



January 16, 2015

Ref: 57201.07

Mr. Tim Clear
Watershed Management Division
Vermont Department of Environmental Conservation
One National Life Drive, Main 2
Montpelier, VT 05620-3522

Re: Jay Peak Resort
Revised 2014 Water Quality Remediation Plan ("WQRP")

Dear Tim:

In accordance with the 1272 Order ("Order") issued by the Vermont Department of Environmental Conservation ("VT DEC") on March 21, 2014, as well as subsequent communications, VHB has prepared the enclosed WQRP Update on behalf of Jay Peak Resort ("JPR" or "Resort"). The WQRP has been revised in accordance with comments received from VT DEC subsequent to the receipt of the 1272 Order and in accordance with the terms of the pending settlement agreement between JPR, the Vermont Agency of Natural Resources, and the Vermont Natural Resources Council.

We believe the WQRP, as revised, complies with the requirements mandated under the 1272 Order and provides the necessary guidance for the Resort to continue the ongoing progress that is being made in order to enable the Jay Branch and its tributaries to meet the Vermont Water Quality Standards.

If you have any questions or require further information, please do not hesitate to call me at (802) 497-6164 or email rwilley@vhb.com.

Mr. Tim Clear
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Sincerely,

A handwritten signature in blue ink that reads "Robert Wildey".

Robert Wildey, CPESC
Water Resources Consultant

RAW/jkw
Enclosure

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**Water Quality Remediation Plan
2014 Update**

JAY PEAK RESORT
Jay, Vermont

Prepared for **Jay Peak Resort**
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Revised: January 16, 2015



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1.0 Introduction

On behalf of Jay Peak Resort ("Resort" or "JPR"), VHB has prepared this revised Water Quality Remediation Plan ("WQRP") as required by Conditions A through I of the 1272 Order¹ ("Order") issued by the Vermont Department of Environmental Conservation ("VT DEC") on March 21, 2014. The preparation of this document follows the presentation of a draft WQRP approach to VT DEC personnel by VHB and JPR on March 6, 2014, as required by Condition H of the Order. VT DEC has previously identified impairments within the Jay Branch, Tributary 9 to Jay Branch ("Tributary 9") and Tributary 3 to South Mountain Branch ("South Mountain Branch") watersheds and has directed the Resort to identify the causes of these impairments and to propose specific actions that will remediate these impairments. This WQRP addresses the additional efforts that the Resort has been undertaking in order to achieve attainment of compliance with the Vermont Water Quality Standards ("VWQS").

1.1 Water Quality Remediation Plan History

As a program built on adaptive management, the Jay Branch WQRP has been developed and modified over time. Earlier WQRP documents were submitted to VT DEC in 2004, 2006, 2009, and 2012. In accordance with these plans, the Resort has worked over that time period to design and implement stormwater management systems, construction best management practices, and to implement other erosion prevention and sedimentation control measures across the Resort property. As of the 2014 WQRP, the geographic scope of remediation activities has expanded to encompass the South Mountain Branch in addition to Jay Branch and Tributary 9, and to respond to requests for additional information from VT DEC.

One critical part of the WQRP process has been the development of a sediment reduction assessment framework to assist the Resort in locating, treating, and report sources of washoff sediment load that may be contributing to the water quality impairment in the Jay Branch and its tributaries. Several of the sites identified through earlier sediment reduction assessments have been addressed by re-development projects in 2012 and 2013 that resulted in the collection and treatment of previously untreated stormwater runoff from areas at the Resort without stormwater controls in place. As described in Section 1.5, such sediment source tracking

¹. VT DEC. 1272 Order "Jay Peak Resort and Water Quality Related to Jay Branch, Jay Branch Tributary #9, and South Mountain Branch Tributary #3," March 21, 2014.

assessments are an on-going process at the Resort, and additional improvements continue to be made through increasing the amount of existing impervious area at the Resort that receives treatment.

1.2 Water Quality Monitoring Plan Reports

Over the time period of WQRP implementation, the Resort has undertaken intensive water quality monitoring programs to document improvements in the watershed and to identify locations where additional efforts are required. These efforts have been documented in previous WQRP and Water Quality Monitoring Plan ("WQMP") reports. The impacts of these efforts are starting to be seen with the improved results observed in the water quality and biomonitoring investigations conducted in 2013. The complete results from the 2013 investigations are reported in the 2013 WQMP that was submitted to VT DEC on June 9, 2014.

1.3 Hydrologic and Sediment Loading Model

In addition to the on-the-ground investigations being conducted to identify and remediate sources of excess washoff sediment in the watershed, the Resort is in the process of developing a hydrologic and sediment loading model. Although initial model runs were presented in the 2013 WQRP, stream flow data with the Jay Branch and its tributaries is being collected in order to better calibrate the model and confirm the output. The data collection and continued development of this model will continue throughout 2014.

1.4 Snow Management Plan

The appropriate management and storage of snow during winter operations is a critical item for the Resort to address on annual basis. Because sand and gravel must be applied to roadways and parking lots during winter months to provide traction control for visitors and staff to the Resort, snow storage and plow areas contain significant sources of sediment that require treatment. The Resort Stormwater Management Team has reviewed the site's roadways and parking lots with these considerations in mind and has developed the Snow Management Plan to direct operations during winter months. The goal of this plan is to improve winter operations and minimize the potential for stream impacts that result from those operations. This plan has been implemented as of the 2014-2015 winter season.

Snow storage areas have been designated in locations where vegetation can slow runoff and capture sediment that would otherwise be conveyed by melt water to a surface receiving water. In addition, shallow basins with level-spreader outlet structures will be excavated where feasible. These structures will be sized according to historical knowledge of snow piles in each location. Additional, plowing directions have been altered to avoid pushing snow into surface waters. The Snow Management Plan is provided at Appendix 3.

1.5 Interim Biocriteria Targets and Attainment Schedule

Interim biocriteria targets have been established to demonstrate and track progress toward reaching attainment with the VWQS in the Jay Branch, Tributary 9 to Jay Branch, and Tributary 3 to South Mountain Branch Watersheds. These biocriteria targets address the four key metrics that have not been in attainment for portions of the Jay Branch and South Mountain Branch watersheds, specifically Density, Richness, Ephemeroptera/Plecoptera/Trichoptera ("EPT"), and percent Oligochaetes. The specific targets for each sub-watershed and flowcharts that outline the required sequence of actions that must be followed if interim targets are not met are presented in Appendix 4.

1.6 Construction and Operational Phase Sediment Offsets

In accordance with the terms of the pending settlement agreement between the Vermont Natural Resources Council, the Vermont Agency of Natural Resources, and Jay Peak Resort, JPR has agreed that until attainment is reached in the target streams, sediment offsets will be provided for all new construction discharges and for most new impervious areas. Sediment loading and offset calculations will be completed in accordance with the steps outlined in the memorandum included in Appendix 5.

Discharges from the following three projects are not required to be offset: Stateside Cottages, Recreation Center, and Medical Center. In addition, South Village Townhomes, Administration Building, and Golf Maintenance Center in the Jay Branch watershed and the Chalet Meadows Residential Area and Snowline Redevelopment Area in the South Mountain Branch watershed do not require new operational phase offsets, as operational phase discharges from these projects were previously offset by providing treatment for existing untreated impervious areas. These projects still require construction offsets in accordance with the offset methodology.

1.7 Resort Stormwater Management Team

Recognizing that an integrated approach is necessary to successfully implement the WQRP goals, the Resort has formed an in-house stormwater management team to engage and coordinate the various operational entities within the Resort. This team holds regular meetings to identify issues and discuss operational changes that could be made to reduce sediment transport and improve water quality in Jay Branch and South Mountain Branch. In addition to designating a stormwater point person, the following operational entities are represented on the stormwater management team:

- Vice President, Real Estate – Jake Webster

- Director of Mountain Planning and Development – Walter Elander
- Stormwater Coordinator – Gordon Stone
- Golf Superintendent – Howie Nosak
- Buildings and Grounds Maintenance Manager – Virgil Starr
- Road Maintenance Manager – Rick Thompson
- Mountain Operations – Dave Heath
- Hotel Maintenance Manager – Rod Marcotte
- On-Site Plan Coordinator – Duane Wheeler

In addition to the management team, Stormwater Coordinator Gordon Stone has a team of eight laborers and equipment operators who are tasked with maintaining the stormwater infrastructure and implementing Erosion Prevention and Sediment Control (“EPSC”) measures across the Resort. This team of Jay Peak employees operates independently of and in addition to the EPSC activities associated with construction projects that are typically managed by subcontractors to the Resort.

2.0 Sediment Source Tracking Assessment

In accordance with Condition E of the Order, a sediment source tracking assessment (“assessment”) will be conducted of existing sources of sediment within the Jay Branch, Tributary 9 to Jay Branch (“Tributary 9”) and Tributary 3 to South Mountain Branch (“Tributary 3”) watersheds.

2.1 Data Management

Condition D of the Order requires JPR to provide “a systematic numbering convention for identification of each source and each existing or proposed remediation project that allows for consistent referencing across various parts of the Plan.” In order to comply with this requirement and streamline the collection and reporting of sediment source tracking data, each sediment source identified has been given a unique identification number that corresponds to a specific geographic location. These locations have been entered into a geographic information system (“GIS”) for data management, tracking, and display purposes.

By maintaining the sediment source tracking in a GIS database, the inventory of sites can be easily queried to identify sediment sources that have been successfully controlled and reported separately from sites that require additional remedial measures. Summary sheets for each sediment source that has been identified through the sediment source tracking process are included in Appendix 1. These sheets display the key

information for each site (for example geographic location, type of sediment source, recommended remedial activity, date identified, date of proposed remediation, and date of follow-up inspections), along with one or more photographs that illustrate the site and remedial measures that have been deployed.

In order to distinguish the location of each site within one of the three subwatersheds of interest, the first digit of the site's identification number is coded to represent the subwatershed in which the site is located. Sites with identification numbers in the 1000 series are located within the Jay Branch Watershed, sites with identification numbers in the 2000 series are located within the Tributary 9 to Jay Branch Watershed, and sites with identification numbers in the 3000 series are located with the South Mountain Branch and Tributary 3 to South Mountain Branch watersheds.

Sites initially identified during the sediment source tracking assessments conducted in the spring and fall of 2012 were reviewed and sites with outstanding concerns were entered into the database, along with the representative photograph that was taken when the site was identified. A total of 40 sites within the Resort's control were identified from the previous sediment source tracking assessments are included into the database. Fifteen sites were added as the result of site inspections conducted in the spring of 2014 and in conjunction with a site visit by DEC staff on July 9, 2014. New sites will be added to the database if additional sediment sources are identified.

During on-site sediment source tracking assessments, deficiencies relating to construction-phase EPSC measures or to existing stormwater best management practices ("BMPs") were periodically observed. Recommendations for remedial actions associated with these measures were referred to the Stormwater Management Team and have been addressed under each site's respective stormwater permit(s). These observations and recommendations have been removed from the database of remedial activities proposed as part of the WQRP. If similar deficiencies are observed in the future, remedial actions will be performed as necessary to maintain compliance with the site's stormwater permit. Table 1 presents maintenance activities or other sediment reduction actions that were recommended as a result of sediment reduction assessments conducted during the preparation of the WQRP. These tasks have been or will be completed during 2014 in accordance with the requirements of their associated stormwater permit.

Table 1. 2014 Maintenance Items Associated with Existing Stormwater Permits					
Location ID	Location Description	Remedial Action	Stormwater Permit #	Identified	Implementation Year
1011	Hotel One Stormwater Basin	Clean out sediment from stormwater basin. On-going annual maintenance item.	5467-9015.A2	2012	2013
2011	Woods beyond end of Fairway	Investigate BMP at end of Fairway; indeterminate inspection due to snow. Trash and sediment present, no apparent outlet but some erosion is visible.	5467-9015.4	2014	2014
2012	Bridge Road	Swale connection to stormwater pond failed during the winter. Rock-line swale to connect across ski trail to BMP.	3758.9015.A	2014	2014
2015	Stormwater Basin on Jay Peak Road	Stabilize slopes of stormwater basin where slumping has occurred.	5467-9015.9	2014	2014
3003	Stormwater Basin on Stateside Road	Stabilize slopes of stormwater basins where slumping has occurred.	5467-9015.9	2014	2014
3004	Stateside Road at Route 242	Repair / reconstruct stone stilling basin / splash pad at outlet of stormwater basin.	5467-9015.9	2014	2014
3019	Stateside Parking Lot	Complete stabilization of parking lot slopes at Stateside lot to prevent excess sedimentation into treatment BMP.	5467-9015.10	2014	2014

2.2 Prioritization of Remedial Measures

The remedial measures identified in the sediment source tracking assessment have been prioritized based several factors, including the anticipated amount of sediment reduction that would be obtained by the remedial measure, known future development or redevelopment activities that are proposed at the specific project location, and the level of design and permitting required to complete the proposed measure. For example, implementation of a remedial measure within an existing developed area that could be completed without affecting wetland resources and could therefore be completed without any impacts to regulated features would be prioritized above a project that would involve impacts to wetland resources and would therefore have a longer lead time.

As an initial prioritization tool, each site identified in the sediment source tracking assessment was assigned a relative "Reduction Potential" ranking of "Higher," "Moderate," or "Lower" and a relative "Remediation Complexity" ranking of "Higher," "Moderate," or "Lower." This assignment helps characterize the anticipated benefits of remediation at a particular site as well as the anticipated costs associated with those benefits.

2.3 2012 Sediment Source Assessments

Of the 40 sediment sources that remain outstanding from previous sediment source assessments conducted in 2012, 13 will be addressed during the 2014 construction season and 12 sites will be addressed during either

the 2014 or 2015 construction season. The remaining 15 sites have been designated as sites that will continue to be monitored and assessed but which do not have an immediate construction date. These sites consist predominantly of recommendations for culvert or bridge replacements or for stabilization in natural channel reaches that may have been previously impacted by stormwater discharges. In locations where replacement of a structure was recommended by the sediment source assessment, the replacement structure would meet or exceed the bankfull channel width in order to restore the equilibrium condition of the stream with respect to sediment transport and hydraulic capacity. In locations where stream bank stability was impacted by stormwater discharges prior to the completion and certification of stormwater BMPs, it is anticipated that the BMPs which have since been completed and certified will provide adequate control of stormwater runoff. These sites will be monitored and assessed to determine if additional intervention is necessary in order for the receiving waters to achieve attainment of compliance with the VWQS. The remaining recommendations that were not given a specific construction date are associated with the remediation of iron seeps at two locations. While not specifically sources of sediment, addressing iron seeps would increase the resiliency of the stream to other perturbations and supports the goal of attaining compliance with the VWQS. These sites are proposed to be addressed in conjunction with other project work that may be proposed in the vicinity of these sites.

2.4 2014 Sediment Source Assessments

A preliminary 2014 sediment source assessment was completed on April 28, 2014 in order to identify potential sediment sources that were present at the end of winter operations or which may have resulted from construction projects completed during the 2013 construction season. Additional follow-up inspections were conducted on May 22, June 23, and July 9, 2014 to review the status of sediment sources identified during previous assessments and to identify any potential new sources that were not previously visible due to snow coverage. As a result of these assessments, an additional 15 specific sites for sediment reduction activities were identified, entered in the GIS database, and are included in the site summary forms presented in Appendix 1.

The 2014 assessments have focused on impervious areas within previously-developed portions of the Resort that currently discharge stormwater runoff directly to receiving waters without being treated to the 2002 Vermont Stormwater Management Manual ("VSMM") standard. Three key areas were identified and are presented on the maps included in Appendix 2. These areas include sites with direct contributions to Jay Branch, mostly located along Jay Peak and West Bowl Roads; sites with direct contributions to Tributary 9 or

its contributing watershed, mostly along North Village Road; and sites with direct contributions to Tributary 3 or its contributing watershed, mostly along Stateside Road and VT Route 242.

Of the 15 potential remediation sites that have been identified in the 2014 sediment assessments, 2 were characterized as having “Higher” reduction potential, 5 with “Moderate” reduction potential, and 8 with “Lower” reduction potential. The implementation of remedial measures at these sites has been prioritized by the Resort as described above. Remedial measures were implemented at most of these sites during the 2014 construction season (including both of the “Higher” reduction potential sites). With the exception of items identified as “Monitor and Assess,” remedial measures are proposed to be implemented at the remainder of the sites by November 1, 2015.

The sediment source identified for 11 of the sites was associated with plowing practices and winter operations. Remedial activities for many of these locations consist of two key components: the first being the snow storage facilities and plowing guidance that are outlined in the Snow Management Plan and the second being annual inspections and spring cleanup operations following snow melt. Because the Resort is active during the winter months, plowing and sanding of the roadways is required in order to provide safe travel conditions for visitors. As a result, winter operations generate sediment that must be controlled and collected on an on-going basis each year. The Resort staff has developed a detailed understanding of the impacts from winter operations and addresses areas of accumulated sediment and exposed soil as soon as practicable once ground conditions permit.

Tables 2 through 4 present the proposed sediment reduction actions within the Jay Branch Direct Watershed, the Tributary 9 to Jay Branch Watershed, and the Tributary 3 to South Mountain Branch Watershed, respectively.

Table 2. Proposed Sediment Reduction Actions – Jay Branch Direct Watershed

Location ID	Location Description	Remedial Action	Reduction Potential	Remediation Complexity	Implementation Date
1001	Toe of slope at snowmaking pond	Iron seep into ditch at toe of slope. Install limestone cutoff trench to treat seep.	Lower	Moderate	11/1/2015
1002	Hotel Jay / Jay Peak Access Road	Vegetate informal parking spaces that occur adjacent to the roadway and parking lots. Install wattles to capture sediment each fall. Remove sand, mulch and reseed as necessary each spring.	Lower	Lower	2014
1003	Tram Haus Lodge	Revegetate edge of roadway and prevent vehicles from parking in this area. Plant shrubs and trees to restore riparian buffer of the tributary to Jay Branch.	Lower	Lower	11/1/2015
1004	Snowmaking / Chair Barn Parking Lot	Improve and armor existing swale and construct a settling basin.	Moderate	Moderate	2014
1005	Jay Peak Road opposite Tram Base Lodge	Vegetate informal parking spaces that appear adjacent to the roadway and other parking lots in this area.	Lower	Lower	2014
1006	West Bowl Road at Tram Haus Lodge	Stream channel under bridge near Tram Haus Lodge has eroded in-stream material; is flowing against bridge abutment but footing is not exposed.	Lower	Moderate	Monitor and assess
1012	Jay Peak Road opposite Hotel Jay	Prevent sediment from plowing activity from directly entering streams.	Moderate	Lower	2014 (Winter Operations)
1013	Tram Haus Lodge	Eliminate snow storage area adjacent to the West Bowl Road bridge. Plant woody species in riparian buffer. Install straw wattles on slope each fall to capture sediment.	Moderate	Lower	2014
1014	Snowmaking / Chair Barn Parking Lot	Regrade and pave parking area; provide stormwater management; restore riparian buffer vegetation	Higher	Moderate	11/1/2015
1015	Work Road to Snowmaking Pond	Armor upstream face of roadway embankment and place rip-rap on edge of road at snowmaking pipes; extend culvert beneath pipes if possible. Evaluate culvert size when replacement is required.	Lower	Moderate	2014
1016	West Bowl Road upgradient from Chair Barn	Culvert constricts bankfull channel width, may be causing downstream erosion. Replace with a wider span structure.	Lower	Moderate	Monitor and assess
1017	Snowmaking Intake at Jay Branch	Remove sediment from snowmaking intake, stabilize area and install additional plant material.	Lower	Moderate	11/1/2015
1018	Golf Course at Jay Branch	Mass bank failure not associated with site development; install monitoring measures to evaluate site as potential source of sediment in the watershed.	Moderate	Higher	Monitor and assess
1019	Golf Course	Repair cart path erosion at Golf Course Bridge over Jay Branch; stabilize approaches to reduce erosion and sediment discharge.	Lower	Lower	2014

Table 3. Proposed Sediment Reduction Actions – Tributary 9 to Jay Branch Watershed					
Location ID	Location Description	Remedial Action	Reduction Potential	Remediation Complexity	Implementation Year
2001	Phase II Tributary at Queen's Highway	Stabilize waterbar and upgrade or eliminate work road crossing.	Lower	Higher	2014
2002	Raccoon Run Ski Trail	Iron seep from underdrain into wetland. Install treatment measures upgradient from wetland to intercept flow.	Lower	Moderate	11/1/2015
2003	Phase II Tributary at Raccoon Run	Stabilize waterbar and upgrade or eliminate work road crossing.	Moderate	Lower	2014
2004	Phase II Tributary at Raccoon Run	Regrade and stabilize waterbar and transition area between ski trail and natural channel at edge of ski trail.	Moderate	Moderate	2014
2005	South Village Road	Prevent sediment from plowing activity from directly entering streams. Protect buffer vegetation (no mow signage) and install straw wattles each fall.	Lower	Lower	11/1/2015
2006	North Village Road	Prevent sediment from plowing activity from directly entering streams. Create snow dump with settling pond to retain winter sand, per Snow Management Plan Area #3.	Lower	Lower	2014
2007	Phase I Tributary at North Village Road	Prevent sediment from plowing activity from directly entering streams. Create snow dump with settling pond to retain winter sand, per Snow Management Plan Area #4.	Moderate	Lower	2014
2008	Phase II Tributary at South Village Road	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.	Moderate	Moderate	Monitor and assess
2009	Phase II Tributary at South Village Road	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.	Moderate	Moderate	Monitor and assess
2010	Phase II Tributary at South Village Road	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.	Moderate	Moderate	Monitor and assess
2013	Phase II Tributary at North Village Road	Repair erosion along Phase II Tributary Restoration Area; Incorporate wider gradation of particle sizes in addition to rock steps. Install woody vegetation.	Moderate	Lower	11/1/2015
2014	Phase I Tributary at North Village Road	Improve stormwater management along roadway adjacent to Phase 1 Tributary.	Moderate	Moderate	2014
2016	Unnamed Trib. along Grammy Jay	Improve work road crossing and stabilize surface	Lower	Lower	2014
2017	Tributary 9 along Driving Range slope	Discontinue intensive vegetation management in riparian buffer. Install additional plant materials to restore stream shading and habitat functions.	Lower	Lower	2014
2018	Wetland adjacent to Tributary 9 near Driving Range slope	Provide treatment for iron seep without encroachment into wetland.	Lower	Moderate	11/1/2015

