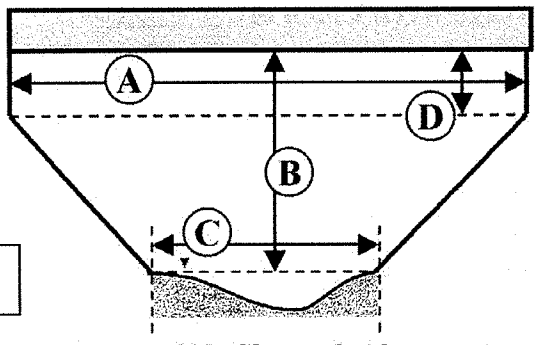


Bridge with Abutments



3.

Bridge with Side Slopes



4.

Bridge w/ Side Slopes & Abutments

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☐ **Ford**

height to streambed

	Ⓐ	WS Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	9	1.7	4.3	
Downstream Dimensions (ft.)	8.4	1.9	3.6	

Length of stream through crossing (ft.): 20

Crossing Slope (%): ~1%

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

Bridge/Arch Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSt Am D+L BCG			Date & Time	7/10/15 9:05A
Town	Gilford	Datum		Latitude (N/S)	
Location				Longitude (E/W)	
SGA Reach ID	M02-B			Stream Name	Black Brk
Road Name	Blaisdell Ave			Road Type	**paved** gravel trail railroad
# of shoulder lanes	2 check			Crossing Condition	**new** old eroding collapsing rusted
# of travel lanes	2	Structure Materials	**Concrete** Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes **no**
# of culverts at crossing	1			Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within ⅓ mile downstream of a ~~significantly steeper~~ segment of stream: yes **no** unsure
Culvert slope as compared with the channel slope is: higher lower **about the same**
Water depth in the crossing matches that of stream: **yes** no (significantly deeper) no (significantly shallower)
Water velocity in crossing matches that of stream: **yes** no (significantly faster) no (significantly slower)

Upstream

Structure opening partially obstructed by (circle all that apply): wood sediment wood & sediment deformation of culvert **none** other: _____
Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** follow road cross and follow road unsure
Estimated distance avulsion would follow road: _____ (ft.)
Angle of stream flow approaching structure: sharp bend (45° - 90°) **mild bend (5° - 45°)** naturally straight channelized straight
Evidence of streambed erosion or aggradation immediately upstream of culvert: erosion aggradation **none**
Culvert inlet: **at grade** cascade free fall
Upstream bankfull widths: 1.) 20 2.) 11 3.) 24 4.) 11 5.) 12 (ft.)

Reference bankfull widths: 1.) 12 2.) 9 3.) _____ 4.) _____ 5.) _____ (ft.)

Downstream

Water depth in culvert (at outlet): 1.0 **(0.0 ft.)** – INUNDATED

Culvert outlet: **at grade cascade free fall backwatered** 100 **(ft.)** Stepped footers: **yes (no)**

Outlet drop (invert to water surface): 0.0 **(0.0 ft.)**

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

Pool depth at point of streamflow entry: – **(ft.)**

Maximum pool depth: – **(0.0 feet)**

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

Hydraulic control type: **bedrock boulders cobble gravel sand wood other:** none

Distance from downstream end of culvert to hydraulic control: – **(ft.)**

Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation (none)**

Downstream bankfull widths: 1.) 12 **2.)** 11 **3.)** 13 **4.)** 18 **5.)** 15 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 (5) 6 UNK	1 2 3 4 (5) 6 UNK	NONE 1 2 3 4 (5) 6 UNK
Bedrock present	yes (no)	yes (no)	Depth of Substrate: (<1 foot) 1-2feet >2 feet UNK N/A
Sediment Deposit Type	(none) delta side point mid-channel	(none) delta side point mid-channel	(none) delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes (no)	yes (no)	yes (no)
			Substrate Throughout? yes (no)
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	(yes) no distance: 1650 (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	(intact) failing none UNK	(intact) failing none UNK	
Bank erosion	high low (none)	high low (none)	
Stream bank scour causing undermining around/under structure (circle all that apply)	(none) culvert footers wing walls	(none) culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	H	H	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes (no)	yes (no)	yes (no)	yes (no)	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** none			
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

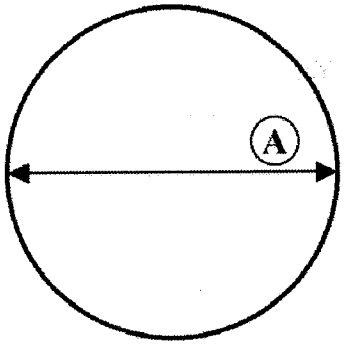
- newish, concrete
- backwater area US, wider channel
- wingwalls narrow channel immediately
- not flowing → (BD) way (DS) (1650')

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	3046 ☐	3047 ☐	3043 ☐
Photo View - Downstream	3045 ☐	3048 ☐	3044 ☐

Record the file name for each photo taken in the appropriate box

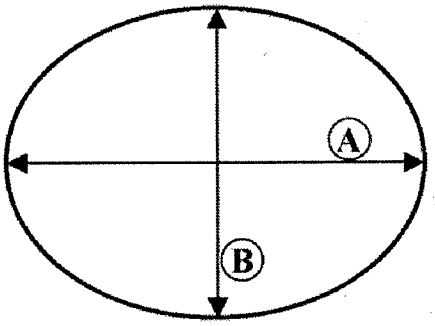
Crossing Dimensions

1.



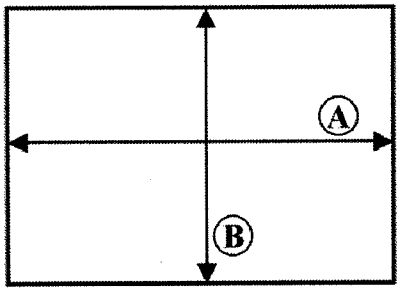
Round Culvert

2.



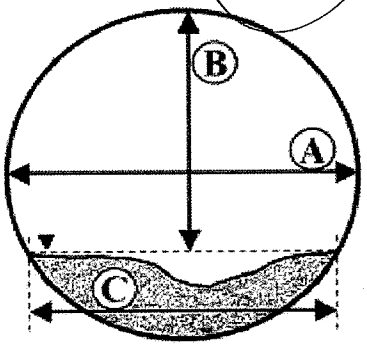
Elliptical Culvert

3.



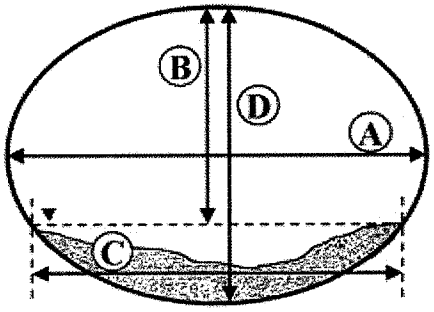
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☑ 3. ☑ 4. ☐ 5. ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5'	4'6"		
Downstream Dimensions (ft.)	5'	4'6"		

Length of stream through crossing (ft.): 100
Crossing Slope (%): < 1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐	Structure Number	
Observer(s)/ Organization(s)	CSE Am	Date & Time	7/10/15 8:40 Am
Town	Gilford	Datum	Latitude (N/S) 43.5622465 (US end)
Location	lot @ CVS	Longitude (E/W)	-71.44774831
SGA Reach ID	M02-B	Stream Name	Blake Bk
Road Name	parking lot	Road Type	**paved** gravel trail railroad
# of shoulder lanes	lot N/A	Crossing Condition	**new** old eroding collapsing rusted
# of travel lanes	lot N/A	Structure skewed to roadway	**yes** no
# of culverts at crossing	1	Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**	Structure Materials: **Concrete**, Plastic-Corrugated, Plastic-Smooth, Tank, Stone, Steel-Corrugated, Steel-Smooth, Aluminum-Corrugated, Other: _____	

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within 1/3 mile downstream of a significantly steeper segment of stream: yes **no** unsure
Culvert slope as compared with the channel slope is: higher lower **about the same**
Water depth in the crossing matches that of stream: **yes** no (significantly deeper) no (significantly shallower)
Water velocity in crossing matches that of stream: **yes** no (significantly faster) no (significantly slower)

Upstream

Structure opening partially obstructed by (circle all that apply): wood sediment wood & sediment deformation of culvert **none** other: some faced RIP RAP
Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: cross road follow road **cross and follow road** unsure (Parking lot)
Estimated distance avulsion would follow road: 200 (ft.)
Angle of stream flow approaching structure: sharp bend (45° - 90°) **mild bend (5° - 45°)** naturally straight channelized straight
Evidence of streambed erosion or aggradation immediately upstream of culvert: erosion aggradation **none**
Culvert inlet: **at grade** cascade free fall
Upstream bankfull widths: 1.) 7 2.) 8 3.) 9 4.) 10 5.) 11 (ft.)

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ (ft.)

can't get any, all underground

Downstream

Water depth in culvert (at outlet): 2 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 50 (ft.) Stepped footers: **yes no**
Outlet drop (invert to water surface): — (0.0 ft.)
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: — (ft.)
Maximum pool depth: — (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:** none
Distance from downstream end of culvert to hydraulic control: _____ (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 9 **2.)** 11 **3.)** 11 **4.)** 13 **5.)** 12 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: <1 foot, 1-2feet, >2 feet, UNK N/A
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: _____ (ft.)	yes no distance: 1900 (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	S	S	H	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

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

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

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

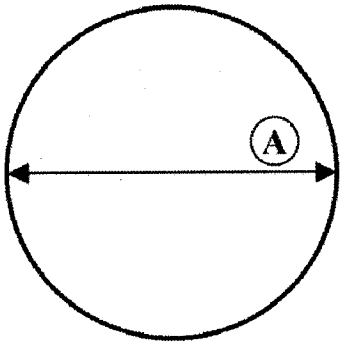
Comments/Drawings:
- under parking lot
- "retention pond" for stormwater & outlet
- not flowing system

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	3036 ☐	3038 ☐	3037 ☐
Photo View - Downstream	3035 ☐	3039 ☐	3033 ☐

Record the file name for each photo taken in the appropriate box

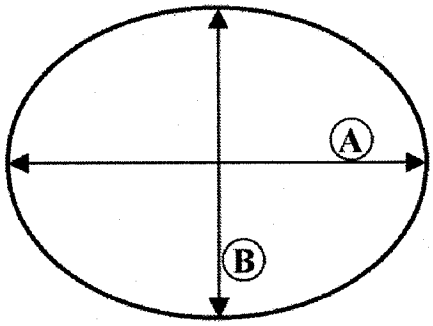
Crossing Dimensions

1.



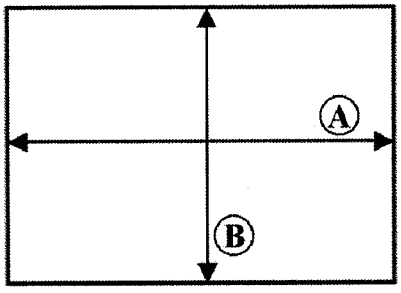
Round Culvert

2.



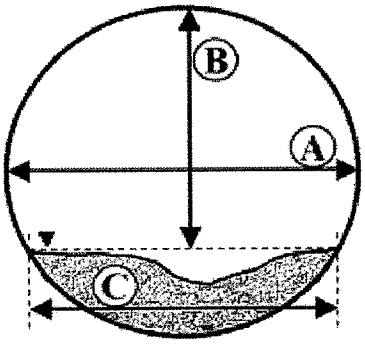
Elliptical Culvert

3.



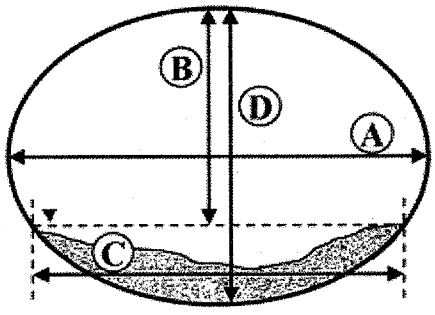
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☑ 3. ☐ 4. ☐ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	6	5		
Downstream Dimensions (ft.)	6	5		

Length of stream through crossing (ft.): 200'
Crossing Slope (%): 1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE Am			Date & Time	7/9/15 8:15A
Town	Gilford	Datum		Latitude (N/S)	43, 56 26.02" N
Location	Meredith Savings Bank			Longitude (E/W)	-71, 44 64.5" W
SGA Reach ID	M02-B			Stream Name	Black Bk
Road Name	10+			Road Type	**(paved)** gravel trail railroad
# of shoulder lanes	10+ N/A			Crossing Condition	**(new)** old eroding collapsing rusted
# of travel lanes	10+ N/A	Structure Materials	**(Concrete)** US Plastic-Corrugated Plastic-Smooth Tank Stone 2x **(Steel-Corrugated)** DS Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	**(yes)** no
# of culverts at crossing	1			Flow Conditions	unusually low **(typical low)** higher than average flood conditions
Overflow pipe(s)	yes **(no)**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** **partially (1/4 – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **(no)** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **(yes)** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **(none)** **other:** _____
Steep riffle present immediately upstream of structure: **yes** **(no)**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 400 **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 7 2.) 7 3.) 8 4.) 7 5.) 8 **(ft.)**

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 1 (0.0 ft.)
Culvert outlet: **at grade** **cascade** **free fall** **backwatered** 20+ (ft.) Stepped footers: **yes** **no**
Outlet drop (invert to water surface): — (0.0 ft.)
Pool present immediately downstream of structure: **yes** **no**
Pool depth at point of streamflow entry: 1.0 (ft.)
Maximum pool depth: 1.0 (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:**
Distance from downstream end of culvert to hydraulic control: 17 (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.) 13 2.) 12 3.) 12 4.) 11 5.) 9 (ft.)

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 **5** 6 UNK	1 2 3 **4** 5 6 UNK	NONE 1 2 3 **4** 5 6 UNK
Bedrock present	yes **no**	yes **no**	Depth of Substrate: **~< 1 foot** **1-2feet** **>2 feet** UNK N/A
Sediment Deposit Type	**none** delta side point mid-channel	none delta **side** point mid-channel	none delta **side** point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	**yes** no	yes **no**
			Substrate Throughout? yes **no**
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	**yes** no distance: 2150 (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact **failing** none UNK	**intact** failing none UNK	
Bank erosion	high **low** none	high low **none**	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** culvert footers wing walls	**none** culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	R	H	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes **no**	yes **no**	yes **no**	yes **no**	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**

Please fill out photo log below

Comments/Drawings:

CONCRETE BOX INLET

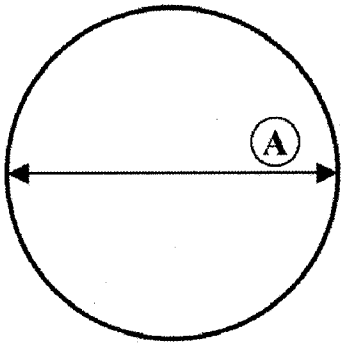
DOUBLE BARREL CMP OUTLET

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	3025 ☐	3030 ☐	3025 ☐
Photo View - Downstream	3024 ☐	3031 ☐	3024 ☐

Record the file name for each photo taken in the appropriate box

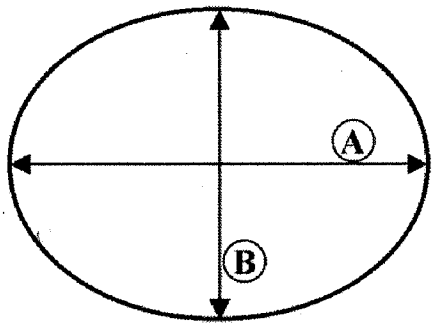
Crossing Dimensions

1.



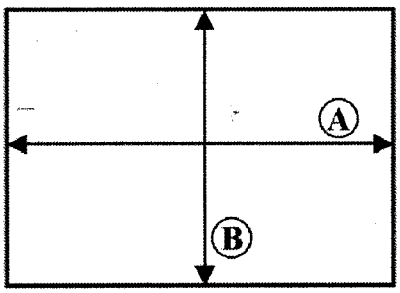
Round Culvert

2.



