Stantec Consulting Services Inc.
30 Park Drive, Topsham ME 04086-1737

October 28, 2016
File: 195601214

Attention: Forrest Bell
FB Environmental Associates
97A Exchange Street, Suite 305
Portland, ME 04101

Dear Forrest,

Reference: Mare Brook Watershed Assessment and Community Engagement Project – Summary and Recommendations Based On Fish Passage Assessment, Geomorphic Assessment, and Riparian Habitat Assessment Studies

Stantec Consulting Services Inc. (Stantec) performed the fish passage, geomorphic, and riparian habitat assessment components as part of the Mare Brook Watershed Assessment and Community Engagement Project (Project). The Project is being performed on behalf of the Town of Brunswick, Maine (Town), and Stantec is subcontracted to FB Environmental Associates (FB) to prepare studies for the three referenced components of the Project. This letter summarizes information presented in the fish passage, geomorphic, and riparian habitat assessment reports prepared by Stantec along with recommendations for potential future actions.

The following sections of this letter includes summaries from each of the reports and associated recommendations.

FISH PASSAGE ASSESSMENT REPORT

Stantec prepared the report titled "Fish Passage Assessment Report – Mare Brook Culverts" dated October 25, 2016, which documents a preliminary fish passage assessment of 13 culverts and 2 dams on Mare Brook and Merriconeag Stream. The objective of the preliminary fish passage assessment was to evaluate continuity of aquatic habitat in Mare Brook and Merriconeag Stream. The focus of the report was on upstream passage at culverts and other identified structures.

Six of the 11 evaluated stream crossings and Coffin Pond Dam on Mare Brook were rated as "not passable" for upstream passage of the target fish species and life stage (adult brook trout). The remaining 5 stream crossings on Mare Brook were rated as "good" for upstream passage. Based on these findings, it is concluded that the evaluated sites substantially limit upstream movement of that target species and life stage in Mare Brook.

The evaluated stream crossings at Beaver Pond Road and Purinton Road on Merriconeag Stream were rated as "not passable" and "poor", respectively, and upstream fish passage is not available at Picnic Pond Dam. Similar to the evaluated conditions on Mare Brook, it is concluded that the evaluated sites substantially limit upstream movement of that target species and life stage in Merriconeag Stream.

Reference: Mare Brook Watershed Assessment and Community Engagement Project – Summary and Recommendations Based On Fish Passage Assessment, Geomorphic Assessment, and Riparian Habitat Assessment Studies

Replacement of the existing culverts with culverts or bridges that are designed to provide for upstream passage appears to be practical at most of the study sites on Mare Brook and Merriconeag Stream, including those sites where upstream passage was rated as "not passable", "poor", and "good". Replacement in-kind is not recommended at any of the evaluated sites except for the Samuel Adams Drive culvert. While upstream fish passage at the Samuel Adams Drive culvert was rated as "good" and not "very good", the lower rating was assigned based on the potential for debris accumulation on the culvert inlet debris gate and can be addressed by regular maintenance.

Additional study is recommended for evaluation of potential approaches to improving upstream fish passage at the Runway Culvert on Mare Brook. As described in Section 2.1.10 of the Fish Passage Assessment Report, behavioral factors may prevent upstream fish passage even with suitable hydraulic conditions through this culvert. Additional study is also recommended for evaluation of potential approaches to improving upstream fish passage at the Beaver Pond Road stream crossing on Merriconeag Stream. The suggested focus of this study is whether the existing stream crossing is hydraulically adequate to convey high flows in Merriconeag Stream given that the existing culvert inlet is not visible and may be occluded by debris.

Coffin Pond Dam on Mare Brook and Picnic Pond Dam on Merriconeag Stream are both barriers to upstream fish passage. Potential actions to improve upstream fish passage at these sites include installation of upstream fish passes and dam removal. Addition study is recommended at both dams, including dam condition assessments.

GEOMORPHIC ASSESSMENT REPORT

Stantec prepared the report titled "Mare Brook Geomorphic Assessment" dated October 25, 2016, which documents sediment sources and channel stability problems linked to processes influenced by land and river management activities along Mare Brook and Merriconeag Stream. Stantec performed a reconnaissance-level assessment of geomorphic conditions as a subcontractor to FB Environmental as part of the Project.

Four of the 10 assessed reaches of Mare Brook were assigned a "stable" rating, one was assigned a "stable to moderately unstable" rating, two were assigned a "moderately unstable" rating, one was assigned a "moderately unstable to unstable" rating, and two were assigned an "unstable" rating. Both assessed reaches of Merriconeag Stream were assigned a "stable" rating.

Excessive sediment loading, stream channel alteration, and stream crossings are all major stressors to the geomorphic condition in Mare Brook and Merriconeag Stream. Debris jams are also a stressor, though the effects caused by debris jams tend to be more localized.