Table 4. Proposed Sediment Reduction Actions – Tributary 3 to South Mountain Branch Watershed					
Location ID	Location Description	Remedial Action	Reduction Potential	Remediation Complexity	Implementation Date
3001	North of Snowline Lodge	Downcutting in overhead power line corridor has resulted in downstream sediment transport and has exposed a stretch of abandoned sanitary sewer line.	Moderate	Moderate	Monitor and assess
3002	Stateside Road Culvert at Route 242	Improve drainage, and prevent road side slope erosion, through repair of ditch.	Lower	Lower	2014
3005	Jay Peak Road	Adjust local grading during repaving operations to direct more impervious area to treatment; add check dams in drainage swales.	Lower	Moderate	11/1/2015
3006	Route 242 Ditches	Route 242 improvements (by VTrans) anticipated 2015; changes to Lower Rt. 242 lot will reduce sediment washoff to roadway.	Lower	Lower	11/1/2015
3007	Stateside Road	Snow Management Plan Area #2. Manage snow from roadway and parking lot in areas away from stream. Promote woody revegetation on stream side slopes and at top of bank..	Moderate	Moderate	2014 (Winter Operations)
3008	VT Route 242 Parking Lot	Relocate parking lot entrance away from VT Rt. 242, replace with dedicated entrance off Stateside Road; reduce the width of Stateside Road at Route 242 intersection.	Moderate	Moderate	11/1/2015
3009	VT Route 242 Parking Lot	Sediment is being routed directly to swale without treatment. Improve parking lot grading and stormwater management.	Moderate	Moderate	11/1/2015
3010	Stateside Road	Slope failure above treatment swale, receiving runoff from sand pile and clogging outlet.	Higher	Lower	2014
3011	VT Route 242 Parking Lot	Regrade parking lot to direct flows away from VT Rt. 242 and into an enhanced stormwater treatment swale.	Higher	Higher	2014
3012	VT Route 242 Parking Lot	Install barriers to prevent vehicle and snow piles from entering the riparian buffer. Snow Management Plan Area #1.	Lower	Lower	2014 (Winter Operations)
3013	Stateside Maintenance Area	Restore sediment controls surrounding Sand Pile and prevent runoff from entering this area.	Higher	Lower	2014
3014	Stateside Road at VT Route 242 Parking Lot	Improve stormwater management along Stateside Road, vegetate swales and stabilize / pave roadway surface to minimize sediment discharge to Trib. 3.	Higher	Higher	11/1/2015
3015	Jet Triple Lift access road	Stream in close proximity to road. Snow plowing operations will cease to push snow onto this stream, per Snow Management Plan Area #11.	Moderate	Moderate	2014 (Winter Operations)
3016	Tributary 3 downstream from Stateside Road culvert	Berm installed along top of slope in 2012, preventing runoff down face of slope. Vegetation is becoming established. Continue to monitor.	Moderate	Moderate	2014
3018	Stateside Maintenance Area	Create berm/terrace to direct snow melt into the Stateside Hotel treatment system.	Moderate	Lower	2014 (Winter Operations)
3020	Stateside Road ditch upgradient from Tributary 3 culvert	Poorly vegetated banks and channel, erosion and sediment delivery to Tributary 3. Install rip-rap to protect channel from erosion.	Lower	Lower	2014
3021	Stateside Road Trib 3 Culvert	Stabilize banks and headwall on upstream end of Tributary 3 culvert to prevent further erosion.	Moderate	Lower	2014

Table 4. Proposed Sediment Reduction Actions – Tributary 3 to South Mountain Branch Watershed					
Location ID	Location Description	Remedial Action	Reduction Potential	Remediation Complexity	Implementation Date
3022	Timber Bridge crossing near First Aid / Ski Patrol	Decrease bank erosion and flood velocity through channel constriction by increasing structure span; wider structure will be used when bridge is replaced. Coordinate with DEC River Management Engineer.	Moderate	Moderate	Monitor and assess
3023	Hell's Crossing Tributary 3 culvert	Culvert is skewed with respect to channel, has perched outlet, and scoured banks downstream. Coordinate with DEC River Management Engineer.	Moderate	Moderate	Monitor and assess
3024	Culverted Stream Crossing	Incised and widening stream 2010/2012-SC-C1 at culvert SMB-15. Replace culvert and stabilize affected channel. Coordinate with DEC River Management Engineer.	Moderate	Moderate	Monitor and assess
3025	2011-TB/SC-C25	Naturally occurring avulsion has active headcut and will likely contribute sediments to downstream resources in the future. Outside of development area	Moderate	Moderate	Monitor and assess
3026	VT Route 242 Parking Lot	Culvert outfall partially blocked, potentially causing localized flooding in Rt. 242 parking lot. Culvert will be replaced in conjunction with Rt. 242 lot improvements.	Lower	Lower	2014
3027	Powerliner Ski Trail Waterbar	Stabilize waterbar and add sediment sump to capture sediment before discharge to stream.	Lower	Moderate	2014
3028	VT Route 242	Poorly stabilized roadside ditches and embankments on VT Rt. 242 are actively eroding. Improvement of Jay Peak portion of the ditch will occur in conjunction with the Rt. 242 parking lot improvements.	Moderate	Moderate	11/1/2015
3029	Stateside Road Tributary 3 Culvert	Reestablish sediment transport, decrease flood flow velocity and scour, and reestablish aquatic organism passage (AOP). Note - AOP goal constrained by perched culvert at VT-242.	Moderate	Higher	Monitor and assess
3030	Stateside Road Ditches	Poorly vegetated banks and channel, erosion and sediment delivery to Tributary 3. Rip-rap ditch sections where required.	Lower	Lower	2014

2.5 Web-Enabled Map

To further achieve the requirements of Condition D of the Order, the sediment source tracking assessment data has also been populated to a web-enabled map that can be reviewed by Jay Peak and VT DEC to facilitate discussion and reporting. The web-enabled map may be accessed via the following internet address:

http://gis.vhb.com/Apps/JayPeakResort_SedimentSourceTracking/

The contents of this map will also be updated periodically to reflect additional sediment source tracking investigations, completion of remediation activities performed by the Resort, and the results of water quality monitoring. A significant benefit of this approach is that the information can be updated over time as different

sediment source reduction projects are completed and photographs of the completed actions can be reviewed to assess progress in meeting goals.

2.6 Progress Tracking Methodology

Because each of the sites identified as a potential sediment source has been entered into a GIS database with a unique ID, the associated attribute fields can be updated to reflect the initial date of identification, the recommended remedial action, the proposed prioritization and schedule for the remedial action, the date the action was deemed complete, and a recommended follow-up monitoring schedule to confirm that the action was sufficient. By updating the information in these data fields and providing quarterly progress reports on the progress of remedial activities, the implementation of remedial measures will be clearly documented for each sediment source that has been identified. The progress reports will consist of a brief narrative describing remedial activities that have taken place, any unanticipated constraints that have prevented a remedial activity from being completed, and an updated summary sheet for each sediment source that has been corrected, including before and after photographs of the site.

3.0 Schedule of Implementation - 2014 and 2015

The following sections provide the schedule of implementation for tasks that are to be completed by JPR as required by the Order and the previously-approved 2013 WQRP.

3.1 Sediment Reduction Implementation Schedule

Tables 1 through 3 that were previously presented include the proposed implementation schedule for each site, along with the site's unique ID and the description of the remedial measures recommended at the site. Critical items have been prioritized for immediate correction in this schedule. The schedule may be subject to modification due to changing weather conditions, material availability, and other issues; however the items identified will be completed within the two construction season timeframe specified by Condition F of the Order.

In addition to the site-specific activities identified during the sediment reduction assessments, additional non-structural best management practices ("BMP") were identified that can be employed at various locations around the Resort. These include improving on-mountain work road water bar crossings with structures (small bridges or culverts) or rock-stabilized crossings; seeding and mulching areas that did not establish vegetation

during the previous growing season; performing spring clean-ups to remove accumulated sand from roadsides and ditches; and to confirm the operational and maintenance status of stormwater systems constructed in the previous year. These BMPs will be carried out on a regular basis by operations crews employed by the Resort or its subcontractors

3.2 Monitoring and Reporting Schedule

A schedule of tasks and products associated with water quality monitoring and reporting in 2014 and 2015 is provided in Table 5 and Table 6.

Table 5. Schedule of Tasks and Products for Jay Peak Resort – 2014	
2014 Tasks	Date
Submit 2013 Annual Water Quality Monitoring Report	May 2014
Complete Preliminary Sediment Reduction Assessment	Spring 2014
On-going Sediment Reduction Assessment, supported by supplemental turbidity monitoring	Spring / Summer 2014
Sediment Reduction Assessment Quarterly Update	September 1, 2014
First and second round of event-based water chemistry sampling	Early Fall 2014
First round of monthly baseflow water chemistry sampling	September 2014
Second round of monthly baseflow water chemistry sampling	October 2014
Substrate sampling and assessment	September / October 2014
Biomonitoring and Habitat Assessment	September / October 2014
Third round of baseflow water chemistry sampling (If needed)	November 2014
Sediment Reduction Assessment Quarterly Update	December 1, 2014
Submit 2014 Annual Water Quality Monitoring Report	February 1, 2015

Table 6. Schedule of Tasks and Products for Jay Peak Resort – 2015	
2015 Tasks	Date
Sediment Reduction Assessment Quarterly Update	March 1, 2015
Update Sediment Reduction Assessment	Spring 2015
Sediment Reduction Assessment Quarterly Update	June 1, 2015

Table 6. Schedule of Tasks and Products for Jay Peak Resort – 2015	
2015 Tasks	Date
On-going Sediment Reduction Assessment, supported by supplemental turbidity monitoring	Spring / Summer 2015
Sediment Reduction Assessment Quarterly Update	September 1, 2015
Two rounds of event-based water chemistry sampling	Early Fall 2015
First round of baseflow water chemistry sampling	September 2015
Second round of baseflow water chemistry sampling	October 2015
Substrate sampling and assessment	September / October 2015
Biomonitoring and Habitat Assessment	September / October 2015
Third round of baseflow water chemistry sampling (If needed)	November 2015
Sediment Reduction Assessment Quarterly Update	December 1, 2015
Submit 2015 Annual Water Quality Monitoring Report	February 1, 2016

In accordance with the revised QAPP, water chemistry and substrate samples will be collected on or before the macroinvertebrate samples. Water chemistry samples results will be provided to the VT DEC within one week of receipt from the laboratory, pebble count results will be provided to VT DEC within two weeks of field collection. Following the format included in prior year's reports, a 2014 Performance Report that summarizes the 2014 water quality monitoring findings will be submitted to the VT DEC by February 1, 2015 and a 2015 Performance Report that summarizes the 2015 water quality monitoring findings will be submitted by February 1, 2016. These reports will review changes in water quality that have occurred in comparison to prior results.

3.3 Construction Phase Stormwater Measures

In accordance with the requirements of the Resort's Individual Construction Phase Stormwater Discharge Permit, weekly inspections are being conducted by the On-Site Plan Coordinator ("OSPC") to address sediment issues within the active development area. Bi-weekly inspections by the Erosion Prevention and Sediment Control ("EPSC") Specialist are also being performed. The reports from both OSPC and EPSC inspections are provided to VT DEC. Where relevant, these reports will also be referenced in the quarterly sediment reduction assessment updates.

3.4 Housekeeping Measures by Resort Staff

The Resort staff has begun tracking housekeeping measures that relate to sediment reduction and stormwater management in their daily operations. Some examples of these sediment reduction activities include:

- Sweep up excess sand at the end of winter operations
- Seed and mulch any previously disturbed areas that are not well-vegetated
- Repair swales and remove sediment from check dams
- Repair stormwater ponds as needed (banks or discharge locations)
- Mulch / stabilize work roads
- Remove accumulated sediment from stormwater treatment practices (forebays, infiltration systems, etc.)

The intention of JPR is that these activities will become an ongoing part of Resort operational practices, to be overseen by the Stormwater Team.

4.0 Water Quality Monitoring Plan

An annual Water Quality Monitoring Plan ("WQMP") Performance Report for the Jay Branch watershed has been prepared and submitted to VT DEC annually since 2004. The WQMP provides the results from each year's sediment substrate, water chemistry, and biological monitoring activities. In addition, the WQMP provides revised recommendations for remediation strategies based on the progress that was made on stormwater treatment and stream restoration projects during the prior year. The WQMP study area was expanded in 2011 to include South Mountain Branch, also known as Tributary 7 to Jay Branch, in recognition of potential impairments associated with previous development in the watershed and in response to recommendations from the VT DEC. The WQMP Quality Assurance Project Plan ("QAPP") was most recently revised in August 2012 in response to VT DEC recommendations.

4.1 Plan Summary

The 2014 sampling season consisted of the continuation of the WQRP monitoring program in accordance with the QAPP that was most recently updated in 2013. In anticipation of construction activities in the Upper Jay Branch ("West Bowl") watershed, baseline data was previously collected at four benchmark stations (WQM 101, WQM 102, WQM 103 and WQM 104). Because no new development activities are planned within the West Bowl during the 2015 construction season, no additional baseline samples are proposed to be

collected during the 2015 calendar year. Additional baseline monitoring will be re-instated at such time as new construction activities are proposed within the Jay Branch or South Mountain Branch watersheds.

4.2 Stations and Parameters

Annual water quality monitoring will continue through the 2014/2015 season in accordance with the QAPP. Event-based sampling will occur in September and October during two baseflow events and two precipitation events at ten (10) WQM stations. Samples will be collected for the following parameters during the baseflow and precipitation events: alkalinity, chloride, total iron, turbidity, conductivity, pH, dissolved oxygen ("DO"), total suspended solids ("TSS"), and temperature. Winter sampling events will occur in mid-late winter 2014/2015 and will include one baseflow event and one mild runoff event. Winter sampling events will occur at five (5) WQM stations and will collect samples for the following parameters: turbidity, conductivity, pH, DO, and temperature. Macroinvertebrate kick net sampling (biomonitoring) will occur at six (6) WQM stations. These samples will be collected in conjunction with or following the water chemistry samples. Substrate sampling is proposed to occur at eleven (11) WQM stations. A summary of the monitoring stations and parameters that was sampled during 2014 is included in Table 7.

Table 7. 2014 Jay Peak Resort Water Quality Monitoring						
Stream	Station	Baseflow Chemistry	Storm Event Chemistry	Substrate	Bio-monitoring & Habitat	Winter Monitoring
Jay Branch	WQM 4-1	X	X	X	X	
	WQM 4-2a	X	X	X		X
	WQM 4-3	X	X	X	X	X
	WQM 4-4a	X	X	X	X	
Trib. 9	WQM 3-1	X	X	X	X	X
Phase I Trib.	WQM 1-2	X	X	X		X
Phase II Trib.	WQM 2-3	X	X	X		X
South Mountain Branch	WQM 105	X	X	X		
	WQM 106	X	X	X		
	WQM 107	X	X	X	X	
	WQM 108	X	X	X		X
Baseflow water chemistry: sampled twice in fall. Parameters include alkalinity, chloride, total iron, turbidity, conductivity, pH, DO, total suspended solids, and temperature.						
Event flow water chemistry: sampled twice in fall. Parameters include alkalinity, chloride, total iron, turbidity, conductivity, pH, DO, total suspended solids, and temperature.						
Biomonitoring and Habitat (macroinvertebrate): once per year - September/October, following baseflow sample collection.						
Substrate Sampling: once per year - September/October, prior to macroinvertebrate sampling.						
Winter melt off water chemistry: sampled twice in mid/late winter. Field parameters only, including turbidity, conductivity, pH, DO, and temperature.						

4.3 Supplemental Turbidity Monitoring

Supplemental turbidity monitoring was performed at multiple locations within the target watersheds over the spring and summer of 2014 in an effort to provide immediate feedback on the success of the remedial activities that have been performed and to identify other potential sources of sediment that require treatment. These investigations are supplemental to the monitoring planned under the 2013 WQRP because they will occur more regularly throughout the course of the year and are not limited to previously-identified water quality monitoring ("WQM") stations. The supplemental turbidity monitoring will follow the previously-approved wet weather monitoring protocols outlined in the Quality Assurance Project Plan ("QAPP"). The results from the supplemental turbidity monitoring will be provided in the Annual Report.

To maximize the efficiency of this monitoring effort, appropriate members of the Resort staff have been trained to conduct the monitoring and have assumed responsibility for much of the sampling. In addition, because the Resort staff is present on site at all times, it will be more feasible for them to sample some of the

smaller, more frequent events that are challenging for remote technicians to sample. Because these same staff members may also be involved in the implementation of remedial measures, it is anticipated that the feedback provided by this sampling effort will shorten the turnaround time between sediment source identification and its subsequent remediation.

4.4 Seasonal Inspections

Because the sources of sediment within a watershed may vary with time, the same location may require seasonal inspection. For example, snow storage areas and no-plow zones will be inspected during winter months to ensure compliance with the snow management plan, whereas bank stabilization measures will be evaluated during the summer months when vegetation establishment is visible. One of the attribute fields in the GIS database captures this aspect of sediment source reduction and identifies those sites that are critical to observe during the winter months when snow storage is a primary concern and which sites are inaccessible during winter and must therefore be inspected during the summer.

5.0 Summary

This water quality remediation plan identifies the steps that Jay Peak Resort has been and will continue to implement in order to improve water quality and stormwater runoff in the portions of the Jay Branch, Tributary 9 to Jay Branch, and Tributary 3 to South Mountain Branch watersheds as required by the Order. Through diligent and complete implementation of the steps outlined in this WQRP, water quality conditions within the reaches of Jay Branch and its tributaries that are currently impaired will be improved, with an expectation of attainment with VWQS.

\\vtfnfdata\projects\57201.07 JPR 14-15 WQ Monitoring\reports\WQRP\2014_WQRP_Revised_Final.docx

APPENDIX 1

Unique ID	1001		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.511; 44.941		
Location Description	Toe of slope at snowmaking pond		
Type of Problem	Iron Seep		
Remedial Action Description	Iron seep into ditch at toe of slope. Install limestone cutoff trench to treat seep.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes			



Work road ditch at toe of slope (04/24/2012)



Updated inspection - similar conditions (05/22/2014)

Unique ID	1002		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.505; 44.939		
Location Description	Hotel Jay / Jay Peak Access Road		
Type of Problem	Untreated Impervious		
Remedial Action Description	Vegetate informal parking spaces that occur adjacent to the roadway and parking lots. Install wattles to capture sediment each fall. Remove sand, mulch and reseed as necessary each spring.		
Discharges to Stormwater BMP	Yes	Associated Stormwater BMP	Hotel Jay Basin
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete); Provide maintenance annually as needed.		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Sand removed and area mulched as of 5/22/2014. Disturbed areas vegetated as of 08/20/2014.		



Ad hoc parking adjacent to Jay Peak Road (04/28/2014)



Area following application of mulch (05/22/2014)



Re-established vegetation along roadside (08/20/2014)

Unique ID	1003		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.507; 44.939		
Location Description	Tram Haus Lodge		
Type of Problem	Untreated Impervious		
Remedial Action Description	Revegetate edge of roadway and prevent vehicles from parking in this area. Plant shrubs and trees to restore riparian buffer of the tributary to Jay Branch.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	November 1, 2015		
Implementation Completed	Initial stabilization completed 2014; Additional plantings to be installed by November 1, 2015.		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Disturbed area seeded & stabilized as of 07/30/2014. Additional plantings scheduled for fall 2014.		



Ad hoc parking adjacent to Tram Haus Lodge (04/28/2014)



Shuttle van parked in area of concern (05/22/2014)



Additional stabilization of area (07/30/2014)

Unique ID	1004		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.508; 44.940		
Location Description	Snowmaking / Chair Barn Parking Lot		
Type of Problem	Plowing Practices		
Remedial Action Description	Improve and armor existing swale and construct a settling basin.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014		
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes	Existing vegetated open area could be used for snow storage; swale lined with stone and disturbed area mulched as of 08/06/2014.		



