

MOUNT SNOW CARINTHIA IRON STREAM REMEDIATION

Dover, Vermont

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1.0 Introduction

On behalf of Mount Snow, Ltd. ("Mount Snow" or the "Resort"), VHB has prepared this annual Water Quality Monitoring Plan Performance Report ("WQMP"). The WQMP has been prepared pursuant to the Resort's "Carinthia Development Iron Seep Remediation Plan" and includes a record, analysis, and an evaluation of water quality monitoring data collected during the 2019 monitoring season. This data was collected in conformance with the approved Quality Assurance Project Plan ("QAPP") (VHB, 2019).

2.0 Project Background

Mount Snow Resort, located in Dover, Vermont, is redeveloping the Carinthia Base Area, including constructing a new Base Lodge, redeveloping the adjacent parking lot, and constructing new residential structures adjacent to the Base Lodge (the "Project"). A significant portion of these activities occur within the contributing watershed to the unnamed tributary to Jack's Brook, known locally as "Iron Stream."

The results of biological assessments in 1996 and 2004 by the Vermont Department of Environmental Conservation ("DEC") identified Iron Stream as impaired and not meeting the Class B aquatic life support ("ALS") biocriteria for the small high-gradient stream ("SHG") classification (DEC, 2017). The dominant source of the impairment has been identified as being associated with the discharge of iron-rich water to Iron Stream via groundwater seeps along the downgradient edges of the existing parking lot ("Lot E"), although other areas of elevated iron within the watershed have also been observed. At the time of those studies, groundwater within the Project Area flowed through the iron-rich soils and organic materials that were used as fill when the parking lot was originally constructed by prior owners of Carinthia. In addition, an existing 30-inch corrugated metal pipe ("CMP") culvert carrying drainage from the west side of the parking lot to the east side was corroded and partially crushed in some locations, resulting in inadvertent release of water from the culvert into the iron-rich fill materials.

A monitoring plan to evaluate water quality in the streams around the Carinthia Base Area was required by the District Environmental Commission as Condition #27 of the Project's Act 250 Land Use Permit



(# 2W1281-1). The requirements of this monitoring plan were further defined in the QAPP, which provides the basis for completing the necessary monitoring activities and identifies the quality assurance and quality control procedures that will be followed to ensure that valid results are obtained. In conjunction with materials submitted to the District Environmental Commission during the Project's Act 250 review, the DEC approved the original version of this plan on December 4, 2015. A revised version of the QAPP that addressed minor comments from DEC was approved on September 17, 2019, in advance of the collection of the 2019 monitoring data.

Water quality within the Iron Stream watershed was evaluated by VHB on September 15, 2015 (VHB, 2015) during the development of the Iron Seep Remediation Plan. During that effort, surface waters within the watershed were sampled at 13 locations and analyzed for their concentration of dissolved iron and total iron. Field measurements of pH, temperature, dissolved oxygen, and conductivity were also recorded. The results from this evaluation indicated that multiple locations exceed the maximum dissolved iron concentration of 1 mg/L that is acceptable for Class B waters under the Vermont Water Quality Standards ("VWQS"). These exceedances do not constitute a violation of the VWQS, as the chronic criteria are based on a four-day average, as opposed to a single grab sample. However, these results document the baseline condition associated with the known issue with iron seepage, as well as the relative iron concentrations at different locations around the resort.

Groundwater flows that have a low pH (i.e., which are acidic) and have low dissolved oxygen concentrations can liberate naturally occurring iron from subsurface soils, particularly where iron-rich fill materials are placed under saturated conditions. This liberated iron remains dissolved in the groundwater until it is exposed to the oxygen at locations where groundwater discharges to surface waters. Once exposed to the air, dissolved iron reacts with atmospheric oxygen and is converted from relatively soluble ferrous iron (Fe^{2+}) to relatively insoluble ferric iron (Fe^{3+}), i.e., is oxidized. Ferric iron precipitates out of solution and forms rust-colored iron minerals that are visible as flocs and staining in surface waters. This form of iron also supports the growth of iron-reducing bacteria that colonize the stream bed and form dense mats that inhibit macroinvertebrate populations, thus resulting in impairment of aquatic habitat and aquatic biota uses as designated in the VWQS.

The current redevelopment of the Carinthia Base Area includes the construction of new residential and



commercial buildings within the watershed of Iron Stream, as well as the redevelopment and expansion of existing parking lots and roadways within the Project Area. This activity has provided opportunities to modify the geochemistry and quantity of groundwater flows through the Project Area in an effort to minimize the mobilization of iron that contributes to the high concentration of iron that is observed in surface waters. The Iron Seep Remediation Plan consists of three components that are intended to minimize the amount of dissolved iron that precipitates into the tributaries of Iron Stream.

The first component of the Iron Seep Remediation Plan involves a reduction in the amount of groundwater that flows through the historic fill that was placed when the Carinthia Base Lodge parking lot was originally constructed by the then-owners of the property. These fill materials contain a high content of iron that was available for dissolution by groundwater flows. By reducing the exposure of these materials to groundwater flows, the amount of liberated iron is anticipated to be reduced. Construction performed in 2019 included rerouting flows away from the deteriorating 30-inch CMP and instead through a new 30-inch high-density polyethylene ("HDPE") culvert. This culvert follows a new alignment but connects between the same jurisdictional features, routing flows from Pond E to stream 2009/2015-TB-C1 ("Stream C1"). This new culvert avoids infiltration associated with routing these flows through the ditch that runs along the western edge of the parking lot and through corroded sections of the deteriorated CMP. While the deteriorated CMP is proposed to be removed in its entirety during a future phase of Lot E construction, work completed in 2019 including blocking the inlet to this culvert with flowable fill to minimize seepage draining to Iron Stream. In addition, the ditch along the western edge of the parking lot was reshaped into a vegetated swale and lined with low permeability soils to minimize infiltration in this area. Surface flows that drain to this swale are routed to the south via a new 24-inch HDPE culvert which conveys flows beneath Somerset Road and drains to wetland 2009/2015-C2 ("Wetland C2"). Stream 2009/2015-SC-C3 ("Stream C3") flows through Wetland C2 and drains to Iron Stream east of the Project Area, thereby maintaining the overall flow distribution pattern within the area. Refer to Appendix 1 for construction activity documentation related to this work.

In addition to these improvements, other authorized components of the Carinthia Base Area and Lot E redevelopment include paving the parking lot, constructing a below-grade parking deck, and constructing a subsurface stormwater treatment system to manage surface runoff. This treatment practice is designed to improve water quality by capturing sediment and other pollutants, while the



paving will minimize the sediment load and limit the amount of infiltration of surface water into the underlying soils. This infrastructure will serve to minimize the potential exposure of groundwater and surface water to iron-rich soils in this area. This work has not been completed at this time and is anticipated to be undertaken in conjunction with the future redevelopment.

The second component of the Iron Seep Remediation Plan involves the excavation of previously placed organic fill materials, with the intent to remove a major contributing source of iron to downstream waters. Organic fill materials have been removed within those portions of the site that have been redeveloped to date, including along the entire length of the new 30-inch HDPE culvert alignment. Such materials were removed down to native ground and replaced with properly compacted crushed rock. This rock is free from materials that would decompose and settle, providing appropriate subbase for the remaining redevelopment activities that are proposed. The future construction of the subsurface parking structure and stormwater treatment practice will also remove a significant volume of additional organic material. Although this excavation work may not completely eliminate iron-rich soils from Lot E, the removal of this material is anticipated to significantly reduce the potential exposure of groundwater to iron-rich fill material. In preparation for removal of these soils, borings were performed to pre-characterize areas of possible contaminants that would require special consideration. VHB prepared a Soil Management Plan (VHB, 2018) to address these concerns and submitted it for approval by the DEC Sites Management Section ("SMS"). SMS approved the SMP on October 27, 2018 and soils in the area of SMA-2 were removed under the observation of an Environmental Professional in 2019. An updated figure from this plan that shows the location of the soil management areas and describes the work that has been completed to date is included on page 6 of Appendix 1.

The third component of the Iron Seep Remediation Plan involved the subsurface backfilling of trenches and footer excavations with crushed limestone during the construction of the previously mentioned improvements. The trench runs where utility structures were backfilled with crushed limestone in 2019 are highlighted on the Iron Seep Remediation Plan that is included on page 7 of Appendix 1. The placement of crushed limestone within these excavations is designed to intercept subsurface groundwater flows. Contact with crushed limestone (predominantly calcium carbonate, or CaCO_3) is intended to increase the pH of the intercepted groundwater flows (i.e., make less acidic), thereby minimizing their ability to liberate iron from the soil. The amount of iron that could precipitate into the



stream when groundwater ultimately discharges to the surface water should therefore be reduced because higher pH groundwater will have dissolved less iron from the surrounding subsurface soils. Although the ability of the crushed limestone to increase the pH of groundwater flows will gradually diminish over time, this effect is significantly slower than if the limestone were placed directly in surface waters ("liming") and were continuously exposed to oxygen. It is anticipated that this remediation effort will continue to provide long-term benefits to Iron Stream in future monitoring years.

Water quality monitoring commenced on August 29, 2019 following the partial implementation of the Iron Seep Remediation efforts described above. As approved by DEC with their QAPP acknowledgment letter dated September 17, 2019, the current monitoring program has reduced the number of sampling locations from the 13 that were included in the initial assessment conducted by VHB in 2015 to the current list of eight monitoring stations that have been identified to assess priority sites on the streams tributary to Iron Stream and which are subject to the mitigation efforts intended to improve water quality.

3.0 Study Area

Mount Snow is located in the town of Dover in southern Vermont (see Water Quality Monitoring Location Map in Appendix 2).

4.0 Monitoring Network Design

As outlined in the QAPP, water quality monitoring activities and analyses that are to be conducted on an annual basis include:

- Baseflow Water Chemistry
- Event Flow Water Chemistry
- Substrate Assessment
- Aquatic Biota Habitat Assessment (macroinvertebrates)



The monitoring network at Mount Snow is designed to examine water quality and stream habitat conditions within the tributaries of the Resort's watershed. Monitoring stations have been chosen to assess in-stream water quality conditions that reflect discharges of managed stormwater runoff associated with Resort development. Ongoing monitoring and evaluation of data that has occurred since the implementation of the WQMP has resulted in various modifications to the sampling protocol, including changes to the monitoring station locations and sampling activities from the initial assessment conducted in 2015 by VHB, prior to the start of redevelopment activities at the Carinthia Base Area. Table 1 summarizes water quality data collected during the 2019 sampling period. The Water Quality Monitoring Station Location Map in Appendix 2 identifies the locations of these stations.

Table 1: Mount Snow Resort Water Quality 2019 Monitoring Station Locations, Activities, and Frequency							
Stream	Water Quality Monitoring Station Name	Water Chemistry				Biomonitoring	
		Baseflow		Event Flow		9/27/19 and 10/15/19	
		8/29/19	9/27/19	9/12/19	10/4/19		
Jack's Brook (reference)	JB-1	X	X	X	X	X	X
Iron Stream and Sub-Tributaries	MS-1	X	X	X	X		
	MS-2	Dry	X	X	X		
	MS-3	X	X	X	X		
	MS-5	X	X	X	X	X	
	MS-8	X	X	X	X		
	MS-11	X	X	X	X		
	MS-13	X	X	X	X		
Dry = streambed was dry, little to no flow							

As indicated in Table 1, eight monitoring stations were monitored for water chemistry in 2019 during baseflow and event flow conditions. Water chemistry parameters monitored in 2019 included temperature, specific conductivity, pH, dissolved oxygen, turbidity, alkalinity, chloride, total iron, and dissolved iron. Specific conductivity is used in conjunction with the state-wide regression equation to evaluate potential chloride concentration in comparison to grab samples analyzed for chloride in the laboratory. Substrate characteristics and aquatic biota ("biomonitoring") were monitored at two of the eight stations in 2019, JB-1 (Jack's Brook) and MS-5 (Iron Stream).

The following is a general description of the location of each monitoring station:



Jack's Brook Watershed

- JB-1 is located on Jack's Brook, south of the Carinthia base area. This monitoring station is approximately 200 feet upstream from where the stream flows through the town-owned Handle Road culvert and is approximately 400 feet south from monitoring station MS-5. This station represents water quality conditions of a reference reach as it does not receive stormwater or streamflow from the Carinthia Base Area. This station corresponds to DEC station 651409000003.

Iron Stream Watershed

- Stream 2009/2015-SC-C3 is located on the south and southeast sides of Lot E and is a tributary to Iron Stream (2009/2015-TB-C1). Monitoring stations MS-3 (downstream) and MS-8 (upstream) are located along this stream.
- Stream 2009/2015-SC-C2 is located on the east side of Lot E and is a tributary to Iron Stream (2009/2015-TB-C1). Monitoring station MS-13 is located along this stream.
- Stream 2009/2015-TB-C1 ("Iron Stream") is located on the east side of Lot E. Three stations are sampled along the length of the stream from the outlet of the new 30-inch HDPE culvert under the parking lot to the inlet of the Handle Road culvert. From upstream to downstream, these stations are identified as MS-1, MS-2, and MS-5.
- The stormwater basin ("Pond E") is located on the northwest corner of Lot E. Station MS-11 is located at the 24-inch culvert outlet flowing into the basin from beneath the Somerset Road. This culvert and another 30-inch CMP culvert convey drainage from the upgradient ski trails and forest areas of the mountain to the pond. Under the construction stormwater permit, additional flows currently enter this basin from the Carinthia Base Area. However, these flows will be redirected to the Lot E subsurface stormwater treatment practice when it is constructed in the future (see page 7 in Appendix 1).

5.0 Monitoring Results

The results from the monitoring conducted in 2019 are presented below. These include baseflow, event flow, substrate analysis, and biomonitoring.

5.1 Baseflow Water Chemistry Analysis

Baseflow water chemistry samples were collected on August 29 and September 27, 2019 in the Iron Stream watershed and on Jack's Brook (reference reach). Samples were collected from eight monitoring stations in 2019.

The scatter plots below provide a summary of the available water chemistry parameters at each monitoring station from 1996 to 2019. Appendix 2 includes the complete set of baseflow water chemistry results from 1996 through 2019 along with the laboratory reports for the 2019 baseflow sampling. Note that water chemistry data prior to 2015 (stations MS-5 and JB-1 only) was collected by DEC and was obtained from the Vermont Integrated Watershed Information System ("IWIS"). Water chemistry results were evaluated to determine compliance with relevant narrative and numerical criteria of the VWQS.

5.1.1 Conductivity & Chloride

Samples were field measured for conductivity using a pre-calibrated YSI Multi-meter for both baseflow events. Figure 1 displays the results for conductivity measurements at each respective station.

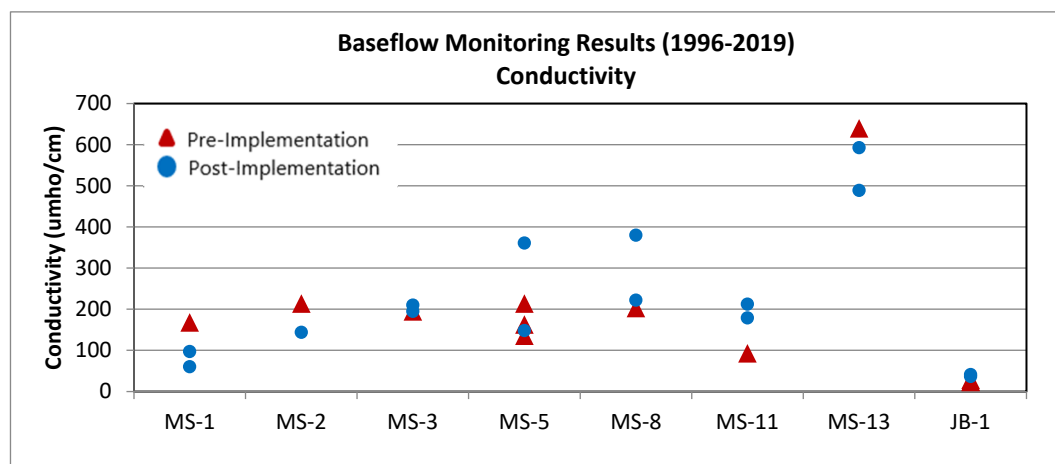


Figure 1: Baseflow Monitoring Results for Conductivity

Baseflow conductivity values measured in 2019 were generally higher than average when compared to the period of record for each station. The maximum conductivity value observed during 2019 baseflow monitoring was recorded at 593.1 on September 27, 2019 (593 $\mu\text{mho/cm}$). Using the statewide regression equation, this value equates to an approximate chloride concentration of 103 mg/L and is well below the chronic VWQS threshold of 230 mg/L. Stations within the Iron Stream subwatershed (MS-5, MS-8 and MS-13) exhibited the highest conductivity values on the respective sampling dates as compared to other stations.

Chloride baseflow samples were collected and analyzed in the laboratory. All samples collected were well below the VWQS acute (860 mg/L) and chronic (230 mg/L) criteria in both baseflow events, as seen in Figure 2 below.

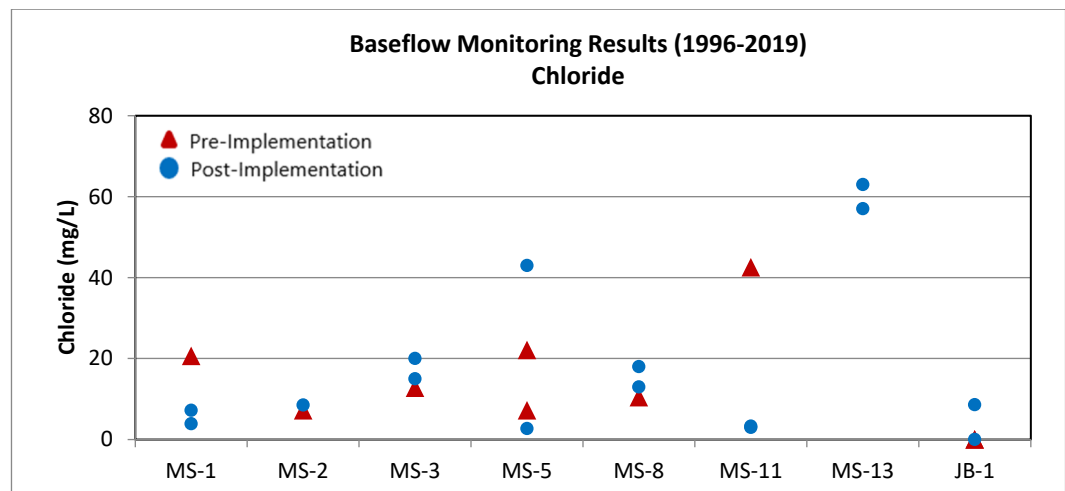


Figure 2: Baseflow Monitoring Results for Chloride

5.1.2 pH

Samples were field measured for pH using a pre-calibrated YSI Multi-meter for both baseflow events. Figure 3 displays the results for pH.

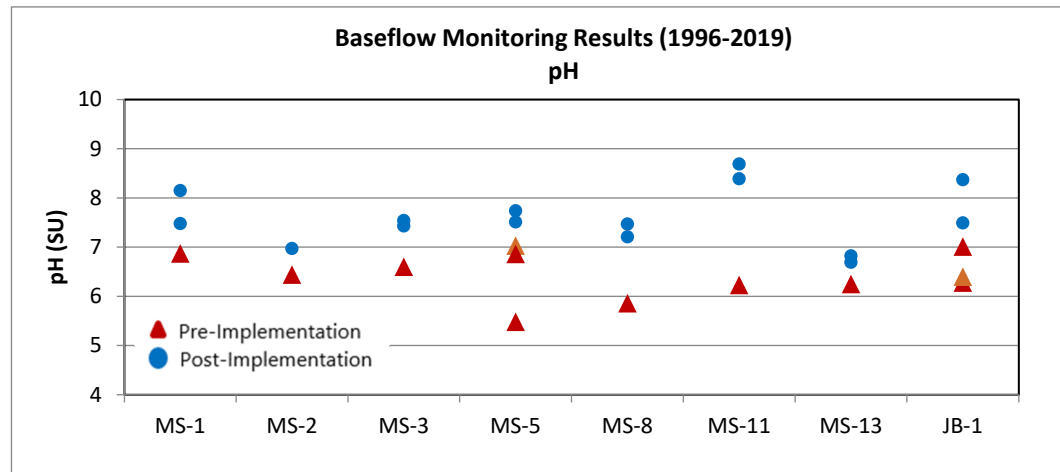


Figure 3: Baseflow Monitoring Results for pH

Baseflow pH values in 2019 were within the acceptable VWQS range of 6.5 to 8.5 for both sampling dates, with the exception of station MS-11 on August 29, reporting a pH of 8.69, slightly above the VWQS threshold.

5.1.3 Alkalinity

Samples were collected during the 2019 period for alkalinity for both baseflow events. Alkalinity is a measure of the buffering capacity (or acid neutralizing) of water. Alkalinity is not a pollutant, but a measure of sensitivity to acidic inputs. For reference, waterbodies with alkalinities below 2.5 mg/L are considered acidic and may be added to the Vermont 303(d) List of Impaired Waters (DEC, 2018), however, there is no VWQS threshold for alkalinity. All samples collected and analyzed in the laboratory were well above the 2.5 mg/L threshold for both baseflow sampling dates, indicating the tributaries within the Iron Stream watershed have a high buffering capacity and are regulating pH levels within the acceptable VWQS range. The placement of limestone bedding for the culverts installed in 2019 may be treating groundwater that flows along these pathways and thereby contributing to this buffering capacity.

5.1.4 Turbidity

Samples were field analyzed for turbidity using a HF Scientific MicroTPW portable turbidity meter. Figure 4 displays the results for turbidity.

