



Memorandum

To: Stratton Master Plan Renewal Project
File

Date: January 11, 2013

Project 57055.05
No.:

From: Jesse A. Therrien and Joshua L. Sky

Re: Stratton Water Quality Remediation Plan
Status Update Pursuant to MP Renewal

On behalf of the Stratton Mountain Resort ("Stratton"), Vanasse Hangen Brustlin, Inc. ("VHB") has prepared this memorandum to provide a status report of the Stratton Water Quality Remediation Plan ("WQRP") as a component of the Stratton Master Plan application to renew and extend the existing Stratton Master Plan decisions: 2W0519-10 (28 March 2000); 2W0519-10-EB (8 May 2001) and 2W0519-10EB (Memorandum of Decision on Motion to Alter) (9 July 2001) and most recently #2W0519-10B(Altered) (15 January 2008). This memorandum provides a brief status report with respect to water quality for the two streams subject to the WQRP, and explain the the Post Attainment Monitoring Flow Chart for future sampling on these streams, Styles Brook and Tributary 1 to the North Branch of the Deerfield River at Stratton.

Included with this memorandum are a Water Quality Monitoring and Watershed Map which shows the Stratton Mountain Resort vicinity, subject watersheds, and monitoring locations (see page 1 of the Attachment); a compilation of the macroinvertebrate monitoring results for Tributary 1 (page 2 of the Attachment) and Styles Brook (page 3 of the Attachment); the Post Attainment Flow Chart (page 4 of the Attachment); and the Potential Future Water Quality Monitoring Schedule (page 5 of the Attachment), both developed by VHB, in consultation with Stratton, the Vermont Agency of Natural Resources ("VT ANR"), and the Vermont Natural Resources Council ("VNRC").

BACKGROUND:

Stratton began implementation of the Stratton Water Quality Remediation Plan in 1999 as part of the Stratton Mountain Resort Master Plan, developed collaboratively with VT ANR, VNRC, and Stratton Area Citizens Committee ("SACC") to address the impacts to water quality primarily attributed to untreated stormwater runoff. The WQRP was approved by the District 2 Environmental Commission during Act 250 Master Plan findings for Stratton, first issued in March 2000 and most recently reissued in January 2008. Since this time Stratton has undertaken significant remediation efforts that have resulted in improvements to water quality in all of its receiving waters. Concurrently, VHB has been collecting and analyzing water chemistry, macroinvertebrate ("kick-net") and sediment data in the subject watersheds to assess progress, and tailor additional remediation measures. The findings of these annual assessments are reported to VT ANR via an annual monitoring report and discussed during an annual presentation for regulators and interested parties.

Since 2008, WQRP implementation has focused on Styles Brook, which, as of 2011, has not yet met Vermont Water Quality Standards ("VWQS"), and Tributary 1 which met standards for two consecutive years (2009 and 2010). The VWQS specify existing uses (Section 1-03(B)(1), general criteria

(Section 3-01(B)), and management objectives and criteria specific to stream classifications (i.e. Class A, Class B. Macroinvertebrate indices, or biocriteria, as determined through kick-net sampling are used to determine compliance with the Aquatic Habitat and Aquatic Biota uses and Aquatic Biota and Aquatic Habitat management objectives as defined in the VWQS. Styles Brook has shown improvements in water quality as various remedial projects have been conducted, and is expected to show continued improvement and meet standards, as untreated stormwater runoff from the Stratton Maintenance Facility is now managed in accordance with the applicable criteria of the VT Stormwater Management Manual, which was completed and became operational in late Summer 2012. Tributary 1 has also shown improvements over the duration of the WQRP and came into compliance with VWQS in 2010. Remediation projects implemented by Stratton, including the removal a box culvert and the restoration of the stream channel in the vicinity of Hole 6 at the Stratton Golf Course, aided in achieving this important milestone for Tributary 1. Since 2008, and as part of the WQRP, sampling of Tributary 2 has also been conducted to provide reference or comparison data. Tributary 2 and its associated watershed have similar physical characteristics and land development patterns as Styles Brook and Tributary 1. Tributary 2 also has consistently met Aquatic Life Support ("ALS") requirements, and thus, represents a benchmark or goal for Tributary 1 and Styles Brook.