Potential enhanced snow storage area (04/28/2014)



Area stabilized and pipeline removed (08/06/2014)

Unique ID	1005		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.506; 44.939		
Location Description	Jay Peak Road opposite Tram Base Lodge		
Type of Problem	Untreated Impervious		
Remedial Action Description	Vegetate informal parking spaces that appear adjacent to the roadway and other parking lots in this area.		
Discharges to Stormwater BMP	Yes	Associated Stormwater BMP	Hotel Jay Basin
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	Completed 2014; Provide maintenance annually as needed.		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Some areas of informal parking eliminated by installing split rail fence. Disturbed areas vegetated as of 08/20/2014.		



Typical example of parking off Jay Peak Rd (04/28/2014)



New fence installed and mulch applied (05/22/2014)



Re-established vegetation along roadside (08/20/2014)



Re-established vegetation in fenced area (08/20/2014)

Unique ID	1006		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.507; 44.940		
Location Description	West Bowl Road at Tram Haus Lodge		
Type of Problem	Bank Stabilization		
Remedial Action Description	Stream channel under bridge near Tram Haus Lodge has eroded in-stream material; is flowing against bridge abutment but footing is not exposed.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	04/28/2014		
Follow-up Inspection Notes	Channel appears stable but is flowing against abutment as of 04/28/2014.		



Stream at West Bowl Road bridge (04/24/2012)



Stream as viewed from above (04/28/2014)

Unique ID	1012		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.504; 44.939		
Location Description	Jay Peak Road opposite Hotel Jay		
Type of Problem	Plowing Practices		
Remedial Action Description	Prevent sediment from plowing activity from directly entering streams.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014 and on-going winter operations		
Implementation Completed	Snow Management Plan implemented 2014		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Straw mulch applied, excess sediment removed. Good vegetative growth as of 08/20/2014.		



Snow storage near Jay Peak Road (04/28/2014)



Well-vegetated slope during summer (08/19/2014)

Unique ID	1013		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.507; 44.940		
Location Description	Tram Haus Lodge		
Type of Problem	Plowing Practices		
Remedial Action Description	Eliminate snow storage area adjacent to the West Bowl Road bridge. Plant woody species in riparian buffer. Install straw wattles on slope each fall to capture sediment.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	04/28/2014; 05/22/2014		
Follow-up Inspection Notes	Similar conditions present as of 04/28/2014. Some sediment removed and area mulched (05/22/2014)		



Snow storage near West Bowl Road Bridge (04/24/2012)



Snow storage near West Bowl Road Bridge (04/28/2014)



Area after straw mulch application (05/22/2014)



Area after straw mulch application (05/22/2014)

Unique ID	1014		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.507; 44.939		
Location Description	Snowmaking / Chair Barn Parking Lot		
Type of Problem	Untreated Impervious		
Remedial Action Description	Regrade and pave parking area; provide stormwater management; restore riparian buffer vegetation		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Higher		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed	Paving completed 2014; Additional plantings to be installed by November 1, 2015.		
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes	Area will be improved with paving project scheduled for fall 2014.		



Unpaved parking area adjacent to stream (04/24/2012)



Snow storage in untreated area (04/28/2014)

Unique ID	1015		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.508; 44.939		
Location Description	Work Road to Snowmaking Pond		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Armor upstream face of roadway embankment and place rip-rap on edge of road at snowmaking pipes; extend culvert beneath pipes if possible. Evaluate culvert size when replacement is required.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014		
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes	Culvert headwall reconstructed and roadway shoulder stabilized as of 08/20/2014.		



Work road culvert crossing (04/24/2012)



Conditions present during 2014 inspection (07/09/2014)



Culvert crossing following stabilization (08/20/2014)

Unique ID	1016		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.508; 44.940		
Location Description	West Bowl Road upgradient from Chair Barn		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Culvert constricts bankfull channel width, may be causing downstream erosion. Replace with a wider span structure.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and Assess		
Implementation Completed			
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes	Minimal amount of erosion/sedimentation observed as of 07/09/2014; continue to monitor.		



West Bowl Road culvert crossing (04/24/2012)



Stable conditions observed, monitor (07/09/2014)

Unique ID	1017		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.507; 44.940		
Location Description	Snowmaking Intake at Jay Branch		
Type of Problem	Bank Stabilization		
Remedial Action Description	Remove sediment from snowmaking intake, stabilize area and install additional plant material.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed	2014 (partial) - slumping bank has been armored; additional plantings to be installed by November 1, 2015.		
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes	Some improvement in vegetative cover observed as of 07/09/2014.		



Exposed sediment at snowmaking intake (04/24/2012)



Conditions present during 2014 inspection (07/09/2014)

Unique ID	1018		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.501; 44.941		
Location Description	Golf Course at Jay Branch		
Type of Problem	Bank Stabilization		
Remedial Action Description	Mass bank failure not associated with site development; install monitoring measures to evaluate site as potential source of sediment in the watershed.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Higher		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	04/28/2014		
Follow-up Inspection Notes	Erosion appears to be continuing when inspected on 04/28/2014.		



Jay Branch slope failure (04/24/2012)



Jay Branch slope failure (04/28/2014)

Unique ID	1019		
Subwatershed	Jay Branch		
Geographic Coordinates	-72.502; 44.940		
Location Description	Golf Course		
Type of Problem	Untreated Impervious		
Remedial Action Description	Repair cart path erosion at Golf Course Bridge over Jay Branch; stabilize approaches to reduce erosion and sediment discharge. Repair erosion at Hole 18 Bridge over Jay Branch; pave approaches to reduce sediment		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	04/28/2014		
Follow-up Inspection Notes	Cartpath regraded and shoulders vegetated as of 08/08/2014.		



Eroded bridge approaches over Jay Branch (04/28/2014)



Eroded bridge approaches over Jay Branch (4/28/2014)



Repaired bridge approach (08/07/2014)

Unique ID	2001		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.508; 44.933		
Location Description	Phase II Tributary at Queen's Highway		
Type of Problem	Bank Stabilization		
Remedial Action Description	Stabilize waterbar and upgrade or eliminate work road crossing.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Summer		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Higher		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Waterbar regraded and stabilized as of 07/09/2014; work road eliminated in this area as of 08/20/2014.		



Phase II Trib. crossing at Queen's Highway (04/24/2012)



Removal of work road crossing underway (07/09/2014)

Unique ID	2002		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.508; 44.933		
Location Description	Raccoon Run Ski Trail		
Type of Problem	Iron Seep		
Remedial Action Description	Iron seep from underdrain into wetland. Install treatment measures upgradient from wetland to intercept flow.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Similar conditions observed as of 05/22/2014.		



Iron seep into wetland near Raccoon Run (04/24/2012)



Staining only visible near outlet (05/22/2014)

Unique ID	2003		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.507; 44.933		
Location Description	Phase II Trib at Raccoon Run		
Type of Problem	Bank Stabilization		
Remedial Action Description	Stabilize waterbar and upgrade or eliminate work road crossing.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Summer		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Work road eliminated and repaired waterbar vegetation establishment in progress as of 08/20/2014.		



Phase II Trib. crossing at Raccoon Run (04/24/2012)



Regraded and stabilized water bar crossing (07/09/2014)



Vegetation establishment on waterbar (08/20/2014)

Unique ID	2004		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.507; 44.933		
Location Description	Phase II Tributary at Racoon Run		
Type of Problem	Bank Stabilization		
Remedial Action Description	Regrade and stabilize waterbar and transition area between ski trail and natural channel at edge of ski trail.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Waterbar and headcut stabilized as of 07/17/2014.		



Phase II Tributary erosion (04/24/2012)



3-ft deep headcut has developed (05/22/2014)



Channel regraded and transition stabilized (07/17/2014)

Unique ID	2005		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.506; 44.933		
Location Description	South Village Road		
Type of Problem	Plowing Practices / Riparian Buffer Management		
Remedial Action Description	Prevent sediment from plowing activity from directly entering streams. Protect buffer vegetation (no mow signage) and install straw wattles each fall.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	No mow zone established 2014; additional plantings to be installed by November 1, 2015.		
Follow-up Inspection Date(s)	07/17/2014		
Follow-up Inspection Notes	Straw wattle present, less sediment visible. No mow signage added 07/17/2014. Additional plantings to be added fall 2014.		



Sediment from snow storage area (04/24/2012)



Straw wattle used to trap sediment (05/22/2014)



No mow area signage added (07/17/2014)

Unique ID	2006		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.506; 44.934		
Location Description	North Village Road		
Type of Problem	Plowing Practices		
Remedial Action Description	Prevent sediment from plowing activity from directly entering streams. Create snow dump with settling pond to retain winter sand, per Snow Management Plan Area #3.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Sediment basin constructed and straw mulch spread over area as of 08/20/2014.		



Sediment from snow storage area (04/24/2012)



Area following application of mulch (05/22/2014)



Snow storage area with rip rap outlet (08/20/2014)



Rip rap outlet spillway (08/20/2014)

Unique ID	2007		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.506; 44.935		
Location Description	Phase I Tributary at North Village Road		
Type of Problem	Plowing Practices		
Remedial Action Description	Prevent sediment from plowing activity from directly entering streams. Create snow dump with settling pond to retain winter sand, per Snow Management Plan Area #4.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/24/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	04/24/2012		
Follow-up Inspection Notes	Good vegetation growth observed as of 08/20/2014, minimal sediment contribution during summer months.		



Sediment from road plowing operations (04/24/2012)



Same area with well-established vegetation (08/19/2014)

Unique ID	2008		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.502; 44.935		
Location Description	Phase II Tributary at South Village Road		
Type of Problem	Bank Stabilization		
Remedial Action Description	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	04/24/2012		
Follow-up Inspection Notes			



Phase II Tributary erosion (04/24/2012)

Unique ID	2009		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.502; 44.935		
Location Description	Phase II Tributary at South Village Road		
Type of Problem	Bank Stabilization		
Remedial Action Description	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	04/24/2012		
Follow-up Inspection Notes	Slumping / erosion appears to have arrested, good vegetation growth observed as of 08/07/2014.		



Phase II Tributary erosion (04/24/2012)



Improved vegetative growth in area (08/07/2014)

Unique ID	2010		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.501; 44.935		
Location Description	Phase II Tributary at South Village Road		
Type of Problem	Bank Stabilization		
Remedial Action Description	Outlet repair, stream bank stabilization. Continue to monitor following completion of 2013 remedial activities and stormwater certifications.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/24/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	04/24/2012		
Follow-up Inspection Notes	Slumping / erosion appears to have arrested, good vegetation growth observed as of 08/07/2014.		



Phase II Tributary erosion (04/24/2012)



Improved vegetative growth in area (08/07/2014)

Unique ID	2013		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.500; 44.936		
Location Description	Phase II Tributary at North Village Road		
Type of Problem	Bank Stabilization		
Remedial Action Description	Repair erosion along Phase II Tributary Restoration Area; Incorporate wider gradation of particle sizes in addition to rock steps. Install woody vegetation.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	November 1, 2015		
Implementation Completed	Bank stabilization completed 2014; Additional plantings to be installed by November 1, 2015.		
Follow-up Inspection Date(s)	04/28/2014; 07/09/2014; 07/31/2014		
Follow-up Inspection Notes	Implementation of remedial action observed on 07/09/2014; Plantings replaced as of 7/31/2014.		



Phase II Trib. erosion in restoration area (04/28/2014)



Contractor repairing restoration reach (07/09/2014)



Vegetation installed after stream repairs (07/29/2014)

Unique ID	2014		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.500; 44.937		
Location Description	Phase I Tributary at North Village Road		
Type of Problem	Untreated Impervious		
Remedial Action Description	Improve stormwater management along roadway adjacent to Phase 1 Tributary.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	04/28/2014		
Follow-up Inspection Notes	Roadway superelevated to direct flow away from stream, rock shoulder installed, settling basin installed in ditchline as of 08/07/2014.		



Untreated impervious near Phase I Trib. (04/28/2014)



Regraded road with stone edging (08/07/2014)



Sedimentation basin adjacent to roadway (08/06/2014)

Unique ID	2016		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.506; 44.932		
Location Description	Unnamed Trib. along Grammy Jay		
Type of Problem	Bank Stabilization		
Remedial Action Description	Improve work road crossing and stabilize surface		
Discharges to Stormwater BMP	no	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	05/22/2014		
Proposed Implementation	2014		
Implementation Completed	2014		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Good vegetation growth observed as of 08/20/2014.		



Work Road crossing near Grammy Jay (05/22/2014)



Close-up of work road crossing (05/22/2014)



Same area with established vegetation (08/19/2014)

Unique ID	2017		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.497; 44.939		
Location Description	Tributary 9 along Driving Range slope		
Type of Problem	Riparian Buffer Management		
Remedial Action Description	Discontinue intensive vegetation management in riparian buffer. Install additional plant materials to restore stream shading and habitat functions.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Summer		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	06/23/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	06/25/2014		
Follow-up Inspection Notes	No mow zone signage installed as of 07/18/2014. Additional plant materials installed fall 2014.		



Mowed area within riparian buffer zone (06/25/2014)



"No Mow" signage installed (7/17/2014)

Unique ID	2018		
Subwatershed	Tributary 9		
Geographic Coordinates	-72.497; 44.939		
Location Description	Wetland adjacent to Tributary 9 near Driving Range slope		
Type of Problem	Iron Seep		
Remedial Action Description	Provide treatment for iron seep without encroachment into wetland.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	07/09/2014		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	07/09/2014		
Follow-up Inspection Notes			



Iron seep within wetland at toe of slope (07/09/2014)

Unique ID	3001		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.495; 44.933		
Location Description	North of Snowline Lodge		
Type of Problem	Bank Stabilization		
Remedial Action Description	Downcutting in overhead power line corridor has resulted in downstream sediment transport and has exposed a stretch of abandoned sanitary sewer line.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes			



Downcutting at abandoned utility crossing (11/08/2012)

Unique ID	3002		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.500; 44.929		
Location Description	Stateside Road Culvert at Route 242		
Type of Problem	Bank Stabilization		
Remedial Action Description	Improve drainage, and prevent road side slope erosion, through repair of ditch.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	05/02/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	04/28/2014; 05/22/2014		
Follow-up Inspection Notes	Slope and ditchline regraded and stabilized as of 08/14/2014.		



Slumped banks and clogged culvert inlet (05/02/2012)



Slumped banks and clogged culvert inlet (04/28/2014)



Repaired bank and ditchline (08/14/2014)

Unique ID	3005		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.500; 44.930		
Location Description	Jay Peak Road		
Type of Problem	Untreated Impervious		
Remedial Action Description	Adjust local grading during repaving operations to direct more impervious area to treatment; add check dams in drainage swales.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	04/28/2014		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	04/28/2014; 06/25/2014		
Follow-up Inspection Notes	Exposed soils have been mulched and check dams added to ditches as of 06/25/2014.		



Jay Peak Road at Rt. 242 (04/28/2014)



Mulched area along Stateside Road (06/25/2014)

Unique ID	3006		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.501; 44.929		
Location Description	Route 242 Ditches		
Type of Problem	Plowing Practices / Untreated Impervious		
Remedial Action Description	Route 242 improvements anticipated 2015; changes to Lower Rt. 242 lot will reduce sediment discharge to roadway.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	05/02/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed	Stateside Road intersection partially reconfigured 2014; complete improvements with paving by November 1, 2015.		
Follow-up Inspection Date(s)	05/02/2012		
Follow-up Inspection Notes			



Sand along road near Rt. 242 Parking Lot (05/02/2012)



Sand along road near Rt. 242 Parking Lot (05/02/2012)

Unique ID	3007		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	Stateside Road		
Type of Problem	Plowing Practices		
Remedial Action Description	Snow Management Plan Area #2. Manage snow from roadway and parking lot in areas away from stream. Promote woody revegetation on stream side slopes and at the top of bank.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	Winter		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	05/02/2012		
Proposed Implementation	2014 and on-going winter operations		
Implementation Completed	Snow Management Plan implemented 2014		
Follow-up Inspection Date(s)	05/02/2012; 04/28/2014;		
Follow-up Inspection Notes	Similar conditions present as of 04/28/2014; continue to monitor; improvements expected when Route 242 lot regraded.		



Sediment entering Trib. 3 near Rt. 242 (05/02/2012)



Sediment entering Trib. 3 at Rt. 242 (04/28/2014)

Unique ID	3008		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	Route 242 Parking Lot		
Type of Problem	Untreated Impervious		
Remedial Action Description	Relocate parking lot entrance away from VT Rt. 242, replace with dedicated entrance off Stateside Road; reduce the width of Stateside Road at Route 242 intersection.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/01/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	11/01/2012; 04/28/2014		
Follow-up Inspection Notes	Similar conditions present as of 07/09/2014; improvements expected when Route 242 lot regraded.. Meeting scheduled with VTrans on 7/28/2014		



Rt. 242 Parking Lot at Stateside Road (11/01/2012)

Unique ID	3009		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	VT-242 Parking Lot		
Type of Problem	Bank Stabilization		
Remedial Action Description	Sediment is being routed directly to swale without treatment. Improve parking lot grading and stormwater management.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/01/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	11/01/2012; 07/09/2014		
Follow-up Inspection Notes	Summer conditions show significant vegetation improvement.continue to monitor. Additional improvements expected when Route 242 lot regraded and Stateside Road intersection reconfigured.		



Untreated runoff from Rt. 242 Parking Lot (11/01/2012)



Improved vegetation during summer months (07/09/2014)

Unique ID	3010		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	Stateside Road		
Type of Problem	STP Issues/Concerns		
Remedial Action Description	Slope failure above treatment swale, receiving runoff from sand pile and clogging outlet.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Higher		
Remediation Cost (est.)	Lower		
Identification Date	11/01/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Swale stabilized as of 05/22/2014; Route 242 lot regraded October 2014		



Slope erosion at Rt. 242 Parking Lot (11/01/2012)



Slope erosion at Rt. 242 Parking Lot (04/28/2014)



Gully repaired with RECP (05/22/2014)

Unique ID	3011		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	Route 242 Parking Lot		
Type of Problem	Untreated Impervious		
Remedial Action Description	Regrade parking lot to direct flows away from VT Rt. 242 and into an enhanced stormwater treatment swale.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Higher		
Remediation Cost (est.)	Higher		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014		
Follow-up Inspection Notes	Swale stabilized as of 05/22/2014; Route 242 lot regraded and Stateside Road culvert replaced October 2014		



Discharge from Rt. 242 Parking Lot (04/28/2014)



Drainage swale at Rt. 242 Parking Lot (04/28/2014)



Improved stabilization of drainage swale (05/22/2014)

Unique ID	3012		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	VT-242 Parking Lot		
Type of Problem	Plowing Practices		
Remedial Action Description	Install barriers to prevent vehicle and snow piles from entering the riparian buffer. Snow Management Plan Area #1.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	05/02/2012		
Proposed Implementation	2014 and on-going winter operations		
Implementation Completed	Snow Management Plan implemented 2014		
Follow-up Inspection Date(s)	05/02/2012; 11/01/2012; 04/28/2014		
Follow-up Inspection Notes	Similar conditions present as of 04/28/2014.		



Sediment from snow storage near stream (05/02/2012)



Equipment storage within riparian corridor (11/01/2012)



Snow storage in riparian corridor (04/28/2014)

Unique ID	3013		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.928		
Location Description	Stateside Maintenance Area		
Type of Problem	Untreated Impervious		
Remedial Action Description	Restore sediment controls surrounding Sand Pile and prevent runoff from entering this area.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Higher		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/22/2014; 07/09/2014		
Follow-up Inspection Notes	Temporary sedimentation basin installed and silt fence restored as of 07/11/2014. Continue to monitor during winter operations.		



Overtopped silt fence at sand pile (04/28/2014)



Erosion and fugitive sand from sand pile (04/28/2014)



Temporary sedimentation basin at sand pile (05/22/2014)



Sand pile surrounded by silt fence (07/09/2014)

Unique ID	3014		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.928		
Location Description	Stateside Road at VT-242 Parking Lot		
Type of Problem	Bank Stabilization		
Remedial Action Description	Improve stormwater management along Stateside Road, vegetate swales and stabilize / pave roadway surface to minimize sediment discharge to Trib. 3.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Higher		
Remediation Cost (est.)	Higher		
Identification Date	11/01/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed			
Follow-up Inspection Date(s)	11/01/2012; 04/28/2014; 07/09/2014		
Follow-up Inspection Notes			



Stateside Road sediment and swales (11/01/2012)



Stateside Road at sand pile (11/01/2012)



Stateside Road near sand pile (07/09/2014)

Unique ID	3015		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.928		
Location Description	Jet Triple Lift access road		
Type of Problem	Untreated Impervious / Plowing Practices		
Remedial Action Description	Stream in close proximity to road. Snow plowing operations will cease to push snow onto this stream, per Snow Management Plan Area #11.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	2014 and on-going winter operations		
Implementation Completed	Snow Management Plan implemented 2014		
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Good vegetation growth observed as of 08/20/2014, minimal sediment contribution during summer months.		



Stream near Jet Triple Lift access road (11/08/2012)



Summer conditions along access road (08/20/2014)

Unique ID	3016		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.929		
Location Description	Tributary 3 downstream from Stateside Road culvert		
Type of Problem	Bank Stabilization		
Remedial Action Description	Berm installed along top of slope in 2012, preventing runoff down face of slope. Vegetation is becoming established. Continue to monitor.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	2014		
Implementation Completed	2014		
Follow-up Inspection Date(s)	05/02/2014; 11/01/2012; 04/28/2014; 07/09/2014		
Follow-up Inspection Notes	Berm added 2013, reducing over bank flows (04/28/2014); vegetation growth suggests bank erosion has slowed in this area (07/09/2014). Continue to monitor and respond if conditions change.		



