

## Memorandum

To: Joe Zingale, Town of Rutland

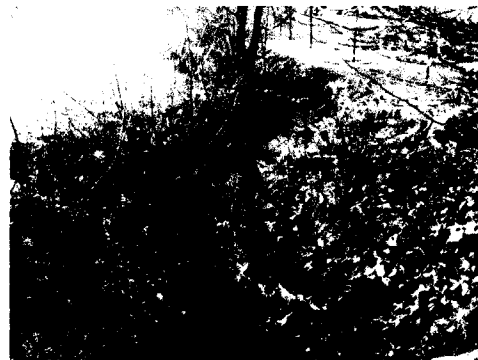
From: Andres Torizzo, CPESC, CPSWQ

Date: 6/30/2014

Re: **Town of Rutland MS4 Flow Restoration Plan Development Study: *Proposed Retrofit Plan***

Dear Joe,

Watershed Consulting Associates, LLC (WCA) has summarized our findings and design recommendations for three proposed stormwater BMPs and one retrofit in the Moon Brook impaired watershed (Figure 1), in completion of the Moon Brook Flow Restoration Plan (FRP) Development Study for Rutland Town. Completion of this project involved an assessment of the State of Vermont Best Management Practice Decision Support System (BMPDSS) models for the watershed, determination of Rutland Town's current TMDL flow target allocation, identification and screening of proposed BMPs to treat primarily Rutland Town's impervious, and evaluation of the proposed BMPs benefit



using the BMPDSS modeling tool. A map of the top 4 retrofits is attached in Appendix 1, while conceptual design plans for the retrofits are included in Appendix 2. This planning study was in preparation for compliance requirements of the approved MS4 General permit 3-9014 Subpart IV.C.1.

Figure 1: Moon Brook Tributary, Rutland Town

This project was completed in combination with two other projects. Under contract with Rutland City, WCA completed a review of the Moon Brook Base and Existing condition BMPDSS models within the jurisdiction of Rutland City. This was important for completion of this project, because the BMPDSS is a watershed-wide model and therefore the entire model needed to be revised. Then, under contract with the Vermont Agency of Transportation (VTRANS), WCA reviewed the Randbury Rd. project in detail and developed the preliminary concept plan as well as made revisions to the subwatershed boundaries near the rail yard. Initial site assessment and refinement of the BMPDSS model files was complete under this contract, in addition to the scoping and BMPDSS assessment for the other retrofit sites.

### **1 Town of Rutland Flow Restoration Responsibility:**

There are two targets in the TMDL, "high flow" and "low flow". This means that the TMDL stipulates stormwater discharges must be better controlled (high flow), and that more stormwater must be infiltrated into the ground to produce more baseflow in the stream (low flow). For Moon Brook, the high-flow target is a -11.9 % reduction of the 1-year storm ( $Q_{0.3}$ ) and the low-flow target is a 23.9% increase in base flow ( $Q_{95\%}$ ). The Town of Rutland comprises a small percentage of developed area

within the Moon Brook watershed, displayed on the following table (Table 1). Note, Mendon is not considered a small MS4 community and therefore was not included in the allocation.

Table 1: Impervious Ownership and TMDL Allocation by MS4

<b>Moon Brook TMDL Flow Target Allocation by Impervious Ownership</b>					
<b>Owner</b>	<b>Total Area w/in Watershed (acres)</b>	<b>Impervious Area (acres)</b>	<b>Percent Impervious (%)</b>	<b>% of Moon Impervious Cover</b>	<b>Target High Flow Q 0.3 ( ± %) Reduction by MS4</b>
Mendon	2041.80	39.95	----	----	NA
Rutland City	1415.51	404.50	28.6%	73.7%	-8.8%
Rutland Town	1558.52	135.00	8.7%	24.6%	-2.93%
VTrans	16.30	9.37	57.5%	1.7%	-0.20%
<b>Watershed Total</b>	<b>2990.33</b>	<b>548.9</b>			<b>-11.9%</b>

\*Revised watershed boundary by WCA 92013

### 1.1 MS4 Allocation of Flow Targets

For the Moon Brook watershed, allocation of the high-flow flow target by MS4 was approximated based on relative impervious ownership and impervious cover currently managed with a Channel Protection (CP<sub>v</sub>) storage BMP. However, there are limitations to this method because the BMPDSS model is an aggregate model, in which upstream BMPs affect downstream flow and runoff doesn't necessarily follow political boundaries. A correction factor was applied based on the flow target to account for the relative error in separation of the BMPDSS results by MS4.