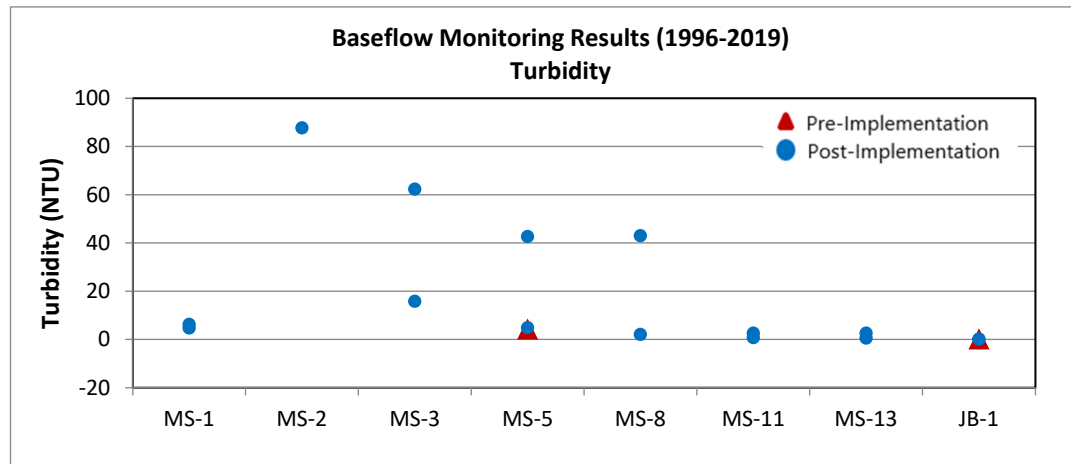


Figure 4: Baseflow Monitoring Results for Turbidity

Baseflow turbidity results for 2019 were generally within ranges of the period of record for all stations. The maximum sampled value for baseflow turbidity from all sampled stations in 2019 was 87.74 nephelometric turbidity units (“NTU”). The minimum possible value of 0.0 NTU was observed at 1 station during the August 29, 2019 sampling event. Stations that exhibited higher NTU values were those that were in close proximity to groundwater seepage sites with observable iron floc formation and stagnant water with algae that accumulate during long periods of warm, dry weather conditions. On the August 29, 2019 sampling event, only two stations (MS-5 and MS-8) exceeded the 25 NTU construction action level (42.65 and 43.04 NTU), while Stations MS-2 and MS-3 exhibited values of 87.74 and 62.34 NTUs on the September 27 event.

5.1.5 Iron

Samples were collected during the 2019 period for Total Iron and Total Dissolved Iron. Iron samples collected and analyzed in the laboratory together with the macroinvertebrate biomonitoring discussed in section 5.4 below will be an indicator of the effectiveness of the Iron Seep Remediation Plan in future monitoring years. Figures 5 and 6 below display Total Iron and Total Dissolved Iron levels for both baseflow sampling events.

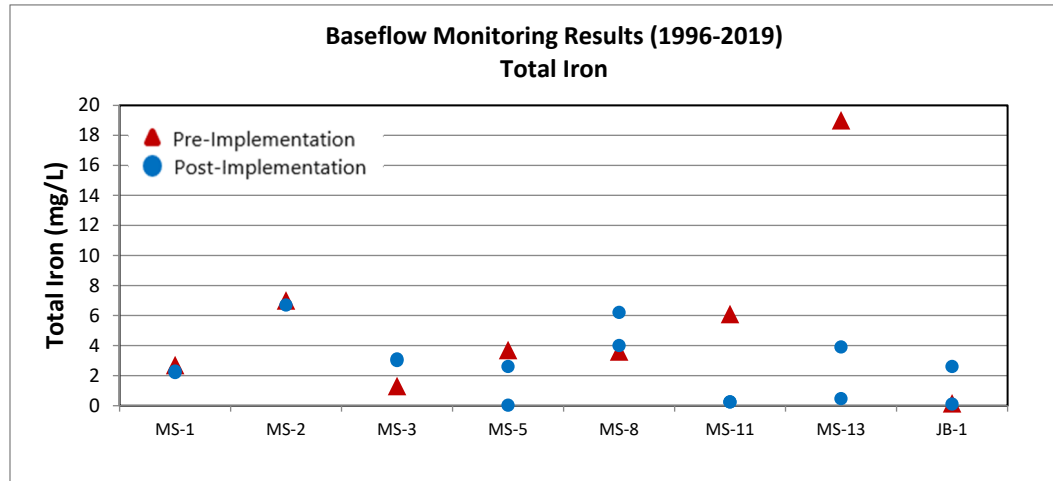


Figure 5: Baseflow Monitoring Results for Total Iron

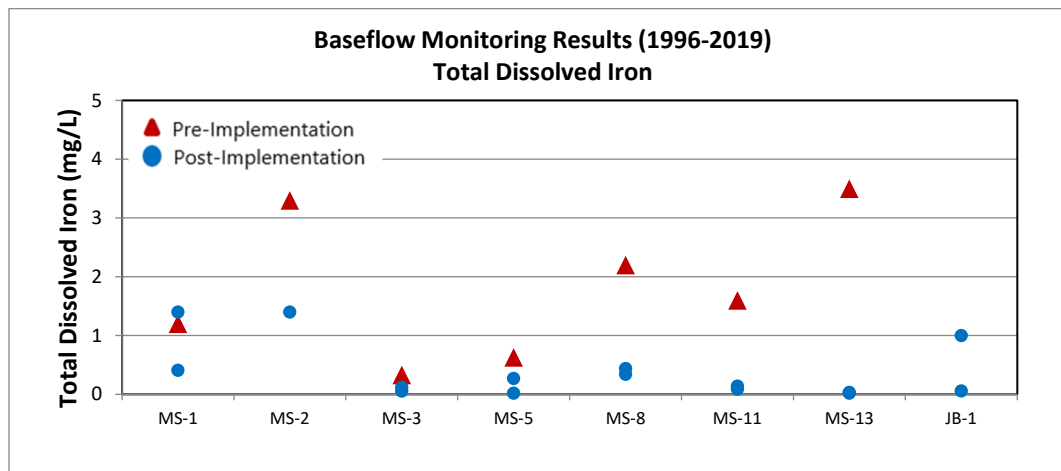


Figure 6: Baseflow Monitoring Results for Total Dissolved Iron

With the exception of MS-11 (the influent to Pond E), total iron concentrations exceeded the VWQS standard at 7 of 8 stations monitored in 2019, including the reference station on Jack's Brook. For the streams downgradient from the Carinthia Base Area, this may be due to iron floc that remains present in the stream channel that may take time to clear from the system after the implementation of the remediation plan. As noted above, the Jack's Brook reference reach station (JB-1) exhibited a total iron concentration of 2.60 mg/L and a total dissolved iron concentration of 1.00 mg/L during the September 27, 2019 sampling event, indicating that naturally-occurring iron is present within this overall watershed and achieving the numeric VWQS may not be possible at all stations. However, the total dissolved iron results may indicate a positive trend reflecting the initial implementation efforts of the Iron Seep Remediation Plan. With two exceptions (MS-1 and JB-1), the concentration of total



dissolved iron in the 2019 samples were all below the mean value for each station and each station exhibited a sample that was the lowest observed concentration for the period of record. Future monitoring will document if this trend continues and if the remediation measures that have been implemented are resulting in the intended water quality improvements.

Baseflow Summary

In 2019, stations within the Iron Stream watershed exhibited chloride values well below the VWQS acute (860 mg/L) and chronic (230 mg/L) criteria in all baseflow samples. Turbidity values were generally low and approaching zero NTU at most stations and pH values were within the acceptable VWQS range during baseflow conditions.

Station MS-1 reported a percent oxygen saturation of 67.4 percent on August 29, 2019, slightly below the 70 percent saturation criteria in the VWQS. During the second round of sampling conducted on September 18, 2019, this station met the VWQS with 70.5 percent saturation. Stations MS-8 and MS-13 had very low flow during the 2019 baseflow sampling and reported a percent oxygen saturation well below the VWQS threshold on both sampling dates, as reported in Appendix 2. Marginally flowing water coupled with warm temperatures would result in lower percent saturation than would otherwise be expected.

5.2 Event Flow Water Chemistry Analysis

Event flow water chemistry samples were collected during rainfall events on September 12 and October 4, 2019, representing conditions in the Iron Stream watershed and Jack's Brook (reference). The scatter plots below provide a summary of the available event flow water chemistry parameters at each monitoring station for 2019. A complete summary of event flow water chemistry results over the period of record for each monitoring station and laboratory reports for each sampling event are included in Appendix 3. Samples were collected from eight monitoring stations in 2019.

Rainfall recorded by the Alpine Village Weather Station (ID: KVTDOVER19) in Dover, VT totaled 0.08 inches in the 24 hours prior to the sampling event of September 12, 2019 and 0.35 inches prior to the October 4, 2019 rainfall event. During both events, rainfall in the Project Area generated runoff to have an observable effect on stream flows after periods of dryer weather.

5.2.1 Conductivity & Chloride

Samples were field measured for conductivity using a pre-calibrated YSI Multi-meter for both events. Figure 6 displays the results for conductivity measurements at each respective station.

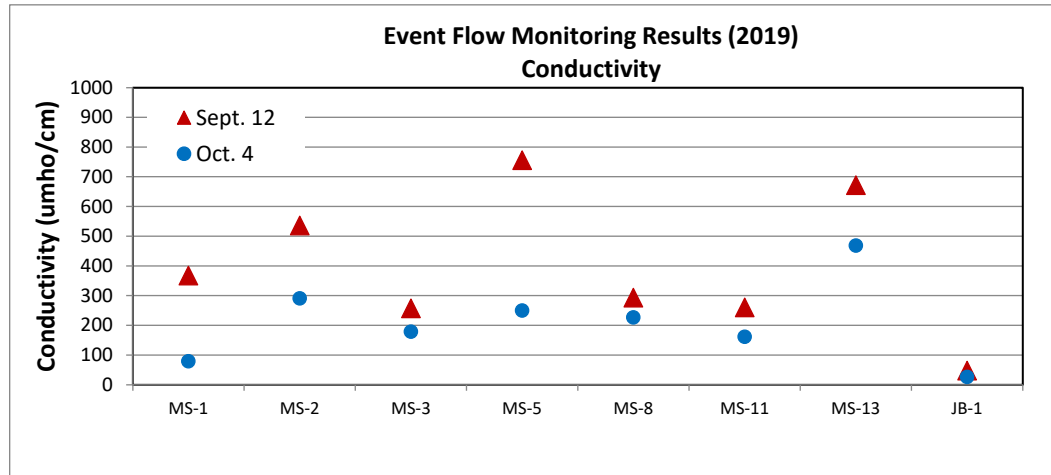


Figure 7: Event Flow Monitoring Results for Conductivity

Event flow conductivity values measured in 2019 were higher than average when compared to the period of record for each station in both baseflow and event flow sampling efforts. The maximum conductivity value observed during 2019 event flow monitoring was recorded on September 12, 2019 (756 $\mu\text{mho/cm}$). Using the statewide regression equation, this value equates to an approximate chloride concentration of 151 mg/L and is below the chronic VWQS threshold of 230 mg/L. Stations within the Iron Stream subwatershed (MS-5, MS-8 and MS-13) exhibited the highest conductivity values on the respective sampling dates as compared to other stations.

In addition to in-field readings for conductivity, chloride samples were collected and analyzed in the laboratory. All samples collected were well below the VWQS acute (860 mg/L) and chronic (230 mg/L) criteria in both event flow samples, as seen in Figure 8 below.

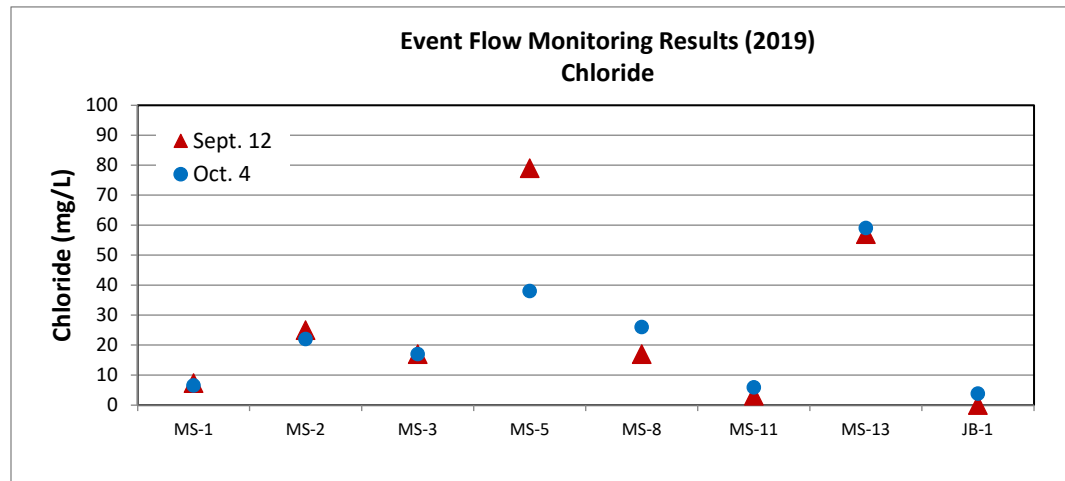


Figure 8: Event Flow Monitoring Results for Chloride

5.2.2 pH

Samples were field measured for pH using a pre-calibrated YSI Multi-meter for both events. Figure 9 displays the results for pH.

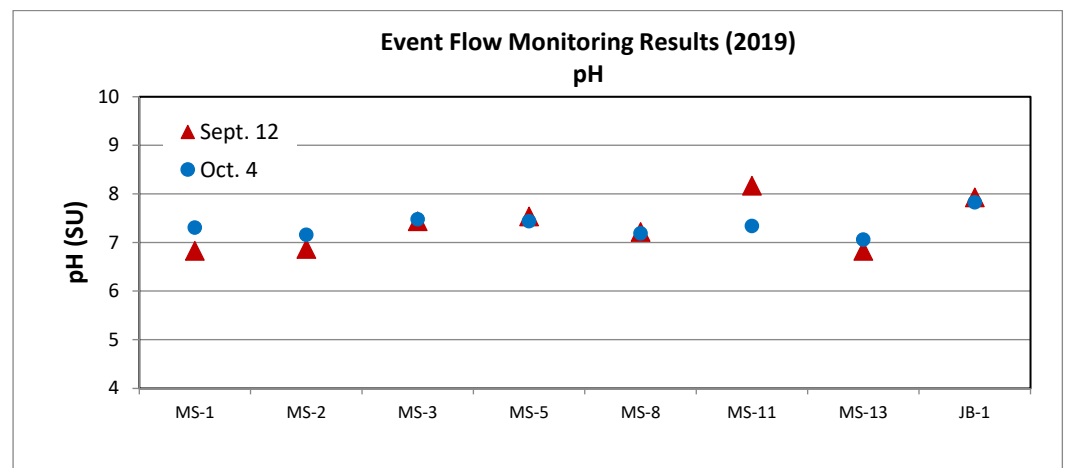


Figure 9: Event Flow Monitoring Results for pH

Observations recorded at all monitoring stations, including the reference station (JB-1) in 2019 had event flow pH values that were within the acceptable VWQS range of 6.5 to 8.5.

5.2.3 Alkalinity

Samples were collected during the 2019 period for alkalinity for both event flow dates. As mentioned in section 5.1.3, Alkalinity is a measure of the buffering capacity of water. All samples

collected and analyzed in the laboratory were well above the 2.5 mg/L threshold for both event flow sampling dates, indicating the tributaries within the Iron Stream watershed have a high buffering capacity and are regulating pH levels within the acceptable VWQS range.

5.2.4 Turbidity

Samples were field analyzed for turbidity using a HF Scientific MicroTPW portable turbidity meter. Figure 8 displays the results for turbidity.

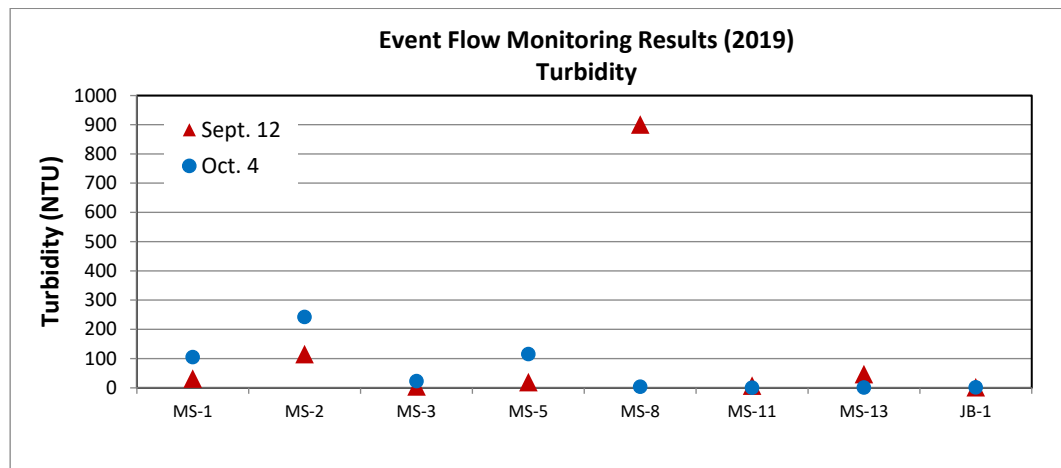


Figure 10: Event Flow Monitoring Results for Turbidity

Event flow turbidity results for 2019 were variable. Station MS-8 exhibited the maximum turbidity value for the period of record, and 5 stations (MS-1, MS-2, MS-5, MS-8, and MS-13) reported turbidity values above the 25 NTU construction action level for both sampling dates. High turbidity values observed in-field were primarily due to the presence of iron floc at their respective monitoring station, and not indicative of finer sediment causing these higher spikes in the data.

5.2.5 Iron

Samples were collected during the 2019 period for Total Iron and Total Dissolved Iron. Samples collected in prior monitoring years have exceeded the VWQS criterion of 1 mg/L for total iron at all sampled stations. As previously stated, iron samples collected and analyzed in the laboratory will be an indicator of the effectiveness of the Iron Seep Remediation Plan in future monitoring years. Figures 11 and 12 below display Total Iron and Total Dissolved Iron levels for both event flow monitoring dates.

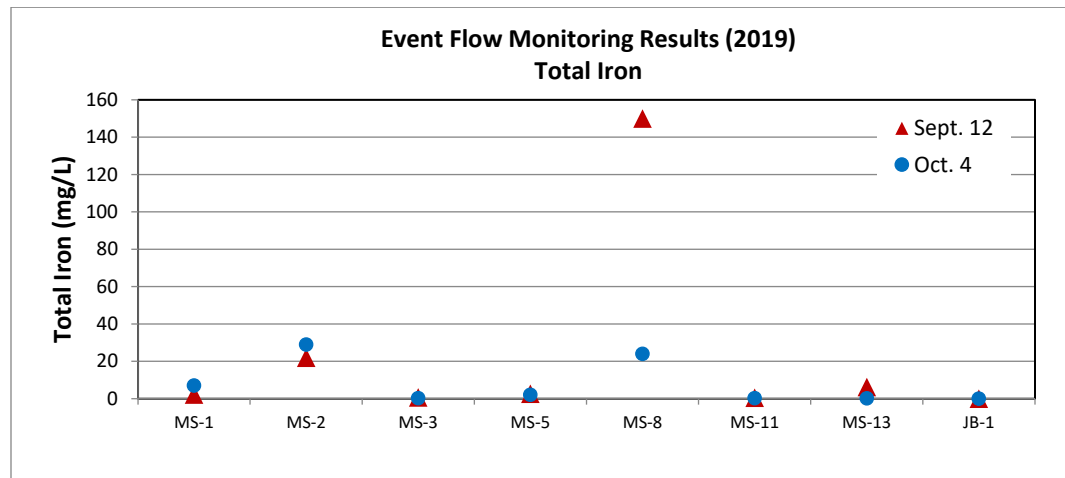


Figure 11: Event Flow Monitoring Results for Total Iron

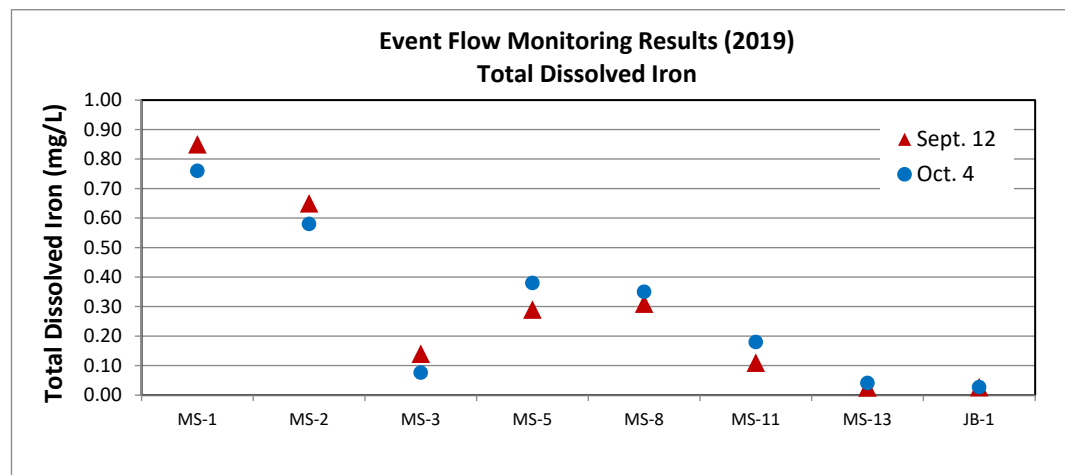


Figure 12: Event Flow Monitoring Results for Total Dissolved Iron

Event Flow Summary

In 2019, stations within the Iron Stream watershed exhibited chloride values well below the VWQS acute (860 mg/L) and chronic (230 mg/L) criteria in all event flow samples. Turbidity values were variable at most stations and pH values were within the acceptable VWQS range across all stations monitored during both event flow sampling dates.

Stations MS-2, MS-5, MS-8 and MS-13 reported a percent oxygen saturation well below the VWQS threshold on both sampling dates, as reported in Appendix 3. As stated previously, marginally flowing



water at these locations would typically result in lower percent saturation than would otherwise be expected.

In 2019, pH values were within the acceptable VWQS range during event flow conditions at all stations for both events. Total Iron concentrations exceeded the VWQS standard at five stations in the Iron Stream watershed (MS-1, MS-2, MS-5, MS-8 and MS-13) in event flow samples collected on both dates. Due to marginally flowing water and a significant presence of iron-laden sediment at station MS 8, total iron concentrations exceeded the VWQS standard at 150 mg/L on the September 12 event, the highest recorded value at all stations for both event flow monitoring dates.