Once both streams attain applicable VWQS criteria, Stratton will have fully achieved the objectives of the WQRP. However, all stakeholders have agreed that a post-attainment monitoring regime should be implemented for a period of time, to ensure that improvements to water quality are sustained. Finding 27 of the 2008 Master Plan decision lists the key components of the potential post attainment monitoring plan, as follows:

- Continued water quality monitoring at a reduced scope
- Performance report following five years of attainment
- Inspection/repair of existing stormwater infrastructure
- Smart project design that incorporated riparian/wetland buffers, minimizes impervious surfaces and incorporates advanced stormwater management and erosion control technology

This post attainment monitoring plan, detailed below and in the attachments to this memorandum, provides the framework that will be employed to meet the purpose and intent of the key components as outlined in the 2008 Master Plan decision.

BIOMONITORING SUMMARY:

Styles Brook has been sampled for macroinvertebrate biota at a location (MP-14) just upstream of its confluence with the North Branch of Ball Mountain Brook from 2000 to 2010 and then again in 2012 (see the Water Quality Monitoring and Watershed Map on page 1 of the attachment). The Fall 2012 samples are currently being processed and are not yet available for analysis. Since 2003, with the exception of 2007, VT DEC has also conducted concurrent sampling at the same location. As agreed upon with VT DEC, no kick-net sampling was conducted in 2011 due to the excessive precipitation from Tropical Storm Irene just prior to the sampling period. The results of the kick-net samples for Styles Brook are provided on page 2 of the Attachment. Over time, the biocriteria or indices used to assess stream health have fluctuated but have generally shown improvement. In particular the EPT metric (an indicator of pollution sensitive species) has improved over time and was in full compliance in 2010 in both the VT DEC and VHB sample sets. Also, in 2009 and 2010 two indices, density (the total number of individual macroinvertebrates present) and percent oligochaetes (an indicator of excess sediment) have not completely met the threshold values required to attain water quality standards. The

additional stormwater treatment resulting from the operation the Stratton Maintenance Facility Stormwater Basin is expected to address the last remaining significant source of untreated stormwater runoff within the Styles Brook watershed, and therefore lead to attainment of applicable biocriteria and VWQS.

Tributary 1 has been sampled for macroinvertebrate biota at a location (MP-TC) just upstream of Stratton Lake by VHB since 2004. Sampling was moved to this location in 2004 from a prior location which was not suited well for kick-net sampling. VT ANR also samples Tributary 1 at a location upstream of MP-TC called T1-0.4. All sampling locations are shown on the attached Water Quality Monitoring and Watershed Map on page 1 of the Attachment. The sampling results for MP-TC are provided on page 3 of the Attachment and the show steady improvement in biocriteria with full compliance with applicable thresholds in 2009 and 2010. Improvements in Tributary 1 are directly attributable to WQRP remedial actions, including the installation of stormwater treatment practices, maintenance practices, and the aforementioned Hole 6 stream restoration and box culvert removal.

POST-ATTAINMENT MONITORING PLAN AND SCHEDULE:

On June 12, 2012 Stratton held the annual WQRP meeting at the Resort to present the monitoring results from the 2011 sampling season and to also discuss post-attainment monitoring, which will be implemented once the streams fully meet the VWQS for two consecutive monitoring seasons. It was agreed upon by the stakeholders that monitoring would continue during the 2012 season and that scope of post-attainment monitoring should be further discussed and developed for Tributary 1 and Styles Brook. On July 21, 2012 a technical review meeting to discuss post-attainment monitoring took place in Waitsfield, VT, and included representatives from the VT DEC, VNRC, VHB and Stratton. As a result of this meeting, a post-attainment monitoring framework and schedule was developed and agreed upon by all parties involved. Descriptions of the monitoring plan and schedule are included in the sections below.