Approximately 73.4% of the impervious cover within the Moon Brook watershed is within the City, 24.9% within the Town, and about 1.7% in the VTRANS Right-of-Way (Table 1). Based on impervious surface ownership, the Town of Rutland is responsible for a portion of the overall Moon Brook TMDL flow targets. The Town of Rutland's responsibility of the overall TMDL targets is estimated to be a high-flow reduction of -2.9% and a low-flow increase of 5.4%. While the low-flow goal is important to ensure flow during the dry summer months, it is not an actionable requirement in the EPA approved TMDL, and therefore was not the primary focus of the FRP BMP identification for this study.

## 2 Existing Conditions Review:

As per subpart IV.C.1. of the approved MS4 general permit, all expired stormwater permits in the watershed were acquired and reviewed. Two expired permits were identified including 1) Permit # 4375-INDS Wynnmere Senior Housing and 2) Permit # 1-1031 La Victoire Subdivision (Table 2). The permitted detention pond under #4375-INDS was assessed for compliance with VT 2002 Stormwater Standards and retrofit opportunity. Based upon our review, a change to the outlet structure would bring the pond up to standard and increase detention. The stormwater system permitted under #1-1031 consists of a system of vegetated swales and culverts. A portion of the permitted runoff area is within the drainage to another proposed BMP; the Hitzel Terrace pond. However, a complete renewal of permit #1-1031 will require assessment of the entire existing system for upgrade to the latest VT stormwater design standards.

Table 2: Rutland Town Expired Stormwater Permits

Site Name	Permit #	Permit Expiration Date	Stormwater System
<b>Rutland Town</b>			
Wynnmere Senior Housing Project	4375-INDS	1/22/2012	Swales and Catch Basin Collection to Detention Pond
LaVictoire residential subdivision	1-1031	6/30/1996	Vegetated swales to culverts

### 2.1 BMPDSS Model Review:

Progress toward the flow targets was assessed using the VT BMPDSS model. VT DEC developed “Base” condition models for all impaired watersheds. The base scenario includes all stormwater BMPs installed prior to issuance of the VT Stormwater Standards in 2002, and impervious cover based on quickbird satellite imagery. A “Post2002” model scenario was then developed with all existing BMPs designed to the VT SW standards, providing credit toward the flow target.

In order to develop a proposed BMP “Credit” scenario, the existing Base and Post2002 models were revised for accuracy. New projects developed since the model was last updated as well as potentially omitted BMPs were added to the model.

#### 2.1.1 Base Model Revisions:

The **Base model** was revised as follows:

- ❖ Replaced VT BMPDSS Combined Sewer Sheds delineation with Rutland City Revised Moon Brook Combined Sewer Sheds (as of February 2013), and revised Moon Brook subwatershed delineations accordingly. This revision reduced the overall watershed from 5070 acres (7.91 sqmi) to 5044 acres (7.84 sqmi).
- ❖ Revised subwatershed boundaries to account for updated utility infrastructure mapping and field verification of drainage paths in areas where there was either an existing BMP installed or a permitted discharge.
- ❖ Based on field observations by WCA, a section of the mapped Moon Brook watershed near the VTRANS-owned rail yard was determined to be out of the watershed, as it was determined through discussion with the City that the property drains to the combined sewer rather than to Moon Brook.
- ❖ Added existing BMPs to the Base model including:
  1. Allen Pond Development - Detention Pond
  2. Family Dental Associates - Detention Pond
  3. Natural Detention area near Rutland Plywood
  4. Northeast School (Thrall Ave)- Pond (without new outlet structure)