Trib. 3 slope failure at maintenance area (11/08/2012)



Trib. 3 slope failure at maintenance area (05/02/2012)



Trib. 3 slope failure at maintenance area (04/28/2014)



Vegetated growth on bank (07/09/2014)

Unique ID	3018		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.929		
Location Description	Stateside Maintenance Area		
Type of Problem	Plowing Practices		
Remedial Action Description	Create berm/terrace to direct snow melt into the Stateside Hotel treatment system.		
Discharges to Stormwater BMP	Yes	Associated Stormwater BMP	Stateside Hotel Basin
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	04/28/2014		
Proposed Implementation	2014		
Implementation Completed	2014 (complete); Snow Management Plan implemented 2014		
Follow-up Inspection Date(s)	04/28/2014		
Follow-up Inspection Notes	Area regraded and stabilized as of 08/20/2014.		



Swale to basin behind maintenance area (04/28/2014)



Area graded to direct snow to swale (08/19/2014)

Unique ID	3020		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.504; 44.928		
Location Description	Stateside Road ditch upgradient from Tributary 3 culvert		
Type of Problem	Bank Stabilization		
Remedial Action Description	Poorly vegetated banks and channel, erosion and sediment delivery to Tributary 3. Install rip-rap to protect channel from erosion.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	11/08/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Similar conditions present as of 07/09/2014. Rock rip rap installed to stabilize ditchline as of 08/20/2014.		



Ditch adjacent to Stateside Road (11/08/2012)



Conditions present during 2014 inspection (07/09/2014)



Area stabilized with rock rip rap (08/19/2014)

Unique ID	3021		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.504; 44.928		
Location Description	Stateside Road Trib 3 Culvert		
Type of Problem	Bank Stabilization		
Remedial Action Description	Stabilize banks and headwall on upstream end of Tributary 3 culvert to prevent further erosion.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Lower		
Identification Date	05/02/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/02/2012		
Follow-up Inspection Notes	Some improvement due to road work and new guardrails. Additional stabilization recommended.		



Stateside Road at Trib. 3 culvert crossing (05/02/2012)



Stateside Road at Tributary 3 culvert (07/09/2014)

Unique ID	3022		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.505; 44.928		
Location Description	Timber Bridge crossing near First Aid / Ski Patrol		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Decrease bank erosion and flood velocity through channel constriction by increasing structure span; wider structure will be used when bridge is replaced. Coordinate with River Management Engineer.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Chris Brunelle, VT DEC River Management Engineer, conducted site visit in October 2014		

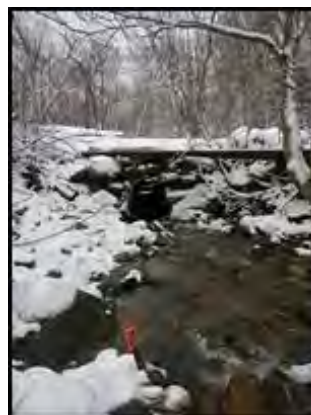


Channel constriction near Ski Patrol (11/08/2012)

Unique ID	3023		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.506; 44.929		
Location Description	Hell's Crossing Tributary 3 culvert		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Culvert is skewed with respect to channel, has perched outlet, and scoured banks downstream. Coordinate with River Management Engineer.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Chris Brunelle, VT DEC River Management Engineer, conducted site visit in October 2014		



Tributary 3 at Hell's Crossing culvert (11/08/2012)



Tributary 3 at Hell's Crossing culvert (11/08/2012)

Unique ID	3024		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.504; 44.928		
Location Description	Culverted Stream Crossing		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Incised and widening stream 2010/2012-SC-C1 at culvert SMB-15. Replace culvert and stabilize affected channel. Coordinate with River Management Engineer.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/08/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Chris Brunelle, VT DEC River Management Engineer, conducted site visit in October 2014		



Incised stream at culvert SMB-15 (11/08/2012)

Unique ID	3025		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.926		
Location Description	2011-TB/SC-C25		
Type of Problem	Bank Stabilization		
Remedial Action Description	Naturally occurring avulsion has active headcut and will likely contribute sediments to downstream resources in the future. Outside of development area		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/01/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/01/2012		
Follow-up Inspection Notes			



Headcut in channel 2011-TB/SC-C25 (11/01/2012)

Unique ID	3026		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	VT-242 Parking Lot		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Culvert outfall partially blocked, potentially causing localized flooding in Rt. 242 parking lot. Culvert will be replaced in conjunction with Rt. 242 lot improvements.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	11/01/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	11/01/2012; 05/22/2014		
Follow-up Inspection Notes	On-going improvements at parking lot have reduced impact to culvert outfall. Outfall channel is stable. Continue to monitor.		



Stateside Road outfall to Tributary 3 (11/01/2012)



View from the outfall toward Tributary 3 (05/22/2014)



Stateside Road culvert replacement (10/14/2014)

Unique ID	3027		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.507; 44.929		
Location Description	Powerliner Ski Trail Waterbar		
Type of Problem	Bank Stabilization		
Remedial Action Description	Stabilize waterbar and add sediment sump to capture sediment before discharge to stream.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Moderate		
Identification Date	05/02/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	05/02/2012		
Follow-up Inspection Notes	Waterbar regraded and stabilized as of 08/20/2014.		



Powerliner Ski Trail Waterbar (05/02/2012)



Stabilized waterbar looking downhill (08/19/2014)

Unique ID	3028		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.502; 44.928		
Location Description	VT-242		
Type of Problem	VTrans Outreach / Untreated Impervious		
Remedial Action Description	Poorly stabilized roadside ditches and embankments on VT Rt. 242 are actively eroding.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Moderate		
Identification Date	11/01/2012		
Proposed Implementation	November 1, 2015		
Implementation Completed	Parking lot regarded and swales added 2014. VTrans expected to conduct Route 242 work in 2015.		
Follow-up Inspection Date(s)	11/01/2012		
Follow-up Inspection Notes	Summer conditions show significant vegetation improvement; additional improvements expected with Route 242 improvement.		



Rt. 242 drainage at Rt. 242 Parking Lot (11/01/2012)



Rt. 242 ditch at Rt. 242 Parking Lot (11/01/2012)



Summer conditions of Route 242 swales (07/09/2014)



Improved swale along Route 242 parking lot (10/14/2014)

Unique ID	3029		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.503; 44.928		
Location Description	Stateside Road Tributary 3 Culvert		
Type of Problem	Culvert / Bridge Improvement		
Remedial Action Description	Reestablish sediment transport, decrease flood flow velocity and scour, and reestablish aquatic organism passage (AOP). Note - AOP goal constrained by perched culvert at VT-242.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	
Seasonal Discharge	All		
Reduction Potential (est.)	Moderate		
Remediation Cost (est.)	Higher		
Identification Date	11/08/2012		
Proposed Implementation	Monitor and assess		
Implementation Completed			
Follow-up Inspection Date(s)	11/08/2012		
Follow-up Inspection Notes	Similar conditions present (04/28/2014).		



Undersized culvert at Stateside Road (11/08/2012)



Upstream face of Tributary 3 culvert (07/09/2014)

Unique ID	3030		
Subwatershed	South Mtn Branch		
Geographic Coordinates	-72.504; 44.929		
Location Description	Stateside Road Ditches		
Type of Problem	Bank Stabilization		
Remedial Action Description	Poorly vegetated banks and channel, erosion and sediment delivery to Tributary 3. Rip-rap ditch sections where required.		
Discharges to Stormwater BMP	No	Associated Stormwater BMP	Stateside Hotel Basin (partial)
Seasonal Discharge	All		
Reduction Potential (est.)	Lower		
Remediation Cost (est.)	Lower		
Identification Date	11/08/2012		
Proposed Implementation	2014		
Implementation Completed	2014 (complete)		
Follow-up Inspection Date(s)	11/08/2012; 07/09/2014		
Follow-up Inspection Notes	Ditches reworked and lined with RECP with Stateside Road improvements. Area is now treated in Stateside Hotel Basin. Continue to monitor for vegetation establishment.		



Former ditch near Stateside Lodge (11/08/2012)



Stabilized ditch along Stateside Road (07/09/2014)

APPENDIX 2

Jay Peak Resort
Jay, Vermont
WQRP
Jay Branch Watershed
Sediment Source Tracking

Revised August 20, 2014
0 100 200 Feet

Stormwater Permit

- 3071-9010
- 3071-9015.A
- 3164-9015.1A
- 3758-9015.A
- 3978-9015.1
- 5467-9015.10
- 5467-9015.1A2
- 5467-9015.2A1
- 5467-9015.3A
- 5467-9015.4
- 5467-9015.8
- 5467-9015.9
- 5467-9015.A2

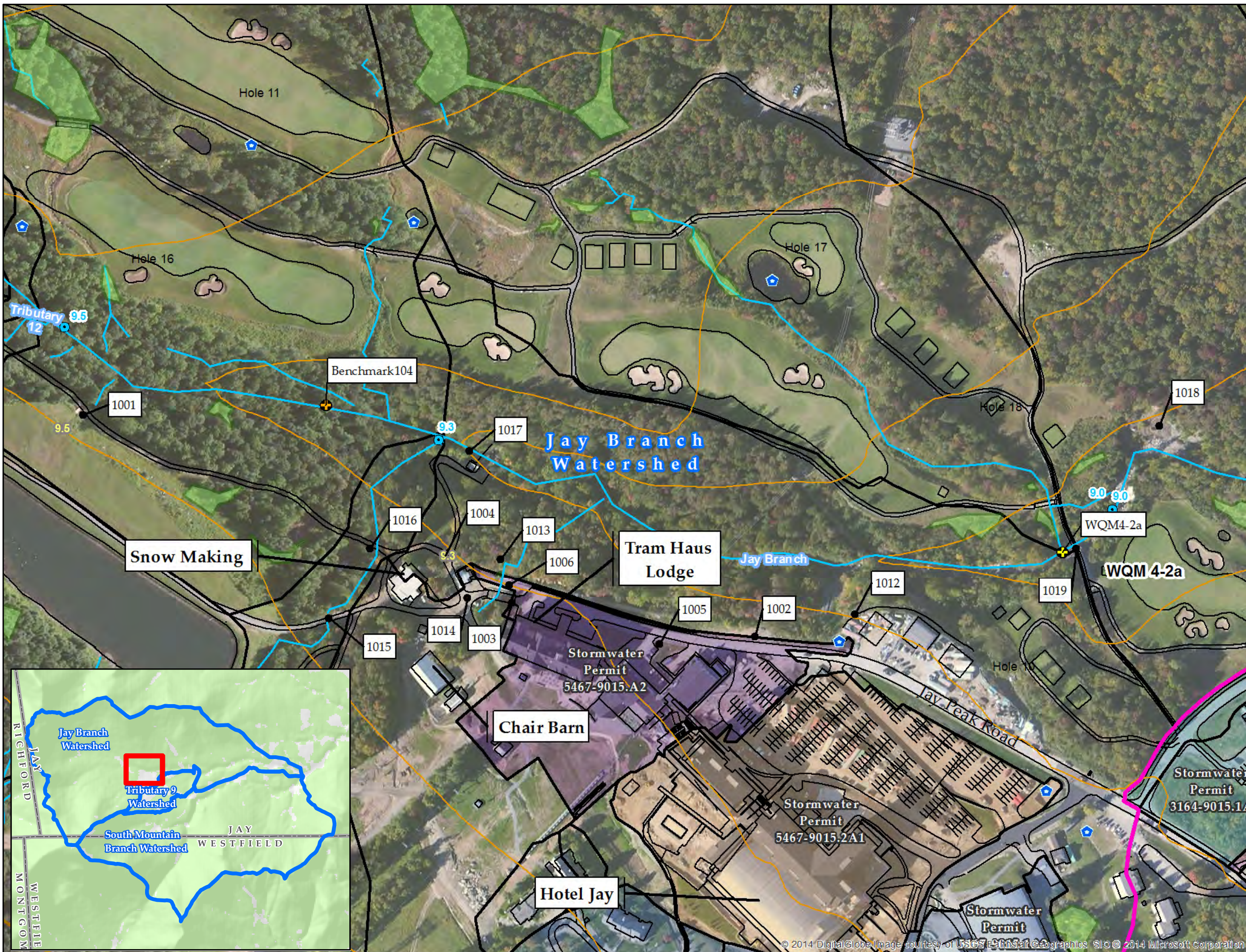
- Sediment Source
- Overall Watershed Boundary
- Watershed Boundaries
- Stream
- Wetlands Delineated (VHB)
- Stormwater BMP
- River Mile

Water Quality Monitoring Station

- WQM Stations
- Benchmark Stations
- Reference Station
- 50' Contour
- 500' Contour

Sources: Background by BING (2011); Roads from VCGI (2005); Water Quality Monitoring locations by VHB (2008-2013); Streams by VHB (2008-2013); Contours derived from HydroDEM, provided by VCGI (2004); Stream and wetland restorations by VHB (JPR GC 2010 Restoration Report); Development Areas by Trudell (V5, 2013).

VHB Vanasse Hangen Brustlin, Inc.



Jay Peak Resort Jay, Vermont WQRP Tributary 9 Watershed Sediment Source Tracking

Revised August 20, 2014

0 150 300 Feet

Stormwater Permit

- 3071-9010
- 3071-9015.A
- 3164-9015.1A
- 3758-9015.A
- 3978-9015.1
- 5467-9015.10
- 5467-9015.1A2
- 5467-9015.2A1
- 5467-9015.3A
- 5467-9015.4
- 5467-9015.8
- 5467-9015.9
- 5467-9015.A2

- Sediment Source
- Overall Watershed Boundary
- Watershed Boundaries
- Stream
- Wetlands Delineated (VHB)

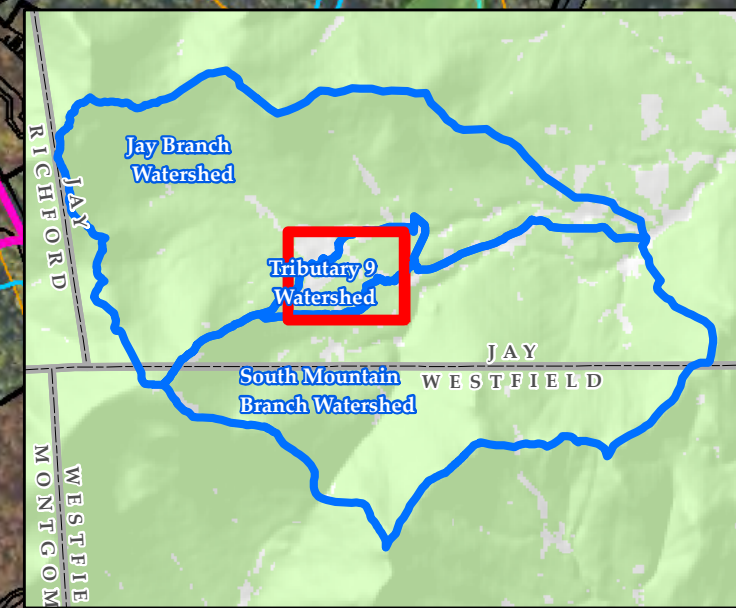
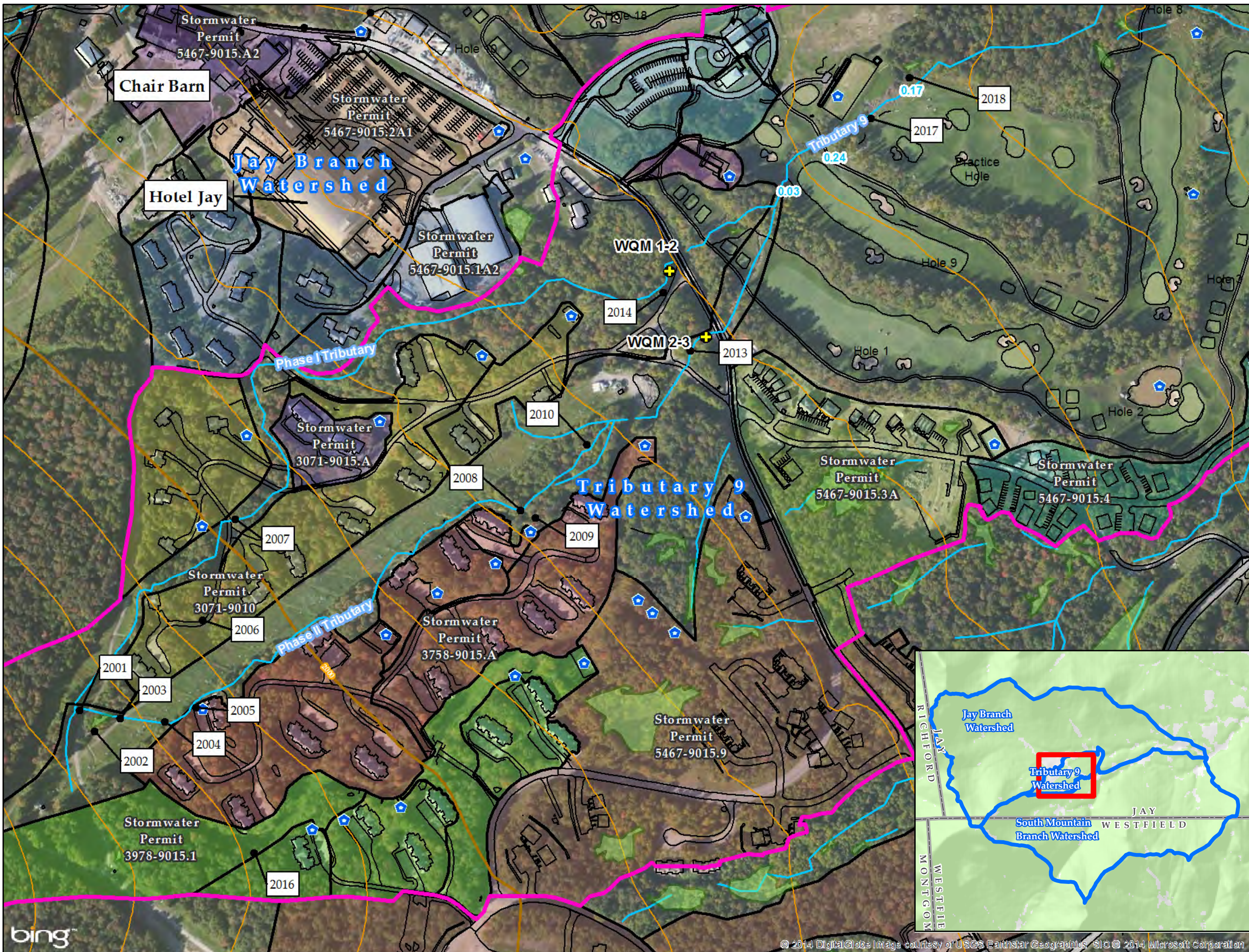
- Stormwater BMP
- River Mile

Water Quality Monitoring Station

- WQM Stations
- Benchmark Stations
- Reference Station
- 50' Contour
- 500' Contour

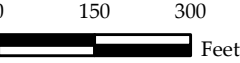
Sources: Background by BING (2011); Roads from VCGI (2005); Water Quality Monitoring locations by VHB (2008-2013); Streams by VHB (2008-2013); Contours derived from HydroDEM, provided by VCGI (2004); Stream and wetland restorations by VHB (JPR GC 2010 Restoration Report); Development Areas by Trudell (V5, 2013).