MONITORING PLAN:

The post attainment monitoring plan (see page 4 of the Attachment) for Tributary 1 and Styles Brook is built upon on a system that takes into account the macroinvertebrate biota sampling results, and whether a stream has fully met the ALS criteria (passed), fails to meet ALS (failed), or is indeterminate due to ALS thresholds not being fully supported, for a given year. Depending on the results of the macroinvertebrate sample, a stream is put into one of three categories; additional sampling with potential best management practice ("BMP") implementation is required, stream only needs to be sampled every two to three years in conjunction with VT DEC sampling schedule until post attainment monitoring is completed, or lastly, varying sizes of BMPs need to be implemented and monitoring will be suspended for one year, in which the monitoring cycle starts over again at the beginning. The ultimate objective of the monitoring plan is to clearly show the pathway that Tributary 1 and Styles Brook need to follow to allow for the every two- to three-year monitoring cycle with the VT DEC to begin and for post-attainment monitoring to be successfully completed, thus ending the WQRP monitoring requirements.

SCHEDULE:

Mirroring the monitoring plan as described above, the proposed monitoring schedule (see page 5 of the attachment) has also been designed to be dependent on the prior years' monitoring results, such as whether a monitoring station has achieved full support (attainment) of ALS for consecutive monitoring years. The schedule also takes into account the five year rotating monitoring schedule that the VT DEC uses to collect macroinvertebrate data in streams across Vermont. Lastly, the monitoring schedule is

also based on the assumption that Styles Brook (MP-14) will achieve full support of the ALS in both 2012 and 2013. As proposed, the monitoring schedule would allow for sampling in conjunction with the VT DEC schedule so that monitoring stations are sampled by either Stratton or the VT DEC every two to three years on a rotating schedule. Pending the outcome of the Styles Brook sampling Stratton anticipates that a summary report of monitoring results will be produced in any year that sampling.

SUMMARY:

Stratton is approaching the completion of implementation of the WQRP and associated monitoring requirements, with all streams but Styles Brook currently in compliance with ALS requirements. Fourteen years ago as Stratton and associated stakeholders deliberated over the details of the remediation plan there were six streams in need of remediation, more than 50 monitoring locations, and more than two dozen potential remediation projects. Currently, only Styles Brook has yet to meet standards, many remediation projects have been successfully implemented, and the overall scale of monitoring at the Resort has been reduced dramatically as sustained compliance was documented. Stratton will continue to collect monitoring data until compliance with ALS requirements has been met in Styles Brook for two consecutive monitoring years. The proposed post attainment monitoring schedule is co-incident with the requested 10-year duration of the Master Plan renewal application.

ATTACHMENT

**Stratton Mountain Resort
Stratton, VT
Styles Brook and
Tributary I
Water Quality Monitoring
and Watershed Map**

January 9, 2013

- Legend**
- Watershed Boundary
 - Styles Brook
 - Tributary I
 - Tributary 2
 - Monitoring Station (VHB)
 - VT DEC Biomonitoring Station
 - Building
 - Road/Parking/Path
 - Ski Trails
 - Water
 - Stream (VHD/VHB)
 - Road (VTrans)
 - 50 ft. Contour
 - 500 ft. Contour



