Fitzgerald Environmental Associates, LLC.

Applied Watershed Science & Ecology

MEMORANDUM

To: Kerry O'Brien**,** Caledonia County Natural Resources Conservation District

From: Evan Fitzgerald and Joe Bartlett

Re: Stormwater Master Planning Library - Lyndon, VT

Date: February 21, 2017

We have gathered and reviewed information and documentation related to stormwater runoff and watershed management in the Town of Lyndon as it pertains to the Lyndon Stormwater Master Plan (SWMP). Below is a summary of available data, mapping, and documentation at the local, state, and federal level. Much of this information is from previously completed studies in Lyndon, but also includes sites discussed during a SWMP steering committee meeting on September 28th, 2016. Other potential sources of data and data gaps are also addressed. A map with relevant data is attached for reference.

Local Data

Town/Village Ordinances

The Village of Lyndonville ordinances do not include any regulation of stormwater or runoff (Village of Lyndonville, 2016). The Town ordinances specify that no stormwater, including rooftop runoff may be discharged to the public sanitary sewer system. "Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as combined sewers or storm sewers, or to a natural outlet approved by the Superintendent." The Town ordinances also have requirements to minimize road and ditch erosion along new gravel roads. Any new road requires properly headed culverts with a minimum diameter of 15 inches and all exposed banks must be immediately topsoiled, seeded, and mulched (Town of Lyndon, 2016).

Lyndon Town Plan

The Lyndon Town Plan does not focus on stormwater issues but does list several best management strategies that may be explored for future action (Lyndon Town Planning Commission, 2014).

- Improvement of ineffective stormwater treatment systems and the "management of stormwater runoff, especially at the point of origin" are listed as primary strategies for public facilities and services.
- "Amend the Town's zoning and subdivision regulations to include standards that minimize the amount of clearing and impervious coverage created from development, and that avoids impacts to wetlands and steep slopes (slopes greater than 20%)"
- Installation of appropriately sized culverts.
- Implementation of vegetated buffers along surface waters.

The Town completed a combined sewer overflow (CSO) project in the 1990's and found the system to be in relatively good condition. The Vermont Agency of Natural Resources (VTANR) recently completed a stormwater infrastructure mapping project to provide a detailed inventory of all stormwater infrastructure within the Town and prioritize future stormwater treatment efforts (described below).

Flood resiliency is a primary focus of the Town plan, likely in response to four (4) flood events that have approximated or exceeded the 100-year flood since 2000. The 100-year floodplain is defined by a detailed FEMA Flood Insurance Study for most of the major waterways in Lyndon. This data was collected in 1977 and updated 1988. Six disaster declarations from 2002 to 2014 have resulted in over $400,000 in FEMA recovery payments to the Town and Village. Lyndon and Lyndonville are members of the National Flood Insurance Program and the Town has enacted bylaws that regulate development within the mapped special flood hazard areas. The Town and Village are preparing updated Local Hazard Mitigation Plans which will complete the requirement of four hazard mitigation measures to qualify for ERAF disaster recovery funding.

The landscape setting of the Town of Lyndon makes it particularly susceptible to flooding. The Town is built within the large flat floodplain of several major rivers and streams. The relatively low slope of the Passumpsic River flowing to the south has led to significant flooding of built infrastructure. The relatively low proportion of impervious cover within the Town and in the larger Passumpsic and tributary watersheds suggests that stormwater runoff within the Town is not likely to be a significant contributor to flood levels in major storm events, however stormwater may play an important role in localized small storm events and is an important water quality consideration. The Town recognizes the importance of partnering with upstream towns to protect and improve floodplain.

VOBCIT Culvert Inventory

CCNRCD funded a bridge and culvert inventory (VOBCIT) for all structures on Town maintained roads. The study was completed in 2008 by a team of student interns. A total of 1,270 culverts and 17 bridges were included in the inventory. This assessment found 97 culverts that were rated as having an overall condition of poor, urgent, or critical. They also found that 201 of the culverts have a diameter less than 15 inches, suggesting that these should be replaced with a larger structure.

Lyndon Steering Committee Meeting

Evan Fitzgerald attended a steering committee meeting with representatives from the Village of Lyndonville, the Town of Lyndon, VTDEC, and CCNRCD to discuss specific stormwater concerns within the project area on September 28th, 2016. The Village and Town road foremen identified several areas of problematic runoff and erosion, and these areas noted on a large map during the meeting. Kerry O'Brien, Ben Copans, and Evan Fitzgerald made some field visits to follow up on a few sites east of the Village area after the meeting. The stormwater problem areas discussed during the meeting are shown on the attached map. One site off the end of South Prospect Street has a large gully created by runoff (see photograph to right).