VHB Vanasse Hangen Brustlin, Inc.



bing

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Stormwater Permit

- 3071-9010
- 3071-9015.A
- 3164-9015.1A
- 3758-9015.A
- 3978-9015.1
- 5467-9015.10
- 5467-9015.1A2
- 5467-9015.2A1
- 5467-9015.3A
- 5467-9015.4
- 5467-9015.8
- 5467-9015.9
- 5467-9015.A2

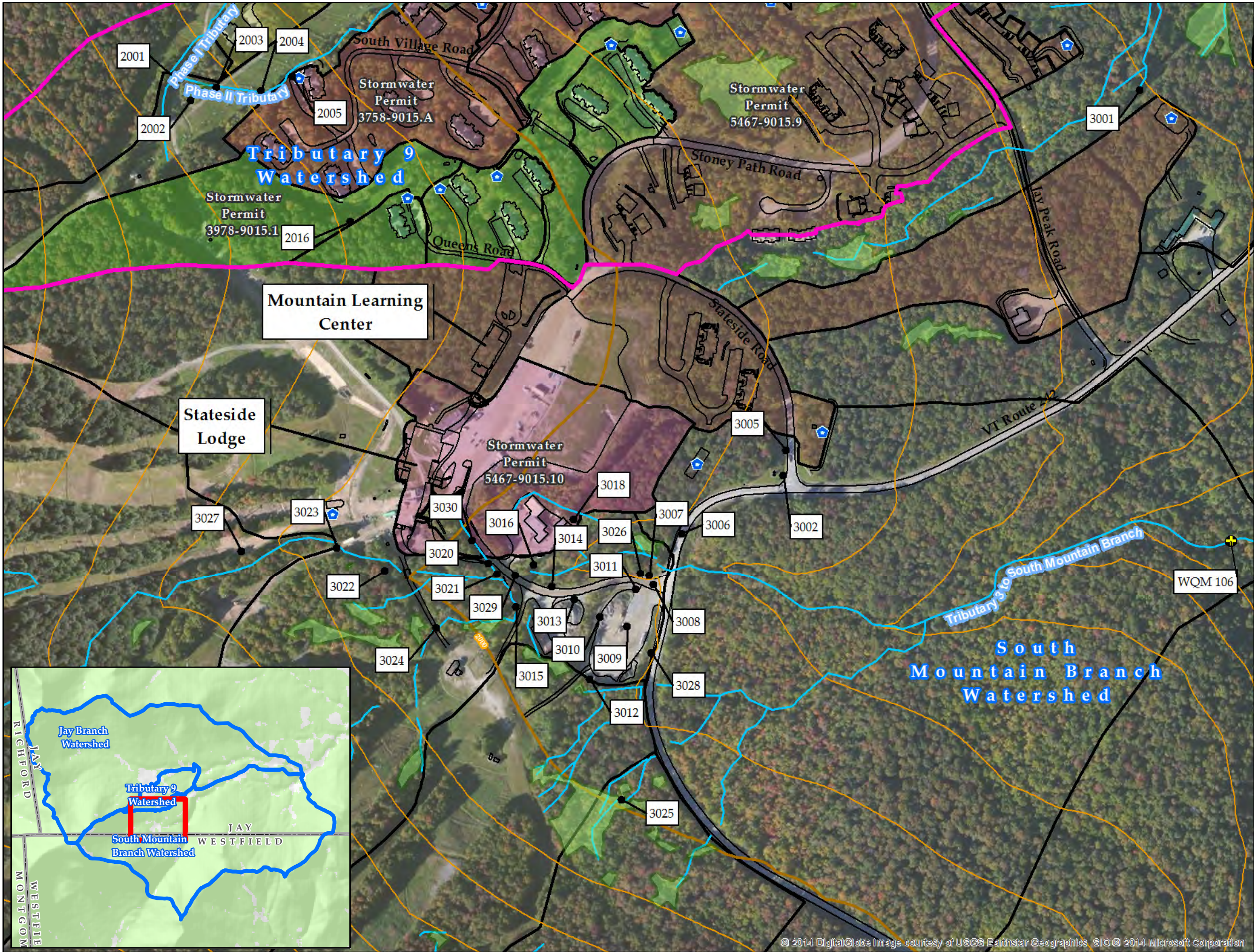
- Sediment Source
- Overall Watershed Boundary
- Watershed Boundaries
- Stream
- Wetlands Delineated (VHB)
- Stormwater BMP
- River Mile

Water Quality Monitoring Station

- WQM Stations
- Benchmark Stations
- Reference Station

- 50' Contour
- 500' Contour

Sources: Background by BING (2011); Roads from VCGI (2005); Water Quality Monitoring locations by VHB (2008-2013); Streams by VHB (2008-2013); Contours derived from HydroDEM, provided by VCGI (2004); Stream and wetland restorations by VHB (JPR GC 2010 Restoration Report); Development Areas by Trudell (V5, 2013).



APPENDIX 3

JAY PEAK RESORT

SNOW MANAGEMENT PLAN

August 21, 2014

Background

In accordance with the 1272 Order ("Order") issued by the Vermont Department of Environmental Conservation ("VT DEC") on March 21, 2014, Vanasse Hangen Brustlin, Inc ("VHB") submitted on May 21, 2014 a WQRP Update on behalf of Jay Peak Resort ("JPR"). The updated WQRP responded to specific requirements of the 1272 Order. A number of key recommendations in the WQRP Update involve changes and improvements to snow management practices throughout the resort. The purpose of this document is to identify a range of facility upgrades and improvements to snow management practices to achieve the goal of reducing the amount of road sand that enters untreated water courses as a result of winter snow plowing activities. This document is a supplement to the May 21, 2014 WQRP Update and in many instances the recommendations contained herein are directly related to recommended actions in the WQRP.

Introduction

Jay Peak Resort enjoys some of the highest snowfall in the northeast of North America. Jay Peak also experiences frequent high winds and the occasional mid-winter thaw. As a result, snow covered roads, driveways, parking lots, and walkways require a significant amount of sand to be spread to ensure safe driving and walking conditions. Jay Peak has a lot of small tributaries running through the base of the mountain which feed two larger streams, the Jay Branch and South Mountain Branch, which eventually merge to become just the Jay Branch. Also, due to topographic conditions, Jay Peak's resort residential developments are situated in close proximity to one another and to the base of the mountain. These conditions all contribute to the potential for road sand to flow into waterways creating erosion and sediment deposits.

The majority of the roads, driveways, parking lots, and walkways, i.e. impervious surfaces, throughout the resort are now served by storm water treatment systems. There are, however, some sections of the resort where storm water is not being collected and treated and, as a result, Jay Peak has been challenged to meet the thresholds of the Vermont Water Quality Standards. Those key areas of the resort where storm water is not being treated are significant aspects of this plan.

It is Jay Peak's goal to spread as little winter sand as possible, but given the numerous roads and residential areas, steep terrain and harsh weather, this goal is often difficult to achieve. Jay Peak's goal therefore is to avoid or minimize plowing snow and sand directly into untreated areas or entering untreated areas during snowmelt events (particularly spring).

The overall purpose of this Snow Management Plan is to focus on physical and operational measures that are specifically related to snow management.

Preventing sand and sediment from entering receiving waters

There are several categories of actions and measures that JPR will implement to prevent sand and other pollutants generated by snow plowing activities from entering streams and other untreated areas:

- Manage snow plowing practices to eliminate or minimize pushing snow laden with sand into areas where it will not receive some form of treatment.
- Build settling basins, berms, or place other features such as erosion control wattles in locations where snow is pushed or stockpiled in order to capture the sand and prevent it from entering streams or passing through an untreated area.
- When practicable during winter operations and during spring clean-up, remove snow and accumulated sand from untreated areas and transfer to treatment areas or approved disposal sites.

The attached map shows locations where Jay Peak will construct features this summer and implement operational improvements starting next winter. **This map will be used at the beginning of the snow season for training and orientation for the snow plowing crews and will be used as the operational guide throughout the winter.**

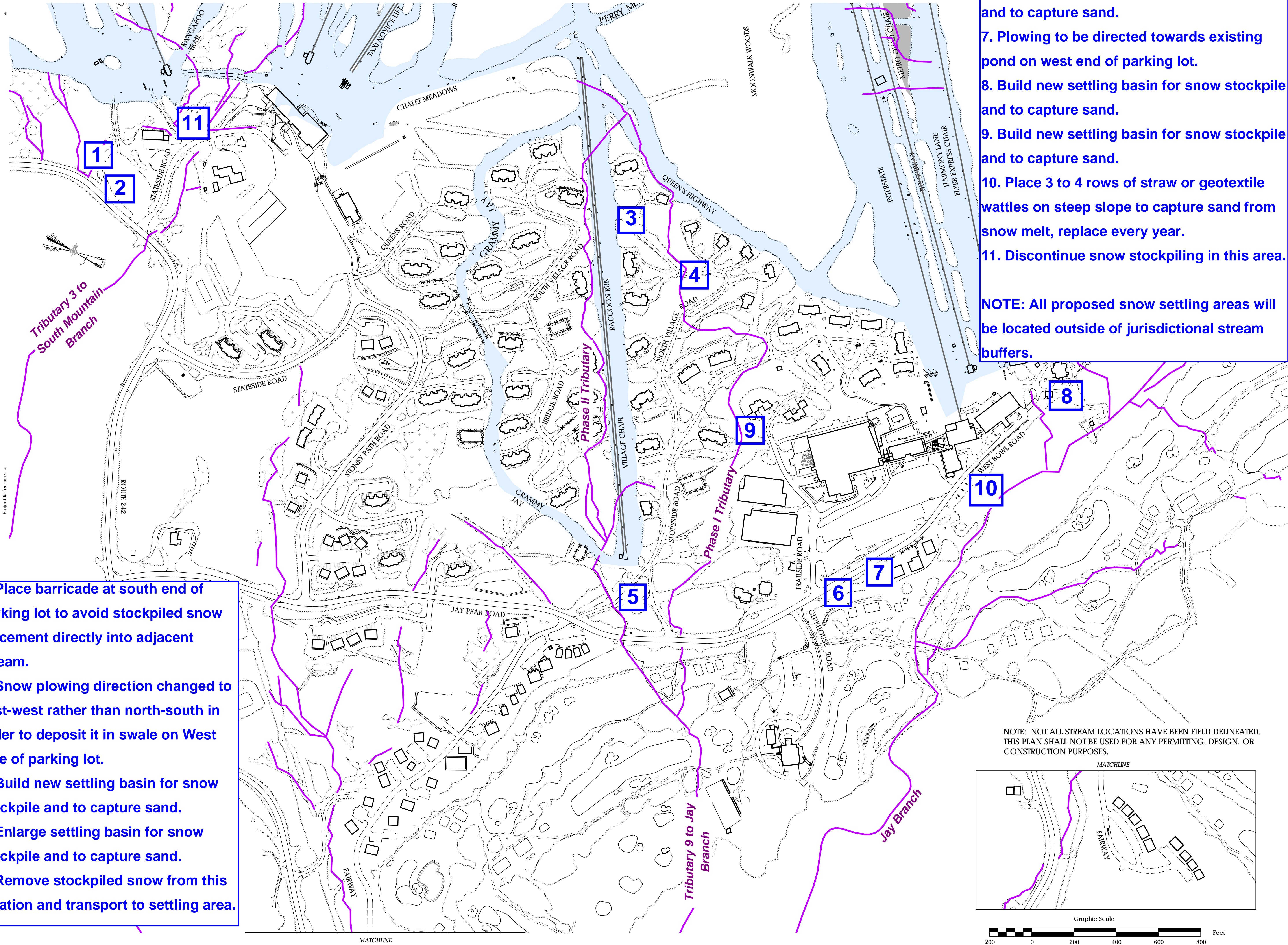
There are a number of additional measures that JPR will take this summer and in 2015 to reduce the transmission and deposition of sediment into receiving waters. Those measures, which are identified in the 2012 and 2014 WQRP Updates, will have benefits over and above the snow management measures identified in this report.

Mitigating sand deposition in waters

Jay Peak has increased its efforts to reduce the amount of sand that can enter receiving waters from snow stockpiles and other sources by employing the following measures.

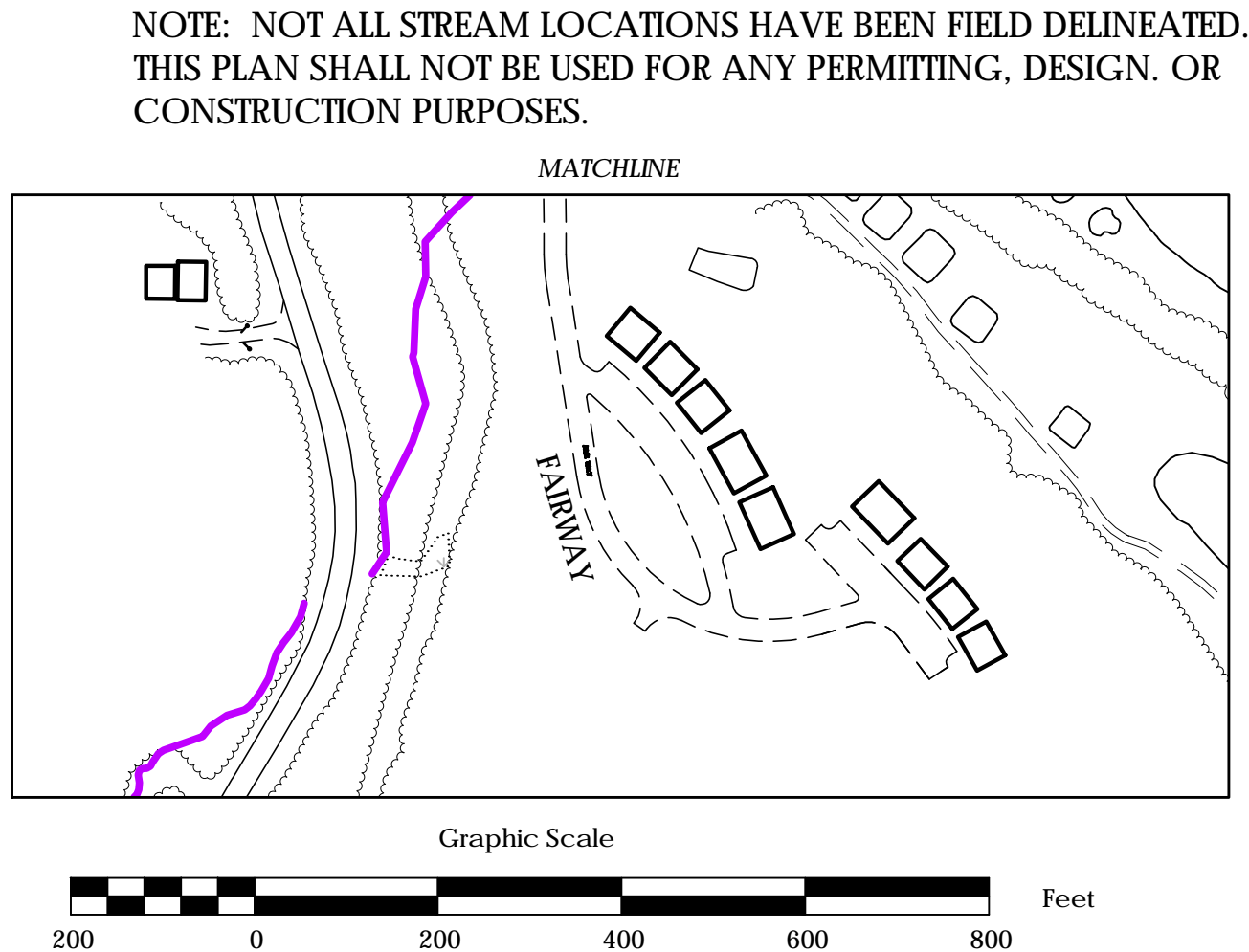
- Piles of snow laden with sand that could end up in streams are picked up in the spring using large loaders and placed in parking lots where the sand will simply form a small pile and then be hauled to a suitable location. JPR often recycles this sand as fill on ski trails or for other non-structural needs.
- JPR has a staff of about 6 people plus a supervisor whose primary task it is to maintain storm water operating systems. In the spring their main tasks are to sweep sand off the roads, rebuild ditches, clean out and rebuild check dams, empty the sump of catch basins using large vacuum trucks, replant grass areas that were damaged in the winter, place mulch and geotextile fabrics on damaged areas, and clean out ponds and other treatment structures on a rotating basis.
- In 2012 JPR had its road sand tested to verify that it met VT AOT standards for road sand and does not have excessive fines. The attached sieve analysis shows the results. The solid line is Jay Peak winter sand and the shaded area is the range of acceptable gradations for winter sand

according to VT AOT. The reader should note that the Jay Peak sand has fewer fines (the lower right side of the solid line) than the acceptable VT AOT standard. JPR continues to buy the same type of winter sand each year.



- 6. Build new settling basin for snow stockpile and to capture sand.
 - 7. Plowing to be directed towards existing pond on west end of parking lot.
 - 8. Build new settling basin for snow stockpile and to capture sand.
 - 9. Build new settling basin for snow stockpile and to capture sand.
 - 10. Place 3 to 4 rows of straw or geotextile wattles on steep slope to capture sand from snow melt, replace every year.
 - 11. Discontinue snow stockpiling in this area.
- NOTE: All proposed snow settling areas will be located outside of jurisdictional stream buffers.

- 1. Place barricade at south end of parking lot to avoid stockpiled snow placement directly into adjacent stream.
- 2. Snow plowing direction changed to east-west rather than north-south in order to deposit it in swale on West side of parking lot.
- 3. Build new settling basin for snow stockpile and to capture sand.
- 4. Enlarge settling basin for snow stockpile and to capture sand.
- 5. Remove stockpiled snow from this location and transport to settling area.



TRUDELL CONSULTING ENGINEERS
478 BLAIR PARK ROAD | WILLISTON, VERMONT 05495
802.879.6321 | WWW.TCEVT.COM

Revisions		Date	By
No.	Description		
1	Update Stream Coloring	8/18/14	AGM

- Use of These Drawings
1. Unless otherwise noted, these Drawings are intended for preliminary planning, coordination with other disciplines or informational purposes only. They are not intended as construction drawings unless noted as such.
 2. Only drawings specifically marked "For Construction" are intended to be used in conjunction with contract documents, specifications, owner/contractor agreements and to be fully coordinated with other disciplines, including V.I. h b c h j a B X i e 2 h Y 5 W F W E Z l d d M V Y A L V g Drawings shall not be used for construction layout. Contact TCE for any construction surveying services or to obtain electronic data suitable for construction layout.
 3. These Drawings are specific to the Project and are not transferable. As instruments of service, these drawings, and any changes to the drawings may only be made by TCE. If errors or omissions are discovered, they shall be brought to the attention of TCE immediately.
 4. By use of these drawings for construction of the Project, the Owner represents that they have reviewed, approved, and accepted the drawings and have met with all applicable parties/disciplines to insure these plans are correct and complete. The Owner and Architect are responsible for any buildings shown, including an area measured a minimum five (5) feet from the building footprint.
 5. It is the User's responsibility to ensure this copy contains the most current revisions.

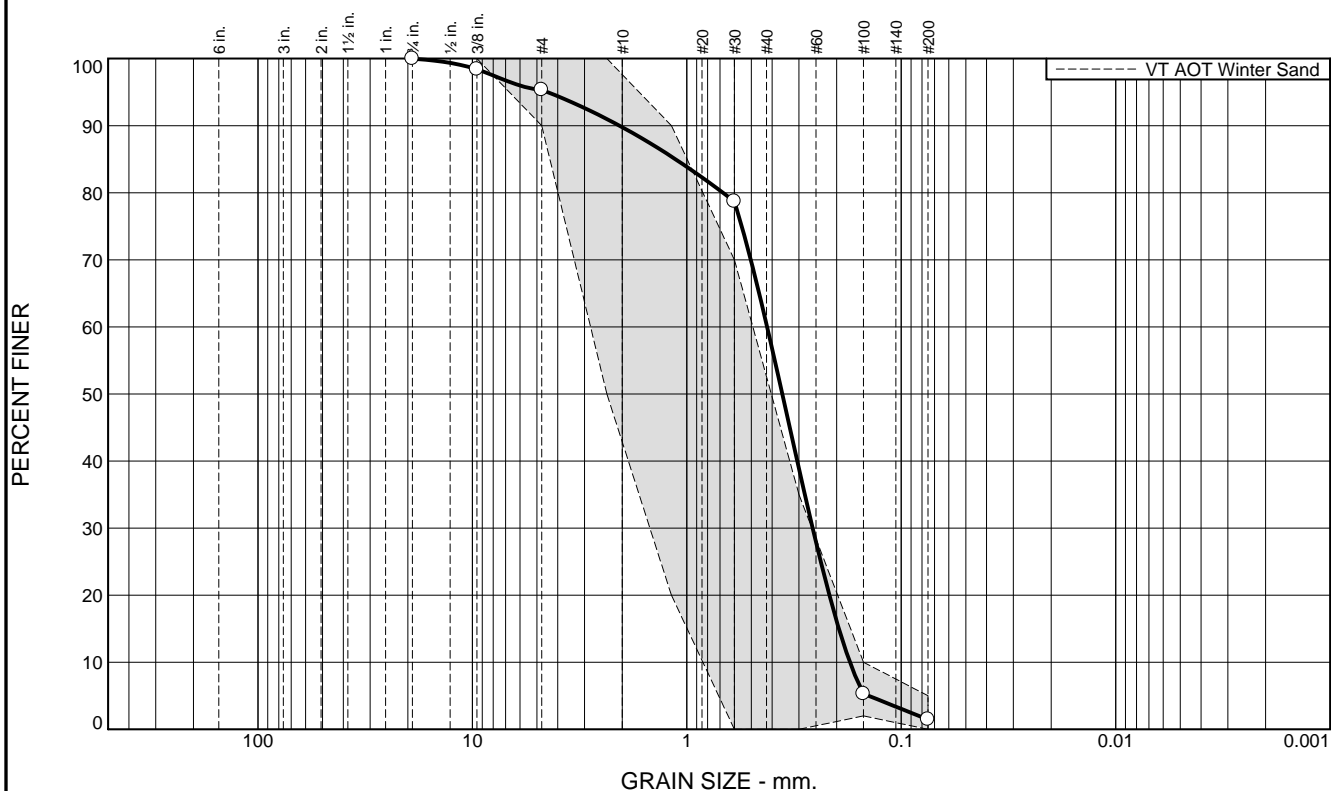
Existing Conditions
Jay, Vermont
Jay Peak Resort

Snow Management Plan
August 21, 2014

Date:	5/13/14
Scale:	1" = 300'
Project Number:	3054
Drawn By:	NPC
Project Engineer:	AGM
Approved By:	AE
Field Book:	

C10-01

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.7	5.5	29.4	58.9	1.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
3/8"	98.4	100.0	X
#4	95.3	90.0 - 100.0	
#30	78.7	0.0 - 70.0	X
#100	5.3	2.0 - 10.0	
#200	1.5	0.0 - 5.0	