5.3 Substrate Analysis

In 2019, streambed substrate composition analyses were conducted at the reference station on Jack's Brook (JB-1), and Iron Stream just above the Handle Road culvert (MS-5). These analyses were completed to evaluate stream bed material composition and a summary of the substrate data for each station, provided in Appendix 4. Habitat and physical characteristics were evaluated, including characterization of periphyton cover, evaluation of substrate type and embeddedness and in-stream organic materials, channel geomorphic characteristics, and riparian vegetation characteristics.

5.3.1 Embeddedness

The percentage of substrate embeddedness was observed at the two monitored stations using quartile estimates and is recorded in accordance with the DEC Lotic Benthos Field Sheet (2016 edition). Substrate embeddedness is evaluated because it is a key factor in the health of macroinvertebrate populations, with lower degrees of embeddedness typically corresponding to higher macroinvertebrate populations and vice-versa. Embeddedness ratios below 50 percent are desirable, with ratios between 0 and 5 percent considered excellent, between 5 and 25 percent considered very good, between 25 and 50 percent considered good, between 50 and 75 percent considered fair and above 75 percent considered poor. Substrate embeddedness was estimated as 25 percent or "Good" (25-50 percent) at JB-1, and as 5 percent or "Very Good" (5-25 percent) or "Excellent" (less than 5 percent) at MS-5. Note that the most significant stressor at station MS-5 appears to be the high concentration of available iron and the associated iron-reducing bacteria that secrete dense mats of slime within the stream channel. As requested by DEC, substrate



measurements included observations of the amount of iron floc / precipitate ("Iron P") on the streambed and recorded that quantity as a percentage of available riffle habitat. Results indicate that two-thirds of the pebble count assessment for micro algae cover in this sampling reach is comprised of Iron P. As noted in the biomonitoring data (refer to Appendix 5), this type of slime coats the streambed, thus inhibiting macroinvertebrate populations.

5.3.2 Channel Materials

The Wolman Pebble Count Procedure (Harrelson, et al. 1994) provided data that were used to calculate the D50 particle size (i.e., median particle), the percentage of sands and fines (materials finer than 2 millimeters), and the percentage of fines (silts, clays, and organic materials less than 0.062 millimeters) at each substrate monitoring station. These three parameters provide a broad understanding of the major channel material, and the proportion of coarser materials (i.e., cobbles, boulders) compared to finer materials (i.e., organic material, sand, gravels). Table 2 below displays the substrate metrics for 2019. Detailed substrate monitoring results for each location is shown graphically for each station in Appendix 4, along with the distribution of each stations' substrate particle size for 2019.

Table 2: 2019 Summary of Channel Materials in Jack's Brook and Iron Stream				
Station	Percent < 2 mm (sands and fines)	D50 Particle Size	Particle Size Range (mm)	Quintile Embeddedness Estimate (%)
JB-1	14	Cobble	64 to 256 mm	25%
MS-5	16	Coarse Gravel	16 to 64 mm	5%

Since 2008, the median particle size increased from coarse gravel (16-64 mm) to cobble (64 to 256 mm) to at JB-1. For station MS-5 on Iron Stream, the median particle size decreased from cobble to coarse gravel since 2004.

Substrate Summary

Substrate embeddedness decreased on Iron Stream while increasing on Jack's Brook since substrate monitoring was last assessed in 2004 and 2008 by VT DEC. The median particle size decreased at MS-5, while the reference reach on Jack's Brook (JB-1) increased from coarse gravel to cobble. Based on



previous assessments by DEC of the percentage of small particles (fines and sands) at both stations, the percentage of sands increased from 3 to 14 percent for JB-1 and 3 to 15 percent at MS-5, respectively, in 2019. The increased quantity of fines in these streams may be associated with geomorphic changes, sediment associated with stormwater inputs, or the result of extreme weather events (e.g., Tropical Storm Irene) that may have altered sediment transport processes. Given that the increase in fines was observed in both the reference reach (JB-1) and subject reach (MS-5), this change may be the result of natural fluctuation. In the vicinity of the Carinthia Base Area, future redevelopment activities such as installing operational-phase stormwater treatment practices and paving the parking lot will reduce sediment loading to Iron Stream. A reduction in the percentage of fines and substrate embeddedness would be anticipated as a result of that reduced load. The monitoring plan will continue to investigate substrate particle size classes and embeddedness in future years as an indicator of water quality.

5.4 Biomonitoring

Biomonitoring data from 2019 was analyzed for aquatic life support ("ALS") use attainment in comparison to the DEC scoring guidelines for small-size high gradient ("SHG") Class B waters. Results for each station are discussed in detail below and the complete data set is included in Appendix 5. In summary, the eight aquatic macroinvertebrate metrics are density; richness; Ephemeroptera, Plecoptera, Trichoptera (EPT) index; Percent Model Affinity of Orders (PMA-O); Biotic Index (BI); percent Oligochaeta; EPT/EPT + C; and the Pinkham-Pearson Coefficient of Similarity - Functional Groups - (PPCS-FG). A brief explanation of each index is as follows:

Density is a general indicator of community viability and productivity and represents the relative abundance of animals in a sample (density per unit sampling effort). Density is based on the total number of individual invertebrate organisms collected in each sample, irrespective of species or taxonomic classification.

Richness is an indicator of taxonomic structure and represents the number of species in a sample unit. Richness is calculated as the total number of distinct taxa identified in a sample.

The **EPT** index is an indicator of taxonomic structure and of tolerance or intolerance to water pollution. The EPT index is a subset of the above richness measure and is calculated as the number of distinct taxa



from the generally more environmentally sensitive insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) identified in a sample unit.

The Percent Model Affinity of Orders (PMA-O) index is an indicator of taxonomic structure. It measures the degree of similarity of the order-level distribution of organisms to a model based on the reference stream.

The Hilsenhoff Biotic Index (BI) is an indicator of tolerance or intolerance to pollution. The BI is a measure of the macroinvertebrate assemblage tolerance toward organic (nutrient) enrichment. BI is based on a ranking for each species, on a 0 to 10 scale, of its sensitivity to pollution, and on the total numbers of individuals in each ranked species that are present in a sample.

Percent Oligochaeta (% Oligo.) is an indicator of tolerance or intolerance to pollution and sedimentation. The percent Oligochaeta is a measure of the percent of the macroinvertebrate community made up of the order Oligochaeta. Percent Oligochaeta is calculated by dividing the number of individuals of the order Oligochaeta by the total number of animals in the sample (the density).

EPT/EPT + C is an indicator of taxonomic structure and pollution tolerance or intolerance. EPT/EPT + C is a measure of the ratio of the abundance of the pollution intolerant EPT orders to the generally tolerant Diptera family Chironomidae. EPT/EPT + C is calculated by dividing the total number of individual organisms from the orders Ephemeroptera, Trichoptera and Plecoptera, by the above plus the number of individual organisms from the order Chironomidae in the sample.

The Pinkham-Pearson Coefficient of Similarity - Functional Groups - (PPCS-FG) is an indicator of functional structure. The PPCS-FG index is a measure of functional feeding group similarity to a model based on the reference streams. It is similar in concept to the PMA-O above; however, it measures functional feeding group structure and distribution, instead of taxonomic structure and distribution. PPCS-FG is based on the percent composition of the six major functional groups (collector gatherer, collector filterer, predator, shredder-detritus, shredder-herbivore, scraper) in a sample, in comparison to the model composition of the reference stream.



On September 27 and October 15, 2019, kick net sampling per aquatic biota was conducted by VHB in accordance with the DEC protocol (ANR 2004). This biomonitoring occurred at two locations in 2019: the reference station on Jack's Brook (JB-1) and one station on Iron Stream (MS-5). Both sampling locations are shown on the Water Quality Monitoring Station Location map in Appendix 2.

JB-1 (Jack's Brook)

Table 3 below displays the biometrics for JB-1 over time. Charts and graphs of all biometrics evaluated at JB-1 are provided in Appendix 5.

Table 3: Biomonitoring Results Jack's Brook – JB-1									
Year	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT / EPT+C	% PPCS-FG	Outcome/ Biological Integrity
Class B ¹ Criteria	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.50	≤ 12	≥ 0.45	≥ 40	
1996 DEC	483	34	15	58	2.61	0.26	0.48	52	Indeterminate ²
2004 DEC	789	32	15	71	2.47	0.34	0.57	61	Indeterminate ²
2008 DEC	1620	35	12	75	2.10	0.49	0.67	56	Does Not Meet Class B Criteria
2019 VHB	426	34	18	78	1.52	1.32	0.86	70	Meets Class B Criteria
¹ Bold denotes metric did not meet the Class B Threshold Criteria ² The EPT richness threshold for an SHG stream was not fully met in 1996-2004. Retired DEC biologist Steve Fiske gave these streams a "best professional judgement" assessment that the biological condition met B(2) standards. This was likely due to the extremely small watershed (<1 km ²), which is smaller than a typical SHG stream.									

Results for all eight biometrics were within the established thresholds for meeting Class B criteria, indicating good water quality conditions at the reference station. Although EPT richness had improved to meet the metric since the last macroinvertebrate sample was collected in 2008, this was the limiting factor from Jack's Brook receiving a very good rating. It is worth noting that although the density of organisms observed in 2019 met the biocriteria, it was the lowest over the period of record for this station since 1996.



MS-5 (Iron Stream)

Station MS-5 is located on the Iron Stream, upstream of Handle Road and downgradient of the Lot E Carinthia development. Table 4 below displays the biometrics for MS-5 over time. Charts and graphs of all biometrics evaluated at MS-5 are provided in Appendix 5.

Table 4: Biomonitoring Results Iron Stream – MS-5									
Year	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT / EPT+C	% PPCS-FG	Outcome/ Biological Integrity
Class B ¹ Criteria	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.50	≤ 12	≥ 0.45	≥ 40	
1996 DEC	21	13	6	55	2.72	14.3	0.63	42	Does Not Meet Class B Criteria
2004 DEC	64	21	7	47	3.35	1.6	0.61	27	Does Not Meet Class B Criteria
2019 VHB	81	18	6	40	3.39	49.7	0.73	39	Does Not Meet Class B Criteria
¹ Bold denotes metric did not meet Class B Criteria									

Iron Stream was sampled for macroinvertebrates on two occasions prior to the implementation of the Iron Seep Remediation Plan. On both sampling efforts by DEC, this station received a score of poor, indicating that it does not meet the Class B criteria. This was due to extremely low density, richness, and EPT metrics. In 2019, station MS-5 on Iron Stream met 2 of the 8 Class B biocriteria (BI and EPT / EPT+C) and did not meet the remaining six. Density increased slightly since 2004 but is still well below the passing threshold for this metric. Percent Oligochaeta increased significantly, exceeding the SHG criterion for this metric, and the highest over the period of record for this station. These results suggest finer sediment has entered the reach over the years, reducing the overall number of macroinvertebrates while shifting the population toward Oligochaetes. In addition, Oligochaeta are efficient at colonizing areas with thick iron precipitate/floc/bacteria and are often found at a very high proportion in these situations. This is supported by the finding that Jacks Brook had low % Oligochaeta, despite a similar amount of fine sediment.



Biomonitoring Summary

A summary of biomonitoring results is included in Table 5 below and in Appendix 5.

Table 5: Biomonitoring Summary Kick Net Monitoring Results Compliance with Class B Criteria					
Stream	Station	'96	'04	'08	'19
Jack's Brook (Reference)	JB-1	P	P	P	P
Iron Stream	MS-5	F	F	-	F
P = Pass, F = Fail, - = Not sampled					

In 2019, one of the two sampled stations, JB-1 (reference) met the Class B biocriteria across all metrics. In 2019, Station (MS-5) did not meet the Class B biocriteria. It is anticipated that in-stream biological indicators would improve gradually over a period of four to five years, although more rapid improvements in water chemistry are expected to be observed from the implementation of the Iron Seep Remediation Plan. Given the history of impairment at this location, a minimum of two consecutive years of attainment would be required to demonstrate compliance with Class B water quality criteria.

6.0 Recommendations for 2020

Recommendations for 2020 highlight the quality assurance procedures outlined in the WQMP and reflect challenges or anomalies that were observed during the 2019 monitoring season, while documenting the effectiveness of the mitigation measures implemented in conjunction with the Iron Seep Remediation Plan in future years of monitoring. Based on the review of the 2019 data, VHB recommends the following updates to the monitoring plan or QAPP.

- Evaluate biomonitoring sampling reaches each year for appropriate habitat conditions prior to kick net sampling and determine if the station location needs to shift upstream or downstream to collect a more representative sample of stream conditions. This is of particular concern at MS-5, which has channel conditions and suitable habitat that may vary through time.
- Collect supplemental readings upstream and downstream from a sampling station if field parameters (pH, temperature, alkalinity, dissolved oxygen, specific conductivity, or turbidity) are outside of anticipated ranges during baseflow and event flow sampling.

7.0 Conclusions

Water quality monitoring at Mount Snow Resort was conducted in 2019 in accordance with the requirements of the Resort's Water Quality Monitoring Plan and the associated Quality Assurance Project Plan. The 2019 water chemistry data results show a reduction in the quantity of total dissolved iron in baseflow samples, which may indicate that the remediation efforts are having some degree of success at reducing the quantity of available iron within the watershed. In addition, all samples collected and analyzed in the laboratory for alkalinity indicate that the tributaries within the Iron Stream watershed have a high buffering capacity and are regulating pH levels within the acceptable VWQS range. However, while this year's monitoring indicates ongoing attainment at reference station JB-1, the macroinvertebrate results at station MS-5 show the need for further remedial efforts to bring the Iron Stream watershed into full attainment. Once monitoring activities demonstrate compliance with the ALS biocriteria, this sampling program will end. In the event that the ALS biocriteria are not met within 4 to 5 years of the implementation of the Iron Seep Remediation Plan, the data collected through this sampling program will be used to identify other potential remediation measures that may be necessary.



References

- ANR 2004. Biocriteria for Fish and Macroinvertebrate Assemblages in Vermont Wadeable Streams and Rivers, Implementation Phase (Methods for Determining Aquatic Life Use Status in Selected Wadeable Streams Pursuant to Applicable Water Quality Management Objectives for Aquatic Biota Found in Vermont Water Quality Standards (WQS) Chapter 3 §3-01, as Well as Those Specified in 3-02 (A1 and B3), 3-03 (A1 and B3), and 3-04 (A1 and B4:a-d)). Biomonitoring and Aquatic Studies Section, Water Quality Division, Department of Environmental Conservation. Waterbury, Vermont.
- ANR 2017. Vermont Agency of Natural Resources. Vermont Water Quality Standards (Effective January 15, 2017). Watershed Management Division. Montpelier, Vermont. 33 pages plus appendices.
- Harrelson 1994. Harrelson, C.C., and C.L. Rawlins, and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture (Forest Service). Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado. General Technical Report RM-245.
- VHB 2015. Phase I Carinthia Water Quality Memorandum. Last revised October 01, 2015.
- VHB 2018. Soil Management Plan – Mount Snow Carinthia Lot E. Last revised October 26, 2018.
- VHB 2019. Water Quality Monitoring Program Quality Assurance Project Plan. Last revised July 29, 2019.

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APPENDIX 1

Mount Snow Resort – Iron Seep Remediation Plan
Construction Activity Photograph Log
Dover, VT



Photograph #1. Initial excavation for Carinthia Base Lodge, showing previously buried organic materials and iron-rich water, 06/28/2019



Photograph #2. New 24-inch HDPE culvert installation at south entrance to Somerset Road; swale to be lined with low permeability liner, 05/24/2019.

Mount Snow Resort – Iron Seep Remediation Plan
Construction Activity Photograph Log
Dover, VT



Photograph #3. Blast rock being removed from Long John Ski Trail for use as backfill during Lot E construction, 06/04/2019.



Photograph #4. Soil Disposal Area #8 receiving excavated soils removed from Lot E for use in regrading Sundance Ski Trail; completed portions stabilized with seed and hay mulch, 06/19/2019.

Mount Snow Resort – Iron Seep Remediation Plan
Construction Activity Photograph Log
Dover, VT



Photograph #5. Excavated soils being removed from Lot E for on-mountain soil disposal areas, 07/02/2019.



Photograph #6. Backfilling of crushed limestone at Lot E in the vicinity of DMH-121 for new 30-inch HDPE culvert installation, 06/27/2019.

Mount Snow Resort – Iron Seep Remediation Plan
Construction Activity Photograph Log
Dover, VT



Photograph #7. Backfilling and compaction of processed blast rock from Long John Ski Trail at Lot E in the vicinity of DMH-120 and DMH-121, 07/02/2019.



Photograph #8. View of completed Carintha Base Lodge; Resurfacing and grading of parking lot completed following installation of 30-inch HDPE culvert, 08/01/2019.

Mount Snow Resort – Iron Seep Remediation Plan
Construction Activity Photograph Log
Dover, VT



Photograph #9. Soil Disposal Area # 8 on regraded Sundance Ski Trail, nearing permanent stabilization, 09/27/2019.

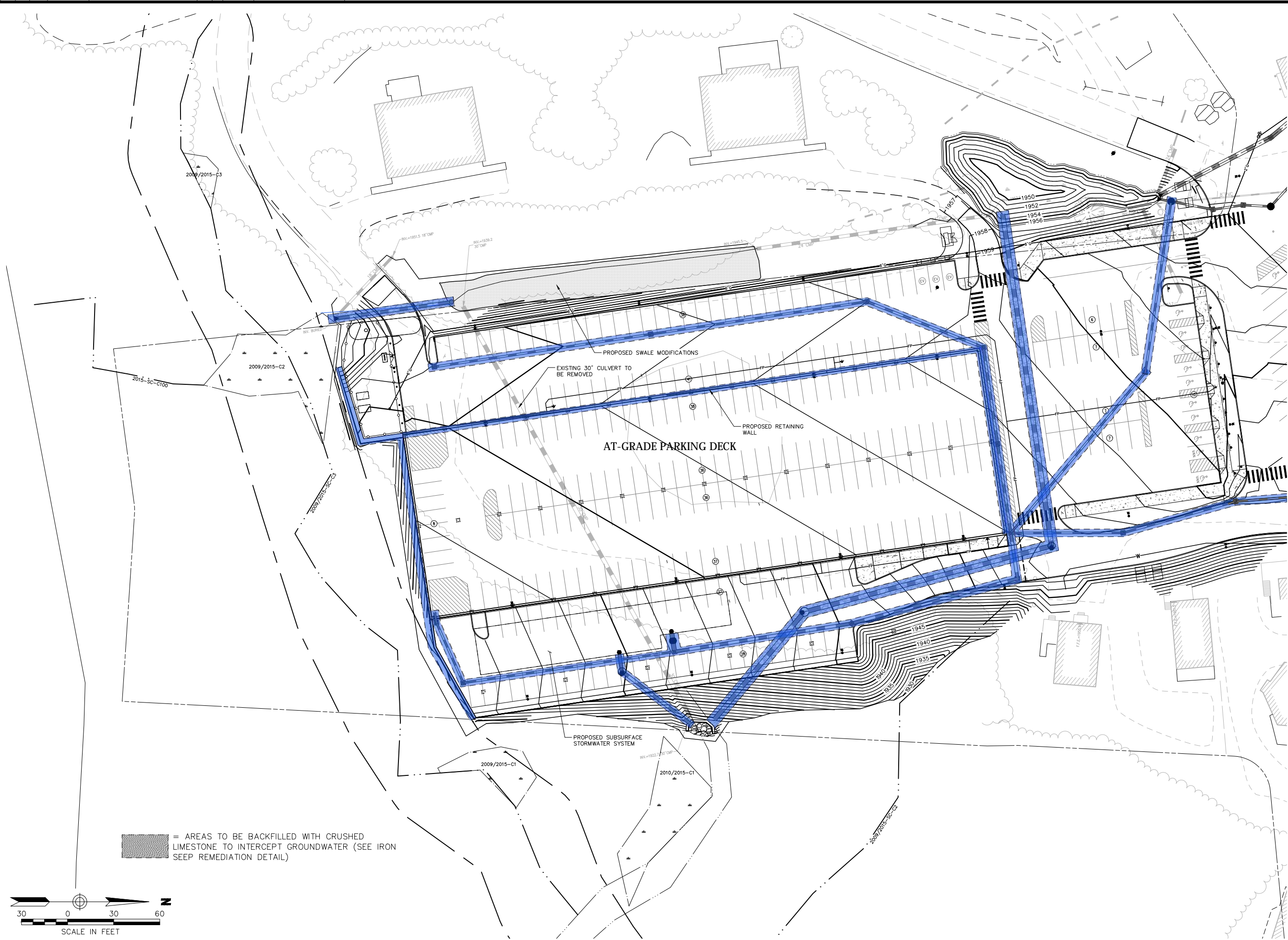


Photograph #10. Reshaped swale with low permeability liner completed along west side of Lot E, 10/08/2019.