0 600 1,200
Feet

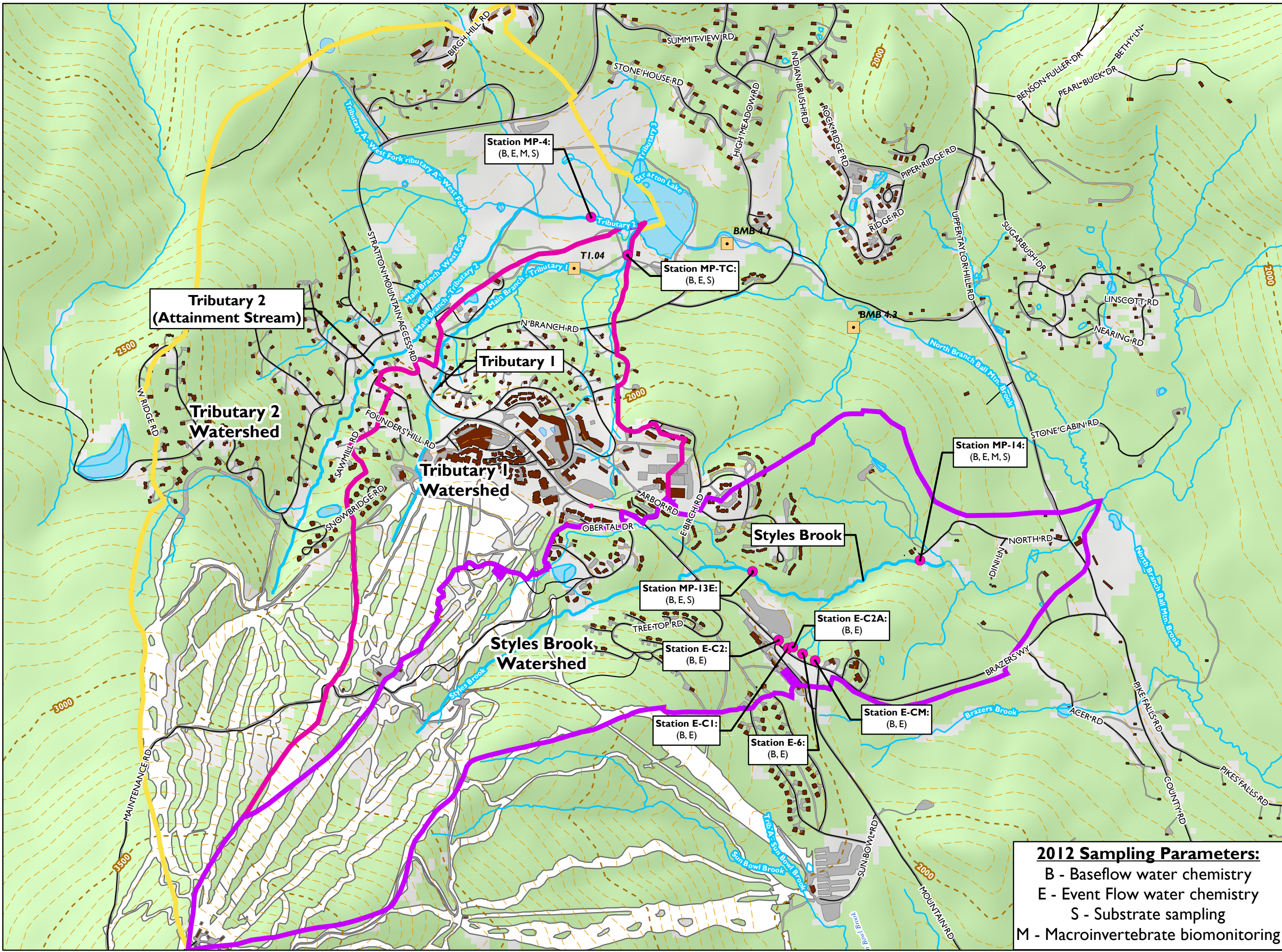
Sources: Background: Landcover and Hillshade layers downloaded from VCGI (2009); Streams layer is a modified VHD layer based on field reconnaissance by VHB (2006); Roads downloaded from VCGI (2012); Water quality monitoring stations by VHB (1999-2012); Biomonitoring station locations provided by the VT DEC (2011); Watershed boundaries prepared by VHB (2007-2012); Contours generated by VHB (2009) using Hydro DEM layer available from VCGI; Landcover layer prepared by VHB (2007-2011);