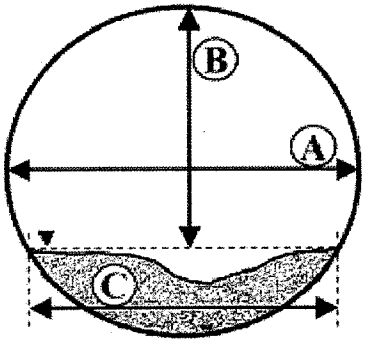
Elliptical Culvert

3.



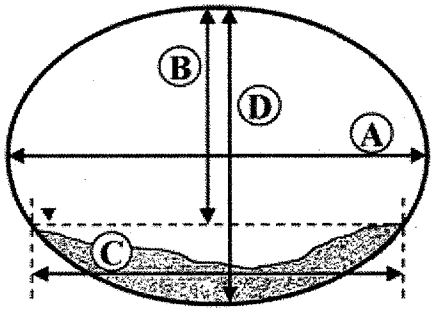
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☑ 3. ☑ 4. ☐ 5. ☐ Ford

US DS

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5	5		
Downstream Dimensions (ft.)	4	3	4	

Length of stream through crossing (ft.): 385'
Crossing Slope (%): ~17.

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)	4	3	4	

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSK Am			Date & Time	7/9/15 7:55P
Town	Gilford	Datum		Latitude (N/S)	43,562 7817° N
Location	Harmaford			Longitude (E/W)	-71.444500 8° W
SGA Reach ID	M02-C			Stream Name	Black Brk
Road Name	driveway			Road Type	**paved** gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old eroding collapsing **rusted**
# of travel lanes	3	Structure Materials	**Concrete** **Plastic-Corrugated** **Plastic-Smooth** **Tank** **Stone** ~~**Steel-Corrugated**~~ **Steel-Smooth** **Aluminum-Corrugated** **Other:** _____	Structure skewed to roadway	yes **no**
# of culverts at crossing	1			Flow Conditions	**unusually low** **typical low** **higher than average** **flood conditions**
Overflow pipe(s)	yes **no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** **partially (1/4 – 3/4 of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** ~~**no (significantly shallower)**~~
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment**
deformation of culvert **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)**
naturally straight **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 6 **2.)** 6 **3.)** 6 **4.)** 6 **5.)** 7 **(ft.)**

Reference bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.2 **(0.0 ft.)**
Culvert outlet: **at grade cascade free fall (backwatered)** 30 **(ft.)** Stepped footers: **yes (no)**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes (no)**
Pool depth at point of streamflow entry: 0 **(ft.)**
Maximum pool depth: 0 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes (no)**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**_____
Distance from downstream end of culvert to hydraulic control: 12 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation (none)**
Downstream bankfull widths: 1.) 7 **2.)** 7 **3.)** 9 **4.)** 8 **5.)** 8 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 (4) 5 6 UNK	1 2 (3) 4 5 6 UNK	(NONE) 1 2 3 4 5 6 UNK
Bedrock present	yes (no)	yes (no)	Depth of Substrate: **< 1 foot, 1-2feet, >2 feet, UNK (N/A)**
Sediment Deposit Type	(none) delta side point mid-channel	(none) delta side point mid-channel	(none) delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes (no)	yes (no)	yes (no)
			Substrate Throughout? yes (no)
Beaver dam near structure Distance from structure to dam	yes (no) distance: _____ (ft.)	yes (no) distance: _____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing (none) UNK	intact failing (none) UNK	
Bank erosion	high (low) none	high (low) none	
Stream bank scour causing undermining around/under structure (circle all that apply)	(none) culvert footers wing walls	(none) culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	S	S	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes (no)	yes (no)	yes (no)	yes (no)	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

Comments/Drawings:

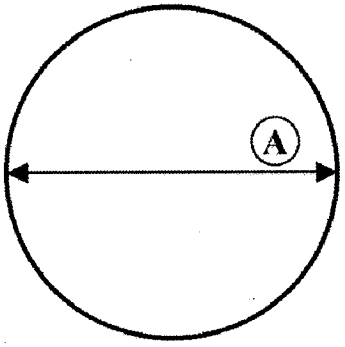
- fairly new but rusty

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	3013 ☐	3014 ☐	3011 ☐
Photo View - Downstream	3012 ☐	3015 ☐	3010 ☐

Record the file name for each photo taken in the appropriate box

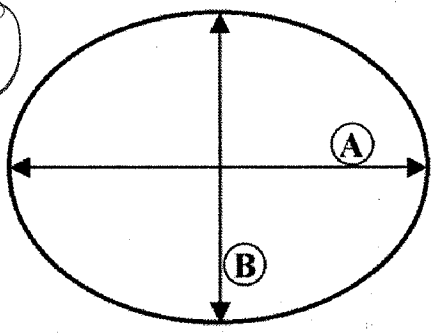
Crossing Dimensions

1.



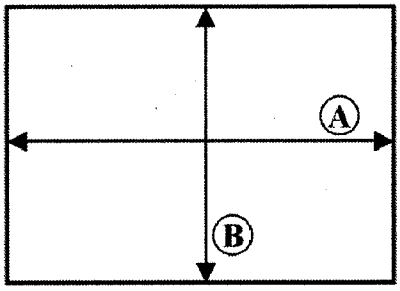
Round Culvert

2.



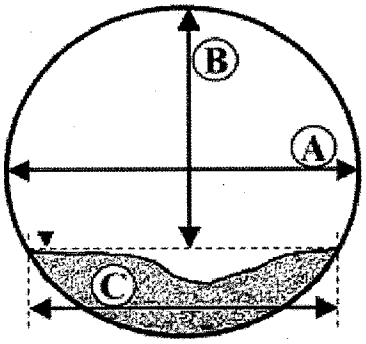
Elliptical Culvert

3.



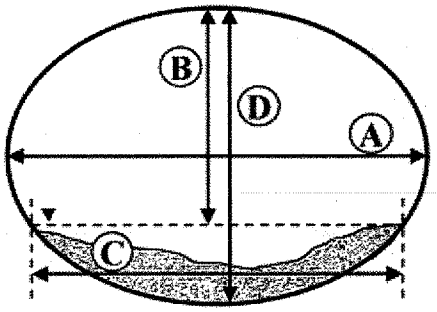
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	7	5		
Downstream Dimensions (ft.)	7	5		

Length of stream through crossing (ft.): 80.5
Crossing Slope (%): < 1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE Am			Date & Time	
Town	Gilford	Datum		Latitude (N/S)	43.512760 °N
Location	@ Wild Bird Depot +Smooth			Longitude (E/W)	-71.443559 °W
SGA Reach ID	M02-C			Stream Name	Black Br
Road Name	driveway			Road Type	paved gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	2	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes no
# of culverts at crossing	1			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> ¾ of floodplain) **partially** (¼ – ¾ of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____
Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 8 2.) 7 3.) 7 4.) 6 5.) 5 **(ft.)**

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.2 **(0.0 ft.)**
Culvert outlet: **at grade** **cascade** **free fall** **backwatered** _____ **(ft.)** Stepped footers: **yes** **no**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes** **no**
Pool depth at point of streamflow entry: 2.5 **(ft.)**
Maximum pool depth: 7.5 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:**_____
Distance from downstream end of culvert to hydraulic control: 3 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.) 7 **2.)** 9 **3.)** 11 **4.)** 14 **5.)** 15 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 **4** 5 6 UNK	1 2 **3** 4 5 6 UNK	**NONE** 1 2 3 4 **5** 6 UNK
Bedrock present	yes **no**	yes **no**	Depth of Substrate: **< 1 foot** **1-2feet** **>2 feet** **UNK** **N/A**
Sediment Deposit Type	**none** delta side point mid-channel	**none** delta side point mid-channel	**none** delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	yes **no**	yes **no**
			Substrate Throughout? yes **no**
Beaver dam near structure Distance from structure to dam	yes **no** distance: _____ (ft.)	yes **no** distance: _____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing **none** UNK	intact failing **none** UNK	
Bank erosion	high **low** none	high **low** none	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** culvert footers wing walls	**none** culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	M	M	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes **no**	yes **no**	yes **no**	yes **no**	

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.** ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	4.2			
Downstream Dimensions (ft.)	4.2	4		

Length of stream through crossing (ft.): 64
Crossing Slope (%): < 1 %

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

Comments/Drawings:

old rusty, slightly crushed c outlet

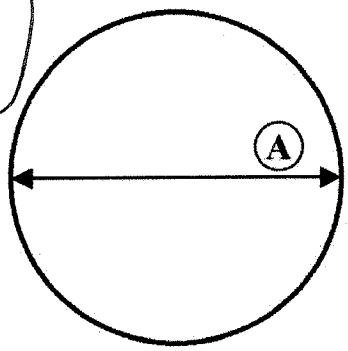
DOWNSTREAM MAT'L MOSTLY GRAVEL WITH COBBLES

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2999 ☐	3000 ☐	2996 ☐
Photo View - Downstream	2998 ☐	3001 ☐	2997/2995 ☐

Record the file name for each photo taken in the appropriate box

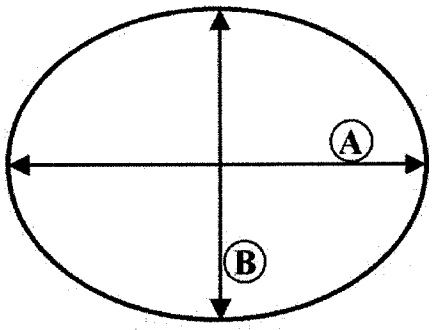
Crossing Dimensions

1.



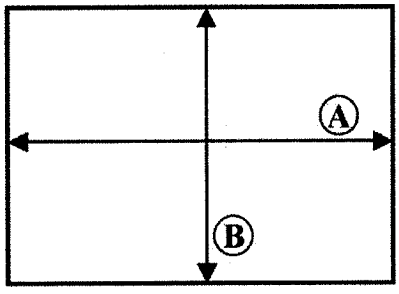
Round Culvert

2.



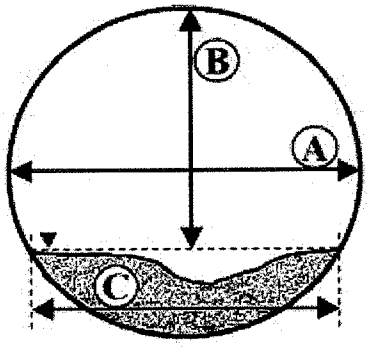
Elliptical Culvert

3.



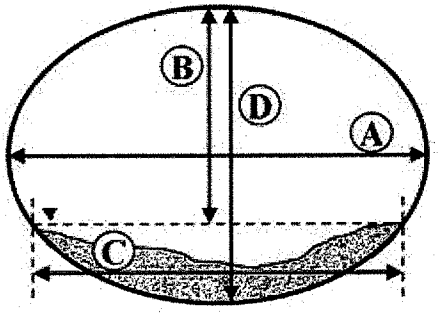
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐	Structure Number	
Observer(s)/ Organization(s)	CSE Am	Date & Time	7/9/15 7:00PM
Town	Gilford Datum	Latitude (N/S)	43.562289° N
Location	@ Bank of NH	Longitude (E/W)	-71.441730° W
SGA Reach ID	M02-C	Stream Name	Black Bk
Road Name	driveway	Road Type	paved gravel trail railroad
# of shoulder lanes	0	Crossing Condition	new old eroding collapsing rusted
# of travel lanes	2	Structure skewed to roadway	yes no
# of culverts at crossing	1	Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no	Structure Materials	Concrete, Plastic-Corrugated, Plastic-Smooth, Tank, Stone, Steel-Corrugated, Steel-Smooth, Aluminum-Corrugated, Other: _____

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** **partially (1/4 – 3/4 of floodplain)** **not significant**
Structure within 1/3 mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 11 **2.)** 10 **3.)** 11 **4.)** 9 **5.)** 10 **(ft.)**

Reference bankfull widths: 1.)_____ **2.)**_____ **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.2 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 62 (ft.) Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 (0.0 ft.)
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: 1.0 (ft.)
Maximum pool depth: 1.0 (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**
Distance from downstream end of culvert to hydraulic control: 10 (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 7 **2.)** 10 **3.)** 11 **4.)** 11 **5.)** 5 (ft.)

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	RIGHT	LEFT	RIGHT	
Dominant vegetation type (use codes to the right)	S	R	R	R	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☑ 4. ☐ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	4.4	3.6	3.5	
Downstream Dimensions (ft.)	4.4	3.7	3.6	

Length of stream through crossing (ft.): 62
Crossing Slope (%): <1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

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

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

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

Comments/Drawings:

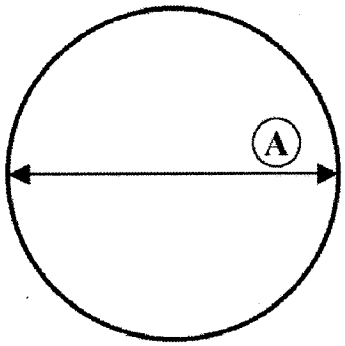
- slope too low
- all backwatered
- rusted

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2983 ☐	2984 ☐	2981 ☐
Photo View - Downstream	2982 ☐	2985 ☐	2980 ☐

Record the file name for each photo taken in the appropriate box

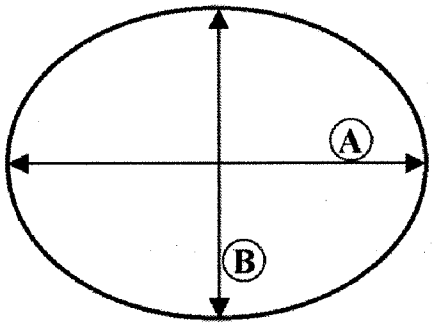
Crossing Dimensions

1.



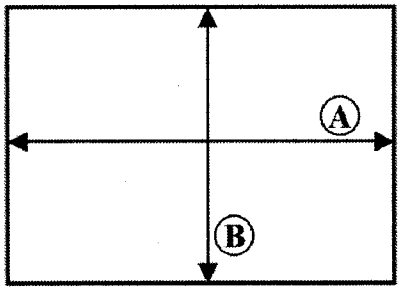
Round Culvert

2.



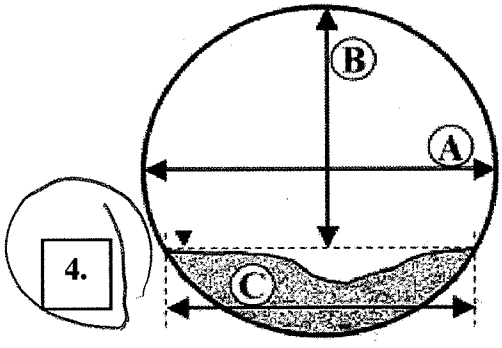
Elliptical Culvert

3.



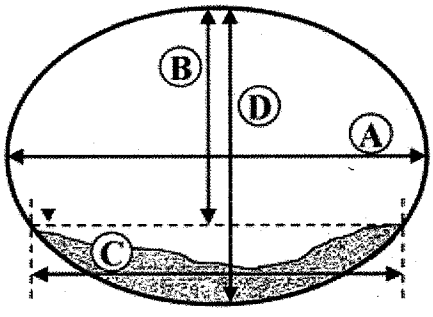
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSG Am			Date & Time	7/9/15 6:35PM
Town	Gilford	Datum		Latitude (N/S)	43.562994
Location	driveway to power station			Longitude (E/W)	-71.441177
SGA Reach ID	Mor-C			Stream Name	Black Brook
Road Name	driveway			Road Type	paved **gravel** trail railroad
# of shoulder lanes	0			Crossing Condition	new **old** **eroding** collapsing **rusted**
# of travel lanes	2	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone **Steel-Corrugated** Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes **no**
# of culverts at crossing	2			Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> 3/4 of floodplain)** partially (1/4 – 3/4 of floodplain) not significant
Structure within ⅓ mile downstream of a significantly steeper segment of stream: yes **no** unsure
Culvert slope as compared with the channel slope is: higher **lower** about the same
Water depth in the crossing matches that of stream: **yes** no (significantly deeper) no (significantly shallower)
Water velocity in crossing matches that of stream: yes no (significantly faster) **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): wood sediment **wood & sediment** deformation of culvert none other: _____

Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** follow road cross and follow road unsure
Estimated distance avulsion would follow road: ~ (ft.)
Angle of stream flow approaching structure: sharp bend (45° - 90°) mild bend (5° - 45°) naturally straight **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: erosion **aggradation** none
Culvert inlet: **at grade** cascade free fall
Upstream bankfull widths: 1.) 15 2.) 12 3.) 10 4.) 8 5.) 5 (ft.)