#### 2.1.2 Post2002 Existing Conditions Model Revisions:

The **Credits model (Post 2002)** was revised as follows

- ❖ Adjusted mapped impervious in areas where an existing BMP was located.
- ❖ Revised Base model subwatershed boundaries to account for additional BMP's.
- ❖ Added five (5) Rain Gardens (RNRCD Projects).
- ❖ Added existing BMPs implemented after 2002 including:
  1. Vermont Eye Care Center- Detention Pond
  2. Vered Sobel Eye Physician Building- Detention Swale
  3. Rutland Heart Center, Common St. – Detention Pond
  4. Proposed Gravel Wetland- RNRCD Project
  5. Northeast School (Thrall Ave) Pond with New Outlet Structure

### 2.1.3 Model Revision Results

Our review of the DEC BMPDSS models for Moon Brook and on-the-ground existing stormwater BMPs resulted in the addition of over eight (8) existing stormwater detention practices as well as one Post 2002 retrofit. Additionally, five (5) infiltration practices were identified and accounted for in the model. A total of **39 acres** were removed from the impaired watershed boundary based on the latest combined sewershed mapping. Additionally, DEC was able to increase the resolution of the model input data and identified two ponds which were previously not accounted for. The most up to date revised Base and Existing Conditions (Post2002) models estimated a **watershed-wide** high-flow percent reduction of **-0.71%** (as compared to the target of **-11.90%**). The low-flow (baseflow) percent change was estimated to be **-0.9%** below the base condition (as compared to the target increase of **23.90%** above the base condition). The existing condition model results show that Rutland Town has addressed approximately **6.0%** of their High-flow target reduction, but has not addressed any portion of the low-flow target.

## 3 Identification of Required Controls

As a first step in identifying new stormwater control measure (SCM) site locations, WCA completed a desktop investigation, identifying large areas of open spaces, available Town-owned parcels, existing stormwater pipe outfalls, and existing ponds/stormwater infrastructure. Sites were prioritized based on their vicinity to clustered areas of untreated impervious surfaces. Sites for detention were assessed on the basis of providing channel protection storage based on the Vermont 2002 stormwater design standards (CPv, 1-year Design Storm storage). Five potential



Figure 2: WCA staff field verifying BMP drainage area, Rutland, VT

Retrofit locations were identified for further investigation including 1) Detention Basin/Infiltration Practice near Randbury Drive/Route 7, 2) Pond Retrofit at Hitzel Terrace, 3) Engineered Open Channel with Check Dams west of Carmel Place in the VELCO ROW, 4) Infiltration SCM along Victoria Drive, and 5) Detention Basin/Infiltration SCM along North End Drive. After an initial list of retrofits were identified, a field visit was completed at each site to assess the engineering feasibility of each BMP including utility conflicts, natural resources, transportation constraints, collateral benefits (visibility, pedestrian safety), and ease of operation and maintenance (Figure 2).

A second screening of the sites was completed based on the field assessment from which the top three sites were selected for further investigation. WCA then prepared input files for the BMPDSS Credit model for submittal to the State in order to assess the combined impact of the proposed BMP's including revised subwatersheds, BMP drainage areas, and BMP designs.

WCA prepared ortho-photo based conceptual design plans for the recommended BMPs, designed to the Vermont 2002 Stormwater Standards for CP<sub>v</sub> storage (1-year Design Storm), as provided in Appendix 2. BMP feasibility was determined based on available space, mapped NRCS soils, existing 10-ft topographic elevation control derived from 2008 LIDAR, and mapped stormwater and wastewater infrastructure. Additional above ground utility constraints were noted in addition to land ownership, operation and maintenance, and safety considerations. An in-depth engineering assessment will still be required at each site to confirm the presence/absence of utilities, natural resource constraints, and potential transportation impacts, as part of the final design process.

The top proposed BMPs include two (2) detention BMPs with Channel Protection Volume Storage (CP<sub>v</sub>), one retrofit to an existing culvert to provide CP<sub>v</sub> detention, and one(1) retrofit to an existing BMP with an expired permit (Table 3). Implementation cost estimates are included in Table 3 as well.