Prepared by: JAT

F:\57082.01 Stratton MP Renewal\GIS\Project
11x17_Styles_Trib1_Watershed_Map.mxd



2012 Sampling Parameters:
B - Baseflow water chemistry
E - Event Flow water chemistry
S - Substrate sampling
M - Macroinvertebrate biomonitoring



Project Stratton Biomonitoring
Station MP-TC
Stream Unnamed Trib. 1
Location Stratton Mountain Golf Course

Class Small, High Gradient, B2-3
Sampler Cathy Szal

Stratton Biomonitoring Kick Net Data - Tributary 1 MP-TC Class B2-3										
Year	Sampler	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT +C	% PPCS- FG	Outcome/ Biological Integrity
		≥300	≥27	≥16	≥45	≤4.50	≤12	≥0.45	≥40	
2004	Pioneer Environmental	1368	40.0	19.0	58.3	2.72	0.88	0.900	52.0	Meets Class B Criteria/Very Good
2005	Pioneer Environmental	314	24.5	13	60.3	2.51	1.73	0.955	38.0	Does Not Meet Class B Criteria/Fair
2006	Pioneer Environmental	609	23.0	15.50	54.4	1.75	0.15	0.975	35.0	Does Not Meet Class B Criteria/Fair
2007	Pioneer Environmental	476	28.0	15.0	55.4	1.48	0.50	0.890	25.0	Does Not Meet Class B Criteria/Fair
2008	VHB Pioneer	484	22.5	15.5	65.0	3.56	0.50	0.990	40.0	Does Not Meet Class B Criteria/Fair
2009	VHB Pioneer	386	28.5	16.0	63.0	1.54	1.95	0.957	38.6	Meets Class B Criteria/Good
2010	VHB	420	30.5	18.0	65.7	2.73	1.99	0.840	48.3	Meets Class B Criteria/Good
Full Support (Pass)		>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%	
Meets Threshold (I+)										
Does Not Meet Threshold (I-)		≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%	
Non-Support (Fail)		<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%	