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ (ft.)

Downstream

Water depth in culvert (at outlet): LT 0.2 (0.0 ft) RT

Culvert outlet: **at grade** **cascade** **free fall** **backwatered** 4.1 **(ft.)** Stepped footers: **yes** **no**

Outlet drop (invert to water surface): 0 **(0.0 ft.)**

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

Pool depth at point of streamflow entry: 0 **(ft.)**

Maximum pool depth: 0 **(0.0 feet)**

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

Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:**_____

Distance from downstream end of culvert to hydraulic control: 3 **(ft.)**

Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**

Downstream bankfull widths: 1.) 13 **2.)** 9 **3.)** 9 **4.)** 9 **5.)** 12 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 **4** 5 6 UNK	1 2 3 **4** 5 6 UNK	NONE 1 2 3 **4** 5 6 UNK not throughout but a outlet
Bedrock present	yes **no**	yes **no**	Depth of Substrate: ~~<1 foot~~ **1-2feet** **>2 feet** **UNK** **N/A**
Sediment Deposit Type	**none** delta side point mid-channel	**none** delta side point mid-channel	**none** delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	yes **no**	yes **no**
			Substrate Throughout? yes **no**
Beaver dam near structure Distance from structure to dam	yes **no** distance: ____ (ft.)	yes **no** distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing **none** UNK	intact failing **none** UNK	
Bank erosion	high **low** none	high **low** none	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** culvert footers wing walls	**none** culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	S	S	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes **no**	yes **no**	yes **no**	yes **no**	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	species: none			
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	sign	species (none)	sign

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

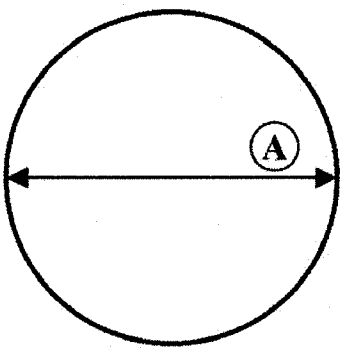
bridge too low, low clearance

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	2974 ☐	2975 ☐	2972 ☐
Photo View - Downstream	2973 ☐	2976 ☐	2971 ☐

Record the file name for each photo taken in the appropriate box

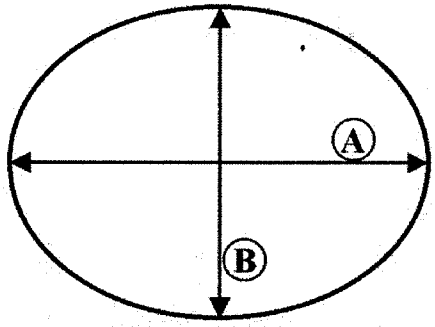
Crossing Dimensions

1.



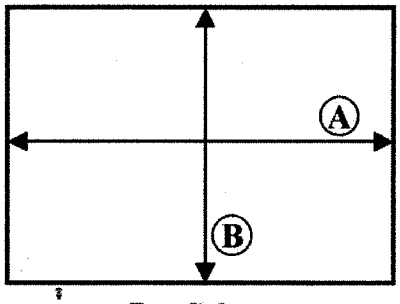
Round Culvert

2.



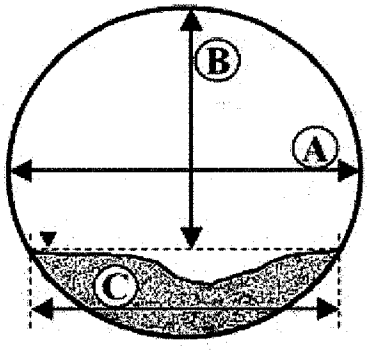
Elliptical Culvert

3.



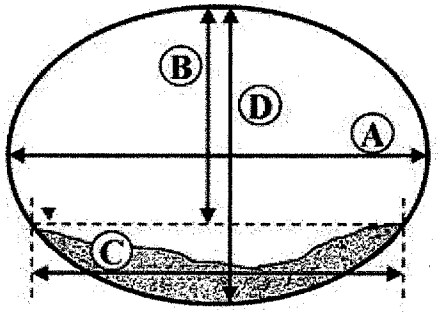
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

US DS

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☑ 5. ☐ **Ford**

(L)

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5.3	2.8	4.2	3.1
Downstream Dimensions (ft.)	5.3	2.8	4.5	3.1

Length of stream through crossing (ft.): 41

Crossing Slope (%): 1

Not recorded similar to D/S

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

Culvert Cell 2 of _____

US DS

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☑ 5.

Not recorded similar to D/S

(R)

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5.4	3.0	4.2	3.1
Downstream Dimensions (ft.)	5.4	2.8	4.5	3.1

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐	Structure Number	
Observer(s)/ Organization(s)	CSC + AM	Date & Time	7/7/15 6:25
Town	Gilford Datum	Latitude (N/S)	43.563215° N
Location	@ Country Cook'n	Longitude (E/W)	-71.440757° W
SGA Reach ID	M02-C	Stream Name	Black Brook
Road Name	driveway	Road Type	**paved** gravel trail railroad
# of shoulder lanes	0	Crossing Condition	new **old** eroding collapsing **rusted**
# of travel lanes	2	Structure skewed to roadway	yes **no**
# of culverts at crossing	1	Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**	Structure Materials	Concrete, Plastic-Corrugated, Plastic-Smooth, Tank, Stone, **Steel-Corrugated**, Steel-Smooth, Aluminum-Corrugated, Other: _____

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within 1/3 mile downstream of a significantly steeper segment of stream: yes **no** unsure
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: yes **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: yes **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____
Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: — (ft.)
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 6 2.) 6 3.) 7 4.) 6 5.) 6 (ft.)

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ (ft.)

Downstream

Water depth in culvert (at outlet): 0.5 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 10 (ft.) Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 (0.0 ft.)
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: ____ (ft.)
Maximum pool depth: ____ (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**____
Distance from downstream end of culvert to hydraulic control: 3 (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 7 **2.)** 7 **3.)** 7 **4.)** 8 **5.)** 7 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes**
Hard bank armoring	intact failing none UNK	intact failing none UNK	**1** – bedrock
Bank erosion	high low none	high low none	**2** – boulder
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	**3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	B	R	S	R	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **(yes)** **no**

Photos taken: **(yes)** **no**
Please fill out photo log below

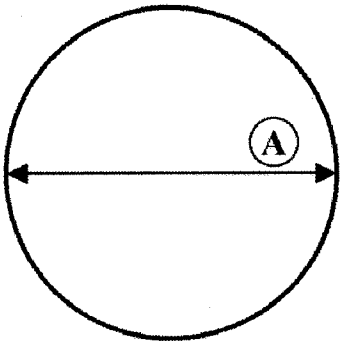
Comments/Drawings:
- SIGNIFICANT STORM WATER EROSION ON BOTH ENDS OF CULVERT FROM ROAD WAY RUNOFF

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2965 ☐	2968 ☐	2963 ☐
Photo View - Downstream	2964 ☐	2969 ☐	2962 ☐

Record the file name for each photo taken in the appropriate box

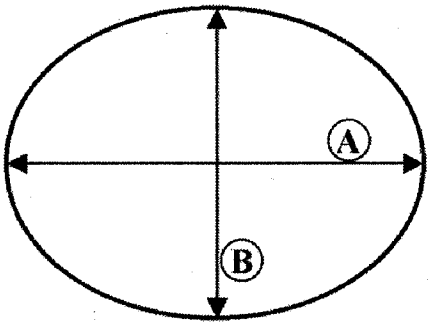
Crossing Dimensions

1.



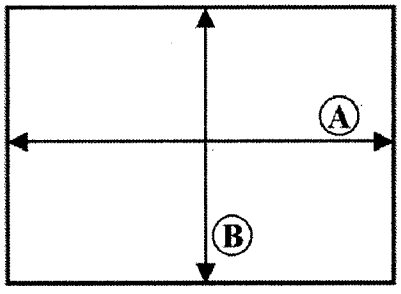
Round Culvert

2.



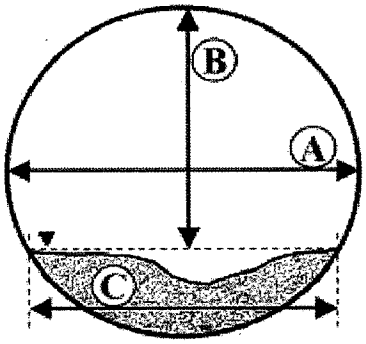
Elliptical Culvert

3.



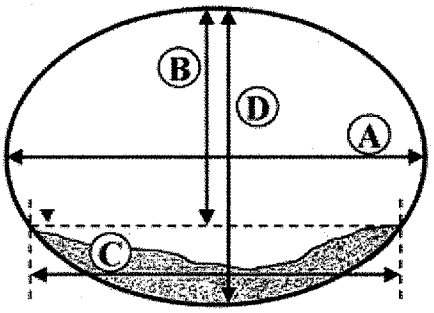
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☑ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5.6	4.3	4.5	5
Downstream Dimensions (ft.)	5.6	4.7	3.4	4.7

Length of stream through crossing (ft.): 52
Crossing Slope (%): 1-2%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	SSG AM			Date & Time	7/9/15 5:55pm
Town	Gilford	Datum		Latitude (N/S)	43,563627777 °N
Location				Longitude (E/W)	-71.43976896 °W
SGA Reach ID	M02-C			Stream Name	Black Brook
Road Name	lot @ Kelso Auto Sales			Road Type	paved gravel trail railroad
# of shoulder lanes	—			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	Many	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes no
# of culverts at crossing	1			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> ¾ of floodplain)** **partially (¼ – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall** backwatered

Upstream bankfull widths: 1.) 7 2.) 7 3.) 3 4.) 7 5.) 9 **(ft.)**

Reference bankfull widths: 1.)_____ 2.)_____ 3.)_____ 4.)_____ 5.)_____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.4 **(0.0 ft.)**
Culvert outlet: **at grade** **cascade** **free fall** **backwatered** ____ **(ft.)** Stepped footers: **yes** **no**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes** **no**
Pool depth at point of streamflow entry: 0 **(ft.)**
Maximum pool depth: 0 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:**____
Distance from downstream end of culvert to hydraulic control: 3 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.) 6 **2.)** 9 **3.)** 6 **4.)** 4 **5.)** 4 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 **4** 5 6 UNK	1 2 3 **4** 5 6 UNK	NONE 1 2 3 **4** 5 6 UNK
Bedrock present	yes **no**	yes **no**	Depth of Substrate: **< 1 foot** **1-2feet** **>2 feet** UNK **N/A**
Sediment Deposit Type	**none** delta side point mid-channel	**none** delta side point mid-channel	**none** delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	yes **no**	yes **no**
			Substrate Throughout? yes **no**
Beaver dam near structure Distance from structure to dam	yes **no** distance: ____ (ft.)	yes **no** distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing **none** UNK	intact failing **none** UNK	
Bank erosion	high **low** none	**high** low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** culvert footers wing walls	**none** culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	S	S	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes **no**	yes **no**	yes **no**	yes **no**	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

Comments/Drawings:

- CULVERT TRANSITIONS FROM PIPE ARCH TO VERICAL ELLIPSE U/S → D/S. METAL RODS HOLD STRUCTURE TOGETHER AT D/S END
- CAR LOT OPERATOR INDICATED LOT IS SUBSIDING QUITE A BIT AND HAS TO PATCH FREQUENTLY

2956

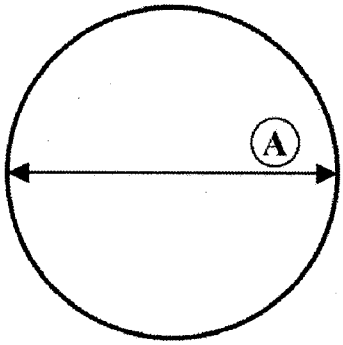
DEBRIS OBSTRUCTION

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2955 ☐	2959 ☐	2953 ☐
Photo View - Downstream	2954 ☐	2957 ☐	2952 ☐

Record the file name for each photo taken in the appropriate box

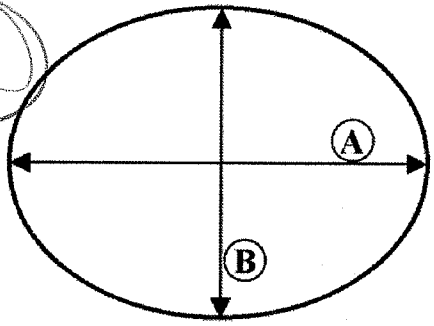
Crossing Dimensions

1.



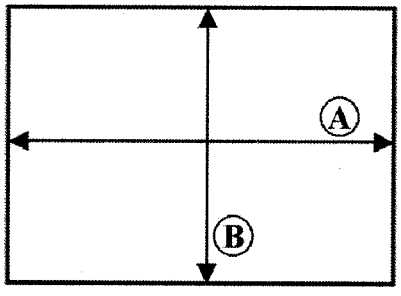
Round Culvert

2.



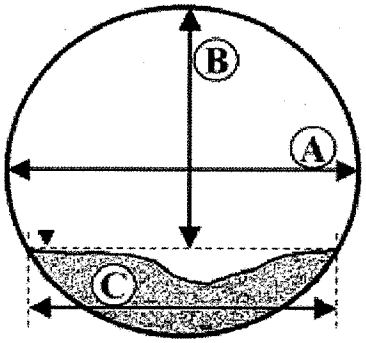
Elliptical Culvert

3.



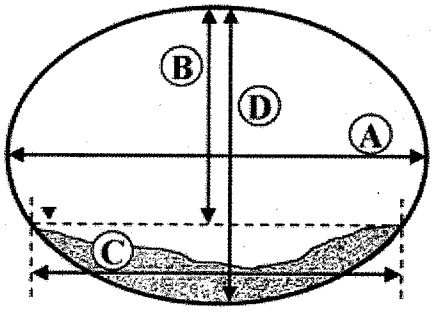
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☑ 2. ☐ 3. ☐ 4. ☐ 5. ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	5.75	5.4		
Downstream Dimensions (ft.)	6.1	5.8		

Length of stream through crossing (ft.): 188'
Crossing Slope (%): 2.9

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE/AM			Date & Time	7/9/15 5:20 PM
Town		Datum		Latitude (N/S)	43.564305° N
Location	~~M02-C~~ DS of Walmart			Longitude (E/W)	-71.439143° W
SGA Reach ID	M02-C			Stream Name	
Road Name	Lakeshore Rd (Route			Road Type	(paved) gravel trail railroad
# of shoulder lanes	2			Crossing Condition	new old eroding collapsing (rusted)
# of travel lanes	2	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone (Steel-Corrugated) Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes (no)
# of culverts at crossing	1			Flow Conditions	unusually low (typical low) higher than average flood conditions
Overflow pipe(s)	yes (no)				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **(entirely** (> 3/4 of floodplain)**)** **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **(no)** **unsure**
Culvert slope as compared with the channel slope is: **higher** **(lower)** **about the same**
Water depth in the crossing matches that of stream: **(yes)** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **(yes)** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **(sediment)** **wood & sediment** **deformation of culvert** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **(no)**
If channel avulses, stream will: **cross road** **(follow road)** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 150 **(ft.)**
Angle of stream flow approaching structure: **(sharp bend** (45° - 90°)**)** **mild bend** (5° - 45°) **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **(erosion)** **(aggradation)** **none**
Culvert inlet: **(at grade)** **cascade** **free fall**
Upstream bankfull widths: 1.) 9 2.) 7 3.) 5 4.) 7 5.) 8 **(ft.)**

Reference bankfull widths: 1.) 11 2.) 10 3.) 9 4.) _____ 5.) _____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.2 **(0.0 ft.)**
Culvert outlet: **at grade cascade free fall backwatered** 25 **(ft.)** Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: — **(ft.)**
Maximum pool depth: — **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**
Distance from downstream end of culvert to hydraulic control: 8 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 13 **2.)** 8 **3.)** 6 **4.)** 5 **5.)** 6 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: < 1 foot; 1-2feet; >2 feet; UNK N/A
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	RIGHT	LEFT	RIGHT	
Dominant vegetation type (use codes to the right)	S	S	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** none			
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

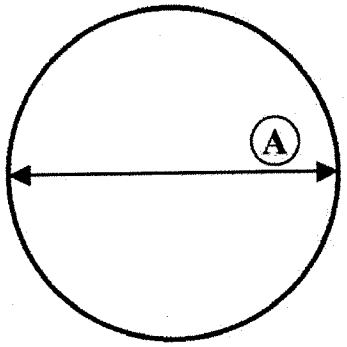
Comments/Drawings:
- temp log @ outlet

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2945 ☐	2946 ☐	2943 ☐
Photo View - Downstream	2944 ☐	2947 ☐	2942 ☐

Record the file name for each photo taken in the appropriate box

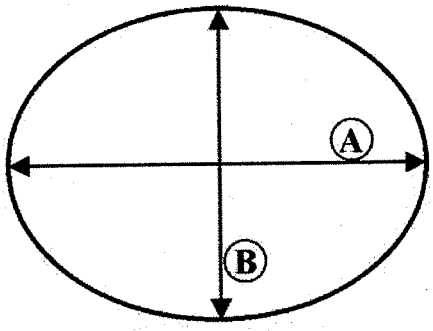
Crossing Dimensions

1.