Reference: Mare Brook Watershed Assessment and Community Engagement Project – Summary and Recommendations Based On Fish Passage Assessment, Geomorphic Assessment, and Riparian Habitat Assessment Studies

To preserve and enhance the geomorphic condition within the stream corridors, we provide the following recommendations:

- Maintain riparian buffers – Encourage landowners to maintain forested habitat between the streams and their homes and yards. Riparian buffers provide protection to the stream system through nutrient and sediment filtering, attenuation of flood flow and sheet flow, and visual and noise buffers for wildlife.
- Culvert replacement or removal – Replace undersized culverts and culverts with perched inlets with adequately sized culverts installed at flatter slope. Remove debris grates and debris from culverts to allow natural sediment transport processes to occur. Remove stream crossings that are redundant and may not be required to remain. Additional study is recommended to assess culvert hydraulics and flood routing through the Mare Brook and Merriconeag Stream watersheds. Note that some channel adjustment may occur due to culvert replacement or removal.
- The Mare Brook culvert under Brunswick Executive Airport was noted to be discharging extensive amounts of sand. The source of this sediment was not determined. Additional study of culvert condition and an assessment of culvert replacement verses relocation of the stream channel around the airport runway is recommended.
- Stormwater filtration – Utilize stormwater "best management practices" (BMPs) to decrease sediment loading from stormwater outfalls. BMPs may include development biofiltration systems along roadside curbs, development of vegetated wetland filtration systems at stormwater outfalls, installation and maintenance of solids separators in the stormwater systems, stormwater infiltration systems, and replacement of leaking stormwater drains. Additional study of the stormwater drainage system is recommended.
- Dam removal – Remove barriers to sediment transport, such as Coffin Pond Dam and Picnic Pond Dam, that affect sediment transport processes within Mare Brook and Merriconeag Stream. Additional study of dam condition and potential for removal is recommended.
- Stream channel re-meandering and stabilization – Segments of stream channel that have been historically straightened and/or cut off from adjacent floodplain habitat could be re-meandered and reconnected to adjacent floodplain habitat to reduce shear stress on stream bed and banks and allow for sediment sorting and deposition within the riparian flood plain habitat.

RIPARIAN HABITAT ASSESSMENT REPORT

Stantec prepared the report titled "Riparian Habitat Assessment Report" dated October 27, 2016, which provides an assessment of the riparian habitat adjacent to and within the floodplain of Mare Brook and Merriconeag Stream.

Reference: Mare Brook Watershed Assessment and Community Engagement Project – Summary and Recommendations Based On Fish Passage Assessment, Geomorphic Assessment, and Riparian Habitat Assessment Studies

Stantec identified a variety of habitat types and conditions as part of the reconnaissance-level assessment of riparian habitat within the Mare Brook and Merriconeag Stream riparian corridor. Wetland types ranged from forested wetlands to impounded open bodies of water, and riparian habitat varied from intact floodplain forest to areas heavily disturbed by human development. The majority of the stream corridors contain riparian vegetation that provides stability and protection to the systems, although the density and diversity of riparian vegetation is variable in the survey area.

To preserve and enhance the riparian habitat within the stream corridors, we provide the following recommendations:

- Maintain riparian buffers – Encourage landowners to maintain forested habitat between the streams and their homes and yards. Riparian buffers provide protection to the stream system through nutrient and sediment filtering, attenuation of flood flow and sheet flow, and visual and noise buffers for wildlife.
- Encourage reduction in use of pesticides and fertilizers – Pesticides and fertilizers used in close proximity to riparian habitats can have a negative effect on both plant and animal species. Use of organic lawn care methods and avoiding chemical fertilizers and pesticides reduces the stress on riparian habitat.
- Invasive species control – Both the Mare Brook and Merriconeag Stream corridors contained extensive invasive plant species. Invasive plant species are disruptive to native species, provide poor wildlife food, and are visually and aesthetically unappealing. Control of these species would improve the quality of the riparian habitat.
- Trash cleanup – Cleaning up trash and debris from within the stream corridors would be a simple method of improving riparian habitat within these stream corridors.

SUMMARY

Findings and recommendations associated with the fish passage, geomorphic, and riparian habitat assessment components of the Project are inherently interrelated. The findings of these studies indicate that anthropogenic influences, such as the evaluated culverts, have altered geomorphic and riparian conditions in and along Mare Brook and Merriconeag Stream. Therefore, it is expected that alteration of anthropogenic features, such as failure or replacement of a given culvert, would likely influence changes geomorphic and riparian processes and associated habitats in and adjacent to the study waterways. Potential actions in and along the study waterways should, therefore, include consideration of multiple factors when evaluating potential opportunities to improve the functions of Mare Brook and Merriconeag Stream.

Reference: Mare Brook Watershed Assessment and Community Engagement Project – Summary and Recommendations Based On Fish Passage Assessment, Geomorphic Assessment, and Riparian Habitat Assessment Studies

Stantec appreciates the opportunity to have assisted FB and the Town as part of the Mare Brook Watershed Assessment and Community Engagement Project. Please do not hesitate to contact Stantec if we can further assist you.

Regards,

STANTEC CONSULTING SERVICES INC.

Michael R. Chelminski, P.E.
Principal, Environmental Services
Phone: (207) 406-5489
Fax: (207) 729-2715
michael.chelminski@stantec.com

Attachments: Fish Passage Assessment Report – Mare Brook Culverts
Mare Brook Geomorphic Assessment
Riparian Habitat Assessment Report