Photographs taken by VHB, unless otherwise noted – Various dates

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▨ = AREAS TO BE BACKFILLED WITH CRUSHED LIMESTONE TO INTERCEPT GROUNDWATER (SEE IRON SEEP REMEDIATION DETAIL)



**MOUNT SNOW
CARINTHIA DEVELOPMENT**

**PERMITTING SET
NOT FOR CONSTRUCTION**

DOVER, VERMONT

ISSUE
Act 250 Planset

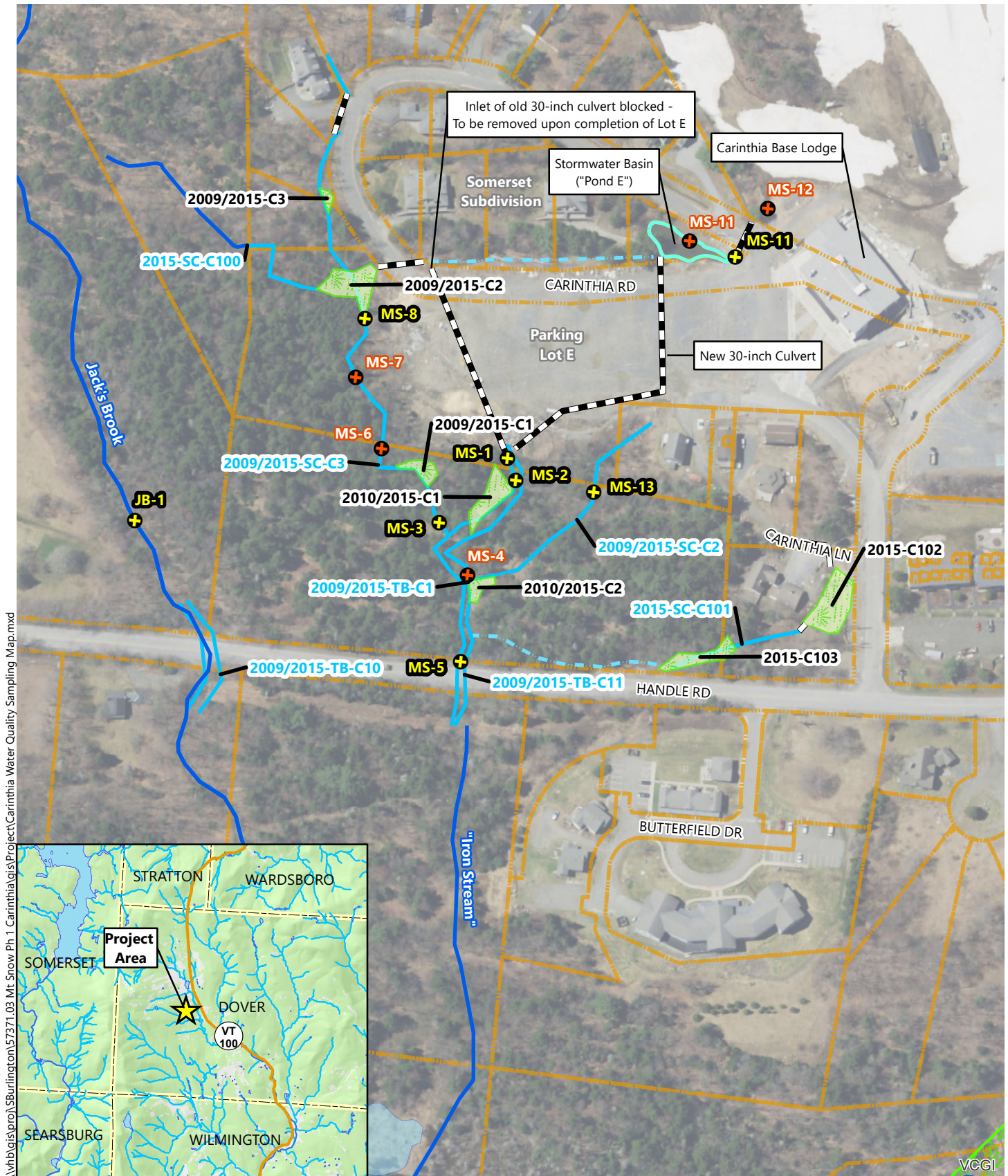
RELEASE DATE
03 Dec 2015

REVISIONS			
1	REVISED DRAINAGE	07/22/2019	
No.	Revision	Date	App'd

PROJECT NO. 57371.03
DRAWN BY TGB
REVIEWED BY RAW

**Iron Seep
Remediation
Plan**

APPENDIX 2



Mount Snow Resort: Phase 1 - Carinthia

Dover, Vermont

Legend

- + WQM Station (VHB, 2015)
- + WQM Station (VHB, 2019)
- Culvert (VHB, 2019)
- Stormwater Basin (VHB)
- Delineated Stream (VHB)
- Approximate Ditch (VHB)
- VSD Wetland (ANR)
- Delineated Wetlands (VHB)
- VHD Streams (VCGI)
- VHD Waterbody (VCGI)
- Parcel Boundary (VCGI)

Iron Stream Remediation Water Quality Monitoring Map

Sources:
Background Imagery by VCGI (2016-2020)
VCGI (Vermont Center for Geographic Information - Various Dates)
ANR (Vermont Agency of Natural Resources - Various Dates)
VHB (2009-2019)

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-1 (2015-TB-C1 at outlet of new 30-inch HDPE culvert)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	10:00 AM	168	13.3	124.6		6.87	20.7		2.70	1.20
8/29/2019	3:14 PM	97.4	20.7	67.4	64	8.15	7.2	6.30	2.30	0.41
9/27/2019	2:20 PM	60.2	16.5	70.5	38	7.48	3.9	4.73	2.20	1.40

2019 STATISTICS										
Mean	***	78.8	18.6	69.0	51	7.93	5.6	5.52	2.25	0.91
2015-2019 STATISTICS										
Mean	***	108.5	16.8	87.5	51	7.78	10.6	5.52	2.40	1.00
Min	***	60.2	13.3	67.4	38	6.87	3.9	4.73	2.20	0.41
Max	***	168.0	20.7	124.6	64	8.15	20.7	6.30	2.70	1.40
n	***	3	3	3	2	3	3	2	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-2 (Groundwater seepage near MS-1)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	10:29 AM	214	13.2	80.1		6.44	7.2		7.00	3.30
8/29/2019	3:25 PM	Insufficient base flow for sampling								
9/27/2019	2:30 PM	144.0	15.7	82.3	36	6.97	8.5	87.74	6.70	1.40

2019 STATISTICS										
Mean	***	144.0	15.7	82.3	36	6.97	8.5	87.74	6.70	1.40
2015-2019 STATISTICS										
Mean	***	179.0	14.5	81.2	36	6.78	7.9	87.74	6.85	2.35
Min	***	144.0	13.2	80.1	36	6.44	7.2	87.74	6.70	1.40
Max	***	214.0	15.7	82.3	36	6.97	8.5	87.74	7.00	3.30
n	***	2	2	2	1	2	2	1	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-3 (2015-SC-C3 above confluence with 2015-TB-C1)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	10:58 AM	195	13.5	73.3		6.60	12.8		1.30	0.330
8/29/2019	3:35 PM	195.1	15.5	90.7	68	7.54	20	15.82	3.10	0.120
9/27/2019	2:35 PM	210.1	11.7	85.1	74	7.43	15	62.34	3.00	0.054

2019 STATISTICS										
Mean	***	202.6	13.6	87.9	71	7.49	17.5	39.08	3.05	0.087
2015-2019 STATISTICS										
Mean	***	200.1	13.6	83.0	71	7.34	15.9	39.08	2.47	0.168
Min	***	195.0	11.7	73.3	68	6.60	12.8	15.82	1.30	0.054
Max	***	210.1	15.5	90.7	74	7.54	20.0	62.34	3.10	0.330
n	***	3	3	3	2	3	3	2	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-4 (2015-SC-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	11:10 AM	235	13.5	<i>80.5</i>		6.76	1		4.6	1.5

2015 STATISTICS										
Mean	***	235	13.5	80.5	***	6.76	1	***	4.6	1.5
Min	***	235	13.5	80.5	***	6.76	1	***	4.6	1.5
Max	***	235	13.5	80.5	***	6.76	1	***	4.6	1.5
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-5 (2015-TB-C11 at Handle Road; VT Side ID 651409010002)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
10/4/1996		136.0	6.0		44.5	5.48				
9/29/2004	12:00 PM	163.0	11.7	120.0	33.8	7.03	22.1	4.37		
9/15/2015	11:19 AM	214.0	13.5	82.7		6.86	7.2		3.700	0.630
8/29/2019	4:05 PM	361.0	16.5	84.8	63.0	7.74	43.0	42.65	2.600	0.270
9/27/2019	1:00 PM	148.4	13.3	66.5	48.0	7.51	< 2.7	4.86	0.028	< 0.020

2019 STATISTICS										
Mean	***	254.7	14.9	75.7	55.5	7.64	22.9	23.76	1.314	0.145
1996-2019 STATISTICS										
Mean	***	204.5	12.2	88.5	47	7.32	18.8	17.29	2.109	0.307
Min	***	136.0	6.0	66.5	34	5.48	2.7	4.37	0.028	0.020
Max	***	361.0	16.5	120.0	63	7.74	43.0	42.65	3.700	0.630
n	***	5	5	4	4	5	4	3	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

1996-2004 data obtained from the Vermont Integrated Watershed Information System ("IWIS") <https://anrweb.vt.gov/DEC/IWIS/>

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-6 (2015-SC-C3 upstream from Wetland 2015-C1)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	11:28 AM	183	13.6	78.6		6.44	16		6.00	0.21

2015 STATISTICS										
Mean	***	183	13.6	78.6	***	6.44	16	***	6.00	0.21
Min	***	183	13.6	78.6	***	6.44	16	***	6.00	0.21
Max	***	183	13.6	78.6	***	6.44	16	***	6.00	0.21
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-7 (2015-SC-C3 downstream from Wetland 2015-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	12:24 PM	199	14.0	77.3		6.29	12		2.80	0.33

2015 STATISTICS										
Mean	***	199	14.0	77.3	***	6.29	12	***	2.80	0.33
Min	***	199	14.0	77.3	***	6.29	12	***	2.80	0.33
Max	***	199	14.0	77.3	***	6.29	12	***	2.80	0.33
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-8 (2015-SC-C3 downstream from Wetland 2015-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	12:35 PM	203	14.7	49.1		5.86	10.4		3.60	2.20
8/29/2019	2:59 PM	222.3	15.6	23.1	67	7.47	18	43.04	6.20	0.44
9/27/2019	2:05 PM	380.2	12.4	16.5	89	7.21	13	2.11	4.00	0.34

2019 STATISTICS										
Mean	***	301.3	14	19.8	78	7.36	15.5	22.58	5.10	0.39
2015-2019 STATISTICS										
Mean	***	268.5	14.2	29.6	78	7.19	13.8	22.58	4.60	0.99
Min	***	203.0	12.4	16.5	67	5.86	10.4	2.11	3.60	0.34
Max	***	380.2	15.6	49.1	89	7.47	18.0	43.04	6.20	2.20
n	***	3	3	3	2	3	3	2	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-9 (2015-SC-C3 downstream from Wetland 2015-C3)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	12:48 PM	152	14.5	72.0		6.31	25		12.00	0.15

2015 STATISTICS										
Mean	***	152	14.5	72.0	***	6.31	25	***	12.00	0.15
Min	***	152	14.5	72.0	***	6.31	25	***	12.00	0.15
Max	***	152	14.5	72.0	***	6.31	25	***	12.00	0.15
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-10 (Culvert outlet from Somerset Stormwater Pond "E")
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	12:57 PM	124	15.8	82.1		6.35	34		6.60	0.77

2015 STATISTICS										
Mean	***	124	15.8	82.1	***	6.35	34	***	6.60	0.77
Min	***	124	15.8	82.1	***	6.35	34	***	6.60	0.77
Max	***	124	15.8	82.1	***	6.35	34	***	6.60	0.77
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-11 (30-inch culvert influent to Somerset Stormwater Pond "E")
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	1:11 PM	93	15.5	67.3		6.23	42.6		6.10	1.600
8/29/2019	2:29 PM	212.4	21.1	58.9	65	8.69	3.0	2.62	0.25	0.140
9/27/2019	11:45 AM	179.0	15.7	73.5	68	8.39	3.3	0.78	0.24	0.088

2019 STATISTICS										
Mean	***	195.7	18.4	66.2	67	8.57	3.2	1.70	0.25	0.114
2015-2019 STATISTICS										
Mean	***	161.5	17.4	66.6	67	8.39	16.3	1.70	2.20	0.609
Min	***	93.0	15.5	58.9	65	6.23	3.0	0.78	0.24	0.088
Max	***	212.4	21.1	73.5	68	8.69	42.6	2.62	6.10	1.600
n	***	3	3	3	2	3	3	2	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-12 (Above culvert inlet to Somerset Stormwater Pond "E")
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	1:22 PM	59	15.8	44.5		5.56	52		0.67	0.084

2015 STATISTICS										
Mean	***	59	15.8	44.5	***	5.56	52	***	0.67	0.084
Min	***	59	15.8	44.5	***	5.56	52	***	0.67	0.084
Max	***	59	15.8	44.5	***	5.56	52	***	0.67	0.084
n	***	1	1	1	***	1	1	***	1	1

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

This station was not sampled and was discontinued as a monitoring station in 2019 as outlined in the Quality Assurance Project Plan ("QAPP")

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station MS-13 (2015-SC-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/15/2015	2:11 PM	640	14.2	30.0		6.25	117.2		19.00	3.500
8/29/2019	3:49 PM	489.2	15.3	17.5	70	6.82	63.0	0.57	0.46	0.032
9/27/2019	2:50 PM	593.1	12.3	6.6	97	6.69	57.0	2.63	3.90	< 0.020

2019 STATISTICS										
Mean	***	541.2	13.8	12.1	84	6.76	60.0	1.60	2.18	0.026
2015-2019 STATISTICS										
Mean	***	574.1	13.9	18.0	84	6.65	79.1	1.60	7.79	1.184
Min	***	489.2	12.3	6.6	70	6.25	57.0	0.57	0.46	0.020
Max	***	640.0	15.3	30.0	97	6.82	117.2	2.63	19.00	3.500
n	***	3	3	3	2	3	3	2	3	3

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

2015 Chloride values based on statewide regression equation using Conductivity data

Dissolved oxygen data in *italics* converted from mg/L to % with: <http://water.usgs.gov/software/DOTABLES/>

This conversion requires site-specific barometric pressure data which was not recorded in the field.

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Baseflow Chemistry)
Iron Seep Remediation Plan
Station JB-1 (Jack's Brook; VT Site ID 651409000003)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
10/4/1996		29.0	6.0		3.6	6.3				
9/27/2004		24.6	12.2	122.0	3.2	6.4	< 2.0	0.25		
9/17/2008		23.2	12.8	85.7	3.9	7.0	< 2.0	0.47	0.15	
8/29/2019	4:20 PM	36.5	15.9	88.7	42	7.5	< 2.7	0.00	0.10	0.057
9/27/2019	12:10 PM	41.2	11.8	75.4	40	8.4	8.6	0.19	2.60	1.000

2019 STATISTICS										
Mean	***	38.9	13.9	82.1	41	8.1	5.7	0.10	1.35	0.529
1996 - 2019 STATISTICS										
Mean	***	31	11.7	93	18.5	7.7	3.8	0.23	0.95	0.53
Min	***	23	6.0	75	3.2	6.3	< 2.0	0.00	0.10	0.06
Max	***	41	15.9	122	42.0	8.4	8.6	0.47	2.60	1.00
n	***	5	5	4	5	5	4	4	3	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

1996-2008 data obtained from the Vermont Integrated Watershed Information System ("IWIS") <https://anrweb.vt.gov/DEC/IWIS/>



Vanasse Hangen Brustlin, Inc.

40 IDX Drive

090395

Building 100, Suite 200

South Burlington, VT 05403

Atten: Dorie Jones

PROJECT: Mount Snow 8 Stations

WORK ORDER: **1908-22099**

DATE RECEIVED: August 30, 2019

DATE REPORTED: September 16, 2019

SAMPLER: Thomas Bryce

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

A handwritten signature in black ink, appearing to be "H. Locker", written over a horizontal line.

Harry B. Locker, Ph.D.
Laboratory Director

www.endynelabs.com



160 James Brown Dr., Williston, VT 05495
Ph 802-879-4333 Fax 802-879-7103

56 Etna Road, Lebanon, NH 03766
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Laboratory Report

DATE REPORTED: 09/16/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
PROJECT: Mount Snow 8 Stations

WORK ORDER: 1908-22099
DATE RECEIVED: 08/30/2019

001	Site: MS-1			Date Sampled: 8/29/19		Time: 15:14	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	64	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	7.2	mg/L	SM 4500-Cl-E-2011	9/9/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.41	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	2.3	mg/L	EPA 6010C	9/13/19	W FAA	A	

002	Site: MS-3			Date Sampled: 8/29/19		Time: 15:35	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	68	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	20	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.12	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	3.1	mg/L	EPA 6010C	9/13/19	W FAA	A	

003	Site: MS-5			Date Sampled: 8/29/19		Time: 16:05	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	63	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	43	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.27	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	2.6	mg/L	EPA 6010C	9/13/19	W FAA	A	

004	Site: MS-8			Date Sampled: 8/29/19		Time: 14:59	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	67	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	18	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.44	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	6.2	mg/L	EPA 6010C	9/13/19	W FAA	A	

005	Site: MS-11			Date Sampled: 8/29/19		Time: 14:29	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	65	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	3.0	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.14	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	0.25	mg/L	EPA 6010C	9/13/19	W FAA	A	

006	Site: MS-13			Date Sampled: 8/29/19		Time: 15:49	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	70	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	63	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	

Laboratory Report

DATE REPORTED: 09/16/2019

CLIENT: Vanasse Hangen Brustlin, Inc.

WORK ORDER: 1908-22099

PROJECT: Mount Snow 8 Stations

DATE RECEIVED: 08/30/2019

006	Site: MS-13			Date Sampled: 8/29/19		Time: 15:49	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Iron, Dissolved	0.032	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	0.46	mg/L	EPA 6010C	9/13/19	W FAA	A	

007	Site: JB-01			Date Sampled: 8/29/19		Time: 16:20	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	42	mg/L, pH 4	SM 2320B-97	9/5/19	W JSS	N	
Chloride	< 2.7	mg/L	SM 4500-Cl-E-2011	9/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/12/19	W FAA	A	
Iron, Dissolved	0.057	mg/L	EPA 200.7	9/9/19	W FAA	A	
Iron, Total	0.10	mg/L	EPA 6010C	9/13/19	W FAA	A	

Mount Snow 8 Stations

Endyne Inc. COC

Prepared: 8/21/19

1908-22099

Bill to:

Karin & Dore

Vanasse Hangen Brustlin, Inc.

40 IDX Drive

South Burlington VT 05403

Ph: 802-497-6137

Report to:

Dorie Jones

Vanasse Hangen Brustlin, Inc.

40 IDX Drive

South Burlington VT 05403

djones@vhb.com

Cust #

MOUN

W-91



1908-22099

Vanasse Hangen Brustlin, Inc.
Mount Snow 8 Stations001 MS-1 Sampled Date/Time: 08/29/19 @ 15:14 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

002 MS-2 Sampled Date/Time: 08/29/19 @ Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

NO SAMPLE COLLECTED

003 MS-3 Sampled Date/Time: 08/29/19 @ 15:35 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

004 MS-5 Sampled Date/Time: 08/29/19 @ 16:05 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

005 MS-8 Sampled Date/Time: 08/29/19 @ 14:59 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

006 MS-11 Sampled Date/Time: 08/29/19 @ 14:29 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

007 MS-13 Sampled Date/Time: 08/29/19 @ 15:49 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2 _____

008 JB-1 Sampled Date/Time: 08/29/19 @ 16:20 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2 _____

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Your initials will allow Endyne to proceed with analysis if the temperature preservation requirement is not satisfied. TGB

Relinquished by: [Signature] 08/30/19 1543 Accepted by: Eileen Torrey 8/30/19 @ 1543

Relinquished by: _____ Date Time _____ Received by: _____ Date Time _____

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.

Delv: Client
Temp C: -4.8
Comment:

Tmpl Ck
Log by

Lab use Only



160 James Brown Dr.
Williston, VT 05495
Ph 802-879-4333
Fax 802-879-7103

56 Etna Road
Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052



Vanasse Hangen Brustlin, Inc.

40 IDX Drive

090395

Building 100, Suite 200

South Burlington, VT 05403

Atten: Dorie Jones

PROJECT: Mount Snow 8 Stations

WORK ORDER: **1910-25297**

DATE RECEIVED: September 30, 2019

DATE REPORTED: October 16, 2019

SAMPLER: Thomas Bryce

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

www.endynelabs.com



160 James Brown Dr., Williston, VT 05495
Ph 802-879-4333 Fax 802-879-7103

56 Etna Road, Lebanon, NH 03766
Ph 603-678-4891 Fax 603-678-4893



Laboratory Report

DATE REPORTED: 10/16/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
PROJECT: Mount Snow 8 Stations

WORK ORDER: 1910-25297
DATE RECEIVED: 09/30/2019

001	Site: MS-1			Date Sampled: 9/27/19		Time: 14:20	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	38	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	3.9	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	1.4	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	2.2	mg/L	EPA 6010C	10/15/19	W MGT	A	

002	Site: MS-2			Date Sampled: 9/27/19		Time: 14:30	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	36	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	8.5	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	1.4	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	6.7	mg/L	EPA 6010C	10/15/19	W MGT	A	

003	Site: MS-3			Date Sampled: 9/27/19		Time: 14:35	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	74	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	15	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	0.054	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	3.0	mg/L	EPA 6010C	10/15/19	W MGT	A	

004	Site: MS-5			Date Sampled: 9/27/19		Time: 13:00	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	48	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	< 2.7	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	< 0.020	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	0.028	mg/L	EPA 6010C	10/15/19	W MGT	A	

005	Site: MS-8			Date Sampled: 9/27/19		Time: 14:05	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	89	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	13	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	0.34	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	4.0	mg/L	EPA 6010C	10/15/19	W MGT	A	

006	Site: MS-11			Date Sampled: 9/27/19		Time: 11:45	
<u>Parameter</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analysis Date/Time</u>	<u>Lab/Tech</u>	<u>NELAC</u>	<u>Qual.</u>
Alkalinity, as CaCO ₃ , to pH 4.5	68	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	3.3	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	

Laboratory Report

DATE REPORTED: 10/16/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
 PROJECT: Mount Snow 8 Stations

WORK ORDER: 1910-25297
 DATE RECEIVED: 09/30/2019

006	Site: MS-11			Date Sampled: 9/27/19	Time: 11:45		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Iron, Dissolved	0.088	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	0.24	mg/L	EPA 6010C	10/15/19	W MGT	A	

007	Site: MS-13			Date Sampled: 9/27/19	Time: 14:50		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	97	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	57	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	< 0.020	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	3.9	mg/L	EPA 6010C	10/15/19	W MGT	A	

008	Site: JB-1			Date Sampled: 9/27/19	Time: 12:10		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	40	mg/L, pH 4	SM 2320B-97	10/4/19	W JSS	N	
Chloride	8.6	mg/L	SM 4500-Cl-E-2011	10/4/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/15/19	W MGT	A	
Iron, Dissolved	1.0	mg/L	EPA 200.7	10/14/19	W MGT	A	
Iron, Total	2.6	mg/L	EPA 6010C	10/15/19	W MGT	A	

Mount Snow 8 Stations

Endyne Inc. COC

Prepared: 8/21/19

1910-25297



1910-25297

Bill to:

Karin & Dorie
 Vanasse Hangen Brustlin, Inc.
 40 IDX Drive
 South Burlington VT 05403
 Ph: 802-497-6137

Report to:

Dorie Jones
 Vanasse Hangen Brustlin, Inc.
 40 IDX Drive
 South Burlington VT 05403
 djones@vhb.com

Cust # 090395

MOUNTSNOW

W-90395MS

Vanasse Hangen Brustlin, Inc.
 Mount Snow 8 Stations

001 MS-1 Sampled Date/Time: 09/27/19 @ 14:20 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

002 MS-2 Sampled Date/Time: 09/27/19 @ 14:30 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

003 MS-3 Sampled Date/Time: 09/27/19 @ 14:35 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

004 MS-5 Sampled Date/Time: 09/27/19 @ 13:00 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

005 MS-8 Sampled Date/Time: 09/27/19 @ 14:05 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

006 MS-11 Sampled Date/Time: 09/27/19 @ 11:45 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

007 MS-13 Sampled Date/Time: 09 / 27 / 19 @ 14150 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

008 JB-1 Sampled Date/Time: 09 / 27 / 19 @ 12110 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Your initials will allow Endyne to proceed with analysis if the temperature preservation requirement is not satisfied. TGB

Relinquished by: [Signature] 09/30/19 1627 Date Time Accepted by: [Signature] 9/30/19 @ 1627 Date Time

Relinquished by: _____ Date Time Received by: _____ Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Delv: Client Tmpl Ck _____ Lab use Only _____

Temp C: 4.1 Log by _____

Comment: Metals are NOT Field Filtered

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.