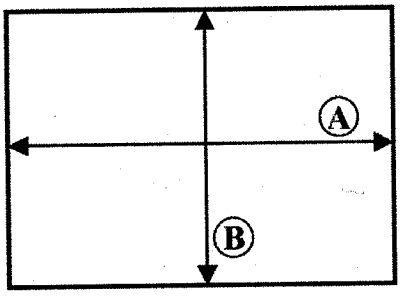
Round Culvert

2.



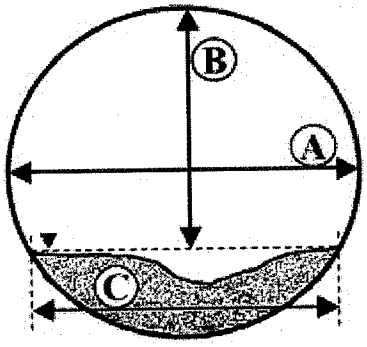
Elliptical Culvert

3.



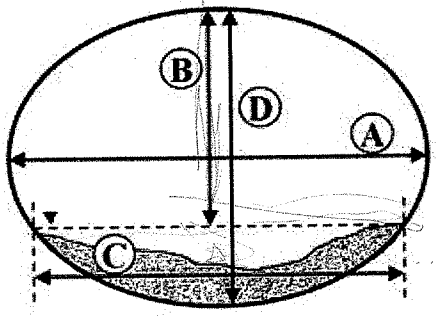
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	7	3.7	7	5
Downstream Dimensions (ft.)	7	3.9	7	5

Length of stream through crossing (ft.): 59'
Crossing Slope (%): 1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	7	3.9	7	5
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE AM D+K BCG			Date & Time	7/9/15 4:35P
Town	Gilford	Datum		Latitude (N/S)	43.515348 °N
Location				Longitude (E/W)	-71.43777 °W
SGA Reach ID	M02-C			Stream Name	Black Br
Road Name	Walmart drive			Road Type	paved gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	1	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes no
# of culverts at crossing	1			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____
Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 0 **(ft.)**
Angle of stream flow approaching structure: **sharp bend** (45° - 90°) **mild bend** (5° - 45°) **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 9 2.) 9 3.) 6 4.) 6 5.) 7 **(ft.)**

Reference bankfull widths: 1.) 11 2.) 10 3.) _____ 4.) _____ 5.) _____ **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.1 **(0.0 ft.)**
Culvert outlet: **at grade** **cascade** **free fall** **backwatered** ____ **(ft.)** Stepped footers: **yes** **no**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes** **no**
Pool depth at point of streamflow entry: 0 **(ft.)**
Maximum pool depth: 0 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** **no**
Hydraulic control type: **bedrock** **boulders** **cobble** **gravel** **sand** **wood** **other:**____
Distance from downstream end of culvert to hydraulic control: 4 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**
Downstream bankfull widths: 1.) 7 **2.)** 7 **3.)** 8 **4.)** 8 **5.)** 9 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 **4** 5 6 UNK	1 2 3 **4** 5 6 UNK	NONE 1 2 3 **4** 5 6 UNK
Bedrock present	yes **no**	yes **no**	Depth of Substrate: **≤ 1 foot** **1-2feet** **>2 feet** **UNK** **N/A**
Sediment Deposit Type	**none** delta side point mid-channel	**none** delta side point mid-channel	**none** delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes **no**	yes **no**	yes **no**
			Substrate Throughout? yes **no**
Beaver dam near structure Distance from structure to dam	yes **no** distance: ____ (ft.)	yes **no** distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing **none** UNK	intact failing **none** UNK	
Bank erosion	high **low** none	high low **none**	
Stream bank scour causing undermining around/under structure (circle all that apply)	**none** culvert footers wing walls	**none** culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	H	H	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	**yes** no	**yes** no	yes **no**	yes **no**	

Crossing Type (from above): ☐ 1. ☒ 2. ☐ 3. ☐ 4. ☐ 5. ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	6.9	5.6		
Downstream Dimensions (ft.)	6.9	5.6		

Length of stream through crossing (ft.): 95
Crossing Slope (%): 2%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** none			
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: yes no **Comments/Drawings:**

Photos taken: yes no

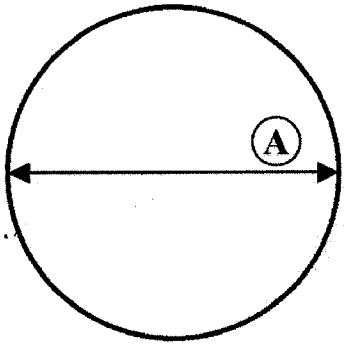
Please fill out photo log below

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2925 ☐	2927 ☐	2923 ☐
Photo View - Downstream	2924 ☐	2926 ☐	2922 ☐

Record the file name for each photo taken in the appropriate box

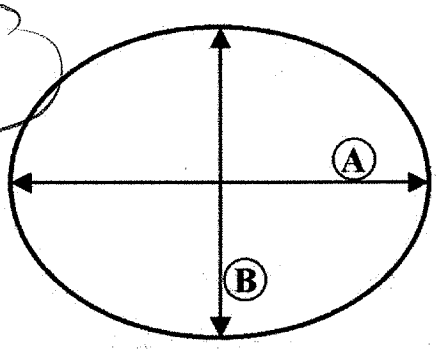
Crossing Dimensions

1.



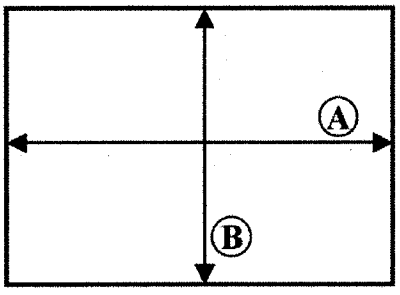
Round Culvert

2.



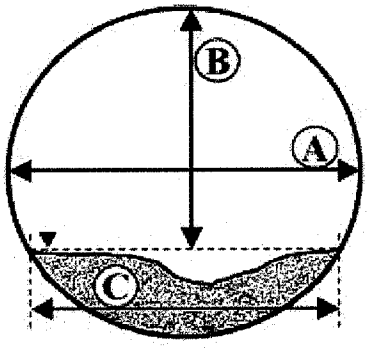
Elliptical Culvert

3.



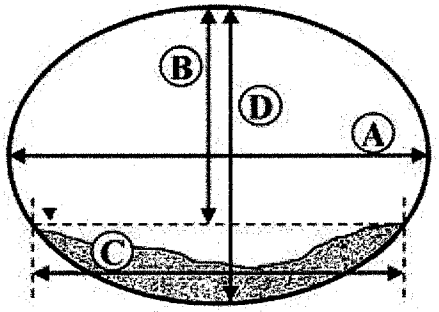
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE, AM	D+K / BCG		Date & Time	7/9/15
Town	Gilford	Datum		Latitude (N/S)	43.566272° N
Location	@ Rt3 overpass			Longitude (E/W)	-71.43441° W
SGA Reach ID	M02-E			Stream Name	Black Brook 6
Road Name	Lakeshore Rd			Road Type	paved gravel trail railroad
# of shoulder lanes	2			Crossing Condition	new old eroding collapsing rusted
# of travel lanes	2	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes no
# of culverts at crossing	2			Flow Conditions	unusually low typical low higher than average flood conditions
Overflow pipe(s)	yes no				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> 3/4 of floodplain) **partially** (1/4 – 3/4 of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **no** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **none** **other:** _____

Steep riffle present immediately upstream of structure: **yes** **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend** (45° - 90°) **mild bend** (5° - 45°) **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 10 2.) 11 3.) 18 4.) 16 5.) 17 **(ft.)**

Reference bankfull widths: 1.) 11 2.) 12 3.) 9 4.) xs 5.) xs **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.7 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 102 (ft.) Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 (0.0 ft.)
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: 0.9 (ft.)
Maximum pool depth: 1.7 (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**
Distance from downstream end of culvert to hydraulic control: 15 (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 13 **2.)** 12 **3.)** 11 **4.)** 10 **5.)** 9 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	RIGHT	LEFT	RIGHT	
Dominant vegetation type (use codes to the right)	S	M	S	M	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no (check)	yes no	yes no	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** none			
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**
	none		none	

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

- backwatered & full of sediment
- headwall in good shape
- temp. BG immediately US

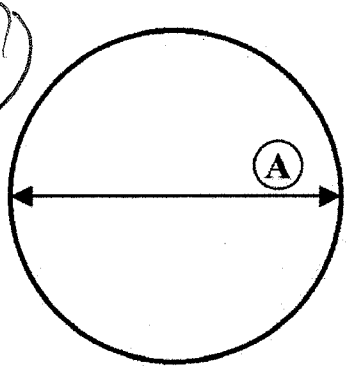
Outlet is full of sediment

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2890 ☐	2891 ☐	2888 ☐
Photo View - Downstream	2889 ☐	2893 2892 ☐	2887 ☐

Record the file name for each photo taken in the appropriate box

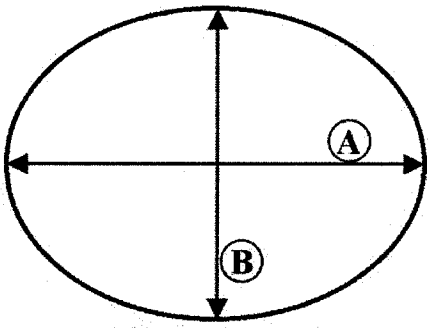
Crossing Dimensions

1.



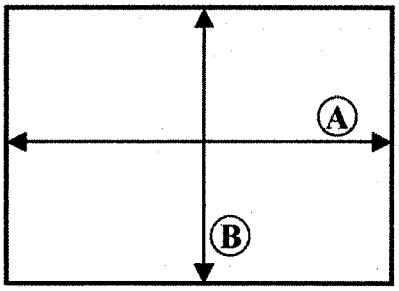
Round Culvert

2.



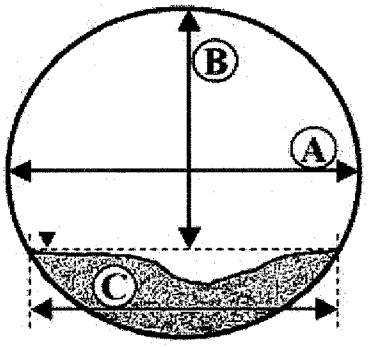
Elliptical Culvert

3.



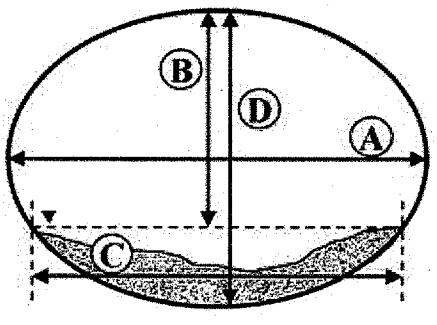
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.** ☐ **Ford**

(L)

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	3,35	~3.35		
Downstream Dimensions (ft.)	3,3<			

Length of stream through crossing (ft.): 102

Crossing Slope (%): <1%

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

Culvert Cell 2 of 2

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

(R)

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	3,33			
Downstream Dimensions (ft.)	3,33			

Length of stream through crossing (ft.): 102

Crossing Slope (%): <1%

Culvert Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

Length of stream through crossing (ft.): _____

Crossing Slope (%): _____

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID	Unknown ☐			Structure Number	
Observer(s)/ Organization(s)	CSE, AM DHK / BCE			Date & Time	7/9/15
Town	GUILFORD	Datum		Latitude (N/S)	43, 565743 °N
Location	HIGHWAY 3 CULVERT			Longitude (E/W)	-71.43334932 °W
SGA Reach ID	MOZE			Stream Name	BLACK BROOK
Road Name	RT 3			Road Type	(paved) gravel trail railroad
# of shoulder lanes	2 1 or 2			Crossing Condition	new old eroding collapsing (rusted)
# of travel lanes	1	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone (Steel-Corrugated) Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	(yes) no
# of culverts at crossing	1			Flow Conditions	unusually low (typical low) higher than average flood conditions
Overflow pipe(s)	yes (no)				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> ¾ of floodplain) (**partially** (¼ – ¾ of floodplain)) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** (**no**) **unsure**
Culvert slope as compared with the channel slope is: **higher** (**lower**) **about the same**
Water depth in the crossing matches that of stream: (**yes**) **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: (**yes**) **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** (**none**) **other:** _____
Steep riffle present immediately upstream of structure: **yes** (**no**)
If channel avulses, stream will: **cross road** (**follow road**) **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 300+ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** (**channelized straight**)
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** (**none**)
Culvert inlet: (**at grade**) **cascade** **free fall**

Upstream bankfull widths:	**1.)** 13	**2.)** 13	**3.)** 11	**4.)** 13	**5.)** 11	**(ft.)**
Reference bankfull widths:	**1.)** ~~11~~	**2.)** 12	**3.)** 9	**4.)** XS	**5.)** XS	**(ft.)**

Weir – 2.8' abv. wtr srf
3.1' total height
10' u/s of culvert inlet

Downstream

Water depth in culvert (at outlet): 0.2 **(0.0 ft.)**
Culvert outlet: **at grade cascade free fall (backwatered)** ____ **(ft.)** Stepped footers: **yes no**
Outlet drop (invert to water surface): 1.0 **(0.0 ft.)**
Pool present immediately downstream of structure: **(yes) no**
Pool depth at point of streamflow entry: 0.5 **(ft.)**
Maximum pool depth: 0.5 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes (no)**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**____
Distance from downstream end of culvert to hydraulic control: 10 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 8 **2.)** 8 **3.)** 7 **4.)** 8 **5.)** 6 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 (5) 6 UNK	1 2 3 (4) 5 6 UNK	NONE 1 2 3 (4) 5 6 UNK
Bedrock present	yes (no)	yes (no)	(Depth of Substrate) **(< 1 foot) 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	(none) **delta side point mid-channel**	(none) **delta side point mid-channel**	(none) **delta side point mid-channel**
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes (no)	yes (no)	yes (no)
			Substrate Throughout? (yes) no
Beaver dam near structure Distance from structure to dam	yes (no) **distance:** ____ **(ft.)**	yes (no) **distance:** ____ **(ft.)**	**Bed Material Codes**
Hard bank armoring	**intact failing (none) UNK**	**(intact) failing none UNK**	**1** – bedrock
Bank erosion	**high (low) none**	**high (low) none**	**2** – boulder
Stream bank scour causing undermining around/under structure (circle all that apply)	**(none) culvert footers wing walls**	**(none) culvert footers wing walls**	**3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	M	M	R	R	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	(yes) no	yes (no)	yes (no)	yes (no)	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	species: N/A		none	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	sign	species (none)	sign

Spatial data collected with GPS: (yes) no

Comments/Drawings: -bottom rusting out, old

Photos taken: (yes) no

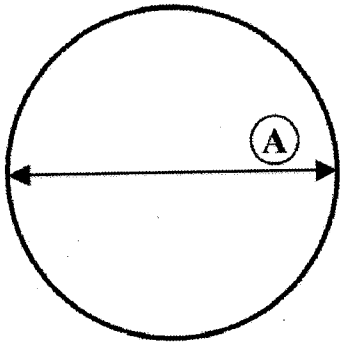
Please fill out photo log below

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	2881 ☐	2882 ☐	2879 ☐
Photo View - Downstream	2880 ☐	2883 ☐	2878 ☐

Record the file name for each photo taken in the appropriate box

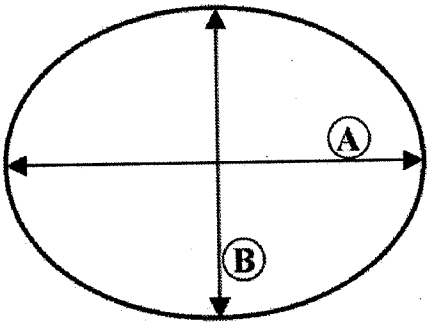
Crossing Dimensions

1.