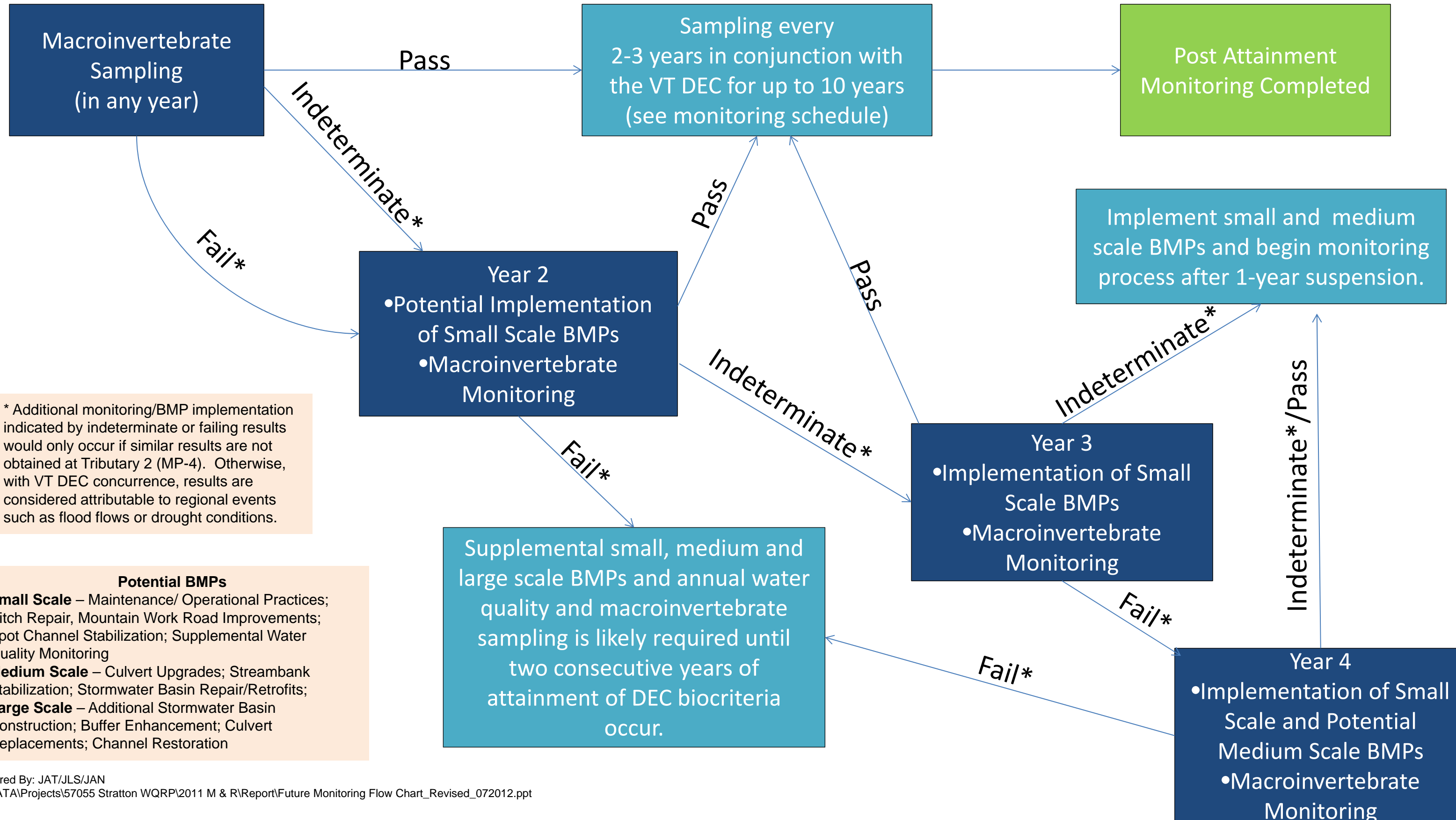
Project Stratton Biomonitoring
Station MP-14
Stream Styles Brook
Location Stratton Mountain Resort

Class Small, High Gradient, B2-3
Sampler Cathy Szal

Stratton Biomonitoring Kick Net Data - Styles Brook MP-14 Class B2-3										
Year	Sampler	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT+ C	% PPCS-FG	Outcome/ Biological Integrity
		≥300	≥27	≥16	≥45	≤4.50	≤12	≥0.45	≥40	
2000	Pioneer Environmental	184	30.0	18.0	71.0	2.93	0.80	0.640	49.0	Does Not Meet Class B Criteria/Fair
2001	Pioneer Environmental	195	26.0	13.0	67.0	2.53	3.30	0.670	55.0	Does Not Meet Class B Criteria/Fair
2002	Pioneer Environmental	208	26.0	14.0	67.0	1.38	1.70	0.900	35.0	Does Not Meet Class B Criteria/Fair
2003	DEC	656	41.0	21.0	77.3	2.64	5.79	0.851	63.0	Meets Class B Criteria/Very Good
	Pioneer Environmental	584	36.0	19.0	69.0	2.46	3.98	0.852	44.0	Meets Class B Criteria/Very Good
2004	DEC	260	34.0	20.0	61.9	1.64	22.31	0.967	56.8	Does Not Meet Class B Criteria/Fair
2004	Pioneer Environmental	275	31.0	16.0	65.0	2.05	23.0	0.920	57.0	Does Not Meet Class B Criteria/Fair
2005	Pioneer Environmental	382	33.0	17.0	68.0	3.28	5.40	0.600	50.4	Meets Class B Criteria/Good
2006	DEC	808	31.0	16.0	63.9	2.25	18.2	0.876	49.5	Does Not Meet Class B Criteria/Fair
	Pioneer Environmental	404	29.0	18.5	57.7	1.70	10.1	0.954	38.8	Meets Class B Criteria/Good-Fair
2007	Pioneer Environmental	150	27.0	15.0	73.0	2.21	8.70	0.830	56.0	Does Not Meet Class B Criteria/Fair
2008	DEC	595	38.0	15.0	66.9	2.79	20.2	0.845	50.0	Does Not Meet Class B Criteria/Fair
	VHBP	328.5	30.0	16.0	58.5	2.14	14.2	0.881	44.3	Does Not Meet Class B Criteria/Fair
2009	DEC	340.0	37.0	18.0	67.2	1.53	30.6	0.873	49.3	Does Not Meet Class B Criteria/Fair-Poor
	VHBP	267.0	31.0	16.0	65.1	1.14	7.43	0.931	41.1	Does Not Meet Class B Criteria/Fair
2010	DEC	332.0	35.0	25.0	62.1	1.54	17.2	0.949	55.2	Does Not Meet Class B Criteria/Fair
	VHB	277	38.5	18.0	69.3	1.66	12.2	0.877	60	Indeterminate/Fair
Full Support (Pass)		>350	>28	>17	>50%	<4.35	<9.5%	>0.47	>45%	
Meets Threshold (I+)		≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%	
Does Not Meet Threshold (I-)										
Non-Support (Fail)		<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%	