Table 3: Rutland Town Proposed BMP's

BMP Site	Street Address	BMP Type	Impervious Cover Managed (ac)	Runoff Area (ac)	DA Percent Impervious (%)	Channel Protection Volume (CF)		Implementation Cost Estimate
						CF	ac-ft	
Randbury Rd	Route 7/ Randbury Rd	Gravel Wetland	13.77	23.32	59%	39,945	0.917	\$ 279,262.11
VELCO Carmel Pl.	Killington Ave/ Carmel Pl.	Detention Swale	2.92	21.37	14%	24,479	0.562	\$ 120,205.80
Hitzel Terrace	421 Hitzel Terrace	Outlet Retrofit	12.14	67.18	18%	44,780	1.028	\$ 15,000.00
4375-INDS	Carmel Pl.	Outlet Retrofit	4.89	17.29	28%	23,130	0.531	\$ 15,000.00
<b>Total:</b>						<b>132,334</b>	<b>3.04</b>	<b>\$ 429,467.91</b>

Cost Estimates for the proposed retrofits were determined using two cost frameworks; 1) for the detention BMPs 2) for the outlet retrofits. The first method was based on the estimated BMP construction volume. For the gravel wetland project and vegetated swale, the cost for plantings was estimated per BMP surface area using a local plantings estimate from a past project. An additional 30% Design and Permitting factor was added as recommended for typical urban stormwater retrofit projects. Furthermore, a 10% contingency factor was included to account for project complications and unforeseen conflicts. The second method involved using a typical unit cost for pond outlet upgrades and professional experience.

### 3.1 VT BMPDSS Assessment Results:

The objective of this study was to identify the top three stormwater controls within Rutland Town’s jurisdiction of the Moon Brook impaired watershed, and to assess the benefit using the BMPDSS tool. The BMPDSS assessment results are summarized in Table 4 below.

The existing condition was determined to address 9.7 % of the Town’s High-Flow reduction allocation. With the addition of the Randbury Rd. BMP, the percent addressed increased to 12.7%. A revised model run (Credits2) was completed with the addition of the two other proposed BMPs and the #4375 Retrofit. The combined impact of the proposed controls addressed 31.4% of the Town’s total High Flow allocation. The low flow was unchanged. The challenge with estimating the exact allocation and progress of the Town is that the estimated progress is relative and depends on the progress of the other MS4’s. Therefore a joint retrofit assessment is recommended for full development of the Moon Brook FRP for Rutland Town. This would ensure the BMPs are placed and assessed where they are most needed.

BMPDSS Run	High Flow Target, Q 0.3 ( ± %)	Percent of TMDL High Flow Target Managed, %	Rutland Town Percent of FRP Allocation Managed, %	BMPDSS Run date
TMDL Target for Moon Brook	-11.90%	----	----	----
Existing Condition-Post2002 Revised	-0.71%	6.0%	9.7%	5/5/2014
Credits Run with Randbury Rd. *	-1.37%	11.5%	12.7%	5/5/2014
Credits Run 5-5-14 with Randbury Rd., Hitzel Terrace, VELCO, and 4375-INDS Pond Retrofit	-2.29%	19.2%	31.4%	5/5/2014

## 4 Proposed Stormwater BMP’s

### Randbury Road Site (Rutland Town/VTRANS):

A stormwater retrofit located behind the new Aldi Store along Route 7/ Cold River Rd. could potentially be an ideal solution to reduce peak-flows and sediment loading to Moon Brook from a 59% impervious area. A gravel wetland is the proposed BMP design, providing flow detention as well as infiltration. The project also has potential for collaboration with VTrans as they are a contributing impervious owner for the proposed retrofit.



The Randbury Road site is located on private property, which would need to be acquired by the

Figure 3: Proposed BMP location, behind new Aldi Store along Cold River Rd./Route 7.