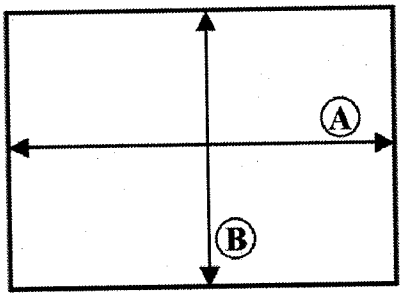
Round Culvert

2.



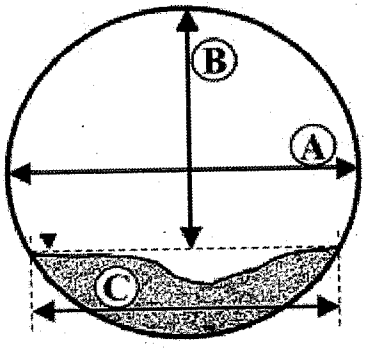
Elliptical Culvert

3.



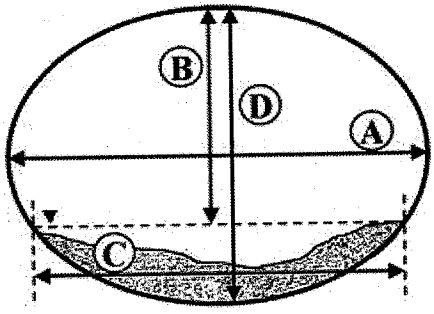
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.** ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	6	6		
Downstream Dimensions (ft.)	6	5.7		

Length of stream through crossing (ft.): 190
Crossing Slope (%): < 1%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CS, AM	PIK/BCE		Date & Time	7/9/15 12:17
Town	GUILFORD	Datum		Latitude (N/S)	43.565048
Location	ANNIS DRIVE LOWER CULVERT			Longitude (E/W)	-71.43835
SGA Reach ID				Stream Name	BLACK BROOK
Road Name	ANNIS			Road Type	(paved) gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new old (eroding) collapsing rusted
# of travel lanes	2	Structure Materials	(Concrete) Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes (no)
# of culverts at crossing	1			Flow Conditions	unusually low (typical low) higher than average flood conditions
Overflow pipe(s)	yes (no)				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **(entirely (> ¾ of floodplain))** **partially (¼ – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **(no)** **unsure**
Culvert slope as compared with the channel slope is: **higher** **lower** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **(sediment)** **wood & sediment** **deformation of culvert** **(none)** **other:** _____ COBBLES + FINE SEDIMENT
Steep riffle present immediately upstream of structure: **yes** **(no)**
If channel avulses, stream will: **(cross road)** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: _____ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **(channelized straight)**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **(aggradation)** **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 11 **2.)** 14 **3.)** _____ **4.)** VERY SHORT DISTANCE TO NEXT **5.)** CULVERT **(ft.)**

Reference bankfull widths: 1.) 11 **2.)** 16 **3.)** 16 **4.)** 15 **5.)** 15 **(ft.)**

Downstream

Water depth in culvert (at outlet): 0.2 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 13 **(ft.)** Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: 0.4 **(ft.)**
Maximum pool depth: 1.3 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**
Distance from downstream end of culvert to hydraulic control: 17 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 16 **2.)** 16 **3.)** 14 **4.)** 12 **5.)** 11 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	B	B	S	S	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:**		**none**	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

Comments/Drawings:

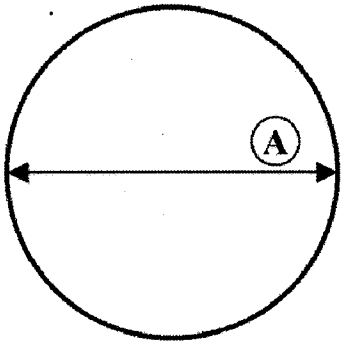
- CV immediately below(?) under lot
- old & cracking
- Structure Point taken at outlet

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	2848 ☐	2849 ☐	2845 ☐
Photo View - Downstream	2847 ☐	2850 ☐	2846 ☐

Record the file name for each photo taken in the appropriate box

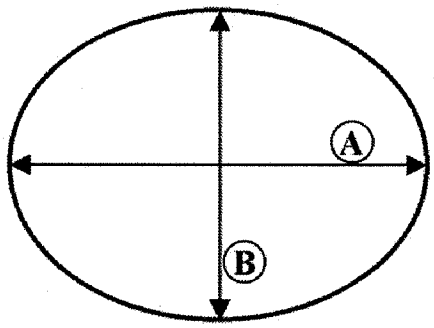
Crossing Dimensions

1.



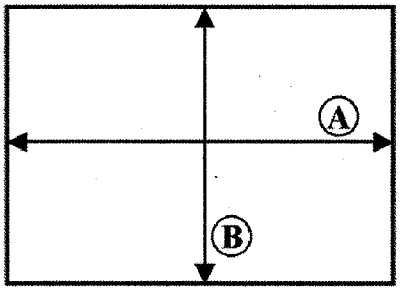
Round Culvert

2.



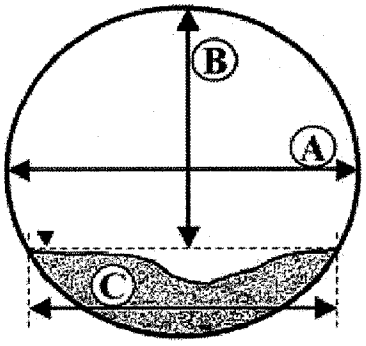
Elliptical Culvert

3.



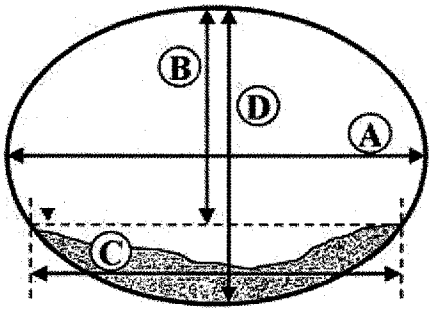
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☐ 1. ☐ 2. ☑ 3. ☐ 4. ☐ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	4.0	6.1		
Downstream Dimensions (ft.)	4.0	6.1		

Length of stream through crossing (ft.): 33
Crossing Slope (%): 1.5%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CS, Am BCE / D+K			Date & Time	7/9/15 11:55A
Town	Gilford	Datum		Latitude (N/S)	43.564767 °N
Location	Under Annis Cir + lot			Longitude (E/W)	-71.431521° W
SGA Reach ID	M03-A			Stream Name	Black Br
Road Name	Annis Cir / lot			Road Type	**paved** gravel trail railroad
# of shoulder lanes	0			Crossing Condition	new **old** eroding collapsing rusted
# of travel lanes	2	Structure Materials	Concrete Plastic-Corrugated Plastic-Smooth Tank Stone **Steel-Corrugated** Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	**yes** no
# of culverts at crossing	1			Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely** (> ¾ of floodplain) **partially** (¼ – ¾ of floodplain) **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: yes **no** unsure
Culvert slope as compared with the channel slope is: higher **lower** about the same
Water depth in the crossing matches that of stream: **yes** no (significantly deeper) no (significantly shallower)
Water velocity in crossing matches that of stream: **yes** no (significantly faster) no (significantly slower)

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** sediment wood & sediment deformation of culvert none other: _____
Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** follow road cross and follow road unsure
Estimated distance avulsion would follow road: _____ (ft.)
Angle of stream flow approaching structure: sharp bend (45° - 90°) mild bend (5° – 45°) naturally straight channelized straight
Evidence of streambed erosion or aggradation immediately upstream of culvert: erosion aggradation **none**
Culvert inlet: **at grade** **cascade** **free fall**
Upstream bankfull widths: 1.) 15 2.) 14 3.) 13 4.) 17 5.) 14 (ft.)

Reference bankfull widths: 1.) 11 2.) 16 3.) 16 4.) 15 5.) 15 (ft.)

Downstream

Water depth in culvert (at outlet): 0.8 **(0.0 ft.)**
Culvert outlet: **at grade cascade free fall backwatered** _____ **(ft.)** Stepped footers: **yes no**
Outlet drop (invert to water surface): 0.5 **(0.0 ft.)**
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: 1.4 **(ft.)**
Maximum pool depth: 1.4 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**_____
Distance from downstream end of culvert to hydraulic control: 2 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 11 **2.)** 14 **3.)**_____ **4.)**_____ **5.)**_____ **(ft.)**

Could not take more measurements, CV right DS

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot, 1-2feet, >2 feet, UNK, N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: _____ (ft.)	yes no distance: _____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream LEFT	Upstream RIGHT	Downstream LEFT	Downstream RIGHT	**Vegetation Type Codes**
Dominant vegetation type (use codes to the right)	B	B	B	B	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no	yes no	yes no	yes no	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** None		**none** None	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**
	None		None	

Spatial data collected with GPS: (yes) no

Photos taken: (yes) no
Please fill out photo log below

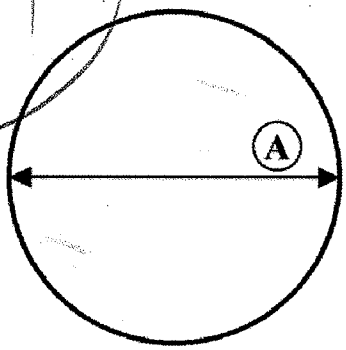
Comments/Drawings:
EROSION EVIDENT ON CULVERT WINGWALLS AND THE CULVERT ITSELF

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2840 ☐	2845 ☐	2838 ☐
Photo View - Downstream	2839 ☐	2846 ☐	2837 ☐

Record the file name for each photo taken in the appropriate box

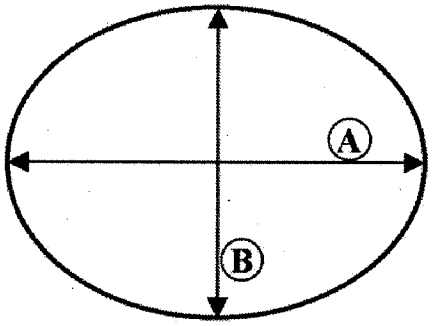
Crossing Dimensions

1.



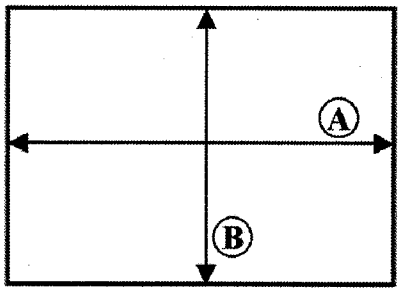
Round Culvert

2.



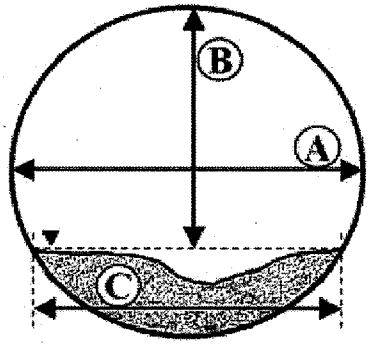
Elliptical Culvert

3.



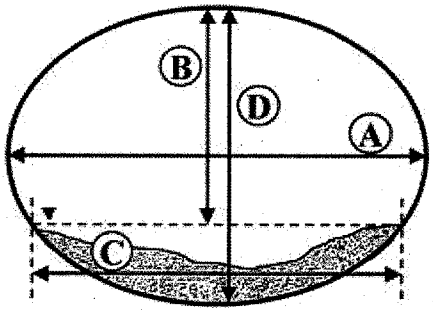
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☑ 1. ☐ 2. ☑ 3. ☐ 4. ☐ 5. ☐ Ford

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	4.9	4		
Downstream Dimensions (ft.)	4	5.4		

Length of stream through crossing (ft.): 200'
Crossing Slope (%): 0-5%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	AM, CS BCE/DHL			Date & Time	7/9/15 11:05 AM
Town	Gilford	Datum	WGS84	Latitude (N/S)	43.513255° N
Location				Longitude (E/W)	-71.430814° W
SGA Reach ID	M03-A			Stream Name	Black Bk
Road Name	Mulberry Rd ?			Road Type	**(paved)** gravel trail railroad
# of shoulder lanes	0			Crossing Condition	**(new)** old eroding collapsing rusted
# of travel lanes	2	Structure Materials	**Concrete, ~~Plastic-Corrugated~~, Plastic-Smooth, Tank, Stone, Steel-Corrugated, Steel-Smooth, Aluminum-Corrugated, Other: _____**	Structure skewed to roadway	**(yes)** no
# of culverts at crossing	1			Flow Conditions	unusually low **(typical low)** higher than average flood conditions
Overflow pipe(s)	yes **(no)**				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **(entirely (> ¾ of floodplain))** **partially (¼ – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: **yes** **(no)** **unsure**
Culvert slope as compared with the channel slope is: **higher** **(lower)** **about the same**
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in crossing matches that of stream: **yes** **(no (significantly faster))** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **deformation of culvert** **(none)** **other: _____**
Steep riffle present immediately upstream of structure: **yes** **(no)**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: 120 **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **(naturally straight)** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of culvert: **erosion** **aggradation** **(none)**
Culvert inlet: **(at grade)** **cascade** **free fall**

Upstream bankfull widths: 1.) 11 2.) 12 3.) 11 4.) 14 5.) 9 **(ft.)**

Reference bankfull widths: 1.) 11 2.) 16 3.) 16 4.) 15 5.) 15 **(ft.)**

Downstream

Water depth in culvert (at outlet): 1 (0.0 ft.)
Culvert outlet: **at grade cascade free fall backwatered** 41 (ft.) Stepped footers: **yes no**
Outlet drop (invert to water surface): 0 (0.0 ft.)
Pool present immediately downstream of structure: **yes no**
Pool depth at point of streamflow entry: 1 (ft.)
Maximum pool depth: 1.5 (0.0 feet)
Downstream bank heights are substantially higher than upstream bank heights: **yes no**
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:**
Distance from downstream end of culvert to hydraulic control: 12 (ft.)
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion aggradation none**
Downstream bankfull widths: 1.) 16 2.) 15 3.) 15 4.) 15 5.) 19 (ft.)

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 4 5 6 UNK	1 2 3 4 5 6 UNK	NONE 1 2 3 4 5 6 UNK
Bedrock present	yes no	yes no	Depth of Substrate: **<1 foot 1-2feet >2 feet UNK N/A**
Sediment Deposit Type	none delta side point mid-channel	none delta side point mid-channel	none delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes no	yes no	yes no
			Substrate Throughout? yes no
Beaver dam near structure Distance from structure to dam	yes no distance: ____ (ft.)	yes no distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact failing none UNK	intact failing none UNK	
Bank erosion	high low none	high low none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		**Vegetation Type Codes**
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	
Dominant vegetation type (use codes to the right)	H	H	S	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes no ?	yes no	yes no	yes no	

31 3%

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.** ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	4.9			
Downstream Dimensions (ft.)	4.9			

Length of stream through crossing (ft.): 31
Crossing Slope (%): 3%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Road-killed wildlife within ¼ mile of structure (circle none or list species)	**species:** None		**none** None	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	**Outside Structure**		**Inside Structure**	
	species (none)	**sign**	**species (none)**	**sign**
	None		None	

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

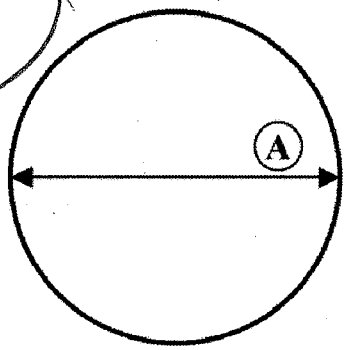
Comments/Drawings:
- put in ~2005
- Scour on Right Bank Downstream of Outlet

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	2826 ☐	2827 ☐	2824 ☐
Photo View - Downstream	2825 ☐	2828 ☐	2823 ☐

Record the file name for each photo taken in the appropriate box

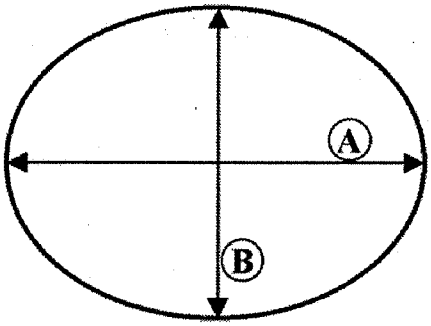
Crossing Dimensions

1.