160 James Brown Dr.
Williston, VT 05495
Ph 802-879-4333
Fax 802-879-7103

56 Etna Road
Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052

APPENDIX 3

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-1 (2015-TB-C1 at outlet of new 30-inch HDPE culvert)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	12:55 PM	368.1	15.5	75.6	38	6.83	7.3	31.48	2.3	0.85
10/4/2019	11:30 AM	79.7	10.7	71.9	40	7.31	6.5	104.50	7.1	0.76

2019 STATISTICS										
Mean	***	223.9	13.1	73.8	39	7.13	6.9	67.99	4.7	0.81
Min	***	79.7	10.7	71.9	38	6.83	6.5	31.48	2.3	0.76
Max	***	368.1	15.5	75.6	40	7.31	7.3	104.50	7.1	0.85
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-2 (Groundwater seepage near MS-1)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	1:10 PM	536.5	14.6	66.5	92	6.87	25	114.90	22	0.65
10/4/2019	11:45 AM	290.9	10.5	63.7	82	7.16	22	242.20	29	0.58

2019 STATISTICS										
Mean	***	413.7	12.6	65.1	87	7.04	24	178.55	26	0.62
Min	***	290.9	10.5	63.7	82	6.87	22	114.90	22	0.58
Max	***	536.5	14.6	66.5	92	7.16	25	242.20	29	0.65
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-3 (2015-SC-C3 above confluence with 2015-TB-C1)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	1:20 PM	257.5	13.0	82.9	57	7.44	17	4.52	0.70	0.140
10/4/2019	11:50 AM	179.2	8.2	83.8	71	7.48	17	22.79	0.27	0.076

2019 STATISTICS										
Mean	***	218.4	10.6	83.4	64	7.46	17	13.66	0.49	0.108
Min	***	179.2	8.2	82.9	57	7.44	17	4.52	0.27	0.076
Max	***	257.5	13.0	83.8	71	7.48	17	22.79	0.70	0.140
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-5 (2015-TB-C11 at Handle Road; VT Side ID 651409010002)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	1:55 PM	756.0	14.0	57.5	83	7.54	79	19.22	2.7	0.29
10/4/2019	12:25 PM	250.0	9.6	91.6	69	7.44	38	114.90	2.1	0.38

2019 STATISTICS										
Mean	***	503.0	11.8	74.6	76	7.49	59	67.06	2.4	0.34
Min	***	250.0	9.6	57.5	69	7.44	38	19.22	2.1	0.29
Max	***	756.0	14.0	91.6	83	7.54	79	114.90	2.7	0.38
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-8 (2015-SC-C3 downstream from Wetland 2015-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	12:40 PM	293.5	12.3	33.3	74	7.22	17	900.50	150	0.31
10/4/2019	11:20 AM	227.0	9.6	6.2	62	7.19	26	3.33	24	0.35

2019 STATISTICS										
Mean	***	260.3	11.0	19.8	68	7.21	22	451.92	87	0.33
Min	***	227.0	9.6	6.2	62	7.19	17	3.33	24	0.31
Max	***	293.5	12.3	33.3	74	7.22	26	900.50	150	0.35
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-11 (30-inch culvert influent to Somerset Stormwater Pond "E")
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	12:13 PM	261.0	14.2	72.7	62	8.17	3.1	7.54	0.58	0.11
10/4/2019	11:05 AM	161.7	9.3	76.2	61	7.34	5.9	0.00	0.32	0.18

2019 STATISTICS										
Mean	***	211.4	11.8	74.5	62	7.93	4.5	3.77	0.45	0.15
Min	***	161.7	9.3	72.7	61	7.34	3.1	0.00	0.32	0.11
Max	***	261.0	14.2	76.2	62	8.17	5.9	7.54	0.58	0.18
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station MS-13 (2015-SC-C2)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	1:35 PM	672.0	13.5	11.0	84	6.83	57	46.52	6.30	0.026
10/4/2019	12:05 PM	469.0	9.2	24.5	69	7.06	59	0.62	0.25	0.041

2019 STATISTICS										
Mean	***	570.5	11.4	17.8	77	6.96	58	23.57	3.28	0.034
Min	***	469.0	9.2	11.0	69	6.83	57	0.62	0.25	0.026
Max	***	672.0	13.5	24.5	84	7.06	59	46.52	6.30	0.041
n	***	2	2	2	2	2	2	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration

Mount Snow Carinthia, West Dover, Vermont
Water Quality Monitoring (Event Flow Chemistry)
Iron Seep Remediation Plan
Station JB-1 (Jack's Brook; VT Site ID 651409000003)
Prepared by VHB on: April 7, 2020

Date Sampled in Field	Time Sampled in Field	Conductivity (µmho/cm)	Water Temp (°C)	Dissolved Oxygen (%)	Alkalinity (mg/L)	pH (SU)	Chloride (mg/L)	Turbidity (NTU)	Total Iron (mg/L)	Dissolved Iron (mg/L)
VWQS Threshold				> 70%		≥ 6.5 and ≤ 8.5	≥ 230 mg/L	≤ 10	< 1	
9/12/2019	2:15 PM	48.1	13.9	80.5	40	7.93	< 2.7	1.85	0.077	0.027
10/4/2019	12:20 PM	26.6	9.3	87.8	< 20	7.83	3.8	1.46	0.056	0.027

2019 STATISTICS										
Mean	***	37.4	11.6	84.2	30	7.88	4	1.66	0.067	0.027
Min	***	26.6	9.3	80.5	20	7.83	4	1.46	0.056	0.027
Max	***	48.1	13.9	87.8	40	7.93	4	1.85	0.077	0.027
n	***	2	2	2	2	2	1	2	2	2

Notes:

Blank cells indicates no data available

*** indicates not applicable

pH statistics based on Hydrogen Ion concentration



Vanasse Hangen Brustlin, Inc.

40 IDX Drive

090395

Building 100, Suite 200

South Burlington, VT 05403

Atten: Dorie Jones

PROJECT: Mount Snow 8 Stations

WORK ORDER: **1909-23671**

DATE RECEIVED: September 13, 2019

DATE REPORTED: September 25, 2019

SAMPLER: Thomas

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

Harry B. Locker, Ph.D.
Laboratory Director

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Laboratory Report

DATE REPORTED: 09/25/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
PROJECT: Mount Snow 8 Stations

WORK ORDER: 1909-23671
DATE RECEIVED: 09/13/2019

001	Site: MS-1			Date Sampled: 9/12/19		Time: 12:55	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	38	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	7.3	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.85	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	2.3	mg/L	EPA 6010C	9/18/19	W FAA	A	

002	Site: MW-2			Date Sampled: 9/12/19		Time: 13:10	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	92	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	25	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.65	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	22	mg/L	EPA 6010C	9/18/19	W FAA	A	

003	Site: MW-3			Date Sampled: 9/12/19		Time: 13:20	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	57	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	17	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.14	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	0.70	mg/L	EPA 6010C	9/18/19	W FAA	A	

004	Site: MW-5			Date Sampled: 9/12/19		Time: 13:55	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	83	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	79	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.29	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	2.7	mg/L	EPA 6010C	9/18/19	W FAA	A	

005	Site: MW-8			Date Sampled: 9/12/19		Time: 12:40	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	74	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	17	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.31	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	150	mg/L	EPA 6010C	9/20/19	W FAA	A	

006	Site: MW-11			Date Sampled: 9/12/19		Time: 12:13	
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	62	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	3.1	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	

Laboratory Report

DATE REPORTED: 09/25/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
 PROJECT: Mount Snow 8 Stations

WORK ORDER: 1909-23671
 DATE RECEIVED: 09/13/2019

006	Site: MW-11			Date Sampled: 9/12/19	Time: 12:13		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Iron, Dissolved	0.11	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	0.58	mg/L	EPA 6010C	9/18/19	W FAA	A	

007	Site: MW-13			Date Sampled: 9/12/19	Time: 13:35		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	84	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	57	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.026	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	6.3	mg/L	EPA 6010C	9/18/19	W FAA	A	

008	Site: JB-1			Date Sampled: 9/12/19	Time: 14:15		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	40	mg/L, pH 4	SM 2320B-97	9/19/19	W JSS	N	
Chloride	< 2.7	mg/L	SM 4500-Cl-E-2011	9/23/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	9/18/19	W FAA	A	
Iron, Dissolved	0.027	mg/L	EPA 200.7	9/23/19	W MGT	A	
Iron, Total	0.077	mg/L	EPA 6010C	9/18/19	W FAA	A	

Mount Snow 8 Stations

Endyne Inc. COC


1909-23671

Prepared: 8/21/19

Bill to:
 Karin & Dorie
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 Ph: 802-497-6137

Report to:
 Dorie Jones
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 South Burlington VT 05403
 djones@vhb.com

Cust # 0
 MOUNTS
 W-903


 1909-23671
 Vanasse Hangen Brustlin, Inc.
 Mount Snow 8 Stations

001	MS-1	Sampled Date/Time:	9 / 12 / 19 @ 12:55	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		
002	MS-2	Sampled Date/Time:	9 / 12 / 19 @ 13:10	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		
003	MS-3	Sampled Date/Time:	9 / 12 / 19 @ 13:20	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		
004	MS-5	Sampled Date/Time:	9 / 12 / 19 @ 13:55	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		
005	MS-8	Sampled Date/Time:	9 / 12 / 19 @ 12:40	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		
006	MS-11	Sampled Date/Time:	9 / 12 / 19 @ 12:13	Sampler:	TGB
	Chloride	1 - 2 oz Plastic	<6C		
	Alkalinity, as CaCO3	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace		
	Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO3		
	Iron, Total	1 - 8 oz Plastic Total Metals	HNO3 pH< 2 _____		

007 MS-13 Sampled Date/Time: 9/12/19 @ 13:35 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

008 JB-1 Sampled Date/Time: 9/12/19 @ 14:15 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Your initials will allow Endyne to proceed with analysis if the temperature preservation requirement is not satisfied. TGB

Relinquished by: [Signature] 09/13/19 1439 Date Time Accepted by: _____ Date Time

Relinquished by: _____ Date Time Received by: Stoomey 9/12/19 @ 1439 Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Delv: Client Tmpl Ck _____ Lab use Only _____

Temp C: -3.1 Log by _____

Comment: _____

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.



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315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
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Vanasse Hangen Brustlin, Inc.

40 IDX Drive

090395

Building 100, Suite 200

South Burlington, VT 05403

Atten: Dorie Jones

PROJECT: Mount Snow 8 Stations

WORK ORDER: **1910-25980**

DATE RECEIVED: October 04, 2019

DATE REPORTED: October 24, 2019

SAMPLER: Tom Bryce

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and "N" the Plattsburgh, NY lab under certification ELAP 11892. "Sub" indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corresponding NELAC and Qual fields.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. "A" indicates the referenced laboratory is NELAC accredited for the parameter reported. "N" indicates the laboratory is not accredited. "U" indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an "A" meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as they were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

A handwritten signature in black ink, appearing to be "H. Locker", written over a horizontal line.

Harry B. Locker, Ph.D.
Laboratory Director

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56 Etna Road, Lebanon, NH 03766
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Laboratory Report

DATE REPORTED: 10/24/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
 PROJECT: Mount Snow 8 Stations

WORK ORDER: 1910-25980
 DATE RECEIVED: 10/04/2019

001	Site: MS-1			Date Sampled: 10/4/19	Time: 11:30		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	40	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	DS-
Chloride	6.5	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.76	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	7.1	mg/L	EPA 6010C	10/22/19	W FAA	A	

002	Site: MS-2			Date Sampled: 10/4/19	Time: 11:45		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	82	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	22	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.58	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	29	mg/L	EPA 6010C	10/22/19	W FAA	A	

003	Site: MS-3			Date Sampled: 10/4/19	Time: 11:50		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	71	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	17	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.076	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	0.27	mg/L	EPA 6010C	10/22/19	W FAA	A	

004	Site: MS-5			Date Sampled: 10/4/19	Time: 12:25		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	69	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	38	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.38	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	2.1	mg/L	EPA 6010C	10/22/19	W FAA	A	

005	Site: MS-8			Date Sampled: 10/4/19	Time: 11:20		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	62	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	26	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.35	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	24	mg/L	EPA 6010C	10/22/19	W FAA	A	

006	Site: MS-11			Date Sampled: 10/4/19	Time: 11:05		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	61	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	5.9	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	

Laboratory Report

DATE REPORTED: 10/24/2019

CLIENT: Vanasse Hangen Brustlin, Inc.
 PROJECT: Mount Snow 8 Stations

WORK ORDER: 1910-25980
 DATE RECEIVED: 10/04/2019

006	Site: MS-11			Date Sampled: 10/4/19	Time: 11:05		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Iron, Dissolved	0.18	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	0.32	mg/L	EPA 6010C	10/22/19	W FAA	A	

007	Site: MS-13			Date Sampled: 10/4/19	Time: 12:05		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	69	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	59	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.041	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	0.25	mg/L	EPA 6010C	10/22/19	W FAA	A	

008	Site: JB-1			Date Sampled: 10/4/19	Time: 12:20		
Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech	NELAC	Qual.
Alkalinity, as CaCO ₃ , to pH 4.5	< 20	mg/L, pH 4	SM 2320B-97	10/14/19	W JSS	N	
Chloride	3.8	mg/L	SM 4500-Cl-E-2011	10/10/19	N JGM	A	
Metals Digestion	Digested		EPA 3015A	10/22/19	W FAA	A	
Iron, Dissolved	0.027	mg/L	EPA 200.7	10/23/19	W FAA	A	
Iron, Total	0.056	mg/L	EPA 6010C	10/22/19	W FAA	A	

Report Summary of Qualifiers and Notes

DS-: The Laboratory Duplicate analysis of this sample was not within method acceptance limits. The value of the Laboratory Duplicate was significantly lower than reported value.

Mount Snow 8 Stations

Endyne Inc. COC

Prepared: 8/21/19

1910-25980

Bill to:

Karin & Dorie
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 40 IDX Drive
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 Ph: 802-497-6137

Report to:

Dorie Jones
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Cust # 090

MOUNTSN

W-9039



1910-25980
 Vanasse Hangen Brustlin, Inc.
 Mount Snow 8 Stations

001 MS-1 Sampled Date/Time: 10/04/19 @ 11:30 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

002 MS-2 Sampled Date/Time: 10/04/19 @ 11:45 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

003 MS-3 Sampled Date/Time: 10/04/19 @ 11:50 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

004 MS-5 Sampled Date/Time: 10/04/19 @ 12:25 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

005 MS-8 Sampled Date/Time: 10/04/19 @ 11:20 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

006 MS-11 Sampled Date/Time: 10/04/19 @ 11:05 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2

007 MS-13 Sampled Date/Time: 10/04/19 @ 12:05 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2 _____

008 JB-1 Sampled Date/Time: 10/04/19 @ 12:20 Sampler: TGB

Chloride	1 - 2 oz Plastic	<6C
Alkalinity, as CaCO ₃	1 - 8 oz --Plastics Alkalinity	<6C, No Headspace
Iron, Dissolved	1 - 8 oz plastic diss Metals	Filter then preserve w HNO ₃
Iron, Total	1 - 8 oz Plastic Total Metals	HNO ₃ pH< 2 _____

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Your initials will allow Endyne to proceed with analysis if the temperature preservation requirement is not satisfied. _____

Relinquished by: [Signature] 10/4/19 16:10
Date Time

Accepted by: _____

Relinquished by: _____
Date Time

Received by: [Signature] 10/4/19 16:12
Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Delv: Client Tmpl Ck _____
Temp C: -5.4 Log by _____
Comment: _____

Lab use Only

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.



160 James Brown Dr.
Williston, VT 05495
Ph 802-879-4333
Fax 802-879-7103

58 Etna Road
Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052

APPENDIX 4

Mount Snow Water Quality Monitoring Plan 2019

Substrate Sampling Summary

Prepared by VHB on: April 7, 2020

Pebble Count and Sediment Monitoring Observations 1996-2019

Stream	Station	Year Sampled	Estimated Embeddedness	% < 2 mm	% Sand	D50 Particle Size (mm)
Jacks Brook	JB-1	1996 (DEC)	---	---	0%	---
		2004 (DEC)	---	1%	3%	---
		2008 (DEC)	5-25%	---	---	16-64
		2019 (VHB)	25-50%	0%	14%	64-256

Stream	Station	Year Sampled	Estimated Embeddedness	% < 2 mm	% Sand	D50 Particle Size (mm)
Iron Stream	MS-5	1996 (DEC)	---	5%	0%	---
		2004 (DEC)	50-75%	1%	3%	64-256
		2019 (VHB)	5-25%	0%	15%	16-64

Notes:

--- no data available

Mount Snow Water Quality Monitoring Plan 2019
Substrate Sampling Summary
Sample Location: JB-1
Sampling Date: September 27 & October 15, 2019
Samplers: TGB, CCS
Prepared by VHB on: March 04, 2020

Station Habitat Observations	Sub-1
Canopy cover:	60%
Embeddedness:	25-50%
Bank stability:	Fair

Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0%	0	0
Silt	0.004 - 0.06	0	0%	0	0
Sand (fines)	0.062-2	14	14%	14	14
Gravel	2 - 16	11	11%	25	25
Coarse gravel	16-64	19	19%	44	44
Cobble	64-256	30	30%	74	74
Boulder	> 256	26	26%	100	100
Bedrock	bedrock	0	0%	100	100
Sample Size (n)		100	100%		
Longitudinal Distance (ft)		0'-100'			

D50 Particle Size	Cobble
Dominant Size Class	Cobble
% Fines	14%
% Particles < 2 mm	14%

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	46	11	12	3

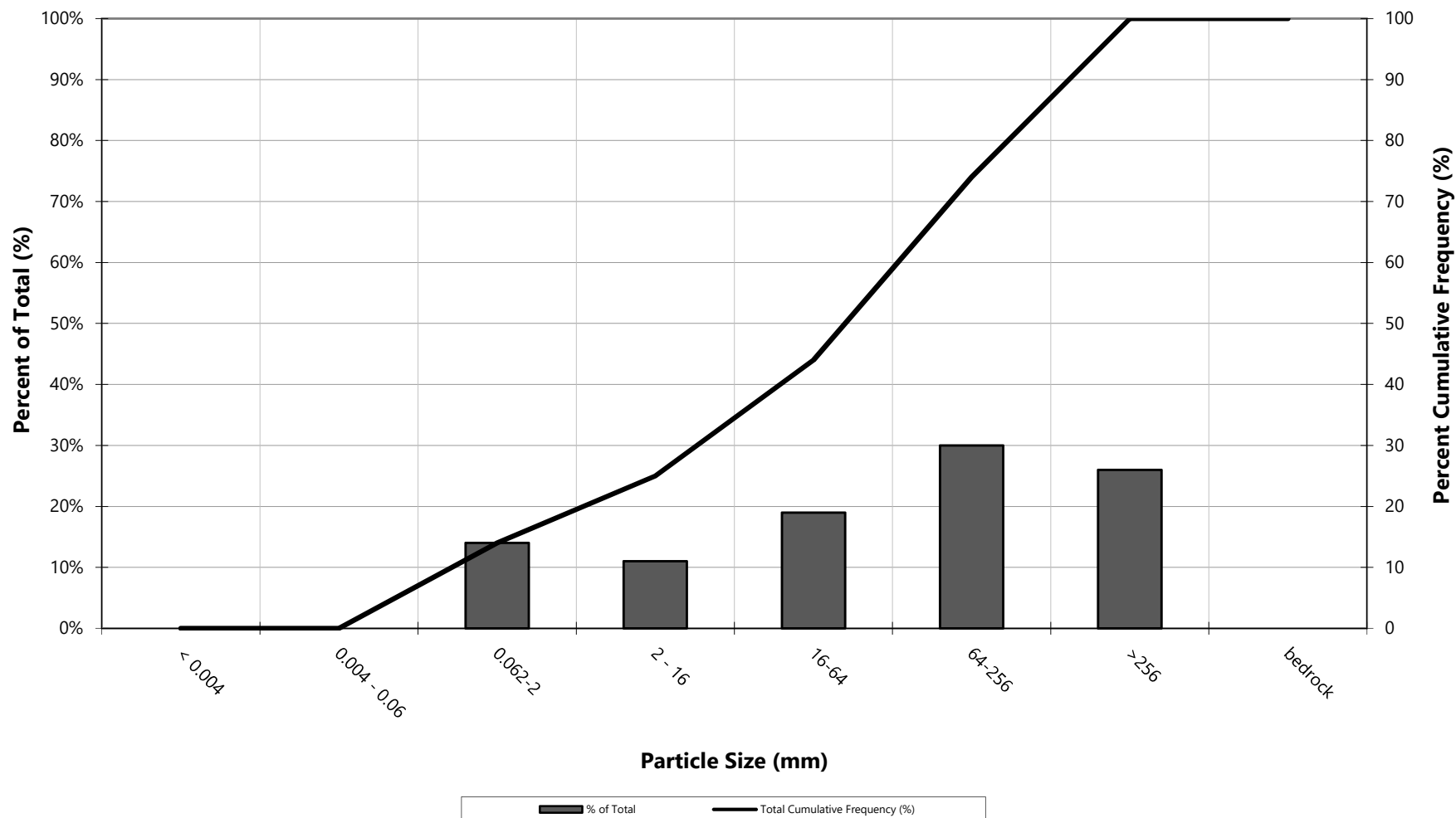
Macro-Algae Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	5 (> 25%)
Tally	65	1	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	-	16	-	-	-	-	-