Gully south of South Prospect Street, Lyndon, VT

State/Federal Data and Plans

Tactical Basin Plan

The Passumpsic River and Upper Connecticut River Tactical Basin Plan prepared by VTDEC lists many important watershed management and stormwater assessments that have been completed or are underway for the surface waters within the Town of Lyndon (VTDEC, 2014a). An illicit discharge detection study and this stormwater master planning document are the two remaining planning tools to complete for the Town. Recommendations listed in Objective 2 in the Tactical Plan Implementation Table are aimed at reducing flooding within the Village of Lyndonville.

- Improve river corridor and floodplain protections.
- Complete Phase 1 and targeted Phase 2 assessments.
- Meet with Towns to discuss updating zoning bylaws to address erosion hazards.
- Complete priority river corridor protection and buffer planting projects described in completed river corridor plans.
- Finalize hazard mitigation plans for Lyndon and upstream towns.
- Support implementation of mitigation measures listed in the hazard mitigation plans.
- Support Low Impact Development standards and the use of Green Stormwater Infrastructure in the watershed.
- Protect upstream wetlands and floodplains.

River Corridor Plans

River Corridor Plans have been completed in the Town of Lyndon by CCNRCD and Fitzgerald Environmental Associates (FEA). These include portions of East Branch Passumpsic (CCNRCD), West Branch Passumpsic (FEA), Millers Run (CCNRCD), Sheldon Brook (FEA), and Wheelock Brook (FEA). Phase 1 stream geomorphic assessments have been completed for the Passumpsic River mainstem, and numerous tributaries to Sheldon and Wheelock Brooks. Several background themes relevant to stormwater master planning are covered in the river corridor plans (O' Brien, 2009a; O'Brien, 2009b; FEA, 2010; FEA, 2014).

Flood History

The United States Geological Survey (USGS) operates real-time flow monitoring gages in the Passumpsic River watershed. These gages provide a valuable record of flood magnitude and frequency. Several recorded floods are noteworthy and correspond to significant damages in the Town of Lyndon. The 1973, 2002, and 2011 (T.S. Irene) floods were the largest on record on the East Branch Passumpsic River. The 1973 and 2002 floods caused significant damage in Lyndon, particularly near the confluence of the East Branch, West Branch, and Millers Run. Stream gages on Pope Brook (North Danville) and the Sleepers River (St. Johnsbury) did not record major floods in 2002 but had historic floods in May of 2011 and significant floods during T.S. Irene. These records highlight the importance of flooding caused by both widespread rainfall (T.S. Irene) and from localized heavy rains (May 2011).

Biological Monitoring

The River Corridor Plans summarize VTDEC biomonitoring data for macroinvertebrate communities within the study watersheds. Recent sampling along the Passumpsic River, West Branch, and Millers Run all

indicate Very Good to Excellent community assessments. Samples collected from 1987 to 1996 indicate excellent community assessments along the East Branch and a poor/moderate community on Millers Run.

Stormwater Mitigation Projects

The corridor plans include an analysis of stressors on the hydrologic and sediment regimes of the study watersheds and a list of potential projects to address these stressors. The projects within a river corridor plan cover a wide range of active restoration options (bridge replacement, channel restoration, armor repair, etc.) and passive restoration options (conservation, buffer planting, etc.). Typically, a subset of these projects is directly aimed at mitigating stormwater impacts on the receiving streams. Table 1 lists the stormwater projects within the Town of Lyndon, as described in the Passumpsic Tributaries and the Millers Run river corridor plans (shown on the attached map).

Table 1: Stormwater projects identified in the Passumpsic River Tributaries and Millers Run River Corridor Plans.