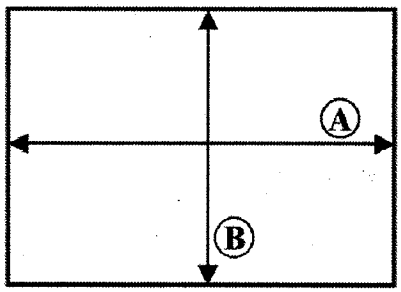
Round Culvert

2.



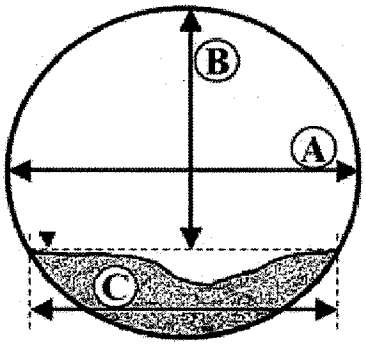
Elliptical Culvert

3.



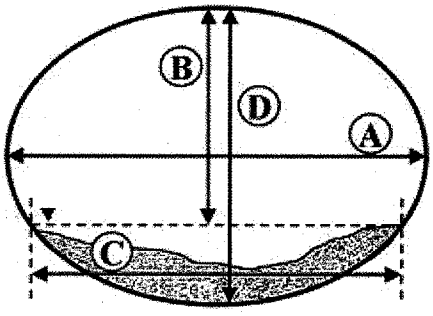
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Culvert Assessment Field Form – Geomorphic & Habitat Parameters

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CS, Am D+K/BCE			Date & Time	7/9/15 10 Am
Town	Gilford	Datum	WGS 1984	Latitude (N/S)	43.5623113°N
Location				Longitude (E/W)	-71.4298794°W
SGA Reach ID	M03-A			Stream Name	Black Bk
Road Name	Bretton Rd			Road Type	(paved) gravel trail railroad
# of shoulder lanes	0			Crossing Condition	(new) old eroding collapsing rusted
# of travel lanes	2	Structure Materials	(Concrete) Plastic-Corrugated Plastic-Smooth Tank Stone Steel-Corrugated Steel-Smooth Aluminum-Corrugated Other: _____	Structure skewed to roadway	yes (no)
# of culverts at crossing	1			Flow Conditions	unusually low (typical low) higher than average flood conditions
Overflow pipe(s)	yes (no)				

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: (entirely (> 3/4 of floodplain)) partially (1/4 – 3/4 of floodplain) not significant
Structure within 1/3 mile downstream of a significantly steeper segment of stream: (yes) no unsure
Culvert slope as compared with the channel slope is: higher (lower) about the same
Water depth in the crossing matches that of stream: yes no (significantly deeper) no (significantly shallower)
Water velocity in crossing matches that of stream: yes (no (significantly faster)) no (significantly slower)

Upstream

Structure opening partially obstructed by (circle all that apply): wood sediment wood & sediment deformation of culvert (none) other: _____
Steep riffle present immediately upstream of structure: yes (no)
If channel avulses, stream will: cross road (follow road) cross and follow road unsure
Estimated distance avulsion would follow road: 123 (ft.)
Angle of stream flow approaching structure: sharp bend (45° - 90°) (mild bend (5° - 45°)) naturally straight channelized straight
Evidence of streambed erosion or aggradation immediately upstream of culvert: erosion (aggradation) none
Culvert inlet: (at grade) cascade free fall
Upstream bankfull widths: 1.) 18 2.) 23 3.) 26 4.) 19 5.) 16 (ft.)

Reference bankfull widths: 1.) 11 2.) 16 3.) 16 4.) 15 5.) 15 (ft.)

Downstream

Water depth in culvert (at outlet): 0.1 **(0.0 ft.)**
Culvert outlet: **at grade** (**cascade**) **free fall** **backwatered** ____ **(ft.)** Stepped footers: **yes** (**no**)
Outlet drop (invert to water surface): 4.0' **(0.0 ft.)**
Pool present immediately downstream of structure: (**yes**) **no**
Pool depth at point of streamflow entry: 0.1 **(ft.)**
Maximum pool depth: 1.4 **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: (**yes**) **no**
Hydraulic control type: **bedrock** (**boulders**) **cobble** **gravel** **sand** **wood** **other:**____
Distance from downstream end of culvert to hydraulic control: 17 **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of culvert: **erosion** **aggradation** **none**
Downstream bankfull widths: **1.)** 27 **2.)** 29 **3.)** 23 **4.)** 20 **5.)** 14 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material (substrate) at structure (use codes below)	1 2 3 (4) 5 6 UNK	1 2 (3) 4 5 6 UNK	(NONE) 1 2 3 4 5 6 UNK
Bedrock present	yes (no)	yes (no)	Depth of Substrate: **<1 foot** **1-2feet** **>2 feet** **UNK** **N/A**
Sediment Deposit Type	none delta (side) point mid-channel	none delta (side) point mid-channel	(none) delta side point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	(yes) no	yes (no)	yes (no)
			Substrate Throughout? yes (no)
Beaver dam near structure Distance from structure to dam	yes (no) distance: ____ (ft.)	yes (no) distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	intact (failing) none UNK	intact (failing) none UNK	
Bank erosion	high low (none)	high (low) none	
Stream bank scour causing undermining around/under structure (circle all that apply)	none culvert footers wing walls	none culvert footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream LEFT	Upstream RIGHT	Downstream LEFT	Downstream RIGHT	**Vegetation Type Codes**
Dominant vegetation type (use codes to the right)	D	D	M	H	**C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	(yes) no	(yes) no	(yes) no	yes (no)	

Road-killed wildlife within ¼ mile of structure (circle none or list species)	species: NONE		none	
Wildlife sign and species observed near (up/downstream) and inside structure (circle none or list species and sign types)	Outside Structure		Inside Structure	
	species (none)	sign	species (none)	sign
	None		None	

Spatial data collected with GPS: yes no

Photos taken: yes no
Please fill out photo log below

Comments/Drawings:
- fairly new plastic
- significant cascade drop @ outlet
- riprap scoured out @ US + DS
- lot of woody debris DS

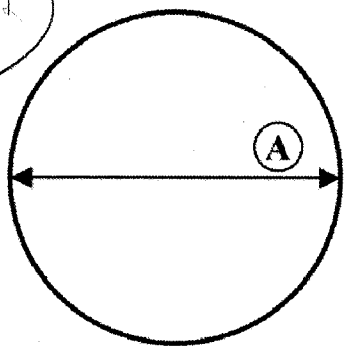
2810

Folder Name:	Structure Inlet	Structure Outlet	Above Structure
Photo View - Upstream	2812 ☐	2814 ☐	2810 ☐
Photo View - Downstream	2811 ☐	2815 ☐	2809 ☐

Record the file name for each photo taken in the appropriate box 2813

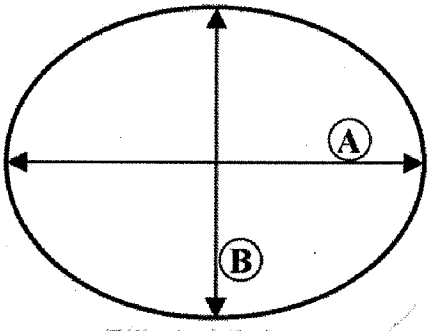
Crossing Dimensions

1.



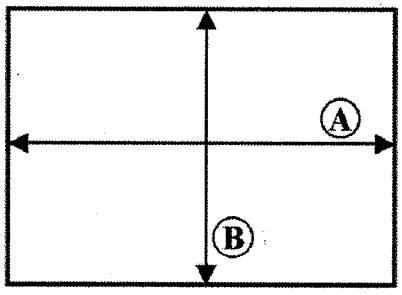
Round Culvert

2.



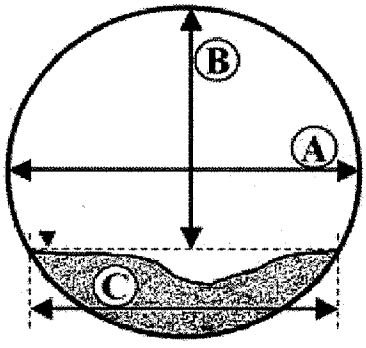
Elliptical Culvert

3.



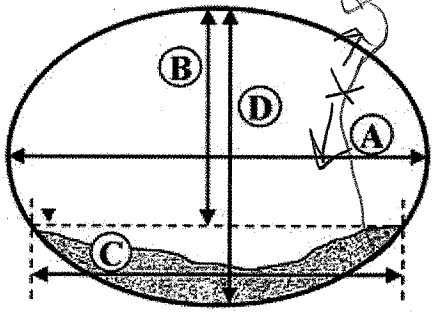
Box Culvert

4.



Embedded Round Culvert

5.



Embedded Elliptical Culvert

Crossing Type (from above): ☑ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.** ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	3.9			
Downstream Dimensions (ft.)	3.9			

Length of stream through crossing (ft.): 49
Crossing Slope (%): 4.9%

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

Culvert Cell 2 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 3 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Culvert Cell 4 of _____

Crossing Type (from above): ☐ **1.** ☐ **2.** ☐ **3.** ☐ **4.** ☐ **5.**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge and Arch Assessment Field Form – Geomorphic & Habitat Parameters

Structure type: **bridge** / **arch**

Structure ID		Unknown ☐		Structure Number	
Observer(s)/ Organization(s)	CSE/AM	Tidal ☐		Date & Time	7/9/15
Town	GILFORD	Datum	WGS84	Latitude (N/S)	43.5604757 N
Location	PRIVATE DRIVE OFF BRETON			Longitude (E/W)	71.4250718 W
Crossing ID	M03-B			Stream Name	BLACK BROOK
Road Name	N/A			Road Type	paved **gravel** trail railroad
# of shoulder lanes	0			Crossing Condition	new **old** eroding collapsing rusted
# of travel lanes	1	Structure Materials	Aluminum **Concrete** Masonry (arches) & Slabs Prestressed Concrete/ Post-tensioned Steel Timber Wood Other: _____	Structure skewed to roadway	yes **no**
# of bridge cells or arches at crossing	1			Flow Conditions	unusually low **typical low** higher than average flood conditions
Overflow pipe(s)	yes **no**				
Inlet Headwall Material	**Metal**	**Concrete**	**Masonry**	**Gabion**	**Dry Fit Stone**	**Plastic**	**Other**	**None**

Geomorphic and Fish Passage Data

General

Floodplain filled by roadway approaches: **entirely (> ¾ of floodplain)** **partially (¼ – ¾ of floodplain)** **not significant**
Structure within ⅓ mile downstream of a significantly steeper segment of stream: yes **no** unsure
Water depth in the crossing matches that of stream: **yes** **no (significantly deeper)** **no (significantly shallower)**
Water velocity in the crossing matches that of stream: **yes** **no (significantly faster)** **no (significantly slower)**

Upstream

Structure opening partially obstructed by (circle all that apply): **wood** **sediment** **wood & sediment** **failure of bridge** **none** **other:** _____

Steep riffle present immediately upstream of structure: yes **no**
If channel avulses, stream will: **cross road** **follow road** **cross and follow road** **unsure**
Estimated distance avulsion would follow road: ~~_____~~ **(ft.)**
Angle of stream flow approaching structure: **sharp bend (45° - 90°)** **mild bend (5° - 45°)** **naturally straight** **channelized straight**
Evidence of streambed erosion or aggradation immediately upstream of bridge: **erosion** **aggradation** **none**
Upstream bankfull widths: 1.) 11 **2.)** 12 **3.)** 12 **4.)** 12 **5.)** 14 **(ft.)**

Reference bankfull widths: 1.) 14 2.) 16 3.) 13 4.) 13 5.) 14 **(ft.)**

Downstream

Pool present immediately downstream of structure: **yes** (**no**)
Pool depth at point of streamflow entry: — **(0.0 feet)**
Maximum pool depth: — **(0.0 feet)**
Downstream bank heights are substantially higher than upstream bank heights: **yes** (**no**)
Stepped footers: **yes** (**no**)
Hydraulic control type: **bedrock boulders cobble gravel sand wood other:** None
Distance from downstream end of bridge/arch to hydraulic control: None **(ft.)**
Evidence of streambed erosion or aggradation immediately downstream of bridge: **erosion aggradation** (**none**)
Downstream bankfull widths: 1.) 13 **2.)** 14 **3.)** 12 **4.)** 14 **5.)** 14 **(ft.)**

	Upstream	Downstream	In Structure
Dominant bed material at structure (use codes below)	1 2 (3) 4 5 6 UNK	1 2 (3) 4 5 6 UNK	1 2 (3) 4 5 6 UNK
Bedrock present	yes (no)	yes (no)	yes (no)
Sediment deposit types (circle all that apply)	(none) delta side point mid-channel	(none) delta side point mid-channel	none delta (side) point mid-channel
Elevation of sediment deposits is greater than or equal to ½ bankfull elevation	yes (no)	yes (no)	yes (no)
Beaver dam near structure Distance from structure to dam	yes (no) distance: ____ (ft.)	yes (no) distance: ____ (ft.)	**Bed Material Codes** **1** – bedrock **2** – boulder **3** – cobble **4** – gravel **5** – sand **6** – silt/clay **UNK** - unknown
Hard bank armoring	(intact) failing none UNK	(intact) failing none UNK	
Bank erosion	high low (none)	high low (none)	
Stream bank scour causing undermining around/under structure (circle all that apply)	(none) abutments footers wing walls	(none) abutments footers wing walls	

Wildlife Data (left/right bank determined facing downstream)	Upstream		Downstream		
	LEFT	**RIGHT**	**LEFT**	**RIGHT**	**Vegetation Type Codes** **C** – coniferous forest **D** – deciduous forest **M** – mixed forest **S** – shrub/sapling **H** – herbaceous/grass **B** – bare **R** – road embankment
Dominant vegetation type (use codes to the right)	M	M	M	M	
Does a band of shrub/forest vegetation that is at least 50' wide start within 25' of structure and extend 500' or more up/downstream?	yes (no)	(yes) no	yes (no)	yes (no)	

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

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

Spatial data collected with GPS: **yes** **no**

Photos taken: **yes** **no**
Please fill out photo log below

Comments/Drawings:

OLD CONCRETE SLAB BRIDGE

BLOCK ABUTS

MINOR ABUTMENT SCOUR

GOOD SHAPE

Folder Name:	**Structure Inlet**	**Structure Outlet**	**Above Structure**
Photo View - Upstream	3111 ☐	3113 ☐	3108 ☐
Photo View - Downstream	3110 ☐	3112 ☐	3109 ☐

Record the file name for each photo taken in the appropriate box

Crossing Type (from above): ☐ 1. ☒ 2. ☐ 3. ☐ 4. ☐ **Ford**

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)	8	4' 6"		
Downstream Dimensions (ft.)	8	4' 6"		

Length of stream through crossing (ft.): 12
Crossing Slope (%): 2 /.

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

Bridge/Arch Cell 2 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

Bridge/Arch Cell 3 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

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

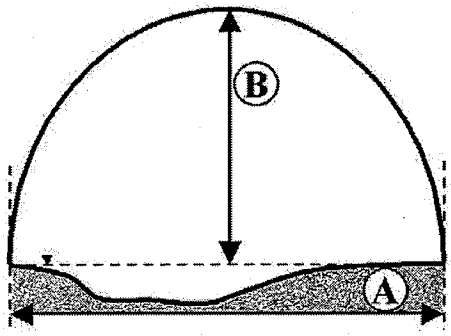
Bridge/Arch Cell 4 of _____

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4.

	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Upstream Dimensions (ft.)				
Downstream Dimensions (ft.)				