* VT AOT Winter Sand

Material Description

Winter Sand

Atterberg Limits

PL= NP

LL= NV

PI=

Coefficients

D₉₀= 2.0634

D₈₅= 1.1305

D₆₀= 0.4223

D₅₀= 0.3588

D₃₀= 0.2591

D₁₅= 0.1953

D₁₀= 0.1735

C_u= 2.43

C_c= 0.92

Classification

USCS= SP

AASHTO= A-3

Remarks

fine Sand

Location: Jay Peak Resort On Site "D"
Sample Number: 1176-05

Date: 7/13/2012

OPTIMUM
CONSTRUCTION LAYOUT-MATERIALS TESTING
P.O. Box 439 • 193 Gosselin Drive • Derby, Vermont 05829
Office: 802-766-2434 • Email: optimum.test@yahoo.com

Client: Gordon Stone
Project: Jay Peak Resort

Project No: 1176

Figure

Tested By: R.Lafoe

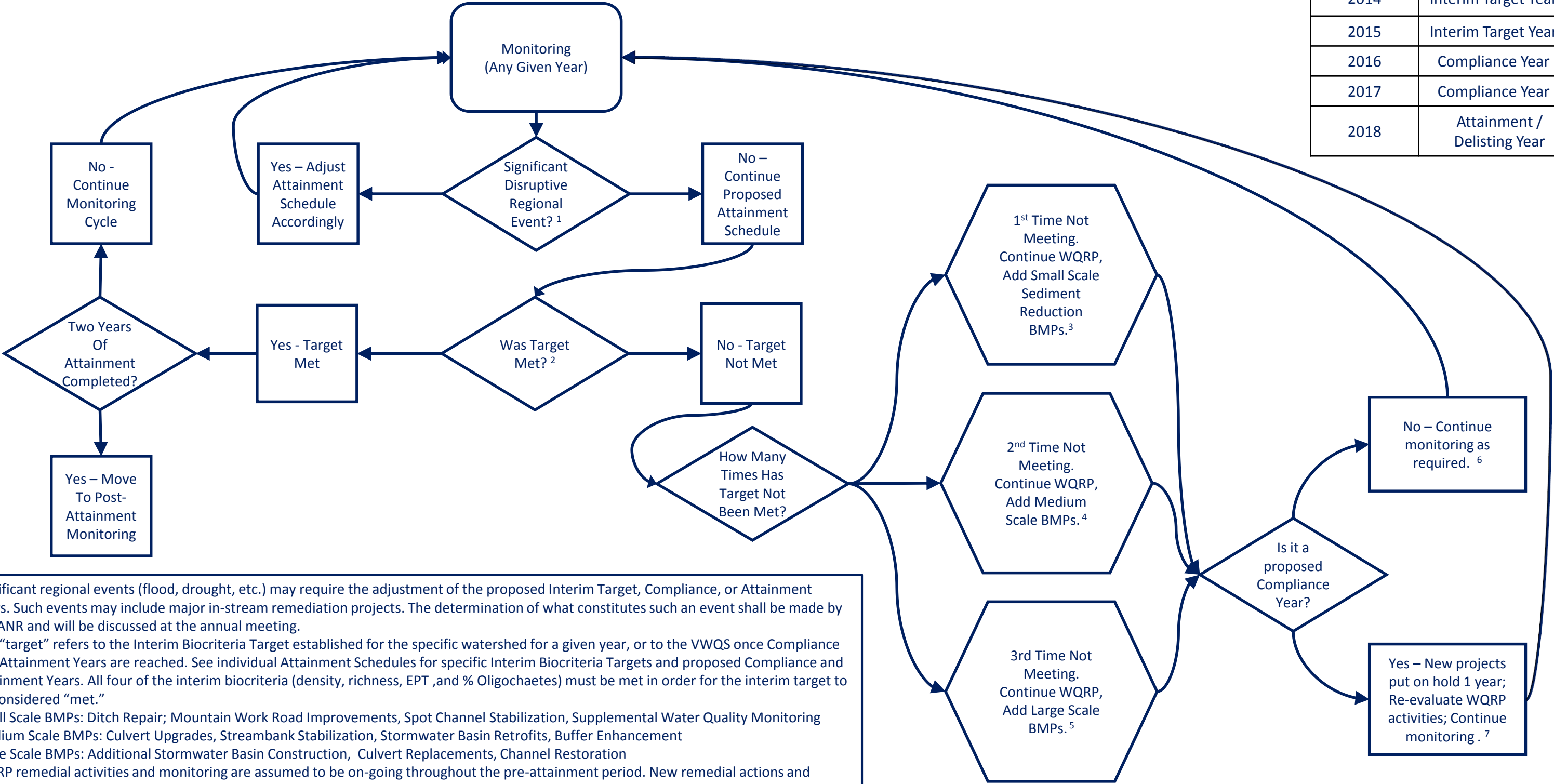
Checked By: B.Wood

APPENDIX 4

JAY BRANCH
INTERIM BIOCRITERIA TARGETS
PRE-ATTAINMENT FLOW CHART



Jay Branch Attainment Schedule	
2014	Interim Target Year 1
2015	Interim Target Year 2
2016	Compliance Year 1
2017	Compliance Year 2
2018	Attainment / Delisting Year



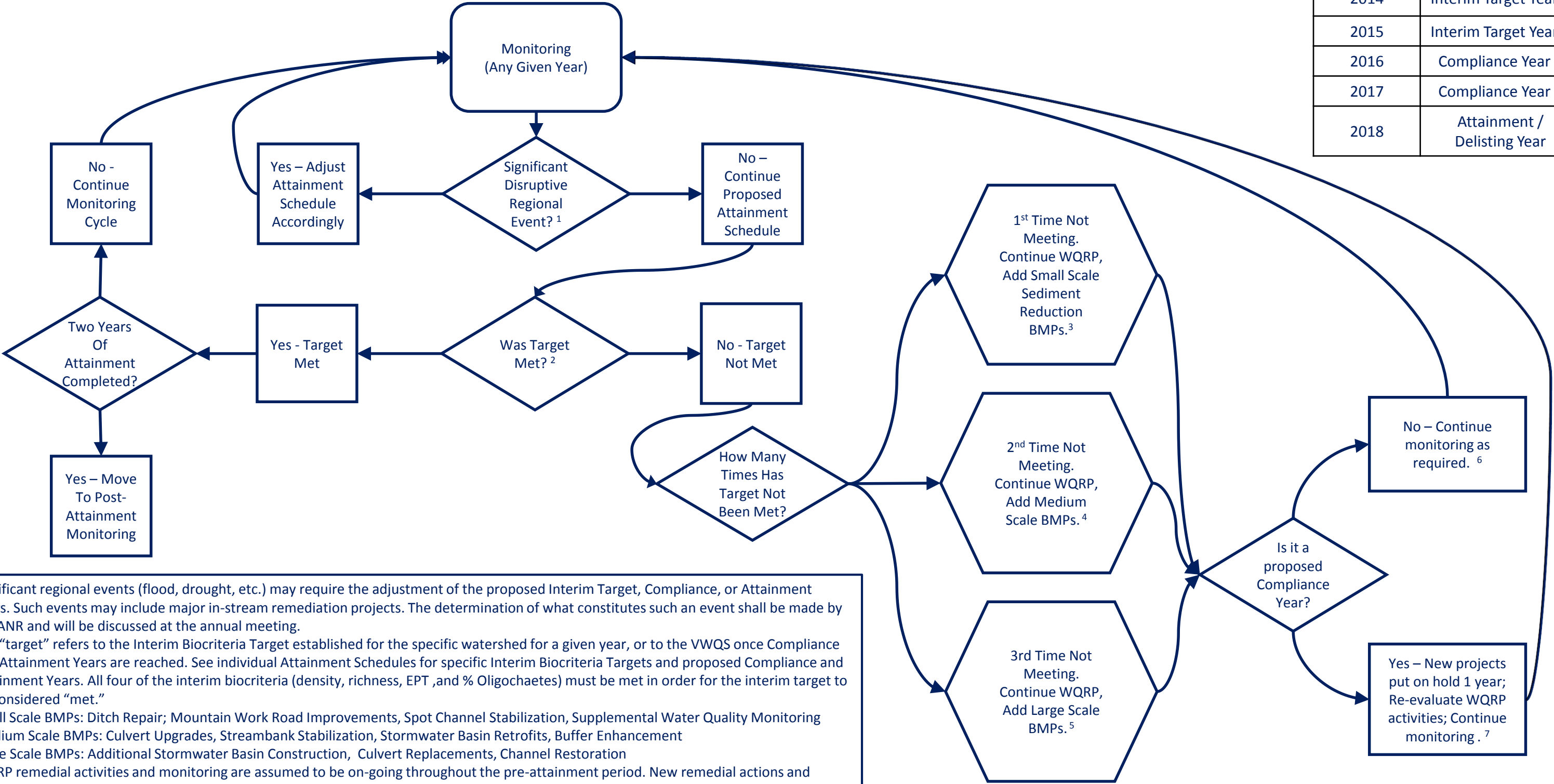
- 1. Significant regional events (flood, drought, etc.) may require the adjustment of the proposed Interim Target, Compliance, or Attainment Years. Such events may include major in-stream remediation projects. The determination of what constitutes such an event shall be made by the ANR and will be discussed at the annual meeting.
- 2. The “target” refers to the Interim Biocriteria Target established for the specific watershed for a given year, or to the VWQS once Compliance and Attainment Years are reached. See individual Attainment Schedules for specific Interim Biocriteria Targets and proposed Compliance and Attainment Years. All four of the interim biocriteria (density, richness, EPT ,and % Oligochaetes) must be met in order for the interim target to be considered “met.”
- 3. Small Scale BMPs: Ditch Repair; Mountain Work Road Improvements, Spot Channel Stabilization, Supplemental Water Quality Monitoring
- 4. Medium Scale BMPs: Culvert Upgrades, Streambank Stabilization, Stormwater Basin Retrofits, Buffer Enhancement
- 5. Large Scale BMPs: Additional Stormwater Basin Construction, Culvert Replacements, Channel Restoration
- 6. WQRP remedial activities and monitoring are assumed to be on-going throughout the pre-attainment period. New remedial actions and sediment reduction BMPs will be incorporated into the WQRP as required by this flow chart or as necessary due to site conditions.
- 7. JPR may not commence construction of any projects that discharge the pollutant(s) of concern, except to finish projects that commenced construction during a previous construction season or to conduct remedial projects which ANR determines would improve water quality.

TRIBUTARY 9 TO JAY BRANCH
INTERIM BIOCRITERIA TARGETS
PRE-ATTAINMENT FLOW CHART



DECEMBER 23, 2014

Trib. 9 Attainment Schedule	
2014	Interim Target Year 1
2015	Interim Target Year 2
2016	Compliance Year 1
2017	Compliance Year 2
2018	Attainment / Delisting Year



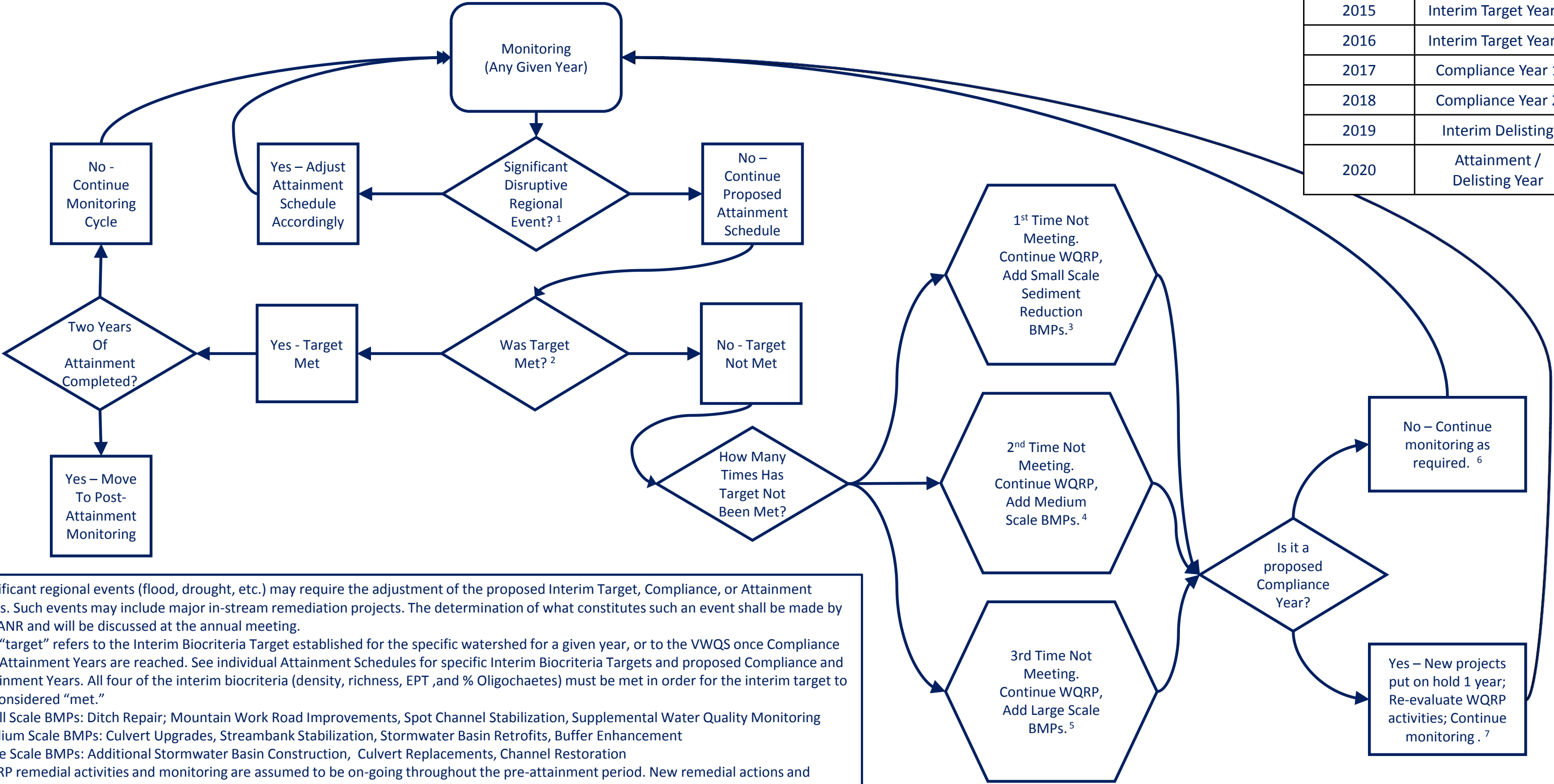
- 1. Significant regional events (flood, drought, etc.) may require the adjustment of the proposed Interim Target, Compliance, or Attainment Years. Such events may include major in-stream remediation projects. The determination of what constitutes such an event shall be made by the ANR and will be discussed at the annual meeting.
- 2. The "target" refers to the Interim Biocriteria Target established for the specific watershed for a given year, or to the VWQS once Compliance and Attainment Years are reached. See individual Attainment Schedules for specific Interim Biocriteria Targets and proposed Compliance and Attainment Years. All four of the interim biocriteria (density, richness, EPT ,and % Oligochaetes) must be met in order for the interim target to be considered "met."
- 3. Small Scale BMPs: Ditch Repair; Mountain Work Road Improvements, Spot Channel Stabilization, Supplemental Water Quality Monitoring
- 4. Medium Scale BMPs: Culvert Upgrades, Streambank Stabilization, Stormwater Basin Retrofits, Buffer Enhancement
- 5. Large Scale BMPs: Additional Stormwater Basin Construction, Culvert Replacements, Channel Restoration
- 6. WQRP remedial activities and monitoring are assumed to be on-going throughout the pre-attainment period. New remedial actions and sediment reduction BMPs will be incorporated into the WQRP as required by this flow chart or as necessary due to site conditions.
- 7. JPR may not commence construction of any projects that discharge the pollutant(s) of concern, except to finish projects that commenced construction during a previous construction season or to conduct remedial projects which ANR determines would improve water quality.

TRIBUTARY 3 TO SOUTH MOUNTAIN BRANCH
INTERIM BIOCRITERIA TARGETS
PRE-ATTAINMENT FLOW CHART



DECEMBER 23, 2014

Trib. 3 Attainment Schedule	
2014	Interim Target Year 1
2015	Interim Target Year 2
2016	Interim Target Year 3
2017	Compliance Year 1
2018	Compliance Year 2
2019	Interim Delisting
2020	Attainment / Delisting Year



- 1. Significant regional events (flood, drought, etc.) may require the adjustment of the proposed Interim Target, Compliance, or Attainment Years. Such events may include major in-stream remediation projects. The determination of what constitutes such an event shall be made by the ANR and will be discussed at the annual meeting.
- 2. The "target" refers to the Interim Biocriteria Target established for the specific watershed for a given year, or to the VWQS once Compliance and Attainment Years are reached. See individual Attainment Schedules for specific Interim Biocriteria Targets and proposed Compliance and Attainment Years. All four of the interim biocriteria (density, richness, EPT ,and % Oligochaetes) must be met in order for the interim target to be considered "met."
- 3. Small Scale BMPs: Ditch Repair; Mountain Work Road Improvements, Spot Channel Stabilization, Supplemental Water Quality Monitoring
- 4. Medium Scale BMPs: Culvert Upgrades, Streambank Stabilization, Stormwater Basin Retrofits, Buffer Enhancement
- 5. Large Scale BMPs: Additional Stormwater Basin Construction, Culvert Replacements, Channel Restoration
- 6. WQRP remedial activities and monitoring are assumed to be on-going throughout the pre-attainment period. New remedial actions and sediment reduction BMPs will be incorporated into the WQRP as required by this flow chart or as necessary due to site conditions.
- 7. JPR may not commence construction of any projects that discharge the pollutant(s) of concern, except to finish projects that commenced construction during a previous construction season or to conduct remedial projects which ANR determines would improve water quality.



INTERIM BIOCRITERIA TARGETS
AND ATTAINMENT SCHEDULE



Stream Jay Branch
Location WQM 4-3
DEC Site # 427800000083

Class B - SHG Criteria		Historic Data			Interim Target Years		Compliance Years	
		2011	2012	2013	2014	2015	2016	2017
Density	≥ 300 (≥ 350)	117	230	238	> 250	> 275	≥ 300	≥ 350
Richness	≥ 27 (≥ 28)	22	24	30	≥ 28	≥ 28	≥ 28	≥ 28
EPT	≥ 16 (≥ 17)	15	16.5	21.5	≥ 17	≥ 17	≥ 17	≥ 17
% PMA-O	≥ 45 (≥ 50)	58	71	80	(-)	(-)	(-)	(-)
BI	≤ 4.50 (≤ 4.35)	1.10	1.15	1.13	(-)	(-)	(-)	(-)
% Oligo.	≤ 12 (≤ 9.5)	17.8	6.9	10.1	≤ 12	≤ 12	≤ 12	≤ 9.5
EPT/EPT+C	≥ 0.45 (≥ 0.47)	0.97	0.98	0.95	(-)	(-)	(-)	(-)
% PPCS-FG	≥ 40 (≥ 45)	54	56	57	(-)	(-)	(-)	(-)

Stream Jay Branch
Location WQM 4-4A
DEC Site # 427800000073

Class B - SHG Criteria		Historic Data			Interim Target Years		Compliance Years	
		2011	2012	2013	2014	2015	2016	2017
Density	≥ 300 (≥ 350)	98	176	327	≥ 300	≥ 300	≥ 300	≥ 350
Richness	≥ 27 (≥ 28)	16.5	27.5	27.5	≥ 28	≥ 28	≥ 28	≥ 28
EPT	≥ 16 (≥ 17)	10.5	19.5	20.5	≥ 17	≥ 17	≥ 17	≥ 17
% PMA-O	≥ 45 (≥ 50)	71	67	73.8	(-)	(-)	(-)	(-)
BI	≤ 4.50 (≤ 4.35)	0.94	1.24	0.79	(-)	(-)	(-)	(-)
% Oligo.	≤ 12 (≤ 9.5)	3.7	9.3	9.2	≤ 9.5	≤ 9.5	≤ 9.5	≤ 9.5
EPT/EPT+C	≥ 0.45 (≥ 0.47)	0.99	0.96	0.96	(-)	(-)	(-)	(-)
% PPCS-FG	≥ 40 (≥ 45)	44	48	62	(-)	(-)	(-)	(-)

Stream Tributary 9 to Jay Branch
Location WQM 3-1
DEC Site # 427809000001

Class B - SHG Criteria		Historic Data			Interim Target Years		Compliance Years	
		2011	2012	2013	2014	2015	2016	2017
Density	≥ 300 (≥ 350)	77	95	157	> 200	> 250	≥ 300	≥ 350
Richness	≥ 27 (≥ 28)	22.5	25.5	30.0	≥ 28	≥ 28	≥ 28	≥ 28
EPT	≥ 16 (≥ 17)	15.0	15.5	19.5	≥ 17	≥ 17	≥ 17	≥ 17
% PMA-O	≥ 45 (≥ 50)	66	69	74.4	(-)	(-)	(-)	(-)
BI	≤ 4.50 (≤ 4.35)	1.47	1.96	2.07	(-)	(-)	(-)	(-)
% Oligo.	≤ 12 (≤ 9.5)	8.7	21.2	13.6	≤ 12	≤ 12	≤ 12	≤ 9.5
EPT/EPT+C	≥ 0.45 (≥ 0.47)	0.99	0.93	0.91	(-)	(-)	(-)	(-)
% PPCS-FG	≥ 40 (≥ 45)	55	54	58	(-)	(-)	(-)	(-)