Other Macro or Micro (FeP at Seep) Cover Index						
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)
Tally	-	-	-	-	-	-



**Mount Snow Resort Water Quality Monitoring
Percent of Total and Cumulative Frequency
Mount Snow Water Quality Monitoring
Station JB-1 (Jacks Brook)**



Mount Snow Water Quality Monitoring Plan 2019

Substrate Sampling Summary

Sample Location: MS-5

Sampling Date: September 27, 2019

Samplers: TGB, CCS

Prepared by VHB on: March 04, 2020

Station Habitat Observations	Sub-1
Canopy cover:	70%
Embeddedness:	5-25%
Bank stability:	Fair

Category	Median Size (mm)	Sample Count	% of Total	Cumulative Total	Total Cumulative Frequency (%)
Clay	< 0.004	0	0%	0	0
Silt	0.004 - 0.06	0	0%	0	0
Sand (fines)	0.062-2	17	15%	17	15
Gravel	2 - 16	18	16%	35	32
Coarse gravel	16-64	23	21%	58	53
Cobble	64-256	32	29%	90	82
Boulder	>256	18	16%	108	98
Bedrock	bedrock	2	2%	110	100
Sample Size (n)		110	100%		
Longitudinal Distance (ft)		0'-100'			

D50 Particle Size	Coarse Gravel
Dominant Size Class	Cobble
% Fines	15%
% Particles < 2 mm	15%

Moss Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	3 (> 25%)
Tally	62	2	6	5

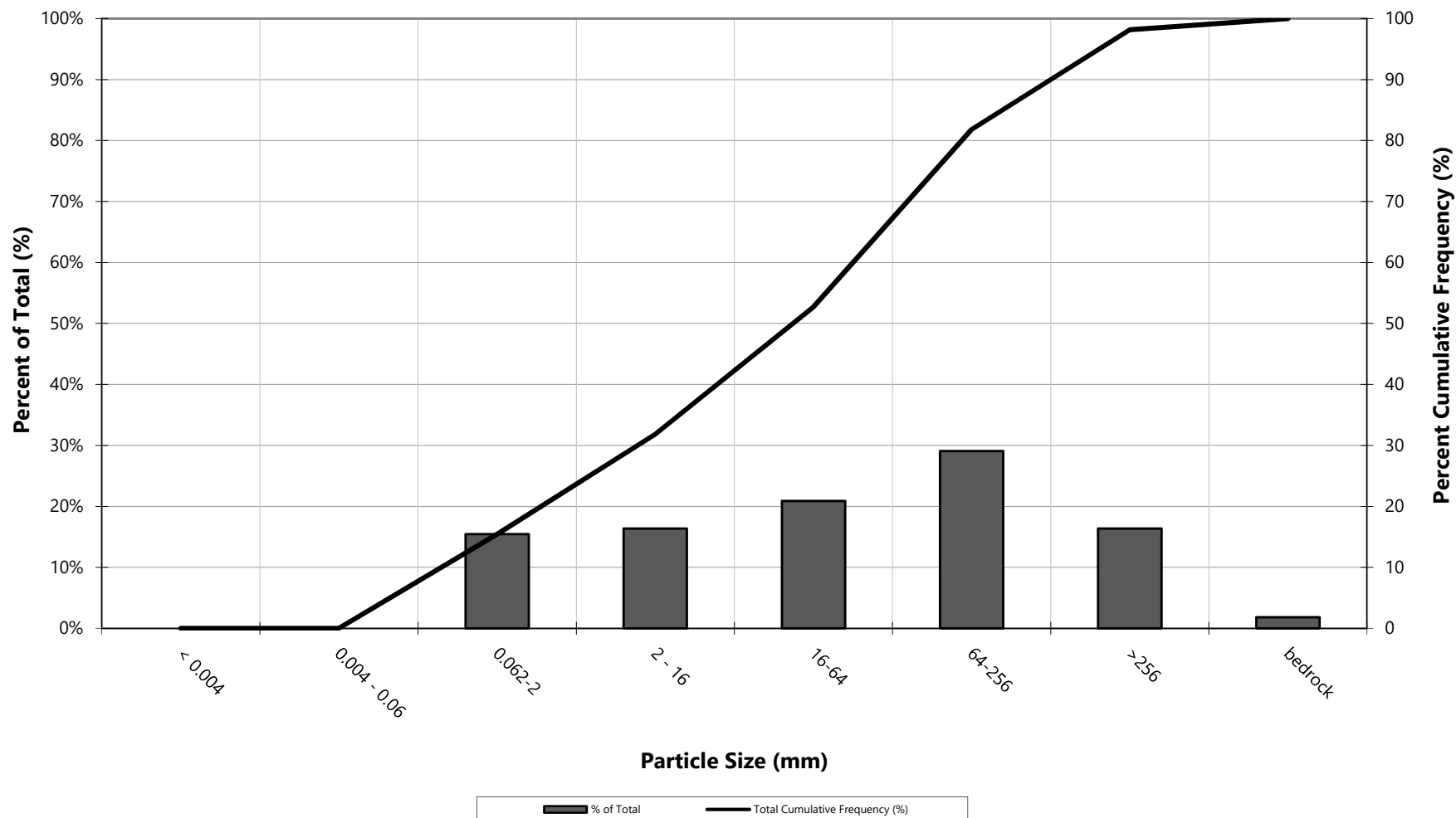
Macro-Algae Cover Index				
Category	0	1 (< 5%)	2 (5-25%)	5 (> 25%)
Tally	72	-	-	-

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)	6 (> 20mm)
Tally	-	-	-	-	-	-	-

Other Macro or Micro (FeP at Seep) Cover Index						
Category	0	1 (slimy)	2 (draw line)	3 (0.5-1mm)	4 (1-5mm)	5 (5-20mm)
Tally	-	12	15	23	14	3



**Mount Snow Resort Water Quality Monitoring
Percent of Total and Cumulative Frequency
Mount Snow Water Quality Monitoring
Station MS-5 (Iron Stream)**



APPENDIX 5

Mount Snow Resort
2019 Kick Net Data Summary (Class B, Small High Gradient Streams)
Prepared by VHB
March 4, 2020



Station	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT / EPT+ C	% PPCS- FG	Outcome / Biological Integrity	Notes
Class B, SHG	≥300	≥27	≥16	≥45	≤4.50	≤12	≥0.45	≥40		
JB-1	426	34	18	78	1.52	1.3	0.86	70	Meets Class B Criteria	Jack's Brook (Reference station) Located immediately above Handle Road. (VT Site ID 651409000003)
MS-5	81	18	6	40	3.39	49.7	0.73	39	Does Not Meet Class B Criteria	Iron Stream, located immediately above Handle Road.
Support (Pass)	≥300	≥27	≥16	≥45%	≤4.50	≤12%	≥0.45	≥40%	In accordance with the 2016 Vermont Water Quality Standards, the "Indeterminate + (I+)" range was eliminated from metric scoring. All metrics that meet the threshold are considered supporting aquatic life use for that metric.	
Below Threshold (I)	<300	<27	<16	<45%	>4.50	>12%	<0.45	<40%		
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%		

Mt. Snow Kick Net Data - Jack's Brook - JB-1 Class B, Small High Gradient Stream									
Year	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT +C	% PPCS-FG	Outcome/ Biological Integrity
Class B, SHG	≥300	≥27	≥16	≥45	≤4.50	≤12	≥0.45	≥40	
1996 DEC	483	34	15	58	2.61	0.26	0.48	52	Indeterminate
2004 DEC	789	32	15	71	2.47	0.34	0.57	61	Indeterminate
2008 DEC	1,620	35	12	75	2.10	0.49	0.67	56	Does Not Meet Class B Criteria
2019 VHB	426	34	18	78	1.52	1.32	0.86	70	Meets Class B Criteria

Metric Scoring Guidelines (Class B)

Support (Pass)	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%	In accordance with the 2016 Vermont Water Quality Standards, the "Indeterminate + (I+)" range was eliminated from metric scoring. All metrics that meet the threshold are considered supporting aquatic life use for that metric.
Below Threshold (I)	<300	<27	<16	<45%	>4.5	>12%	<0.45	<40%	
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%	

Macroinvertebrate data submittal form - VTDEC October 2019 version

Project Name:	Mt. Snow
VT DEC Lab ID:	
Stream Name:	Jack's Brook
Station:	JB-1

Note: a minimum of 25% of sample and no less than 300 animals must be processed; no fewer than 24 grids (squares) should be used to process a sample

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long: or VT Site ID:	42.9552612304688	-728891296386719
Date collected:	10/15/2019	
# Reps Collected:	1	
# Rep Picked:	1	
Collection Method:	Kicknet	
Collector:	C. Szal	

REPS:	Rep 1
Picked By:	CCS
Date Picked:	Feb. 2020
#sq picked:	17
#sq total:	24
Checked By:	CCS
Sorted By:	CCS
Sorted Date:	Feb. 2020

Taxonomic Data															
Expanded Key	Order	Family	SubFamily Or Tribe	Genus Group	Genus	Species Group	Species	Rep1				NOTES	FFG	Chiro	
								ID [1]	QA [2]	Count [3]	Total Sample Count [4]				
01.03.00.00.006.00.00	COLEOPTERA	ELMIDAE	N/A	N/A	OULIMNIUS	N/A	sp	CCS	A	7	9.882352941		SCR	N	
01.08.00.00.000.00.00	COLEOPTERA	HYDROPHILIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	1	1.411764706			N	
02.05.01.00.055.00.00	DIPTERA	CHIRONOMIDAE	CHIRONOMIN	N/A	ICROTENDIP	N/A	sp	CCS	A	1	1.411764706		CG	Y	
02.05.01.00.085.00.05	DIPTERA	CHIRONOMIDAE	CHIRONOMIN	N/A	POLYPEDILUN	N/A	aviceps	CCS	A	1	1.411764706		CG	Y	
02.05.03.02.121.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	OPSEC/TANYTA	ICROPSECTR	N/A	sp	CCS	A	1	1.411764706		CG	Y	
02.05.05.00.017.00.00	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	N/A	ORYNONEUR	N/A	sp	CCS	A	1	1.411764706		CG	Y	
02.05.05.00.029.00.11	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	N/A	UKIEFFERIELL	N/A	tirolensis	CCS	A	4	5.647058824		CG	Y	
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	N/A	AMETRIOCNE	N/A	sp	CCS	A	28	39.52941176		CG	Y	
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	N/A	TVETENIA	bavarica grp	paucunca	CCS	A	2	2.823529412		CG	Y	
02.08.00.00.000.00.00	DIPTERA	EMPIDIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	1	1.411764706		PRD	N	
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	N/A	DICRANOTA	N/A	sp	CCS	A	2	2.823529412		PRD	N	
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	N/A	HEXATOMA	N/A	sp	CCS	A	10	14.11764706		PRD	N	
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	N/A	TIPULA	N/A	sp	CCS	A	6	8.470588235		SRD	N	
03.01.00.02.007.00.00	EPHEMEROPTERA	BAETIDAE	N/A	ITRELLA/PLAUD	PLAUDITUS	N/A	sp	CCS	A	1	1.411764706		SCR	N	
03.04.00.00.005.00.02	EPHEMEROPTERA	EPHEMERELLIDAE	N/A	N/A	URYLOPHELL	N/A	funeralis	CCS	A	1	1.411764706		SRD	N	
03.06.00.00.003.00.00	EPHEMEROPTERA	HEPTAGENIIDAE	N/A	N/A	EPEORUS	N/A	sp	CCS	A	1	1.411764706		CG	N	
03.06.00.00.007.00.91	EPHEMEROPTERA	HEPTAGENIIDAE	N/A	N/A	ACCAFFERTIL	N/A	sp a	CCS	A	10	14.11764706		SCR	N	
03.07.00.01.006.00.00	EPHEMEROPTERA	LEPTOPHEBIIDAE	N/A	HLEBIA/PARALE	OLEPTOPHE	N/A	sp	CCS	A	3	4.235294118		CG	N	
03.14.00.00.001.00.00	EPHEMEROPTERA	AMELETIDAE	N/A	N/A	AMELETUS	N/A	sp	CCS	A	6	8.470588235		CG	N	
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	N/A	MICRASEMA	N/A	sp	CCS	A	3	4.235294118		SHR	N	
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	DIPLECTRONA	N/A	modesta	CCS	A	1	1.411764706		CF	N	
04.05.00.00.004.00.12	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	HYDROPSYCH	N/A	ventura	CCS	A	13	18.35294118		CF	N	
04.05.00.00.004.03.04	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	HYDROPSYCH	alh/slo/spa	sparna	CCS	A	3	4.235294118		CF	N	
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	N/A	EPIDOSTOM	N/A	sp	CCS	A	38	53.64705882		SRD	N	
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	N/A	OLOPHILODI	N/A	sp	CCS	A	75	105.8823529		CF	N	
04.14.00.00.005.00.00	TRICHOPTERA	POLYCENTROPODIDAE	N/A	N/A	PLYCENTROP	N/A	sp	CCS	A	1	1.411764706		PRD	N	
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHIL	carolina/fenestra	carolina group	CCS	A	1	1.411764706		PRD	N	
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	N/A	SWELTSIA	N/A	sp	CCS	A	37	52.23529412		PRD	N	
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	26	36.70588235		SRD	N	
05.07.00.00.007.00.02	PLECOPTERA	PERLODIDAE	N/A	N/A	MALIREKUS	N/A	iroquois	CCS	A	4	5.647058824		PRD	N	
05.09.00.00.000.00.01	PLECOPTERA	TAENIOPTERYGIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	4	5.647058824		SRD	N	
06.06.00.00.007.00.00	ODONATA	GOMPHIDAE	N/A	N/A	LANTHUS	N/A	sp	CCS	A	4	5.647058824		PRD	N	
14.00.00.00.000.00.00	NEOOPHORA	N/A	N/A	N/A	UNID	N/A	N/A	CCS	A	1	1.411764706		PRD	N	
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	4	5.647058824		CG	N	
TOTALS by Rep:										302		426.3529412			
GRAND TOTAL:										426.3529412 organisms					

*Notes:

[1] ID is initial of taxonomist or organization

[2] QA is confidence of ID: A=99%, B=90%, C=75%, D=50%

[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no organisms were identified in a rep.

[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked to # squares total

Macroinvertebrate data submittal form - VTDEC October 2019 version

Project Name:	Mt. Snow
VT DEC Lab ID:	
Stream Name:	Jack's Brook
Station:	JB-1

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:	42.9552612304688	-728891296386719
or VT Site ID:		
Date collected:	10/15/2019	
# Reps Collected:	1	
# Rep Picked:	1	
Collection Method:	Kicknet	
Collector:	C. Szal	

Expanded Key	Order	Family	SubFamily Or Tribe	Biotic Index				Richness Metrics	
				Biotic Index Scores		Old Biotic Index (1-5)	New Biotic Index (1-10)	Richness	EPT
				Old BI	New BI	KN-1	KN-1	KN-1	KN-1
01.03.00.00.006.00.00	COLEOPTERA	ELMIDAE	N/A	2	3	19.76470588	29.64705882	1	0
01.08.00.00.000.00.00	COLEOPTERA	HYDROPHILIDAE	N/A	-	-	-	-	1	0
02.05.01.00.055.00.00	DIPTERA	CHIRONOMIDAE	CHIRONOMIN	3	6	4.235294118	8.470588235	1	0
02.05.01.00.085.00.05	DIPTERA	CHIRONOMIDAE	CHIRONOMIN	3	4	4.235294118	5.647058824	1	0
02.05.03.02.121.00.00	DIPTERA	CHIRONOMIDAE	TANYTARSINI	3	6	4.235294118	8.470588235	1	0
02.05.05.00.017.00.00	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	2	4	2.823529412	5.647058824	1	0
02.05.05.00.029.00.11	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	2	2	11.29411765	11.29411765	1	0
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	3	5	118.5882353	197.6470588	1	0
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	RTHOCLADIIN	2	4	5.647058824	11.29411765	1	0
02.08.00.00.000.00.00	DIPTERA	EMPIDIDAE	N/A	3	6	4.235294118	8.470588235	1	0
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	2	3	5.647058824	8.470588235	1	0
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	2	2	28.23529412	28.23529412	1	0
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	3	6	25.41176471	50.82352941	1	0
03.01.00.02.007.00.00	EPHEMEROPTERA	BAETIDAE	N/A	2	5	2.823529412	7.058823529	1	1
03.04.00.00.005.00.02	EPHEMEROPTERA	EPHEMERELLIDAE	N/A	1	0	1.411764706	0	1	1
03.06.00.00.003.00.00	EPHEMEROPTERA	HEPTAGENIIDAE	N/A	0	0	0	0	1	1
03.06.00.00.007.00.91	EPHEMEROPTERA	HEPTAGENIIDAE	N/A	2	3	28.23529412	42.35294118	1	1
03.07.00.01.006.00.00	EPHEMEROPTERA	LEPTOPHLEBIIDAE	N/A	2	1	8.470588235	4.235294118	1	1
03.14.00.00.001.00.00	EPHEMEROPTERA	AMELETIDAE	N/A	0	0	0	0	1	1
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	1	2	4.235294118	8.470588235	1	1
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	0	0	0	0	1	1
04.05.00.00.004.00.12	TRICHOPTERA	HYDROPSYCHIDAE	N/A	1	3	18.35294118	55.05882353	1	1
04.05.00.00.004.03.04	TRICHOPTERA	HYDROPSYCHIDAE	N/A	2	4	8.470588235	16.94117647	1	1
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	1	1	53.64705882	53.64705882	1	1
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	0	0	0	0	1	1
04.14.00.00.005.00.00	TRICHOPTERA	POLYCENTROPODIDAE	N/A	3	6	4.235294118	8.470588235	1	1
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	0	1	0	1.411764706	1	1
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	0	0	0	0	1	1
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	0	0	0	0	1	1
05.07.00.00.007.00.02	PLECOPTERA	PERLODIDAE	N/A	1	2	5.647058824	11.29411765	1	1
05.09.00.00.000.00.01	PLECOPTERA	TAENIOPTERYGIDAE	N/A	2	3	11.29411765	16.94117647	1	1
06.06.00.00.007.00.00	ODONATA	GOMPHIDAE	N/A	2	5	11.29411765	28.23529412	1	0
14.00.00.00.000.00.00	NEOOPHORA	N/A	N/A	3	6	4.235294118	8.470588235	1	0
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	-	-	-	-	1	0
TOTALS by Rep:				Total BI Score		396.7058824	636.7058824	Total	Total
GRAND TOTAL:				Total # Organisms		426.3529412	426.3529412	Richness	EPT-R
				# of Organisms w/o BI		7.058823529	7.058823529	34	
				Total # Organisms with BI		419.2941176	419.2941176		18
				Biotic Index		0.95	1.52		

*Notes:

[1] ID is initial

[2] QA is confi

[3] Count: only

[4] Total Samp



Major Taxonomic Group Statistics

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Sample Date 10/15/19

2019 Expanded Key ID#	KN-1: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
01.03.00.00.006.00.00	9.882352941	0	0	0	0	0	0	0	0	0	
01.08.00.00.000.00.00	1.411764706	0	0	0	0	0	0	0	0	0	
02.05.01.00.055.00.00	0	1.411765	0	0	0	0	0	0	0	0	
02.05.01.00.085.00.05	0	1.411765	0	0	0	0	0	0	0	0	
02.05.03.02.121.00.00	0	1.411765	0	0	0	0	0	0	0	0	
02.05.05.00.017.00.00	0	1.411765	0	0	0	0	0	0	0	0	
02.05.05.00.029.00.11	0	5.647059	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	39.52941	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	2.823529	0	0	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	1.411765	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	2.823529	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	14.11765	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	8.470588	0	0	0	0	0	0	0	0	
03.01.00.02.007.00.00	0	0	1.411764706	0	0	0	0	0	0	0	
03.04.00.00.005.00.02	0	0	1.411764706	0	0	0	0	0	0	0	
03.06.00.00.003.00.00	0	0	1.411764706	0	0	0	0	0	0	0	
03.06.00.00.007.00.91	0	0	14.11764706	0	0	0	0	0	0	0	
03.07.00.01.006.00.00	0	0	4.235294118	0	0	0	0	0	0	0	
03.14.00.00.001.00.00	0	0	8.470588235	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	4.235294118	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	1.411764706	0	0	0	0	0	0	
04.05.00.00.004.00.12	0	0	0	18.35294118	0	0	0	0	0	0	
04.05.00.00.004.03.04	0	0	0	4.235294118	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	53.64705882	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	105.8823529	0	0	0	0	0	0	
04.14.00.00.005.00.00	0	0	0	1.411764706	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	1.411764706	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	52.23529412	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	36.70588235	0	0	0	0	0	
05.07.00.00.007.00.02	0	0	0	0	5.647058824	0	0	0	0	0	
05.09.00.00.000.00.01	0	0	0	0	5.647058824	0	0	0	0	0	
06.06.00.00.007.00.00	0	0	0	0	0	0	0	0	5.64705882	0	
14.00.00.00.000.00.00	0	0	0	0	0	0	0	0	0	1.41176471	
18.04.00.00.000.00.00	0	0	0	0	0	5.647058824	0	0	0	0	
Total	11.29411765	80.47059	31.05882353	190.5882353	100.2352941	5.647058824	0	0	5.6470588	1.4117647	426.35
Percent	2.65%	18.9%	7.3%	44.7%	23.5%	1.32%	0.00%	0.00%	1.32%	0.33%	100%