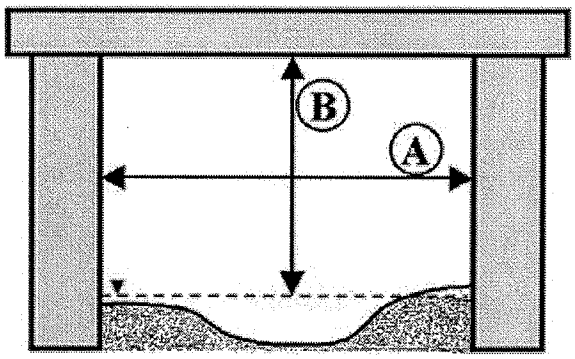
Length of stream through crossing (ft.): _____
Crossing Slope (%): _____

1.



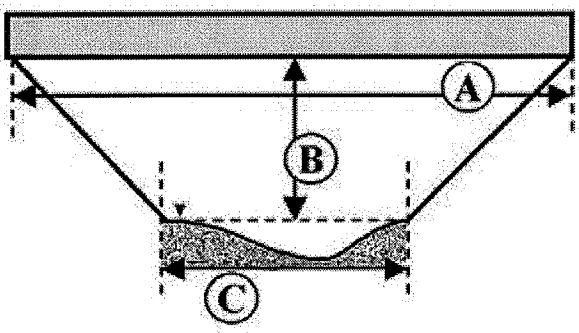
Open Bottom Arch

2.



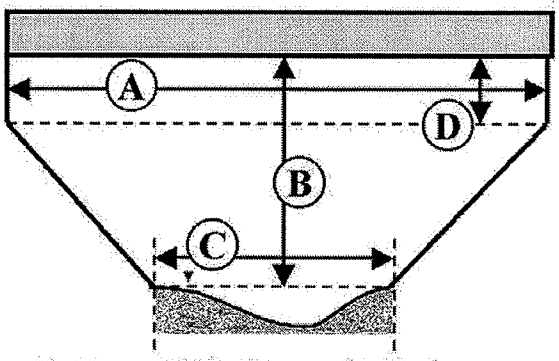
Bridge with Abutments

3.



Bridge with Side Slopes

4.



Bridge w/ Side Slopes & Abutments

ATTACHMENT E
CULVERT AND BRIDGE PHOTOGRAPHS

Black Brook Culverts and Bridges
Note: Photos are outlet on left and inlet on right

#	Reach	Road/Drive	Type	Span (ft)	Length (ft)	Notes
1	M01A	Private Pedestrian Walkway	Bridge	55	9	Timber with center pier on concrete


2	M01A	Railroad (abandoned)	Bridge	30	15	Old wood pilings piles


3	M01A	Union Avenue	Bridge	20	44	Modern concrete


4	M01A	Ped/Bike Path	Bridge	32	15	Old timber


5	M02A	Laconia Ice	Bridge	9	20	Old concrete slab


6	M02B	Blaisdell Avenue	Culvert	5	100	Concrete box


7	M02B	CVS Parking Lot	Culvert	6	200	Concrete box


8	M02B	Meredith Savings Bank Lot	Culvert Culvert	4 (x2) 5	385	Double corrugated steel outlet Concrete box culvert inlet


9	M02C	Hannaford Entrance Drive	Culvert	7	81	Elliptical corrugated steel


10	M02C	Wild Bird Depot Entrance	Culvert	4.2	64	Old smooth steel


11	M02C	Bank of NH Entrance Drive	Culvert	4.4	62	Old smooth steel


12	M02C	Electrical Substation	Culvert	5.3 (x2)	41	Double elliptical corrugated steel


13	M02C	Country Cooking Entrance	Culvert	5.6	52	Corrugated steel


14	M02C	Kelso Motors	Culvert	6.1 5.75	188	Corrugated steel vert ellipse outlet Corrugated steel arch at inlet


15	M02C	Lakeshore Road	Culvert	7	59	Corrugated steel ellipse


16	M02C	Walmart Entrance Drive	Culvert	6.9	95	Corrugated steel ellipse


17	M02E	Lakeshore Road	Culvert	3.3 (x2)	102	Double barrel concrete pipes


18	M02E	Rte 3	Culvert	6	190	Corrugated steel


19	M03A	Annis Drive	Culvert	4	33	Concrete box


20	M03A	Parking Lot and Upper Annis Drive	Culvert	4 4.9	200	Concrete box outlet Corrugated steel inlet


21	M03A	Mulberry Road	Culvert	4.9	81	Corrugated plastic


22	M03A	Bretton Road	Culvert	3.9	49	Corrugated plastic


23	M03B	Priv drive off Bretton	Bridge	8	12	Concrete slab on blocks


ATTACHMENT F
PROJECT CONCEPT SHEETS

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 1	**Description:** Replace Culverts with Larger Structures that Span the Channel	**Pg 1/2**

Location:
Multiple locations in Reach M02 and M03

Lat: **Long:**	**Reach ID: M02, M03** (from Geomorphic Assessment Report)

Map 1

Selected undersized culverts in Reach M02B that are candidate for replacement. All from Blaisdell Avenue upstream are undersized, in addition to those shown on map above.

Photo 1

Typical undersized culvert

Photo 2

Another typical undersized culvert:

Site Issues and Relevance to the Watershed Plan Objectives: Eighteen of the 23 culverts on Black Brook are smaller than the channel and this disrupt the flow of water and sediment and contribute to channel instability. While impacts may be localized, the shear number of culverts makes the impacts systemic.

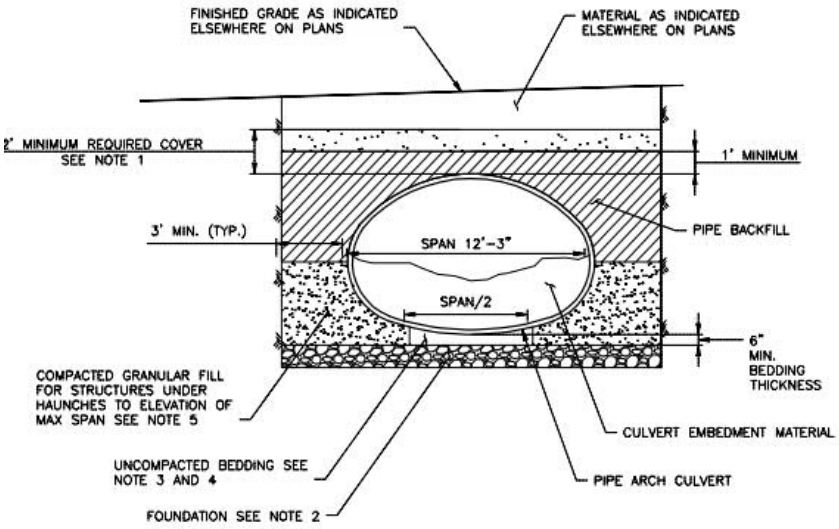
Field Assessment Date: 2015-2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General **Structural** Non-Structural

Project Type Specific ~~Bank stabilization~~ Wall Stabilization Dredging Stormwater Control **Culvert replacement** Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Replace culverts with aluminum pipe arches that are recessed below the channel with the channel bottom reconstructed inside. Tapered ends can be used to eliminate expense of concrete headwalls. Width of 12-14 is suitable for all locations.

Site/Project Sketch: (typical pipe arch culvert installation)



Considerations for Prioritization: Given the expense and number of culverts, this is best implemented on an ongoing basis as culverts fail and need to be replaced.

Estimated Eng/Permitting Cost Range *
<$10k **$10 - $20k** $20 - $40k
$40 - $60k $60 - $100k >$100k
other _____

Estimated Construction Cost Range *
~~<$10k~~ $10 - $20k $20 - $40k
$40 - $60k $60 - $100k >$100k
other _____

Additional Considerations and Notes: Grant funding (sponsored by Laconia or Gilford or others) may be available to help private land owners replace their culverts. Note that construction cost is for typical 2-lane drive. Municipal crossings, 3+ lane crossings, or need for guiderail will increase cost.

* The costs presented here are our opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 2	**Description:** Eliminate Culverts by Sharing Drives	**Pg 1/2**

Location: Electrical Substation/Country Cooking Restaurant in Reach M02C. Future developments upstream.

Lat: **Long:**	**Reach ID:** M02C (from Geomorphic Assessment Report)

Map 1

Electrical substation readily accessible from upstream restaurant

Map 2

Access to not-yet-developed lots further upstream can be via existing culverts or a new common culvert, if developers are encouraged and incentiviced to do so.

Photo 1

Country Kitchen culvert

Photo 2

Electrical substation dual culverts

Site Issues and Relevance to the Watershed Plan Objectives:

Every linear foot of culvert represents a linear foot of lost natural channel and functioning floodplain. Eliminating a typical entrance culvert would restore approximately 40 linear feet of channel and associated floodplain.

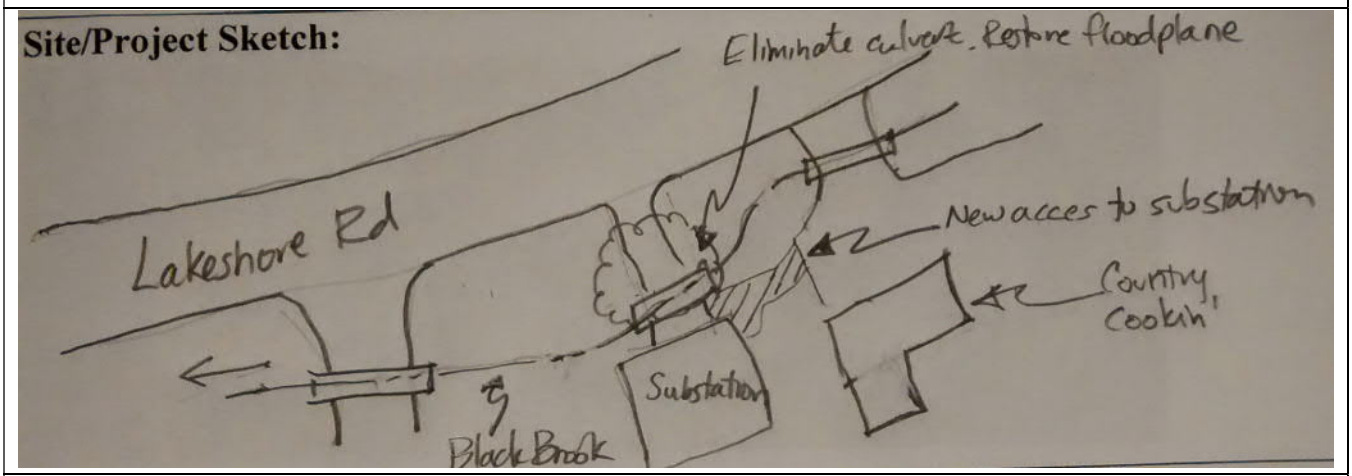
Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General (Structural) Non-Structural

Project Type Specific ~~Bank stabilization~~ Wall Stabilization Dredging Stormwater Control (Culvert replacement) Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Remove an existing culvert and restore the natural stream channel and floodplain. Construct improvements on the ground to allow convenient access to the site from the neighboring culvert that remains. Since substation traffic is certainly less than for the restaurant, initial design effort would focus on eliminating the substation culvert.

Site/Project Sketch:



Considerations for Prioritization:
Older culverts in poor condition, as well as proposed culverts to new developments should be highest priority because probability of success is higher.

Estimated Eng/Permitting Cost Range *
<$10k ($10 - $20k) $20 - $40k
$40 - $60k $60 - $100k >$100k

other includes legal fees

Estimated Construction Cost Range *
<$10k ($10 - $20k) $20 - $40k
$40 - $60k $60 - $100k >$100k

other _____

Additional Considerations and Notes:
There may be a role for the Laconia or Gilford or other entities to facilitate the easements between adjacent landowners. Particularly with aging culverts that need replacing, there is clear financial incentive for owners to collaborate, but unlikely to happen without assistance. The sharing of a culvert should be considered whenever a culvert is being replaced or a new one is proposed.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 3A	**Description: "**Daylight" the Brook by taking it out of pipes	**Pg 1/2**

Location: Annis Drive Loop under parking lot

Lat: **Long:**	**Reach ID: M02C, M03B** (from Geomorphic Assessment Report)

Annis Drive Loop. Restore stream (140 LF)and create floodplain on left bank

Site Issues and Relevance to the Watershed Plan Objectives:
Removing the pipes and restoring the channel and floodplain will allow high flows and sediment to spill out of the channel and deposit on the floodplain. Owner would lose use of west end of lot.

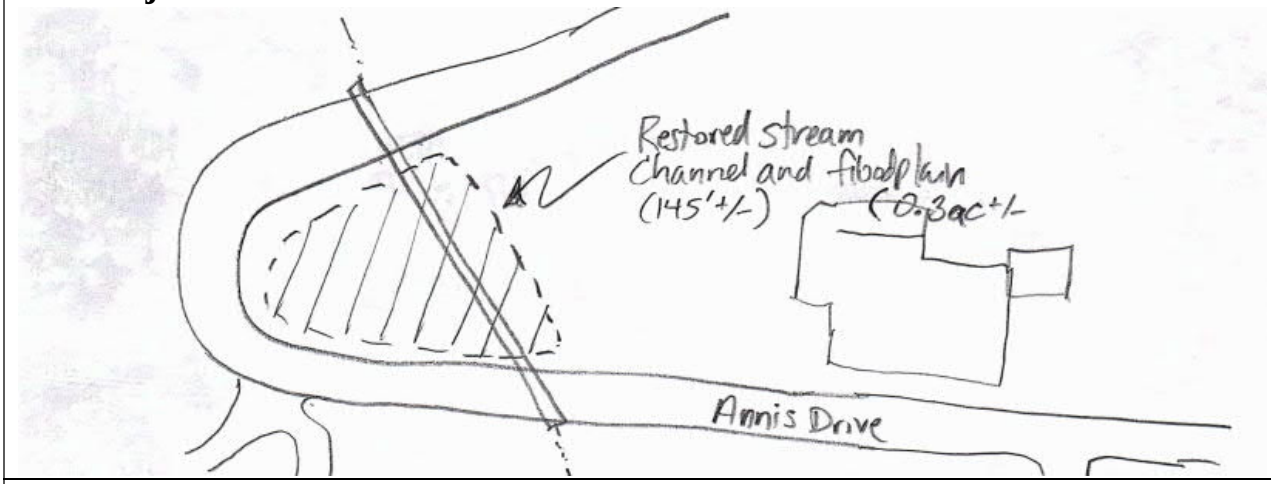
Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General (Structural) Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping (Restore Floodplain Access) Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Excavate to remove the pipe and construct a new stream channel. Create a new floodplain in the space available. Expand the excavated floodplain on the left of channel (west) into the grassy area to maximize restored area.

Site/Project Sketch:



Considerations for Prioritization:
Willingness of landowners should be a primary consideration for prioritization

Estimated ~~Eng/Permitting~~ Cost Range *
<$10k ($10 - $20k) $20 - $40k
$40 - $60k $60 - $100k >$100k

other _ _____

Estimated Construction Cost Range *
<~~$10k~~ $10 - $20k $20 - $40k
($40 - $60k) $60 - $100k >$100k

other _____

Additional Considerations and Notes: The area that would become stream and floodplain has value to the owners in its current state, and thus planners must think creatively how to create incentives for the projects to be constructed. The pipes at this site are relatively old and will take maintenance in the foreseeable future, which may provide the needed incentive.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 3B	**Description: "**Daylight" the Brook by taking it out of pipes	**Pg 1/2**

Location: Kelso Motors Frontage

Lat: **Long:**	**Reach ID: M02C** (from Geomorphic Assessment Report)

Kelso Motors Frontage. Restore stream (140 LF) leaving single entrance drive

Note failing pavement due to loss of underlying gravel into corroded culvert

Site Issues and Relevance to the Watershed Plan Objectives:
Removing the pipes and restoring the channel and floodplain will allow high flows and sediment to spill out of the channel and deposit on the floodplain. Owner would lose ability to park on top of pipe.