Town of Rutland in order for this site to be a feasible retrofit location. The site currently consists of a wooded undeveloped area with a highly eroded drainage ditch. The retrofit BMP could collect runoff from this drainage ditch, which has been formed from the high volume of runoff originating from the Route 7 outfall. Based on field observation, the site is underlain by sandy soils so infiltration of runoff may be possible. Additionally, the existing drainage ditch was assessed by the State Fisheries Biologist, and determined to be void of fisheries resources, therefore alterations to the existing ditch would be feasible.

This BMP location is of particular interest, as the project could align with the Town's re-development goals for the area including a new access road to ease traffic on Route 7, which would require a new stormwater management system. Assessment and design of the BMP included a theoretical build out of impervious area associated with new private development on the lots surrounding the BMP and a new access road.

**Hitzel Terrace (Rutland Town):**

The town-owned parcel along Hitzel Terrace is a natural wetland area which currently provides some level of stormwater detention and peak-flow attenuation. The proposed project would involve retrofitting the existing culvert under Hitzel Terrace with a low-flow outlet structure to allow for additional ponding and detention of stormwater in the town-owned area. The proposed retrofit would not increase flow to the existing downstream privately owned pond, across the road.



Figure 4: View of natural detention area from Hitzel Terrace Rd., just south of site.

The site was assessed by the State Wetlands Ecologist and determined to be a Class III Wetland, which are not regulated by the Vermont Wetland Rules and no Vermont Wetland Permit is required. The project was also reviewed by the U.S. Army Corps project manager, and determined to potentially qualify as Category 1 of the VT General Streams Alteration Permit, in which only a self-verification form would be required.

**VELCO/Carmel Place (Rutland Town):**

Adjacent to the power lines, just west of Carmel Place (Wynnmere Senior Housing Development) there is a naturally depressed area which collects overland flow from homes along Victoria Dr. as well as drainage from Killington Ave. The proposed BMP would consist of amending the existing soil in a 1,700 ft long vegetated swale with periodic stone check dams to detain the 1-yr design storm. A concrete weir is proposed at the outlet of the channel to control overflow.



Figure 5: View from Killington Ave of the proposed BMP area, proposed to run adjacent to the power lines.

The feasibility of this project would require presenting the project to VELCO power at the early stages of the planning process to identify potential conflicts with constructing in close proximity to the power lines. Additionally, the site will need to be assessed for potential natural resource constraints. However, upon initial assessment the area appears to be grassland with limited wetland function. Furthermore, the site is located on private property, therefore the land owner would need to be engaged to assess the feasibility of the project.

#### **#4375-INDS Wynnmere Pond Retrofit:**

The Wynnmere Senior Housing Project on Killington Avenue currently has an expired permit, #4375-INDS for their stormwater management system. The system consists of a series of catch basins and swales which all drain to a detention pond. According to the permit, the pond meets the 2002 Vermont Stormwater Design Standards. Upon review of the runoff model and design plans, WCA determined that the current pond has capacity for additional detention to maximize flow control. A proposed retrofit would involve raising the outlet structure to increase the Channel Protection storage by 0.11 acre-feet. If this project is considered for implementation, WCA advises that an existing condition survey be complete to verify outlet inverts and detention capacity.



Figure 6: #4375-INDS Detention Pond

## **5 Final Recommendations**

To meet the high flow target, the Town will need to seek out and implement projects that are capable of controlling large volumes of water. Given that these projects are more expensive and complicated as compared to smaller projects such as a raingarden, it is recommended that the Town focus its effort on designing and funding these larger scale retrofit projects first. Smaller projects that are capable of infiltration are important and will be required, but these projects will be easier and much less costly to implement.

The next steps to achieve compliance with the MS4 permit are to work with the other MS4 permittees within Moon Brook, to decide if a joint FRP would be feasible. If it is decided that Rutland Town prefers to develop their own Flow Restoration Plan, the next step would involve developing a formal plan, based on the findings of this planning study.

Please feel free to contact me with any questions regarding the submitted deliverables and/or follow up recommendations

Sincerely,

Andres Torizzo, CPESC, CPSWQ  
Principal