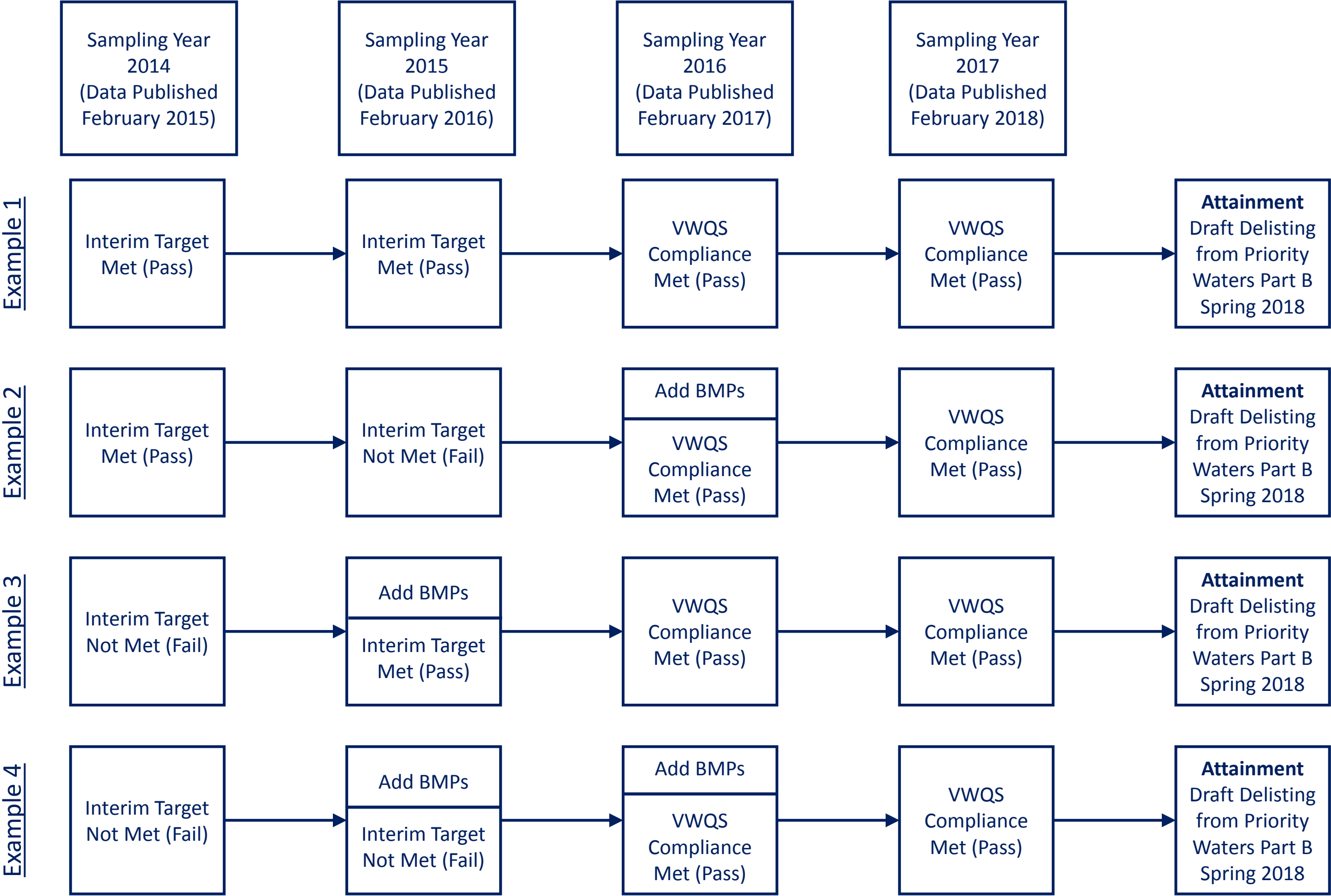
Stream Tributary 3 to South Mountain Branch
Location WQM 106
DEC Site # 427807030001

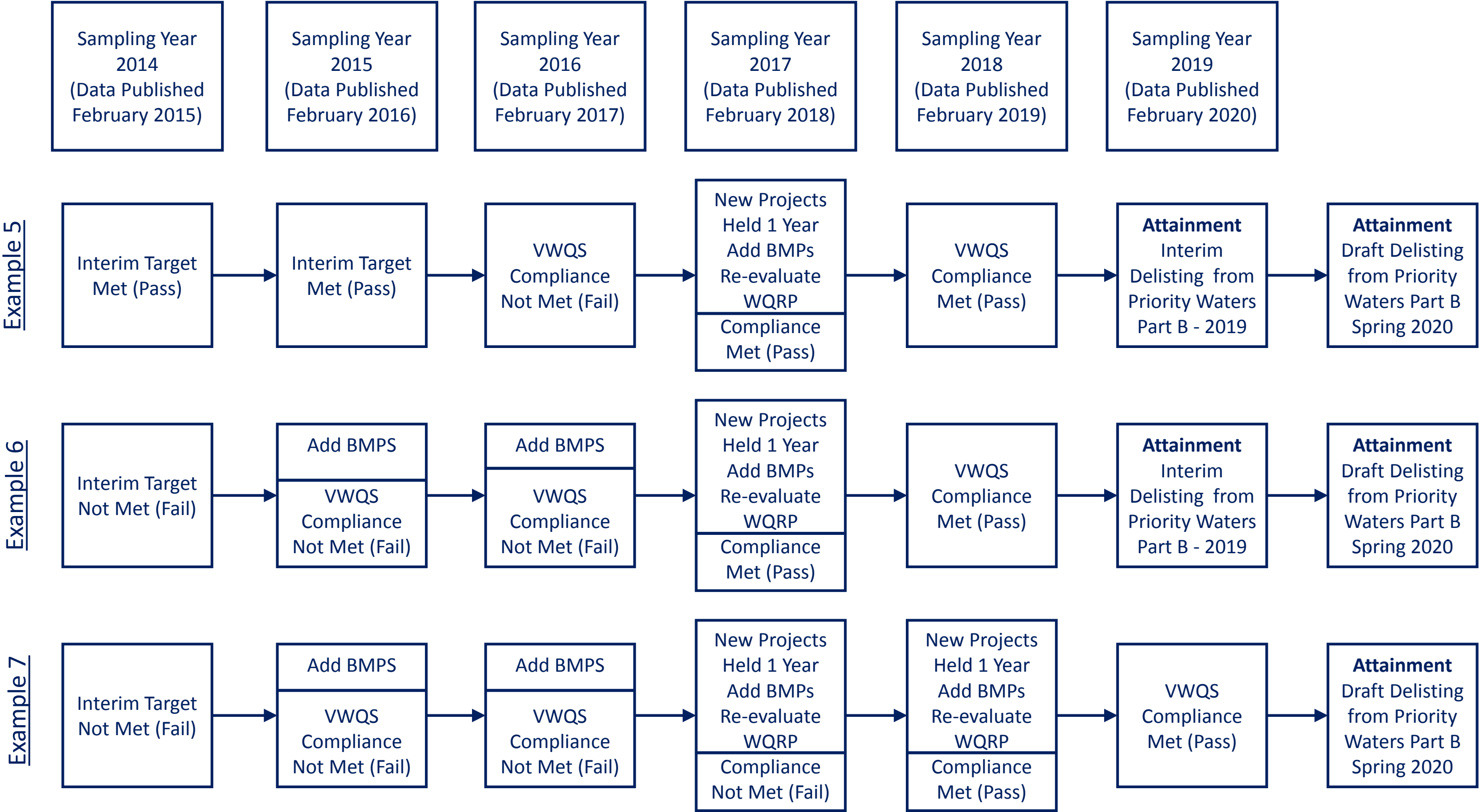
Class B - SHG Criteria		Historic Data		Interim Target Years			Compliance Years	
		2012	2013	2014	2015	2016	2017	2018
Density	≥ 300 (≥ 350)	259	133	> 150	> 200	> 250	≥ 300	≥ 350
Richness	≥ 27 (≥ 28)	34.5	21.5	> 22	> 24	> 26	≥ 27	≥ 28
EPT	≥ 16 (≥ 17)	22.0	15.0	> 15.3	> 15.5	> 15.7	≥ 16	≥ 17
% PMA-O	≥ 45 (≥ 50)	67.4	58.3	(-)	(-)	(-)	(-)	(-)
BI	≤ 4.50 (≤ 4.35)	0.93	1.04	(-)	(-)	(-)	(-)	(-)
% Oligo.	≤ 12 (≤ 9.5)	20.7	29.6	< 25.0	< 20.0	< 14.5	≤ 12	≤ 9.5
EPT/EPT+C	≥ 0.45 (≥ 0.47)	0.93	0.93	(-)	(-)	(-)	(-)	(-)
% PPCS-FG	≥ 40 (≥ 45)	57	50	(-)	(-)	(-)	(-)	(-)

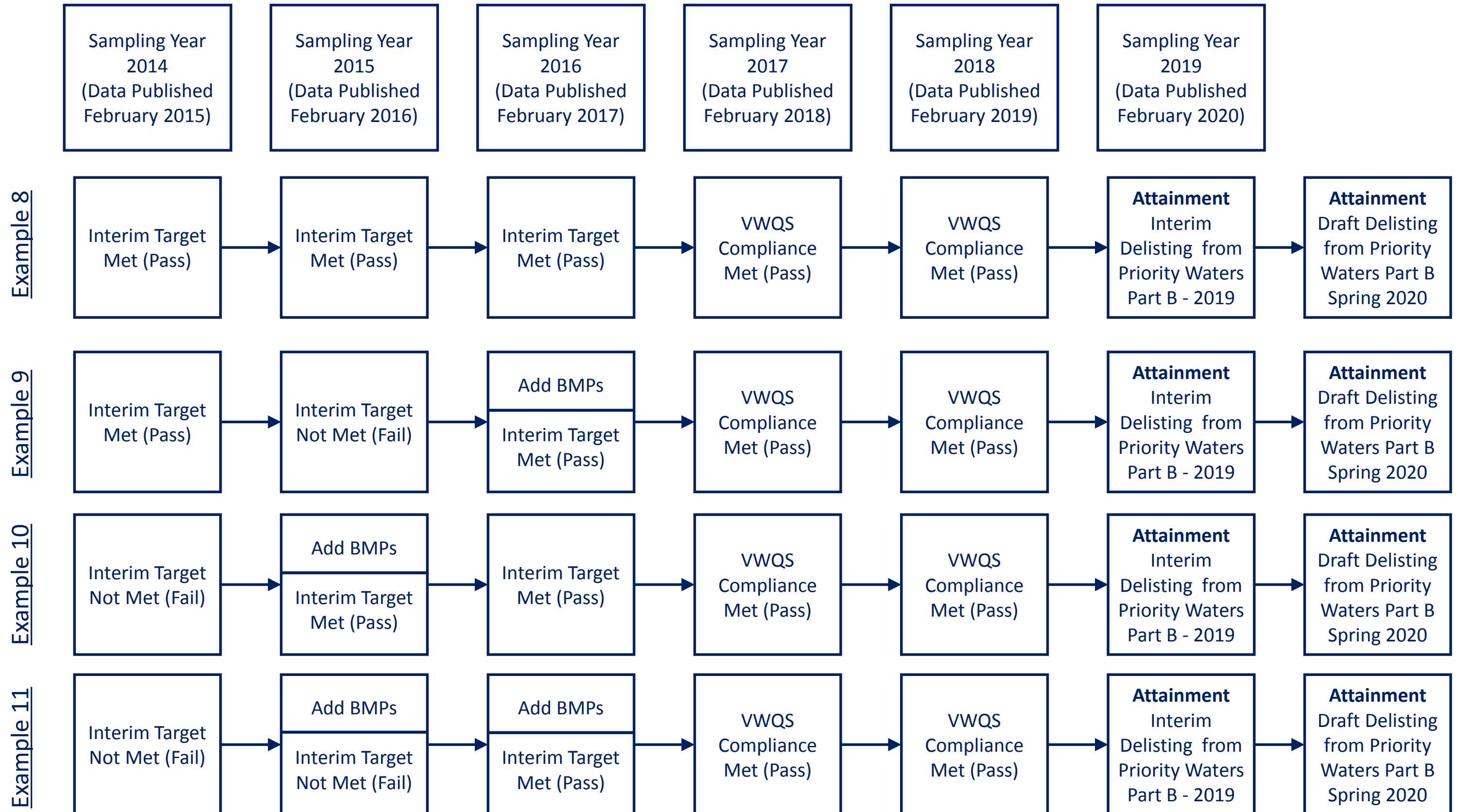
Biocriteria Color Coding System	
	Full Support (Pass)
	Above Threshold (I+)
	Below Threshold (I-)
	Non-Support (Fail)

Targets are set to demonstrate improvement each year until criteria has reached compliance with VWQS or to continue meeting VWQS for criteria that are already being met. (-) indicates criterion is currently being met and no interim target is required. Attainment is reached following two years of compliance with the VWQS.

EXAMPLE SCENARIOS
JAY BRANCH AND TRIBUTARY 9 TO JAY BRANCH
DELISTING IN 2018

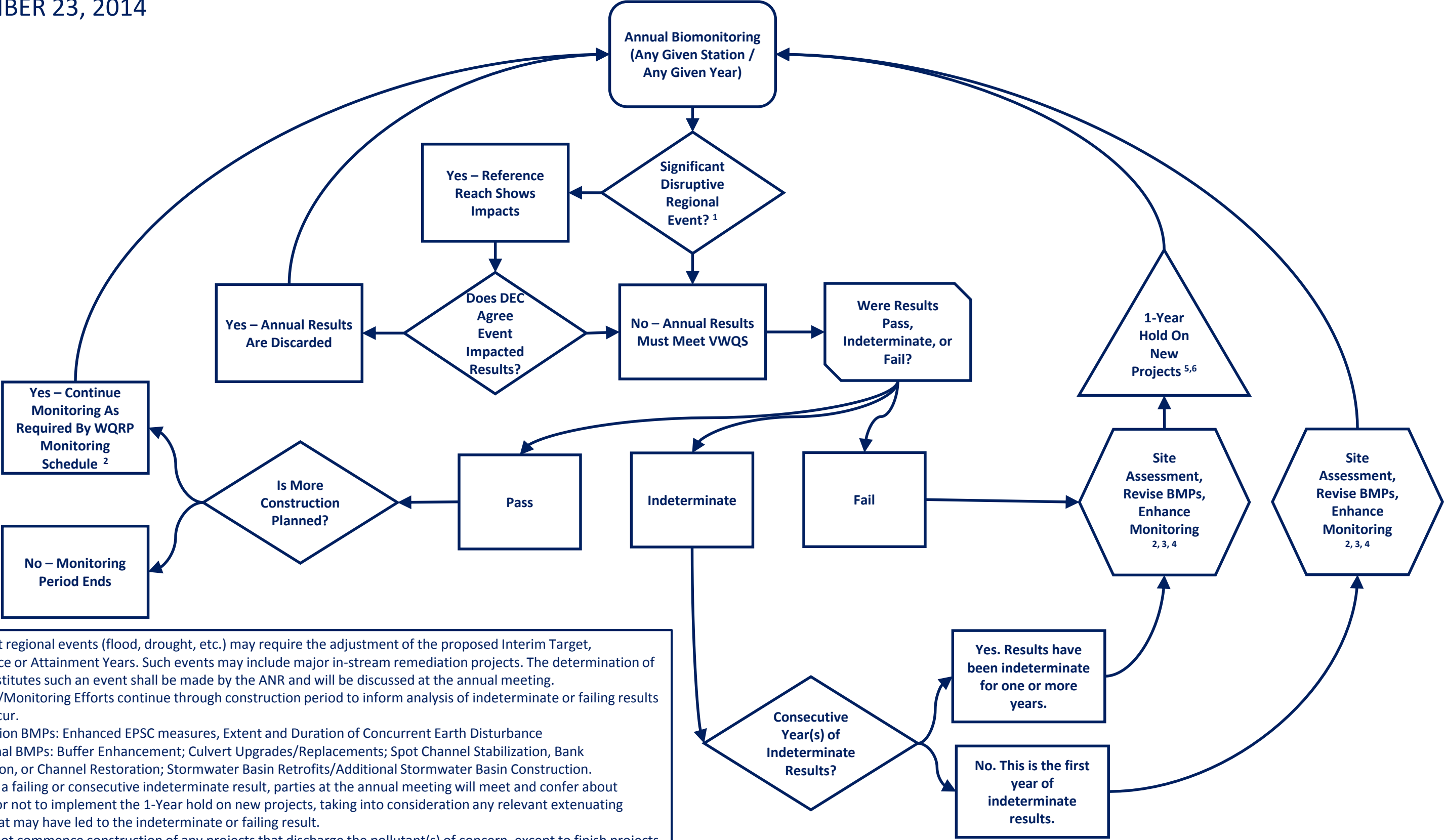






JAY PEAK RESORT
POST-ATTAINMENT FLOW CHART

DECEMBER 23, 2014



1. Significant regional events (flood, drought, etc.) may require the adjustment of the proposed Interim Target, Compliance or Attainment Years. Such events may include major in-stream remediation projects. The determination of what constitutes such an event shall be made by the ANR and will be discussed at the annual meeting.

2. Modeling/Monitoring Efforts continue through construction period to inform analysis of indeterminate or failing results if they occur.

3. Construction BMPs: Enhanced EPSC measures, Extent and Duration of Concurrent Earth Disturbance

4. Operational BMPs: Buffer Enhancement; Culvert Upgrades/Replacements; Spot Channel Stabilization, Bank Stabilization, or Channel Restoration; Stormwater Basin Retrofits/Additional Stormwater Basin Construction.

5. Following a failing or consecutive indeterminate result, parties at the annual meeting will meet and confer about whether or not to implement the 1-Year hold on new projects, taking into consideration any relevant extenuating factors that may have led to the indeterminate or failing result.

6. JPR may not commence construction of any projects that discharge the pollutant(s) of concern, except to finish projects that commenced construction during a previous construction season or to conduct remedial projects which ANR determines would improve water quality.

APPENDIX 5



To: Project File

Date: January 16, 2015
Project #: 57711.00

Memorandum

From: Robert Wildey

Re: Jay Peak Resort – Construction Phase and Operational Phase
Sediment Discharges and Offset Projects

VHB has prepared this memorandum to outline the calculation of construction phase and operational phase sediment offsets that would be implemented in order to mitigate sediment loading from certain proposed projects at Jay Peak Resort. The purpose of these offsets is to reduce and minimize the impact of sediment discharges to the streams within the Jay Branch and South Mountain Branch watersheds. The objective of the offset program would be to achieve no net increase to sediment loading attributable to construction projects or new areas of impervious cover. These offsets would be required for projects completed during the "pre-attainment" period while Jay Branch, Tributary 9 to Jay Branch, and Tributary 3 to South Mountain Branch do not meet the Vermont Water Quality Standards ("VWQS"). In accordance with the terms of the settlement agreement between the Vermont Natural Resources Council, the Vermont Agency of Natural Resources, and Jay Peak Resort, the Stateside Cottages, Recreation Center, and Medical Center projects do not require construction or operational phase offsets.

As described in the following sections, sediment loads will be calculated for both construction phase and operational phase discharges. Three key methodologies will be used to calculate sediment loads and offsets: the Revised Universal Soil Loss Equation ("RUSLE"), the Simple Method, and the Spreadsheet Tool for Estimating Pollutant Load ("STEPL"). The RUSLE will be used to evaluate sediment loads during construction. The Simple Method will be used to evaluate post-construction sediment loads as well as to evaluate offsets generated by providing treatment for existing impervious areas or by changing the land use/land cover to one that generates less sediment. The STEPL model estimates load reductions associated with gully stabilization and bank stabilization projects. Offsets associated with other types of projects that are not addressed by one of these models would be calculated in accordance with the methodology outlined in the Vermont Environmental Protection Rules ("EPR"), Chapter 22, Appendices B and C, using the appropriate calculation techniques and reasonable assumptions. Projects generating sediment offset credits are required to be implemented prior to or concurrently with the projects that need to be offset, and a ledger system will be maintained to track offset credits and debits.

Construction Phase Offsets

Subject to the limitations noted above, construction phase offsets would be required to offset sediment discharges associated with periods of soil exposure during construction. The RUSLE would be used to calculate potential soil losses from active construction earth disturbance areas (i.e. covered under a NPDES discharge permit), and thus the resultant sediment loading to receiving waters. The RUSLE methodology, including the application of calculation parameters, is described below in the section titled "Calculation of Discharges and Offsets." An example RUSLE calculation is included in the "Calculation of Discharges and Offsets" section.

Operational Phase Offsets

Operational phase offsets are required in order to offset the on-going discharge of additional sediment that would result from the creation of new impervious cover. Best Management Practices ("BMPs") designed in accordance with the Vermont Stormwater Management Manual ("VSMM") are presumed to provide an 80 percent reduction in the

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Memorandum

quantity of Total Suspended Solids ("TSS") discharged from pre-routed new impervious surfaces. To achieve no net increase of sediment discharge in the subject watershed, operational phase offsets are required that will provide sufficient treatment for the remaining 20 percent of sediment load that would otherwise be discharged by the project. BMPs constructed to provide these offsets would be in addition to the stormwater treatment facilities required under the Stormwater General Permit. A BMP required for compliance with the VSMM could be sized to also provide treatment for additional areas of existing untreated impervious. However, only the volume and sediment removal associated with the additional area treated would be counted as an offset. The Simple Method would be used to evaluate and document the offset required for operation phase discharges. An example Simple Method calculation is included in the "Calculation of Discharges and Offsets" section.