Project	Project Type	Location	Description
57	Gully Stabilization, Ditch Stabilization, and Stormwater Treatment	New Boston Rd	Runoff from the New Boston Road ditch has carved a gully into the streambank leading directly in to Sheldon Brook. The steep ditch is also a major source of sediment.
62	Gully Stabilization and Stormwater Treatment	Hayfield near Simpson Drive	A natural flow path draining a large hayfield has carved a large gully into the forested valley wall draining to Sheldon Brook.
74	Buffer Planting and Bioretention	Kingdom Hall of Jehovah's Witnesses	Runoff from the parking lot sheet flows to a narrow vegetated buffer adjacent to Wheelock Brook.
83	Stormwater Treatment and Ditch Stabilization	Couture Flats at South Wheelock Rd	Runoff from the Couture Flats Rd ditch is carrying a large volume of sediment that has filled the swale across a small hayfield before flowing in to Wheelock Brook.
*	Stormwater Runoff	Hubbard Hill Rd	Three stormwater inputs were mapped near the Hubbard Hill Bridge and stormwater runoff and associated nutrient loading is a concern with the adjacent farm.

*denotes a project listed in the Millers Run River Corridor Plan without a number (CCNRCD, 2009)

<u>VTDEC Stormwater Infrastructure Mapping Project</u>

VTDEC completed a full inventory and mapping study of stormwater infrastructure within the Town of Lyndon (VTDEC, 2014b). These studies are being carried out for municipalities across the state and assist with optimizing infrastructure functionality. The maps produced by this study are important tools for identifying outfalls and other drainage features that directly convey untreated stormwater into surface waters. The associated watershed draining to each outfall can be used to estimate pollutant loads from the landscape. The report includes watershed imperviousness and estimated pollutant loads for the 99 mapped outfall subwatersheds within the town. A total of nine (9) subwatersheds were prioritized for

stormwater mitigation and were ranked based on the feasibility of stormwater treatment implementation and the potential pollutant reductions (Table 2 and attached map).

Table 2: Action list for priority stormwater treatment sites identified in the Lyndon Stormwater Infrastructure Mapping Project.

Drainage ID	Priority	Location	Description
23	High	Gus' Run at Whipple Hill Drive	Bioretention to treat runoff from a large (442 acre) watershed
9	High	406 Broad St	Bioretention or infiltration basin to treat runoff from an 8 acre watershed that is 55% impervious
60	High	Lower Campus Drive	Bioretention or wet pond at culvert outfall to treat runoff from a 7.7 acre watershed (59% impervious)
17	High	White Market parking lot	Bioretention along parking lot to treat runoff from a 2.3 acre watershed (67% impervious)
58	High	Poland/Rogers Hall Lyndon State College	Bioretention or wet pond at culvert outfall to treat runoff from a 1.4 acre watershed (59% impervious)
6	Medium	Angies Alley and Pinehurst St	Extended detention basin and upgrade wet pond to treat runoff from a 95.4 acre watershed (35% impervious)
2	Medium	Powers Park	Infiltration basin treating runoff from a small watershed with 78% impervious cover
5	Low	South St	Extended detention basin treating runoff from a 37 acre watershed (36% impervious)
4	Low	Park St	Infiltration basin or underground storage to treat runoff at culvert outfall for a 17 acre watershed (57% impervious).

VTDEC Hydrologically Connected Road Segment Data

VTDEC created a statewide inventory of roads that are likely to be hydrologically connected to surface waters. The road network was split into 100m segments and then checked for proximity to surface waters and river corridors. Variables including road slope, adjacent hill slope, and soil erodibility were used to create a preliminary "road erosion risk rank". These ranking provide a good starting point for identifying areas of potential sediment generation from erosion of road surfaces and ditches. Road erosion risks are predicted to be low within the Village; moderate and high risk segments become more prevalent along gravel roads in the steeper portions of the town (see attached map).

Data Gaps

The watershed library describes the available documents, reports, and datasets that characterize stormwater and flooding concerns within the Town of Lyndon. Limited geomorphic field data is available for the Passumpsic River main stem through Lyndon. This section is not appropriate for Phase 2 SGA due to the level of impoundment from downstream dams; however, additional data collection for stormwater concerns would be beneficial. Updated FEMA FIS data would be useful for improving hazard mitigation efforts and will be critical for siting and sizing stormwater treatment systems that are within the 100-year

floodplain. Biomonitoring data is relatively sparse for the town and additional sampling effort in smaller streams that are impacted by sedimentation from dirt roads would be helpful for tracking improvements over time. LiDAR elevation data would be extremely helpful for stormwater planning and development of conceptual designs. LiDAR data is currently under development for this portion of Caledonia County, and is expected to be available through VCGI sometime in late 2017 or 2018.

Literature Cited

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