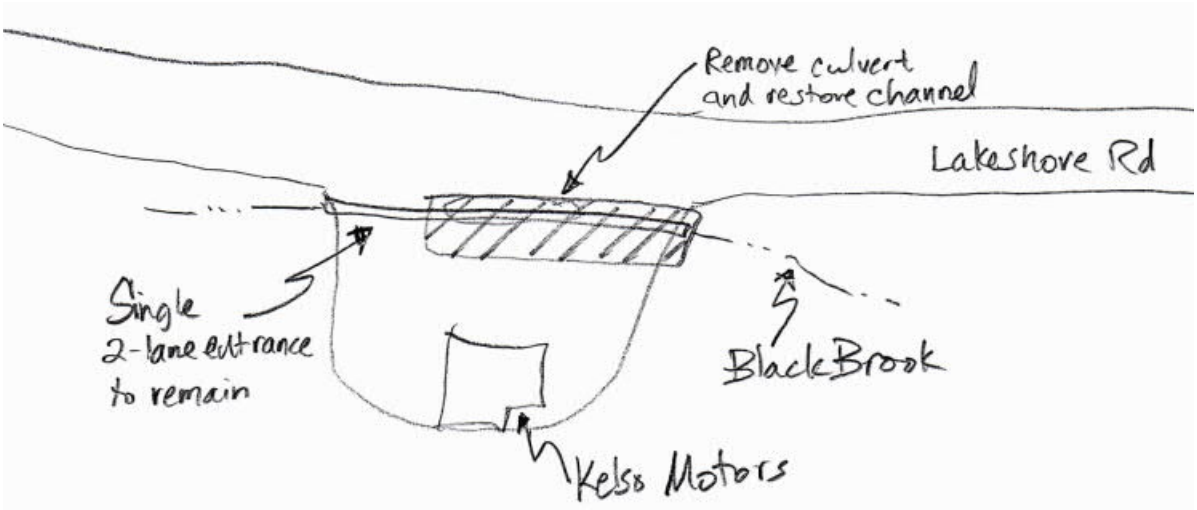
Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General Structural Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control ~~Culvert replacement~~ Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Excavate to remove the pipe, leaving enough (40'+/-) to maintain a 2-lane entrance. Construct new channel and floodplain. Space constraints will limit floodplain width. Pipe is in poor condition and inspection is needed to determine which portion to save.

Site/Project Sketch:



Considerations for Prioritization:
Willingness of landowners should be a primary consideration for prioritization

Estimated ~~Eng/Permitting~~ Cost Range *
<$10k $10 - $20k $20 - $40k
$40 - $60k $60 - $100k >$100k
other _ _____

Estimated Construction Cost Range *
~~<$10k~~ $10 - $20k $20 - $40k
$40 - $60k $60 - $100k >$100k
other _ _____

Additional Considerations and Notes: The area that would become stream and floodplain has value to the owners and thus planners must think creatively how to create incentives for the projects to be constructed. The pipes are old and will take maintenance in the near future. That may provide the incentive.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

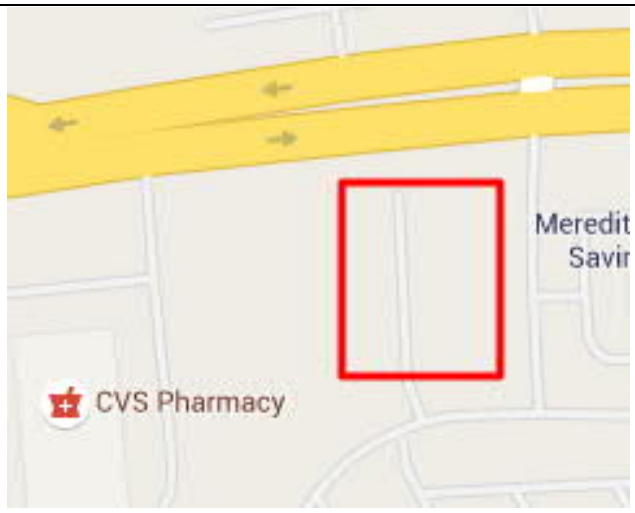
BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 3	**Description: "**Daylight" the Brook by taking it out of pipes	**Pg 1/2**

Location: Lowes Overflow Parking

Lat: **Long:**	**Reach ID: M02C** (from Geomorphic Assessment Report)

Lowes Overflow Parking. Restore stream (120 LF) and create floodplain and wetland



Site Issues and Relevance to the Watershed Plan Objectives:

Removing the pipes restores channel and floodplain that can absorb water and sediment reducing the burden on downstream reaches and Paugus Bay. .

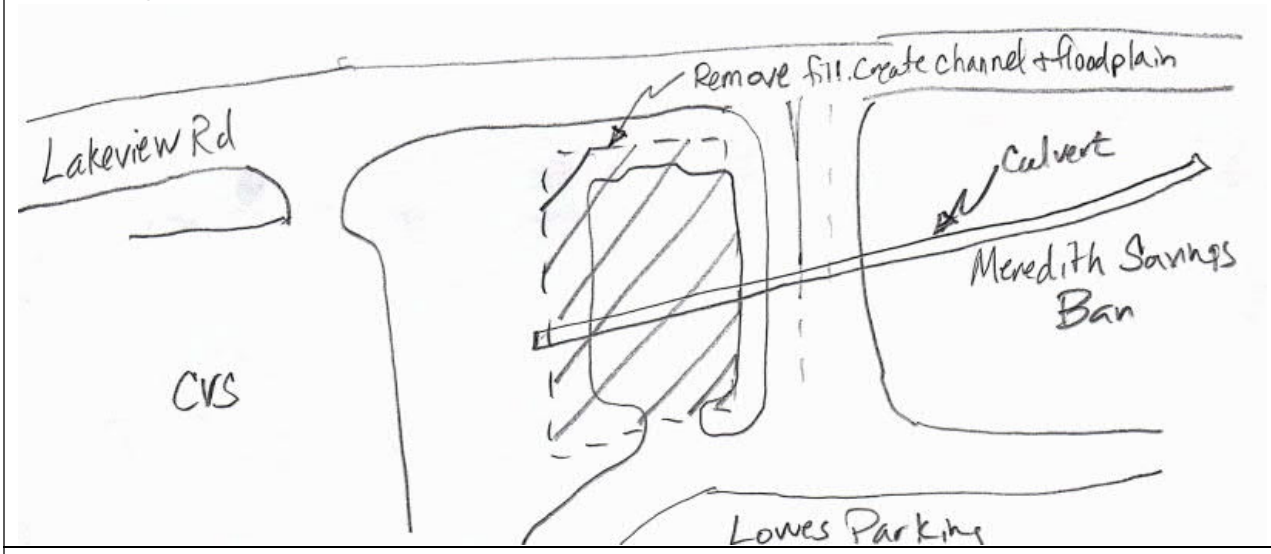
Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General (Structural) Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping (Restore Floodplain Access) Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Excavate to remove the pipe and construct a new stream channel. Create a new floodplain in the space available. At the Lowes site, create and expanded floodplain with wetland to provide flow attenuation.

Site/Project Sketch:



Considerations for Prioritization:
Willingness of landowners should be a primary consideration for prioritization

Estimated Eng/Permitting Cost Range * <$10k $10 - $20k ($20 - $40k) $40 - $60k $60 - $100k >$100k other _ _____

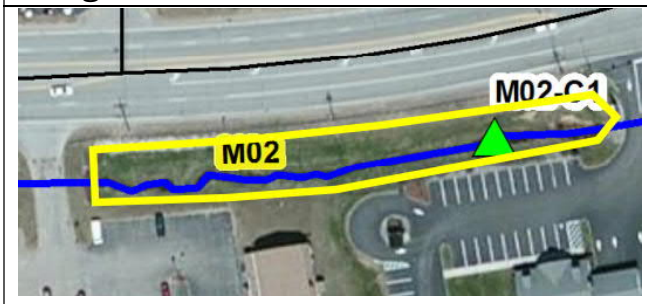
Estimated Construction Cost Range * <$10k $10 - $20k $20 - $40k $40 - $60k ($60 - $100k) >$100k other _ _____

Additional Considerations and Notes: The area that would become stream and floodplain has value to the owners and thus planners must think creatively how to create incentives for the projects to be constructed. At this site, conditioning future development on the daylighting may be one approach.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 4A	**Description:** Revegetate to Improve Floodplain Function	**Pg 1/2**
Location: Bank of New Hampshire		
Lat: **Long:**	**Reach ID: M02C** (from Geomorphic Assessment Report)	



Site Issues and Relevance to the Watershed Plan Objectives:
There is floodplain at the site, but without vegetation it is not as effective as it could be at reducing flood velocity and trapping sediment. Further, the banks are more prone to erosion without vegetation. Tax maps suggest downstream portion of mowed floodplain owned by downstream building owner, though that owner says it is owned by the bank.

Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General Structural Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):

Plant the banks and floodplain densely with riparian shrubs. Bare root stock is acceptable. Incorporate larger specimen trees for aesthetics. Extend planting to downstream culvert.

Site/Project Sketch:

Considerations for Prioritization:

These projects are relatively inexpensive, non-controversial, and effective, and thus should be made a high priority.

Estimated Eng/Permitting Cost Range *

<$10k $10 - $20k $20 - $40k $40 - $60k $60 - $100k >$100k

other _ _____

Estimated Construction Cost Range *

<$10k $10 - $20k $20 - $40k $40 - $60k $60 - $100k >$100k

other _____

Additional Considerations and Notes:

The planting plan will need to consider aesthetics and concerns about tall vegetation reducing sight lines to the building.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 4	**Description:** Revegetate to Improve Floodplain Function	**Pg 1/2**

Location: Upstream of Bypass

Lat: **Long:**	**Reach ID: M02E** (from Geomorphic Assessment Report)
 Reach M02E just upstream of the Bypass	
 Unvegetated right bank in Reach M02E	

Site Issues and Relevance to the Watershed Plan Objectives:
There is floodplain at the site, but without vegetation it is not as effective as it could be at reducing flood velocity and trapping sediment. Further, the banks are more prone to erosion without vegetation.

Field Assessment Date:	**Assessed by:**	**Pg 2/2**

Project Type General Structural Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Plant the banks and floodplain densely with riparian shrubs. Bare root stock is acceptable.

Site/Project Sketch:

Considerations for Prioritization:
These projects are relatively inexpensive, non-controversial, and effective, and thus should be made a high priority.

Estimated Eng/Permitting Cost Range * **Estimated Construction Cost Range ***

<$10k $10 - $20k $20 - $40k <$10k $10 - $20k $20 - $40k
$40 - $60k $60 - $100k >$100k $40 - $60k $60 - $100k >$100k

other _____ other _ _____

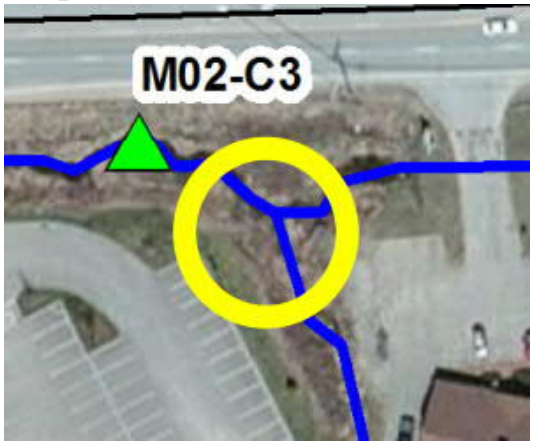
Additional Considerations and Notes:
Some additional channel widening is likely, and a relatively wide planted buffer on the right bank (e.g., 60') would be desirable.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT CONCEPT SHEET

Project ID #: 5	**Description:** Remove pockets of fill to Restore Floodplain	**Pg 1/2**

Location: Multiple locations. A) Right bank just downstream of crossing under Lakeshore Road, B) Hannafords near where tributary joins.

Lat: **Long:**	**Reach ID:** M02C (from Geomorphic Assessment Report)
Map  **1**	**Map 2** 

Site Issues and Relevance to the Watershed Plan Objectives:
There are local pockets of excess fill into the floodplain that can be removed with no loss of site function to the owners. The amount of floodplain restored is relatively small, but cumulatively the benefit can become significant.

Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

Project Type General Structural Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):
Remove fill that was placed in the floodplain but serves no purpose. Seed and plant disturbed area.

Site/Project Sketch:

Considerations for Prioritization:
These are inexpensive non-controversial projects. While the benefit is modest, they can be effective for building momentum toward larger projects. Landowner willingness should be assessed.

Estimated Eng/Permitting Cost Range * **Estimated Construction Cost Range ***

<$10k $10 - $20k $20 - $40k $40 - $60k $60 - $100k >$100k other _____

<$10k $10 - $20k $20 - $40k $40 - $60k $60 - $100k >$100k other _____

Additional Considerations and Notes:

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.

BLACK BROOK WATERSHED PLAN
PROJECT DETAIL SHEET

Project ID #: 6	**Description: Actively stabilize channel**	**Pg 1/2**

Location: Between Annis Drive and the Bypass

Lat: **Long:**	**Reach ID: M03A** (from Geomorphic Assessment Report)

Incised channel with continuously failing banks

Site Issues and Relevance to the Watershed Plan Objectives:

This site is a persistent source of sediment and will be until it has widened sufficiently to build a new floodplain at a lower elevation. By mechanically removing some bank material, we can prevent the ongoing erosion.

Field Assessment Date: March 2016	**Assessed by:** MTM	**Pg 2/2**

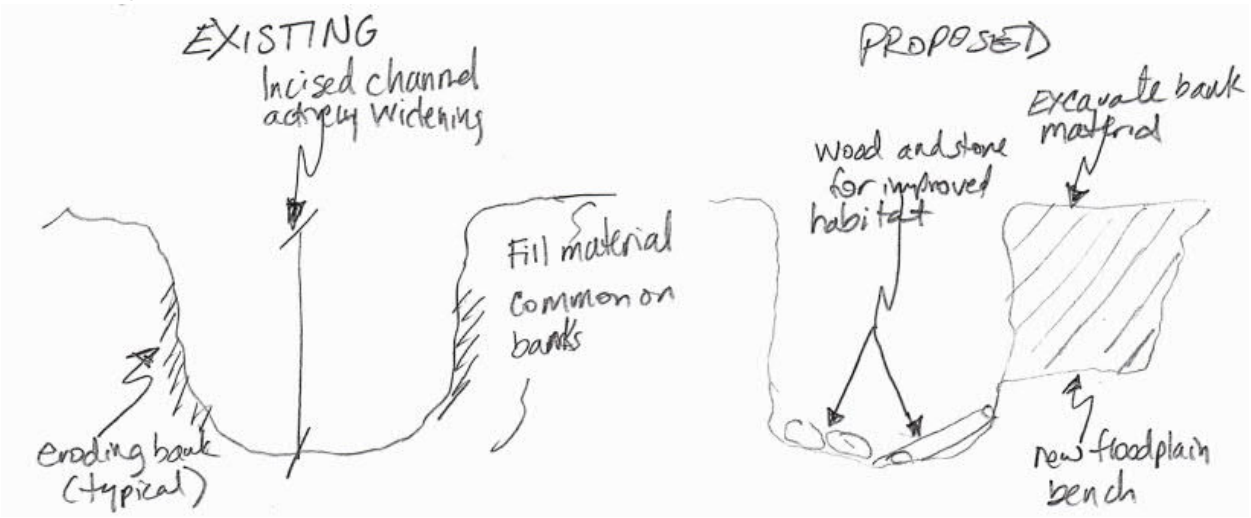
Project Type General Structural Non-Structural

Project Type Specific Bank stabilization Wall Stabilization Dredging Stormwater Control Culvert replacement Landowner Outreach FEH Zone Mapping Restore Floodplain Access Easements Riparian Plantings Other _____

Project Narrative Description (up/downstream limits, banks(s), etc):

Excavate banks to create floodplain at appropriate elevation. Seed and densely plant exposed banks.

Site/Project Sketch:



Considerations for Prioritization:

Estimated Eng/Permitting Cost Range *

<$10k $10 - $20k ~~$20 - $40k~~

$40 - $60k $60 - $100k >$100k

other _____

Estimated Construction Cost Range *

<$10k $10 - ~~$20k~~ $20 - $40k

$40 - $60k ~~$60 - $100k~~ >$100k

other _____

Additional Considerations and Notes:

Detailed site investigation required, including topographic survey. Reasonably detailed plans will be necessary for permitting.

* The costs presented here are D&K's opinion of probable cost based solely on field observations, the conceptual project descriptions presented above, and professional judgment informed by experience with similar projects. Unforeseen conditions encountered during preliminary or final design could significantly change these estimates.