Functional Feeding Group Analysis

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Sample Date 10/15/19

2019 Expanded Key ID#	KN-1: Numbers of Organisms											Total
	Collector Filterer	Collector Gatherer	Parasite	Planktivore	Predator	Piercing Carnivore	Piercing Herbivore	Scraper	Shredder-Herbivore	Shredder-Detritus	Other/Unidentified	
01.03.00.00.006.00.00	0	0	0	0	0	0	0	9.88235	0	0	0	9.8824
01.08.00.00.000.00.00	0	0	0	0	0	0	0	0	0	0	1.411764706	1.4118
02.05.01.00.055.00.00	0	1.41176471	0	0	0	0	0	0	0	0	0	1.4118
02.05.01.00.085.00.05	0	1.41176471	0	0	0	0	0	0	0	0	0	1.4118
02.05.03.02.121.00.00	0	1.41176471	0	0	0	0	0	0	0	0	0	1.4118
02.05.05.00.017.00.00	0	1.41176471	0	0	0	0	0	0	0	0	0	1.4118
02.05.05.00.029.00.11	0	5.64705882	0	0	0	0	0	0	0	0	0	5.6471
02.05.05.00.075.00.00	0	39.5294118	0	0	0	0	0	0	0	0	0	39.529
02.05.05.00.114.01.04	0	2.82352941	0	0	0	0	0	0	0	0	0	2.8235
02.08.00.00.000.00.00	0	0	0	0	1.411765	0	0	0	0	0	0	1.4118
02.19.00.00.003.00.00	0	0	0	0	2.823529	0	0	0	0	0	0	2.8235
02.19.00.00.006.00.00	0	0	0	0	14.11765	0	0	0	0	0	0	14.118
02.19.00.00.016.00.00	0	0	0	0	0	0	0	0	0	8.4705882	0	8.4706
03.01.00.02.007.00.00	0	0	0	0	0	0	0	1.41176	0	0	0	1.4118
03.04.00.00.005.00.02	0	0	0	0	0	0	0	0	0	1.4117647	0	1.4118
03.06.00.00.003.00.00	0	1.41176471	0	0	0	0	0	0	0	0	0	1.4118
03.06.00.00.007.00.91	0	0	0	0	0	0	0	14.1176	0	0	0	14.118
03.07.00.01.006.00.00	0	4.23529412	0	0	0	0	0	0	0	0	0	4.2353
03.14.00.00.001.00.00	0	8.47058824	0	0	0	0	0	0	0	0	0	8.4706
04.01.00.00.003.00.00	0	0	0	0	0	0	0	0	4.2352941	0	0	4.2353
04.05.00.00.003.00.01	1.411764706	0	0	0	0	0	0	0	0	0	0	1.4118
04.05.00.00.004.00.12	18.35294118	0	0	0	0	0	0	0	0	0	0	18.353
04.05.00.00.004.03.04	4.235294118	0	0	0	0	0	0	0	0	0	0	4.2353
04.07.00.00.001.00.00	0	0	0	0	0	0	0	0	0	53.647059	0	53.647
04.12.00.00.002.00.00	105.8823529	0	0	0	0	0	0	0	0	0	0	105.88
04.14.00.00.005.00.00	0	0	0	0	1.411765	0	0	0	0	0	0	1.4118
04.16.00.00.001.02.00	0	0	0	0	1.411765	0	0	0	0	0	0	1.4118
05.02.00.00.006.00.00	0	0	0	0	52.23529	0	0	0	0	0	0	52.235
05.03.00.00.000.00.01	0	0	0	0	0	0	0	0	0	36.705882	0	36.706
05.07.00.00.007.00.02	0	0	0	0	5.647059	0	0	0	0	0	0	5.6471
05.09.00.00.000.00.01	0	0	0	0	0	0	0	0	0	5.6470588	0	5.6471
06.06.00.00.007.00.00	0	0	0	0	5.647059	0	0	0	0	0	0	5.6471
14.00.00.00.000.00.00	0	0	0	0	1.411765	0	0	0	0	0	0	1.4118
18.04.00.00.000.00.00	0	5.64705882	0	0	0	0	0	0	0	0	0	5.6471
Group Total	129.882353	73.411765	0	0	86.1176	0	0	25.4118	4.235294	105.8824	1.411764706	426.35
Percent of Sample Total	30.5%	17.2%	0.0%	0.0%	20.2%	0.0%	0.0%	6.0%	1.0%	24.8%	0.3%	100.0%



Functional Feeding Group Analysis

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Sample Date 10/15/19

	Model			Kicknet 1 vs. SHG	
	SHG	MHG	WWMG	KN-1	PPCS
Col. Gath.	31%	32%	22%	17.2%	55.5%
Col. Filt.	18%	30%	36%	30.46%	59.1%
Predator	19%	13%	7%	20.2%	94.1%
Shred-Det.	15%	4%	2%	24.8%	60.4%
Shred- Herb.	1%	1%	5%	0.99%	99.3%
Scraper	12%	13%	22%	5.96%	49.7%
				PPCS-FG =	69.7%



Percent Model Affinity of Orders (PMA-O) Calculations

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Class SHG

Sample Date 10/15/19

Sampler C. Szal

Order	Model			Kicknet 1 vs. Model (SHG)	
	SHG	MHG	WWMG	%	difference
Coleoptera	8%	6%	13%	2.65%	5.35
Diptera	19%	18%	13%	18.9%	0.13
Ephemeroptera	23%	34%	32%	7.3%	15.72
Plecoptera	21%	8%	8%	23.5%	2.5
Trichoptera	28%	33%	33%	44.7%	16.7
Oligochaeta	0.5%	0.5%	1.0%	1.32%	0.82
Other	0.5%	0.5%	1.0%	2.98%	2.480
Sum diff					43.7
Sum diff * 0.5					21.9
100-(sum diff * 0.5)					78.1
% model affinity					78.1%



EPT / EPT+C Calculations

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Sample Date 10/15/19

Class SHG

Sampler C. Szal

	KN-1
#EPT organisms	321.8823529
#C organisms	54
EPT/EPT+C	0.857



Biometrics Summary

Project Mt. Snow

Station JB-1

Stream Jack's Brook

Location 0

Sample Date 10/15/19

Class SHG

Sampler C. Szal

Replicate # Sampling Method	1 KN	Average KN
Biometrics:		
Density/Unit	426	426
Species Richness	34.0	34.0
EPT Richness	18.0	18.0
Old Bio Index (0 to 5)	0.95	0.95
New Bio Index (0 to 10)	1.52	1.52
% dominant taxa	24.8%	24.8%
# dominant taxa	105.8823529	
dominant taxa ID	TRICHOPTERA	PHILOPOTAMIDAE
EPT/EPT+C	0.857	0.857
EPT/Richness	0.529	0.529
% Model Affinity (orders)	78.1%	78.1%
PPCS - functional groups	69.7%	69.7%
Major Groups:		
Coleoptera (%)	2.65%	2.65%
Diptera (%)	18.9%	18.9%
Ephemeroptera (%)	7.3%	7.3%
Trichoptera (%)	44.7%	44.7%
Plecoptera (%)	23.5%	23.5%
Oligochaeta (%)	1.32%	1.32%
Bivalvia (%)	0.00%	0.00%
Megaloptera (%)	0.00%	0.00%
Odonata (%)	1.32%	1.32%
Other (%)	0.33%	0.33%
Total (%)	100%	100%
Feeding Groups:		
Collector Gatherer (%)	17.2%	17.2%
Collector Filterer (%)	30.46%	30.46%
Predator (%)	20.2%	20.2%
Shredder - Detritus (%)	24.8%	24.8%
Shredder - Herbivore (%)	0.99%	0.99%
Scraper (%)	5.96%	5.96%
Other (%)	0.33%	0.33%
Total (%)	100%	100%

Project Mt. Snow
Station JB-1
Stream Jack's Brook
Location 0
Sample Date 10/15/19

Latitude 42.9552612304688
Longitude -728891296386719
Class 0
Sampler CCS



APPLICATION OF STATE OF VERMONT DEC BIOCRITERIA (1/15/2017)

Metric	Value	Metric Scoring Results Based on DEC Thresholds for SHG Streams					
		Class B2		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	426	≥300	Pass	≥400	Pass	≥500	Fail
Richness	34.0	≥27	Pass	≥31	Pass	≥35	I
EPT	18.0	≥16	Pass	≥19	I	≥21	Fail
PMA-O	78.1%	≥45%	Pass	≥55%	Pass	≥65%	Pass
BI (New 1-10)	1.52	≤4.50	Pass	≤3.50	Pass	≤3.00	Pass
% Oligo	1.32%	≤12%	Pass	≤5	Pass	≤2	Pass
EPT/EPT+C	0.857	≥0.45	Pass	≥0.55	Pass	≥0.65	Pass
PPCS-FG	69.7%	≥ 40%	Pass	≥ 45%	Pass	≥ 50%	Pass
Outcome:		Biocriteria are met					
The following metrics do not meet Class B2 thresholds:							

Individual Metric Outcome Guidelines (using the table below)

- 1) A metric is scored "Pass" when the result meets the threshold requirements
- 2) A metric is scored "I" when the result is between the threshold level and the non-support level
- 3) A metric is scored "Fail" when the result is below the non-support requirements

Overall Outcome Guidelines

- 1) Biocriteria are "met" when all metrics are scored "Pass" and no metrics have a score of "I" or "Fail"
- 2) Biocriteria are "not met" when one or more metrics are scored "Fail"
- 3) In situations where neither items 1 or 2 are the result, an "Indeterminate" finding will be made

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/ EPT+C	PPCS-F
A-1	Threshold	≥500	≥35	≥21	≥65%	≤3	≤2%	≥0.65	≥50%
	Non-Support	<450	<34	<20	<60%	>3.30	>3%	<0.63	<45%
B1	Threshold	≥400	≥31	≥19	≥55%	≤3.5	≤5%	≥0.55	≥45%
	Non-Support	<350	<30	<18	<50%	>3.65	>6.5%	<0.53	<40%
B2	Threshold	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
	Non-Support	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

LOTIC BENTHOS FIELD SHEET

(2016 edition)

Bug Lab ID _____

Chem ID _____ Time _____

DUP Chem ID _____ Time _____

12

Site Name Mt Snow - Jack's Bk River Mile _____ USFS _____ PROB _____

Site ID JB-1

Date 10.15.19 Time 0800 Crew CCS

Site Description _____

Town: _____ Stream Order: _____ Drainage Area: _____ Km² Elevation: _____ ft

D.D° Latitude: _____ Longitude: _____ Lat/Long source (GPS – set to NAD83:) _____

Weather: Sunny Flow/Weather Previous (2 weeks/2days): Fairly rainy 2 wks, quiet the last 4 days

Surrounding Land Use: Forest, resort, residential

SAMPLING INFORMATION

Sampler: CCS Gear: KN

Effort Time: _____ min Mesh: _____ um

Area: _____ m² Quantitative: Y / N

#Reps: 1 Comp/rep: 4

Limited habitat

Qual. PERIPHYTON COVER for each type 0-100% (See back for Periphyton Cover Form)

Diatom 70% Filamentous Green _____% and length _____ in

Blue Green _____% Moss Tr% Green Tr% Other _____%

General Trophic Rating: 0 (0=oligo, 5=Eutroph)

HABITAT OBSERVATIONS

Embeddedness (5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75% Poor Estimate 25

Silt Rating: 4 (0=none, 5= chocolate)

CPOM Rating (leaf packs): 2-3 (0= none, 5=high)

Lg Woody Debris (>4" dia) #: 3 /100m (reach)

Fresh leaf packs

Habitat Comments

GENERAL WATER TYPE Riffle, Winder, or Other _____ Channelized: Y / N Upstream Dam: Y / N mi

B.F.Width: 12' (m) Wetted Width: 1-3' (m) Riffle Depth: 1-2" (in) Pool Depth: none (in) and Obs: _____

Bank Stability: EX VG G F P Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Fish: Bottom Type: Hard – Soft – Mixed Cover Rating: Exc – Very Good – Good – Fair -- Poor

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) L10 m, R2100 m

Overstory: Softwood 20% Hardwood 80% Understory: Shrub (brush) 30 Grass _____% Herbaceous 30%

Canopy %: 100 90 80 70 60 50 40 30 20 10 0 Overhead: Open, Partly Open, or Closed

Leaves over half off

WQ Section Sampler: _____ Baseflow or Freshet Flow Present Flow: H M-L

Meter (type, #) 1- _____ 2- _____ 3- _____ Color _____ Color DUP: _____

Annotate? Y / N

Temp Air 36 °C, °F Temp Water 8 °C fPH _____ lab pH _____ fCond _____ D.O.% _____ D.Omg/l _____

Circle: Cond pH Alk TP DP Cl ICAnions Turb TN N02-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____

WQ Notes/Comments

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply)

Overall Aesthetic Rating 0 (poor) – 5 (exc.) 4

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash | Iron | Scum | None

B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secchi Tube _____ mm

C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur (eggs) | Oily/gas

Aquatic Biota Observed:

A shallow narrow stream with many failing banks

Still not a lot of flow, but better than earlier sampling

Field Sheet Complete: CS (initial)

Photos: Y / N

Fish Survey Conducted: Y / N

Pebble Count Field Form

Complete % observed substrate if no pebble ct done

Periphyton Cover Observations Date _____

Particle	Millimeters	Inches	% Observed	Transect 1 (100 pebbles)	Tot #	Item %
organic						
Fines	0.062-2	0.002-0.08"				
very fine gravel	2-4	0.08-0.15"				
small gravel	4-8	0.15-0.3"				
medium gravel	8-16	0.3-0.6"				
coarse gravel	16-32	0.6-1.25"				
very coarse gravel	32-64	1.25-2.5"				
small and medium cobble	64-128	2.5-5"				
large cobble	128-256	5-10"				
small boulder	265-512	10-20"				
medium boulder	512-1024	20-40"				
large boulder	1024-2048	40-80"				
very large boulder	>2048	>80"				
bedrock						
				TOTALS		

Moss Cover Index			
Category	0	1(<5%)	2(5-25%)
Tally			

Macro-Algae Cover Index			
Category	0	1(<5%)	2(5-25%)
Tally			

Micro-Algae Cover Index							
Category	0	1 (slimy)	2 (draw line)	3(.5-1mm)	4(1-5mm)	5(5-20mm)	6(>20mm)
Tally							

Other Macro or Micro Cover Index						
Category	0	1	2	3	4	5
Tally						

Substrate Comments:

Mt. Snow Kick Net Data - Iron Stream - MS-5 Class B, Small High Gradient Stream									
Year	Density	Richness	EPT	% PMA-O	BI	% Oligo.	EPT/EPT +C	% PPCS-FG	Outcome/ Biological Integrity
Class B, SHG	≥300	≥27	≥16	≥45	≤4.50	≤12	≥0.45	≥40	
1996 DEC	21	13	6	55	2.72	14.3	0.63	42	Does Not Meet Class B Criteria
2004 DEC	64	21	7	47	3.35	1.6	0.61	27	Does Not Meet Class B Criteria
2019 VHB	81	18	6	40	3.39	49.7	0.73	39	Does Not Meet Class B Criteria

Metric Scoring Guidelines (Class B)									
Support (Pass)	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%	In accordance with the 2016 Vermont Water Quality Standards, the "Indeterminate + (I+)" range was eliminated from metric scoring. All metrics that meet the threshold are considered supporting aquatic life use for that metric.
Below Threshold (I)	<300	<27	<16	<45%	>4.5	>12%	<0.45	<40%	
Non-Support (Fail)	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%	



Macroinvertebrate data submittal form - VT DEC October 2019 version

Project Name:	Mt. Snow
VT DEC Lab ID:	
Stream Name:	Iron Stream
Station:	MS-5

Note: a minimum of 25% of sample and no less than 300 animals must be processed; no fewer than 24 grids (squares) should be used to process a sample

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:	42.9566688537598	-72.8891677856445
or VT Site ID:		
Date collected:	9/27/2019	
# Reps Collected:	2	
# Rep Picked:	2	
Collection Method:	Kicknet	
Collector:	C. Szal	

REPS:	Rep 1	Rep 2
Picked By:	CCS	CCS
Date Picked:	Feb. 2020	Feb. 2020
#sq picked:	24	24
#sq total:	24	24
Checked By:	CCS	CCS
Sorted By:	CCS	CCS
Sorted Date:	Feb. 2020	Feb. 2020

Taxonomic Data																	
Expanded Key	Order	Family	SubFamily Or Tribe	Genus Group	Genus	Species Group	Species	Rep1				Rep2					
								ID [1]	QA [2]	Count [3]	Total Sample Count [4]	ID [1]	QA [2]	Count [3]	Total Sample Count [4]		
02.03.00.01.003.00.00	DIPTERA	CERATOPOGONIDAE	N/A	ZIA/PALPON	BEZZIA	N/A	sp	CCS	A	2	2	CCS			0		
01.08.00.00.000.00.00	COLEOPTERA	HYDROPHILIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	3	3	CCS	A	4	4		
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	PARAMETRIOCNEMUS	N/A	sp	CCS	A	2	2	CCS	A	2	2		
02.05.05.00.109.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	THIENEMANNIELLA	N/A	sp	CCS	A	1	1	CCS	A	2	2		
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE	N/A	TVETENIA	bavarica grp	paucunca	CCS	A	1	1	CCS	A	1	1		
02.05.09.04.000.00.00	DIPTERA	CHIRONOMIDAE	PENTANEURINI	MANNIMYIA	N/A	N/A	group	CCS	A	2	2	CCS	A	1	1		
02.08.00.00.000.00.00	DIPTERA	EMPIDIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	1	1	CCS	A	1	1		
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A	N/A	DICRANOTA	N/A	sp	CCS	A	2	2	CCS			0		
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A	N/A	HEXATOMA	N/A	sp	CCS	A	1	1	CCS			0		
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A	N/A	TIPULA	N/A	sp	CCS	A	8	8	CCS	A	1	1		
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A	N/A	MICRASEMA	N/A	sp	CCS	A	2	2	CCS	A	7	7		
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	DIPLECTRONA	N/A	modesta	CCS			0	CCS	A	3	3		
04.05.00.00.004.00.12	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	HYDROPSYCHE	N/A	ventura	CCS	A	1	1	CCS			0		
04.05.00.00.004.03.02	TRICHOPTERA	HYDROPSYCHIDAE	N/A	N/A	HYDROPSYCHE	alh/slo/spa	alheda	CCS	A	4	4	CCS	A	2	2		
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A	N/A	LEPIDOSTOMA	N/A	sp	CCS			0	CCS	A	1	1		
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A	N/A	DOLOPHILODES	N/A	sp	CCS	A	3	3	CCS			0		
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A	N/A	RHYACOPHILA	carolina/fenestra	carolina group	CCS	A	1	1	CCS			0		
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A	N/A	SWELTSIA	N/A	sp	CCS	A	1	1	CCS	A	1	1		
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A	N/A	N/A	N/A	imm	CCS	A	6	6	CCS			0		
06.04.00.00.001.00.00	ODONATA	CORDULEGASTRIDAE	N/A	N/A	CORDULEGASTER	N/A	sp	CCS	A	1	1	CCS			0		
07.02.00.00.001.00.00	MEGALOPTERA	SIALIDAE	N/A	N/A	SIALIS	N/A	sp	CCS	A	4	4	CCS	A	3	3		
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A	N/A	N/A	N/A	uid	CCS	A	19	19	CCS	A	65	65		
18.05.00.00.000.00.00	OLIGOCHAETA	ENCHYTRAEIDAE	N/A	N/A	N/A	N/A	uid	CCS			0	CCS	A	3	3		
TOTALS by Rep:										65		65		97		97	
GRAND TOTAL:										162 organisms							

*Notes:

[1] ID is initial of taxonomist or organization

[2] QA is confidence of ID: A=99%, B=90%, C=75%, D=50%

[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no organisms were identified in a rep.