Stratton WQRP: Post Attainment Monitoring Flow Chart for Tributary 1 and Styles Brook

Post attainment monitoring applies after Vermont Water Quality Standards are met as determined by two consecutive years of macroinvertebrate scores that meet or exceed the criteria. (e.g. Pass)



Stratton Mountain Resort
Stratton, VT
Summary of Potential Future Water Quality Monitoring Schedule
Prepared by: VHB
Janaury 11. 2013

		Monitoring Years & Parameters																					
Project Watershed	Station ID	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022	
		Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC	Stratton	VT DEC
Tributary 1 ¹	MP-TC	OP ⁵	Bio ⁴	2	-	2	-	Bio	-	2	-	2	Bio ⁴	2	-	2	-	Bio	-	2	-	2	Bio ⁴
Styles Brook ¹	MP-14	Bio, OP ⁵	-	Bio, OP ⁵	-	3, 2	-	Bio	-	2	-	2	Bio ⁴	2	-	2	-	Bio	-	2	-	2	Bio ⁴
Tributary 2 (Attainment Stream)	MP-4	Bio, OP ⁵	-	Bio, OP ⁵	-	3,2	-	Bio	-	2	-	2	Bio ⁴	2	-	2	-	Bio	-	2	-	2	Bio ⁴
Kidder Brook (Local Reference)	RM 0.9	-	Bio ⁴	-	-	-	-	-	-	-	-	-	Bio ⁴	-	-	-	-	-	-	-	-	-	Bio ⁴

Table Legend and Notes:

Bio = Macroinvertebrate sampling

"-" = No monitoring planned

1 = Monitoring at the non-compliance stations on Tributary 1 and Styles Brook is dependent on the status of monitoring at stations MP-TC and MP-14.

2 = Future monitoring is dependent on prior macroinvertebrate sampling results. See Post Attainment monitoring flow chart for Tributary 1 and Styles Brook.

3 = Monitoring schedule is based on the assumption that Styles Brook (MP-14) achieves full support (attainment) of ALS in 2012 and 2013. Also, Stratton proposes to conduct aquatic biota sampling in conjunction with the VT DEC rotating schedule (see note #4 below) so that the monitoring locations are sampled by either Stratton or the VT DEC every two to three years for a period of 10 years.

4 = VT DEC monitoring is based on the current 5 year rotating schedule for biomonitoring in Vermont and is subject to change or suspension at the discretion of VT DEC.

5 = OP - Other monitoring parameters (baseflow and event flow water chemistry and substrate monitoring)

Baseflow parameters to include: Chloride, Conductivity, pH, Temperature, Total Iron, and Turbidity

Event flow parameters to include: Conductivity, pH, Temperature, Turbidity and Total Suspended Solids