Calculation of Discharges and Offsets

Offsets for construction and operational phase sediment loads could include the construction of additional stormwater BMPs to reduce sediment loads from areas of existing untreated impervious cover, alteration of land cover (i.e. revegetation of work roads or other areas), or improvements that would reduce existing sediment sources, such as repair of gullies, upgrading work road water bar crossings, replacing culverts, or stream bank stabilization. These activities would all be measurable, verifiable and permanent and would not be granted for activities required for compliance with existing permit conditions or for operation and maintenance activities. The offset capacity provided by such projects would be tracked in a ledger format to ensure that debits (sediment loads to receiving waters) associated with construction projects are balanced by credits (reductions in sediment loads to receiving waters) from offset projects. The main methods for calculating sediment loads and offset generation are described below.

Revised Universal Soil Loss Equation

The RUSLE will be used to calculate losses due to exposed soils during construction as follows:

$$A = R \times K \times LS \times C \times P \times M \times SDR$$

Where:

A= soil loss (tons per acre)

R= erosivity factor (estimated to be 71 in northern Vermont; USDA, 1987)

K= erodibility factor (based on NRCS soils data for each construction site)

LS= slope length factor (based on horizontal slope length to depositional area or defined channel, Table 1)

C= cover management factor (seeding and mulch application rates per Table 2a and 2b)

P= practice factor (assume bare loose soil; use a factor of 1.0 across all sites; NYSDEC, 2005)

M = construction duration adjustment factor (calculated for each day of disturbance per Table 3)

SDR = Sediment Delivery Ratio (assume SDR equals 70 percent of the overall estimated load)

Apply a 60 percent BMP efficiency for temporary sediment basins where present (i.e., multiply the overall estimated load by 0.4 if a temporary sediment basin designed in accordance with the Vermont Standard Specifications for Erosion Prevention and Sediment Control is used).

Table 1. Values for topographic factor LS

Values for topographic factor, L.S., for high ratio of rise to interrill erosion.¹

Slope <3 (%)	Horizontal slope length (ft)															
	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.5	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
1.0	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
2.0	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
3.0	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
4.0	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5.0	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
6.0	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
8.0	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
10.0	0.35	0.37	0.38	0.39	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
12.0	0.36	0.41	0.43	0.47	0.49	0.51	0.54	0.58	0.62	0.65	0.68	0.71	0.75	0.78	0.81	0.84
14.0	0.38	0.45	0.51	0.55	0.58	0.61	0.64	0.67	0.70	0.73	0.76	0.79	0.82	0.85	0.88	0.91
16.0	0.39	0.49	0.56	0.62	0.67	0.71	0.74	0.77	0.80	0.83	0.86	0.89	0.92	0.95	0.98	1.01
20.0	0.41	0.56	0.67	0.76	0.84	1.04	1.24	1.44	1.64	1.84	2.04	2.24	2.44	2.64	2.84	3.04
25.0	0.45	0.64	0.80	0.93	1.04	1.56	2.07	2.57	3.07	3.57	4.07	4.57	5.07	5.57	6.07	6.57
30.0	0.48	0.72	0.91	1.08	1.24	1.86	2.41	2.91	3.41	3.91	4.41	4.91	5.41	5.91	6.41	6.91
40.0	0.53	0.85	1.13	1.37	1.59	2.41	3.24	4.07	4.89	5.72	6.55	7.38	8.21	9.04	9.87	10.70
50.0	0.58	0.97	1.31	1.62	1.91	2.91	3.91	4.91	5.91	6.91	7.91	8.91	9.91	10.91	11.91	12.91
60.0	0.63	1.07	1.47	1.84	2.19	3.36	4.36	5.36	6.36	7.36	8.36	9.36	10.36	11.36	12.36	13.36

¹Such as for freshly prepared construction and other highly disturbed soil conditions with little or no cover (not applicable to thawing soil)



Memorandum

Table 2a. Construction Site Mulching C Factor

Type of Mulch (for slopes 2:1 or less)	Mulch Rate (tons per acre)	Land Slope (percent)	Mulching C Factor	Length Limit ¹
Straw or hay, tied down by anchoring and tacking equipment	1.0	1 – 5	0.20	200
	1.0	6 – 10	0.20	100
	1.5	1 – 5	0.12	300
	1.5	6 - 10	0.12	150
	2.0	1 – 5	0.06	400
	2.0	6 - 10	0.06	200
	2.0	11 – 15	0.07	150
	2.0	16 – 20	0.11	100
	2.0	21 – 25	0.14	75
	2.0	26 - 33	0.17	50
	2.0	34 - 50	0.20	35
Crushed Stone, to 1 ½ inch	135	< 16	0.05	200
	135	16 – 20	0.05	150
	135	21 – 33	0.05	100
	135	34 – 50	0.05	75
	240	< 21	0.02	300
	240	21 – 33	0.02	200
	240	34 - 50	0.02	150
Wood chips	7	< 16	0.08	75
	7	16 – 20	0.08	50
	12	< 16	0.05	150
	12	16 – 20	0.05	100
	12	21 – 33	0.05	75
	25	< 16	0.02	200
	25	16 – 20	0.02	150
	25	21 – 33	0.02	100
	25	34 - 50	0.02	75
Other				
Rolled erosion control fabrics for slopes greater than 2:1	Variable, refer to manufacturer specifications			

Source: Wischmeier and Smith, 1978 and Pitt 2004, as reproduced in New York Standards and Specifications for Erosion and Sediment Control, August 2005.

1. Maximum slope lengths for which the specified mulch rate is considered effective. If these limits are exceeded, either a higher application rate or mechanical shortening of the effective slope length is required (such as with terracing).



Memorandum

Table 2b. Cover Factor C Values for Different Growth Periods for Planted Cover Crops for Erosion Control at Construction Sites

Vegetative Cover	SB (seedbed preparation)	Period 1 (Establishment)	Period 2 (Development)	Period 3A (maturing crop)	Period 3B (maturing crop)	Period 3C (maturing crop)
Crop Canopy	0 – 10 %	10 – 50%	50 – 75%	75 – 80%	70 – 90%	75 – 96%
Seeding on topsoil, without mulch	0.79	0.62	0.42	0.17	0.11	0.06
Seeding on a desurfaced areas, where residual effects of prior vegetation are no longer significant	1.0	0.75	0.50	0.17	0.11	0.06
Sod (laid immediately)	0.01	0.01	0.01	0.01	0.01	0.01

Source: Wischmeier and Smith, 1978 and Pitt 2004, as reproduced in New York Standards and Specifications for Erosion and Sediment Control, August 2005.

The Month ("M") adjustment factor is applied to the equation to reflect the number of days in a given month or months when active earth disturbance takes place. This factor varies by month due to the differing rates of erosion that occur at different times of the year. Construction projects at Jay Peak do not have continuously exposed soils during the entire construction season would not have any exposure during the winter months, therefore it is necessary to modify the RUSLE equation with this factor. The M factor is provided as a daily value to reflect the construction sequencing that occurs in accordance with the exposure limits outlined in the Individual Construction Stormwater Discharge Permit ("INDC"). During the construction season, individual project elements are allowed to be exposed for a limited time period (typically 7 days) prior to temporary stabilization. As each project element is stabilized, other project elements may become active, so long as the area of concurrent earth disturbance remains below the 5-acre threshold permitted by the INDC. Project elements that were temporarily stabilized but which were not fully constructed may be reactivated and completed at a later point during the construction season. Using a daily M factor allows the calculation of the erosion potential during the periods of active earth disturbance as well as the period of temporary stabilization between and following periods of active earth disturbance.

Table 3 provides the daily "M" factor for each month, regionally-adjusted for the site using the U.S. EPA online application designed to assist with these calculations. The EPA calculator can be accessed through the following website: <http://water.epa.gov/polwaste/npdes/stormwater/Rainfall-Erosivity-Factor-Calculator.cfm>.



Table 3. Construction Duration Adjustment Factor "M"

Month	M Factor (Per Day of Month)
January	0.00063
February	0.00056
March	0.00084
April	0.00120
May	0.00233
June	0.00488
July	0.00633
August	0.00596
September	0.00356
October	0.00230
November	0.00191
December	0.00130

EPA Rainfall Erosivity Factor Calculator for Small Construction Sites <http://water.epa.gov/polwaste/npdes/stormwater/Rainfall-Erosivity-Factor-Calculator.cfm>

Simple Method Calculation

The Simple Method will be used to determine the allowable offset credit capacity for offset projects that implement or improve treatment or control practices at existing impervious surfaces, and will be used to determine both existing and proposed loading conditions from the site. Offset credits calculated under this analysis will be presented as a net reduction in pounds of sediment determined by subtracting the load under proposed conditions from the load under existing conditions. Sediment loads for both pre- and post- construction scenarios are calculated using the Simple Method as follows:

$$L = 0.226 \times P \times P_j \times C \times A \times R_v \times T$$

Where:

L = annual load (pounds/year)

0.226 = unit conversion coefficient

P = annual precipitation (inches)

P_j = fraction of rainfall events producing runoff

C = flow weighted mean concentration for pollutant (mg/l), varies by land use, see Table 4

A = area of contributing sub-watershed (acres)

R_v = runoff factor, $0.05 + 0.009 \times (\text{site imperviousness})$ or accepted value



Memorandum

T = treatment removal rate; calculated as $(1 - \text{removal efficiency assumed for treatment practice})$; the removal efficiency is assumed to equal to 80 percent for BMPs that comply with the Vermont Stormwater Management Manual, therefore $T = 1 - 0.80 = 0.2$

The following site-specific values are assumed for the watersheds in the vicinity of Jay Peak:

P = 64 inches (PRISM climatological data, most recently updated as of 2006)

Pj = 0.9 (based on assumption that 10 percent of storms do not produce significant runoff)

Table 4. Sediment Loading Concentration Values by Land Use Type

Land Use	TSS (mg/L)	Sources
Commercial	77	NYS DEC Draft Manual (2001)
Commercial Lodging	97	NYS DEC Draft Manual (2001)
Forest	51	NYS DEC Draft Manual (2001)
Golf Course	70	EPA NURP Results for Forest/Rural Open (1993)
Meadow/Open	51	NYS DEC Draft Manual (2001)
Residential	70	NYS DEC Draft Manual (2001)
Ski Trail	100	VHB Best Professional Judgment
Transportation Gravel	374	Clinton & Vose - WQ Report (2003)
Transportation Paved	142	NYS SMDM (2001)
Water	0	n/a

Spreadsheet Tool for Estimating Pollutant Load

The STEPL model provides worksheets for calculating sediment load reductions associated with gully stabilization and bank stabilization projects. 100 percent of eroding soil from gullies and stream banks is assumed to be delivered to the stream. Units for both equations must be consistent, with distances given in feet or feet per year and soil weight given in tons per cubic foot. The spreadsheet is available for download at:

<http://it.tetrattech-ffx.com/steplweb/default.htm>

The Gully Erosion Equation ("GEE") calculates the annual average sediment reduction associated with gully stabilization as follows:

$$\text{GEE} = [(\text{Top Width} + \text{Bottom Width}) / 2 \times \text{Depth} \times \text{Length} \times \text{Soil Weight}] / \text{Number of Years}$$

The Channel Erosion Equation ("CEE") calculates the annual average sediment reduction associated with bank stabilization as follows:

$$\text{CEE} = \text{Length} \times \text{Height} \times \text{Lateral Recession Rate} \times \text{Soil weight}$$



Memorandum

Other Non-Impervious Surface Treatment Offset Projects

For proposed sediment reductions from the management of existing non-impervious sediment sources or from projects that decrease sediment loading in the watershed, offsets will be calculated in accordance with the methodology set out in EPR Chapter 22 Appendix C - Non-Impervious Surface Treatment Offset Projects (NISTOP):

- Project must provide enhancement of hydrologic and/or sediment attenuation
- Riparian Corridor Protection - establish and protect permanent forested riparian corridor to slow stormwater flows; hydrologic offset capacity only; requires average contributing area and riparian corridor slope to be less than 5 percent; Per NISTOP guidance, a Margin of Safety ("MOS") of 1 applies.
- Buffer Establishment and Protection – establish and protect forested riparian buffer adjacent to stream reaches the receive sheet flow from pervious and impervious areas adjacent to stream; requires level spreaders entering buffer and average 5 percent slope of contributing area and buffer zone; Per NISTOP guidance, MOS of 1 applies.
- Channel Modifications – stabilization of eroding stream banks, stream restoration, and floodplain enhancement or restoration necessary to restore Fluvial Geomorphic Equilibrium Condition (FGEC), enhance hydrologic and/or sediment attenuation; requires Phase 2 Stream Geomorphic Assessment (SGA), analysis of stream condition, characterization of sediment regime, and design details for proposed modifications; Per NISTOP guidance, MOS range of 3 to 10 applies.
- Infrastructure Modifications – culvert replacement or other transportation infrastructure modifications within channel, floodplain, or riparian corridor to support Fluvial Geomorphic Equilibrium Condition (FGEC), and enhance hydrologic and/or sediment attenuation; requires Phase 2 Stream Geomorphic Assessment (SGA), analysis of stream condition, characterization of sediment regime, and design details for proposed modifications; Per NISTOP guidance, MOS range of 3 to 10 applies.
- Calculations should account for potential sediment losses that would occur during the construction of sediment offset projects and any secondary stream adjustment that is anticipated to occur following construction which may reduce the benefit associated with the sediment offset project.

The suite of sediment offset projects may include tasks identified through the Sediment Source Tracking investigations that are completed as part of the WQRP, but shall not take credit for projects that were completed in 2014, projects that have been identified for completion in 2015, or projects identified as "winter operations." Potential sediment sources identified as "monitor and assess" in the 2014 WQRP may qualify as sediment offset projects in future years. In accordance with the principles of EPR Chapter 22, offset projects must be constructed prior to or concurrent with the project(s) requiring the offset. The offset project must be constructed within the sub-watershed of the proposed discharge.



Tracking and Management of Offset Credits

A ledger system will be maintained in order to manage the generation and use of offset credits. This record-keeping will ensure that sediment reduction activities and other offset projects are credited to the sediment offset bank and that construction and operational phase discharges are debited as they are used. The tracking ledger will be maintained within the Water Quality Remediation Plan ("WQRP") and will be reported on in the annual reports and annual meeting.

- An amount of sediment reduction equal to or greater than the sediment load associated with the proposed construction discharge would need to be available prior to or concurrent with the construction project. Commencement of earth disturbance activities associated with a project will be noted on the On Site Plan Coordinator ("OSPC") weekly report.
- A MOS of 1 will be applied to offset requirements for the sediment load discharged by each construction project. In other words, the offset project must provide a sediment load reduction capacity equal to the sediment load generated by the project.
- The sediment reduction associated with each offset project may only be used once and does not regenerate on an annual basis. This will serve as an additional factor of safety by establishing permanent sediment load reductions to offset temporary construction period discharges. The construction period offsets will thereby provide permanent benefits to the watershed through an ongoing reduction in sediment loading.
- Excess sediment load reduction capacity that is not required for a single construction project or construction season would be maintained in the bank for use in subsequent years. These credits could then be used to offset construction phase discharges or to offset operational phase discharges.

Operational phase offset credits have been previously established for the following proposed East Side projects: South Village Townhomes, Administration Building and Golf Maintenance Center within the Jay Branch watershed and the Welcome Center, Chalet Meadows Residential Area, and the Snowline Area Redevelopment in the South Mountain Branch watershed. These offsets were generated by enlarging the stormwater treatment basins that were designed to treat runoff from these specific project areas. This additional capacity was designed to provide treatment and control for existing areas of impervious that were previously untreated. Although the impervious area associated with these projects have not been constructed, the stormwater basins that will provide treatment and control of the runoff from these areas have already been constructed and are operating at a fractional capacity in expectation of these projects being built. The basins were designed and constructed to provide excess capacity that could be used to treat runoff from existing areas of untreated impervious. Runoff from these areas has been redirected or will be redirected during the construction of these projects. The calculation of the offsets associated with incorporating these areas of existing untreated impervious was performed in accordance with the guidance provided in the 2004 WQRP, which identified need to provide treatment for 25 percent of the existing untreated impervious. Construction-phase offsets are still required for these projects.



Example Calculations

The example calculation below demonstrates how sediment loads associated with construction activities on a site will be calculated.

- 0.5 acres of proposed disturbance
- $R = 71$ (site-wide)
- $K = 0.20$ (Colton-Duxbury complex, 3 to 8 percent slopes)
- $LS = 0.30$ (3 percent slope for 50 feet)
- $C_1 = 1$ (active earth disturbance, May 7 - 17 and Aug. 3 - 14)
- $C_2 = 0.06$ (mulched at 2 tons per acre, May 18 - Aug. 2 and Aug. 15 - Sep. 30)
- $P = 1$ (site wide)
- $M_1 = 0.026$ (May 7 through May 17)
- $M_2 = 0.387$ (May 18 through August 2)
- $M_3 = 0.072$ (August 3 through August 14)
- $M_4 = 0.208$ (August 15 to September 30)

$$A = \text{Area} \times R \times K \times LS \times C \times P \times M \times \text{SDR}$$

$$\text{Period 1} = 0.5 \times 71 \times 0.20 \times 0.30 \times 1 \times 1 \times 0.026 \times 0.7 = 0.04 \text{ tons}$$

$$\text{Period 2} = 0.5 \times 71 \times 0.20 \times 0.30 \times 0.06 \times 1 \times 0.387 \times 0.7 = 0.03 \text{ tons}$$

$$\text{Period 3} = 0.5 \times 71 \times 0.20 \times 0.30 \times 1 \times 1 \times 0.072 \times 0.7 = 0.11 \text{ tons}$$

$$\text{Period 4} = 0.5 \times 71 \times 0.20 \times 0.30 \times 0.06 \times 1 \times 0.208 \times 0.7 = 0.31 \text{ tons}$$

$$\text{Total Construction Sediment Offset Required} = 0.04 + 0.03 + 0.11 + 0.31 = 0.49 \text{ tons (981 pounds)}$$

This calculation assumes that the area is seeded and mulched as of August 15 and that final stabilization occurs by September 30, which allows 6 weeks for establishment of permanent vegetation and thus the termination of the construction phase discharge permit for this portion of the site.

The example calculation provided below demonstrates how treating an additional area of existing impervious that is equal to 25 percent of the proposed new impervious area effectively offsets sediment loads associated with the new impervious area.

- Assume 1 acre of proposed new impervious area with "Commercial" cover type, 100 percent impervious cover, treated in a stormwater BMP that meets the VSMM design requirements and therefore provides 80 percent TSS removal. The Simple Method calculation for the sediment load remaining after treatment would be as follows:



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- $0.226 \times P \times P_j \times C \times A \times R_v \times (1 - \text{Percent Treatment}) = \text{Remaining Sediment Load}$
- $0.226 \times 64 \times 0.9 \times 77 \times 1.0 \times [0.05 + (0.009 \times 100)] \times (1 - 0.80) = 190 \text{ pounds/year}$
- Assume 0.25 acre of formerly untreated existing impervious area with the same "Commercial" cover type and 100 percent impervious cover is routed to treatment in a stormwater BMP providing 80 percent TSS removal. The Simple Method calculation for the sediment load reduction associated with this treatment would be as follows:
 - $0.226 \times P \times P_j \times C \times A \times R_v \times \text{Percent Treatment} = \text{Sediment Load Removed Through Treatment}$
 - $0.226 \times 64 \times 0.9 \times 77 \times 0.25 \times [0.05 + (0.009 \times 100)] \times 0.80 = 190 \text{ pounds/year}$

It can be seen from this calculation that 190 pounds sediment would be discharged from the new impervious area following treatment to the 80 percent treatment standard. This amount of sediment discharge can be offset by providing treatment for an area of existing untreated impervious equal to 25 percent of the new impervious area.

References

The following references provide more details on the calculation methods described herein and may be helpful in the calculation of sediment loading rates and offset benefits:

New York State Department of Environmental Conservation, 2005. New York Standards and Specifications for Erosion and Sediment Control. Appendix A – Revised Universal Soil Loss Equation (RUSLE). Available at: http://www.dec.ny.gov/docs/water_pdf/appendix.pdf

New York State Department of Environmental Conservation, 2001. New York State Stormwater Management Design Manual. Appendix A – Simple Method to Calculate Urban Stormwater Loads. Available at: http://www.dec.ny.gov/docs/water_pdf/simple.pdf

USDA, 1987. Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE). Available at: http://www.ars.usda.gov/SP2UserFiles/Place/64080530/RUSLE/AH_703.pdf

USEPA, 2005. EPA Region 5. Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual. September 2005. Originally published by Michigan Department of Environmental Quality. Available at: http://michigan.gov/documents/deq/deq-wb-nps-POLCNTRL_250921_7.pdf

USEPA, no date. Spreadsheet Tool for Estimating Sediment Load (STEPL) and Region 5 Model Website. Available at: <http://it.tetrattech-ffx.com/steplweb/default.htm>