[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked to # squares total



Macroinvertebrate data submittal form - VT DEC October 2019 version

Project Name:	Mt. Snow
VT DEC Lab ID:	
Stream Name:	Iron Stream
Station:	MS-5

	Latitude (NAD83)	Longitude (NAD83)
Site lat/long:	42.9566688537598	-72.8891677856445
or VT Site ID:		
Date collected:	9/27/2019	
# Reps Collected:	2	
# Rep Picked:	2	
Collection Method:	Kicknet	
Collector:	C. Szal	

Expanded Key	Order	Family	SubFamily Or Tribe	NOTES	FFG	Chiro	Biotic Index						Richness Metrics			
							Biotic Index Scores		Old BI (1-5)		New BI (1-10)		Richness	EPT	Richness	EPT
							Old BI	New BI	KN-1	KN-2	KN-1	KN-2	KN-1	KN-1	KN-2	KN-2
02.03.00.01.003.00.00	DIPTERA	CERATOPOGONIDAE	N/A		PRD	N	3	6	6	0	12	0	1	0	-	0
01.08.00.00.000.00.00	COLEOPTERA	HYDROPHILIDAE	N/A		-	N	-	-	-	-	-	-	1	0	1	0
02.05.05.00.075.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		CG	Y	3	5	6	6	10	10	1	0	1	0
02.05.05.00.109.00.00	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		CG	Y	2	5	2	4	5	10	1	0	1	0
02.05.05.00.114.01.04	DIPTERA	CHIRONOMIDAE	ORTHOCLADIINAE		CG	Y	2	4	2	2	4	4	1	0	1	0
02.05.09.04.000.00.00	DIPTERA	CHIRONOMIDAE	PENTANEURINI		PRD	Y	3	6	6	3	12	6	1	0	1	0
02.08.00.00.000.00.00	DIPTERA	EMPIDIDAE	N/A		PRD	N	3	6	3	3	6	6	1	0	1	0
02.19.00.00.003.00.00	DIPTERA	TIPULIDAE	N/A		PRD	N	2	3	4	0	6	0	1	0	-	0
02.19.00.00.006.00.00	DIPTERA	TIPULIDAE	N/A		PRD	N	2	2	2	0	2	0	1	0	-	0
02.19.00.00.016.00.00	DIPTERA	TIPULIDAE	N/A		SRD	N	3	6	24	3	48	6	1	0	1	0
04.01.00.00.003.00.00	TRICHOPTERA	BRACHYCENTRIDAE	N/A		SHR	N	1	2	2	7	4	14	1	1	1	1
04.05.00.00.003.00.01	TRICHOPTERA	HYDROPSYCHIDAE	N/A		CF	N	0	0	0	0	0	0	-	0	1	1
04.05.00.00.004.00.12	TRICHOPTERA	HYDROPSYCHIDAE	N/A		CF	N	1	3	1	0	3	0	1	1	-	0
04.05.00.00.004.03.02	TRICHOPTERA	HYDROPSYCHIDAE	N/A		CF	N	2	3	8	4	12	6	1	1	1	1
04.07.00.00.001.00.00	TRICHOPTERA	LEPIDOSTOMATIDAE	N/A		SRD	N	1	1	0	1	0	1	-	0	1	1
04.12.00.00.002.00.00	TRICHOPTERA	PHILOPOTAMIDAE	N/A		CF	N	0	0	0	0	0	0	1	1	-	0
04.16.00.00.001.02.00	TRICHOPTERA	RHYACOPHILIDAE	N/A		PRD	N	0	1	0	0	1	0	1	1	-	0
05.02.00.00.006.00.00	PLECOPTERA	CHLOROPERLIDAE	N/A		PRD	N	0	0	0	0	0	0	1	1	1	1
05.03.00.00.000.00.01	PLECOPTERA	LEUCTRIDAE	N/A		SRD	N	0	0	0	0	0	0	1	1	-	0
06.04.00.00.001.00.00	ODONATA	CORDULEGASTRIDAE	N/A		PRD	N	1	3	1	0	3	0	1	0	-	0
07.02.00.00.001.00.00	MEGALOPTERA	SIALIDAE	N/A		PRD	N	3	6	12	9	24	18	1	0	1	0
18.04.00.00.000.00.00	OLIGOCHAETA	LUMBRICULIDAE	N/A		CG	N	-	-	-	-	-	-	1	0	1	0
18.05.00.00.000.00.00	OLIGOCHAETA	ENCHYTRAELIDAE	N/A		CG	N	-	-	-	-	-	-	-	0	1	0
TOTALS by Rep:							Total BI Score		79	42	152	81	Total	Total	Total	Total
GRAND TOTAL:							Total # Organisms		65	97	65	97	Richness	EPT-R	Richness	EPT-R
							# of Organisms w/o BI		22	72	22	72	20		15	
							Total # Organisms with BI		43	25	43	25		7		5
							Biotic Index		1.84	1.68	3.53	3.24				

*Notes:

[1] ID is initial of taxonomist or organization

[2] QA is confidence of ID: A=99%, B=90%, C=75%, D=50%

[3] Count: only report a 0 in case of Rare taxa not found in subsample. Leave blank if no org

[4] Total Sample Count: estimated count for entire sample, based on ratio of # squares picked



Major Taxonomic Group Statistics

Project Mt. Snow

Station MS-5

Stream Iron Stream

VT Site ID 0

Sample Date 09/27/2019

2019 Expanded Key ID#	KN-1: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
02.03.00.01.003.00.00	0	2	0	0	0	0	0	0	0	0	
01.08.00.00.000.00.00	3	0	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.109.00.00	0	1	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	1	0	0	0	0	0	0	0	0	
02.05.09.04.000.00.00	0	2	0	0	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	1	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	2	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	1	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	8	0	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	2	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	0	0	0	0	0	0	0	
04.05.00.00.004.00.12	0	0	0	1	0	0	0	0	0	0	
04.05.00.00.004.03.02	0	0	0	4	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	3	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	1	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	1	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	6	0	0	0	0	0	
06.04.00.00.001.00.00	0	0	0	0	0	0	0	0	1	0	
07.02.00.00.001.00.00	0	0	0	0	0	0	0	4	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	19	0	0	0	0	
18.05.00.00.000.00.00	0	0	0	0	0	0	0	0	0	0	
Total	3	20	0	11	7	19	0	4	1	0	65
Percent	5%	31%	0%	17%	11%	29%	0%	6%	2%	0%	100%



Major Taxonomic Group Statistics

Project Mt. Snow

Station MS-5

Stream Iron Stream

VT Site ID 0

Sample Date 09/27/2019

2019 Expanded Key ID#	KN-2: Numbers of Organisms										
	COLEOPTERA	DIPTERA	EPHEMEROPTERA	TRICHOPTERA	PLECOPTERA	OLIGOCHAETA	BIVALVIA	MEGALOPTERA	ODONATA	OTHER	TOTAL
02.03.00.01.003.00.00	0	0	0	0	0	0	0	0	0	0	
01.08.00.00.000.00.00	4	0	0	0	0	0	0	0	0	0	
02.05.05.00.075.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.109.00.00	0	2	0	0	0	0	0	0	0	0	
02.05.05.00.114.01.04	0	1	0	0	0	0	0	0	0	0	
02.05.09.04.000.00.00	0	1	0	0	0	0	0	0	0	0	
02.08.00.00.000.00.00	0	1	0	0	0	0	0	0	0	0	
02.19.00.00.003.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	0	0	0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	1	0	0	0	0	0	0	0	0	
04.01.00.00.003.00.00	0	0	0	7	0	0	0	0	0	0	
04.05.00.00.003.00.01	0	0	0	3	0	0	0	0	0	0	
04.05.00.00.004.00.12	0	0	0	0	0	0	0	0	0	0	
04.05.00.00.004.03.02	0	0	0	2	0	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	1	0	0	0	0	0	0	
04.12.00.00.002.00.00	0	0	0	0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	0	0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	0	0	1	0	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	0	0	0	0	0	0	0	
06.04.00.00.001.00.00	0	0	0	0	0	0	0	0	0	0	
07.02.00.00.001.00.00	0	0	0	0	0	0	0	3	0	0	
18.04.00.00.000.00.00	0	0	0	0	0	65	0	0	0	0	
18.05.00.00.000.00.00	0	0	0	0	0	3	0	0	0	0	
Total	4	8	0	13	1	68	0	3	0	0	97
Percent	4%	8%	0%	13%	1%	70%	0%	3%	0%	0%	100%



Functional Feeding Group Analysis

Project Mt. Snow

Station MS-5

Stream Iron Stream

Location 0

Sample Date 09/27/2019

2019 Expanded Key ID#	KN-1: Numbers of Organisms								KN-2: Numbers of Organisms							
	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total	CG	CF	PRD	SRD	SHR	SCR	No FG Designation	Total
02.03.00.01.003.00.00	0	0	2	0	0	0	0		0	0	0	0	0	0	0	
01.08.00.00.000.00.00	0	0	0	0	0	0	3		0	0	0	0	0	0	4	
02.05.05.00.075.00.00	2	0	0	0	0	0	0		2	0	0	0	0	0	0	
02.05.05.00.109.00.00	1	0	0	0	0	0	0		2	0	0	0	0	0	0	
02.05.05.00.114.01.04	1	0	0	0	0	0	0		1	0	0	0	0	0	0	
02.05.09.04.000.00.00	0	0	2	0	0	0	0		0	0	1	0	0	0	0	
02.08.00.00.000.00.00	0	0	1	0	0	0	0		0	0	1	0	0	0	0	
02.19.00.00.003.00.00	0	0	2	0	0	0	0		0	0	0	0	0	0	0	
02.19.00.00.006.00.00	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
02.19.00.00.016.00.00	0	0	0	8	0	0	0		0	0	0	1	0	0	0	
04.01.00.00.003.00.00	0	0	0	0	2	0	0		0	0	0	0	7	0	0	
04.05.00.00.003.00.01	0	0	0	0	0	0	0		0	3	0	0	0	0	0	
04.05.00.00.004.00.12	0	1	0	0	0	0	0		0	0	0	0	0	0	0	
04.05.00.00.004.03.02	0	4	0	0	0	0	0		0	2	0	0	0	0	0	
04.07.00.00.001.00.00	0	0	0	0	0	0	0		0	0	0	1	0	0	0	
04.12.00.00.002.00.00	0	3	0	0	0	0	0		0	0	0	0	0	0	0	
04.16.00.00.001.02.00	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
05.02.00.00.006.00.00	0	0	1	0	0	0	0		0	0	1	0	0	0	0	
05.03.00.00.000.00.01	0	0	0	6	0	0	0		0	0	0	0	0	0	0	
06.04.00.00.001.00.00	0	0	1	0	0	0	0		0	0	0	0	0	0	0	
07.02.00.00.001.00.00	0	0	4	0	0	0	0		0	0	3	0	0	0	0	
18.04.00.00.000.00.00	19	0	0	0	0	0	0		65	0	0	0	0	0	0	
18.05.00.00.000.00.00	0	0	0	0	0	0	0		3	0	0	0	0	0	0	
Total	23	8	15	14	2	0	3	65	73	5	6	2	7	0	4	97
Percent	35%	12%	23%	22%	3%	0%	5%	100%	75%	5%	6%	2%	7%	0%	4%	100%



Functional Feeding Group Analysis

Project Mt. Snow

Station MS-5

Stream Iron Stream

Location 0

Sample Date 09/27/2019

FFG Summary:							
	Model			Kicknet 1 vs. SHG		Kicknet 2 vs. SHG	
	SHG	MHG	WWMG	KN-1	PPCS	KN-2	PPCS
Col. Gath.	31%	32%	22%	35.4%	87.6%	75.3%	41.2%
Col. Filt.	18%	30%	36%	12.3%	68.4%	5.2%	28.6%
Predator	19%	13%	7%	23.1%	82.3%	6.2%	32.6%
Shred-Det.	15%	4%	2%	21.5%	69.6%	2.1%	13.7%
Shred- Herb.	1%	1%	5%	3.08%	32.5%	7.22%	13.9%
Scraper	12%	13%	22%	0.00%	0.00%	0.00%	0.0%
				PPCS-FG =	56.7%	PPCS-FG =	21.7%

CG = Collector/Gatherer

CF = Collector/Filterer

PRD = Predator

SRD = Shredder - Detritus

SHR = Shredder - Herbivore

SCR = Scraper



Percent Model Affinity of Orders (PMA-O) Calculations

Project Mt. Snow

Station MS-5

Stream Iron Stream

VT Site ID 0

Sample Date 09/27/2019

Class Small, High Gradient, B2

Sampler CCS

Order	Model			Kicknet 1 vs. Model (SHG)		Kicknet 2 vs. Model (SHG)	
	SHG	MHG	WWMG	%	difference	%	difference
Coleoptera	8%	6%	13%	4.62%	3.38	4.12%	3.88
Diptera	19%	18%	13%	30.8%	11.77	8.2%	10.753
Ephemeroptera	23%	34%	32%	0.0%	23.0	0.00%	23.0
Plecoptera	21%	8%	8%	10.8%	10.2	1.0%	20.0
Trichoptera	28%	33%	33%	16.9%	11.1	13.4%	14.6
Oligochaeta	0.5%	0.5%	1.0%	29.23%	28.73	70.10%	69.60
Other	0.5%	0.5%	1.0%	7.69%	7.192	3.09%	2.593
				Sum diff	95.4		144.4
				Sum diff * 0.5	47.7		72.2
				100-(sum diff * 0.5)	52.3		27.8
				% model affinity	52.3%		27.8%



EPT / EPT+C Calculations

Project Mt. Snow

Station MS-5

Stream Iron Stream

Location 0

Sample Date 09/27/2019

Class Small, High Gradient, B2

Sampler CCS

	KN-1	KN-2
#EPT organisms	18	14
#C organisms	6	6
EPT/EPT+C	0.75	0.70



Biometric Summary

Project Mt. Snow

Station MS-5

Stream Iron Stream

Location 0

Sample Date 09/27/2019

Class Small, High Gradient, B2

Sampler CCS

Replicate # Sampling Method	1 KN	2 KN	Average KN
Biometrics:			
Density/Unit	65	97	81
Species Richness	20.0	15.0	17.5
EPT Richness	7.0	5.0	6.0
Old Bio Index (0 to 5)	1.84	1.68	1.76
New Bio Index (0 to 10)	3.53	3.24	3.39
% dominant taxa	29.2%	67.0%	48.1%
EPT/EPT+C	0.750	0.700	0.725
EPT/Richness	0.350	0.333	0.343
% Model Affinity (orders)	52.3%	27.8%	40.1%
PPCS - functional groups	56.7%	21.7%	39.2%
Major Groups:			
Coleoptera (%)	4.62%	4.12%	4.37%
Diptera (%)	30.8%	8.2%	19.5%
Ephemeroptera (%)	0.0%	0.00%	0.00%
Trichoptera (%)	16.9%	13.4%	15.2%
Plecoptera (%)	10.8%	1.0%	5.9%
Oligochaeta (%)	29.23%	70.10%	49.67%
Bivalvia (%)	0.00%	0.00%	0.00%
Megaloptera (%)	6.15%	3.09%	4.62%
Odonata (%)	1.54%	0.00%	0.77%
Other (%)	0.00%	0.00%	0.00%
Total (%)	100%	100%	100%
Feeding Groups:			
Collector Gatherer (%)	35.4%	75.3%	55.3%
Collector Filterer (%)	12.3%	5.15%	8.7%
Predator (%)	23.1%	6.2%	14.6%
Shredder - Detritus (%)	21.5%	2.1%	11.8%
Shredder - Herbivore (%)	3.08%	7.22%	5.15%
Scraper (%)	0.00%	0.00%	0.00%
No FG Designation (%)	4.62%	4.12%	4.37%
Total (%)	100%	100%	100%



Project Mt. Snow
Station MS-5
Stream Iron Stream
Location 0
Sample Date 09/27/2019

Latitude 42.9566688537598
Longitude -72.8891677856445
Class Small, High Gradient, B2
Sampler CCS

APPLICATION OF STATE OF VERMONT DEC BIOCRITERIA (1/15/2017)

Metric	Value	Metric Scoring Results					
		Based on DEC Thresholds for SHG Streams					
		Class B2		Class B1		Class A	
		Threshold	Outcome	Threshold	Outcome	Threshold	Outcome
Density	81.0	≥300	Fail	≥400	Fail	≥500	Fail
Richness	17.5	≥27	Fail	≥31	Fail	≥35	Fail
EPT	6.0	≥16	Fail	≥19	Fail	≥21	Fail
% PMA-O	40.1%	≥45%	I	≥55%	Fail	≥65%	Fail
BI (New 1-10)	3.39	≤4.50	Pass	≤3.50	Pass	≤3.00	Fail
% Oligo	49.67%	≤12%	Fail	≤5	Fail	≤2	Fail
EPT/EPT+C	0.725	≥0.45	Pass	≥0.55	Pass	≥0.65	Pass
% PPCS-FG	39.2%	≥ 40%	I	≥ 45%	Fail	≥ 50%	Fail
Outcome:		Biocriteria are not met					
The following metrics do not meet Class B2 thresholds:		Density (Fail), Richness (Fail), EPT (Fail), % PMA (I), % Oligo (Fail), % PPCS (I)					

Individual Metric Outcome Guidelines (using the table below)

- 1) A metric is scored "Pass" when the result meets the threshold requirements
- 2) A metric is scored "I" when the result is between the threshold level and the non-support level
- 3) A metric is scored "Fail" when the result is below the non-support requirements

Overall Outcome Guidelines

- 1) Biocriteria are "met" when all metrics are scored "Pass" and no metrics have a score of "I" or "Fail"
- 2) Biocriteria are "not met" when one or more metrics are scored "Fail"
- 3) In situations where neither items 1 or 2 are the result, an "Indeterminate" finding will be made

Scoring Guidelines - Wadeable Stream Category SHG

WQ Class	Score	Density	Richness	EPT	PMA-O	BI	% Oligo	EPT/EPT+C	PPCS-F
A1	Threshold	≥500	≥35	≥21	≥65%	≤3	≤2%	≥0.65	≥50%
	Non-Support	<450	<34	<20	<60%	>3.30	>3%	<0.63	<45%
B1	Threshold	≥400	≥31	≥19	≥55%	≤3.5	≤5%	≥0.55	≥45%
	Non-Support	<350	<30	<18	<50%	>3.65	>6.5%	<0.53	<40%
B2	Threshold	≥300	≥27	≥16	≥45%	≤4.5	≤12%	≥0.45	≥40%
	Non-Support	<250	<26	<15	<40%	>4.65	>14.5%	<0.43	<35%

LOTIC BENTHOS FIELD SHEET

(2016 edition)

Bug Lab ID _____

Chem ID _____ Time _____

DUP Chem ID _____ Time _____

25

Site Name Mt Snow Iron Stream River Mile _____ USFS _____ PROB _____

Site ID MS5

Date 9.27.19 Time 1300 Crew CCS, TB

Site Description _____

Town: _____ Stream Order: _____ Drainage Area: _____ Km² Elevation: _____ ft

D.D° Latitude: _____ Longitude: _____ Lat/Long source (GPS – set to NAD83:) _____

Weather: Sunny Flow/Weather Previous (2 weeks/2days): Fairly quiet 2 wk, light rain yesterday

Surrounding Land Use: Resort & forest

SAMPLING INFORMATION

Sampler: CS Gear: KN

Effort Time: _____ min Mesh: _____ um

Area: _____ m² Quantitative: Y / N

#Reps: 2 Comp/rep: 4

Heavy Fe-P

Qual. PERIPHYTON COVER for each type 0-100% (See back for Periphyton Cover Form)

Diatom _____ % Filamentous Green _____ % and length _____ in

Blue Green IR % Moss _____ % Green _____ % Other _____ %

General Trophic Rating: 1 (0=oligo, 5=Eutroph)

HABITAT OBSERVATIONS

Embeddedness (5) 0-5% Excel (4) 5-25% V Good (3) 25-50% Good (2) 50-75% Fair (1) > 75% Poor Estimate 52

Silt Rating: NA (0=none, 5=chocolate) (IRON DOMINANT) CPOM Rating (leaf packs): 2-3 (0=none, 5=high)

Lg Woody Debris (>4" dia) #: 4 /100m (reach)

Habitat Comments

GENERAL WATER TYPE Riffle, Winder, or Other _____ Channelized: Y N Upstream Dam: Y (N) mi

B.F.Width: 10' (m) Wetted Width: 6' (m) Riffle Depth: 2" (in) Pool Depth: 1' (in) and Obs: _____

Bank Stability: EX VG G (F) P Velocity estimate (circle): (S) <0.4 ft/sec, (M) 0.4-2 ft/sec, (F) >2 ft/sec Measured: _____ ft/sec

Fish: Bottom Type: Hard – Soft – Mixed

Cover Rating: Exc – Very Good – Good – Fair – Poor

Riparian VEGETATION (both sides, does not need to add up to 100%) Riparian Width (facing upstream) 1200 m, R 7100 m

Overstory: Softwood 40 % Hardwood 40 % Understory: Shrub (brush) 20 Grass 10 % Herbaceous 30 %

Canopy %: 100 90 80 (70) 60 50 40 30 20 10 0 Overhead: Open Partly Open or Closed

Leaves falling ~ 50%

WQ Section Sampler: _____ Baseflow or Freshet Flow Present Flow: H - M - (L)

Meter (type, #) 1- _____ 2- _____ 3- _____ Color _____ Color DUP: _____

Annotate? Y / N

Temp Air 60 °C/F Temp Water 13.3 °C fpH _____ lab pH _____ fCond _____ D.O.% _____ D.Omg/l _____

Circle: Cond pH Alk TP DP Cl ICAnions Turb TN NO2-3 Ca Mg Na K Hardness Metals, TNH3, TSS Other _____

WQ Notes/Comments

SITE SKETCH & GENERAL OBSERVATIONS (circle those that apply)

A – Pollution: Sludge | Sawdust | Paper Fiber | Sand | Silt | Sewage | Oily Sheen | Trash Iron | Scum | None

B – Water Clarity: Clear | Slightly Turbid | Moderately Turbid | Very Turbid | Secci Tube _____ mm

C – Water Color: Clear | Green Milky | Brown (Tannic) L M H | Gray | Metallic | Reddish

D – Odors: None | Musty | Fishy | Sewage | Manure | Sulfur(eggs) | Oily/gas

Aquatic Biota Observed:

Heavy Fe P

Overall Aesthetic Rating 0 (poor) – 5 (exc.) 1

HEAVY IRON P FOR ENTIRE WETTED AREA

Field Sheet Complete: TB (initial)

Photos (Y) N

Fish Survey Conducted: Y / (N)

Pebble Count Field Form
Complete % observed substrate if no pebble ct done

Periphyton Cover Observations Date

Particle	Millimeters	Inches	% Observed	Transect 1 (100 pebbles)	Tot #	Item %
organic						
Fines	0.062-2	0.002-0.08"				
very fine gravel	2-4	0.08-0.15"				
small gravel	4-8	0.15-0.3"				
medium gravel	8-16	0.3-0.6"				
coarse gravel	16-32	0.6-1.25"				
very coarse gravel	32-64	1.25-2.5"				
small and medium cobble	64-128	2.5-5"				
large cobble	128-256	5-10"				
small boulder	265-512	10-20"				
medium boulder	512-1024	20-40"				
large boulder	1024-2048	40-80"				
very large boulder	>2048	>80"				
bedrock						
TOTALS						

Moss Cover Index			
Category	0	1(<5%)	2(5-25%)
Tally	 		

Macro-Algae Cover Index			
Category	0	1(<5%)	2(5-25%)
Tally	 		

Micro-Algae Cover Index						
Category	0	1 (slimy)	2 (draw line)	3(5-1mm)	4(1-5mm)	5(5-20mm)
Tally						

Other Macro or Micro <u>IRON P</u> Cover Index					
Category	0	1	2	3	4
Tally					

Substrate Comments: